308 --- Q200312080001

Scientific Notebooks No. 104: Thermal-Hydrology Project (02/18/1994 through 01/17/1997)

G. A.

21
300

R

GEORGE RICE

Contents

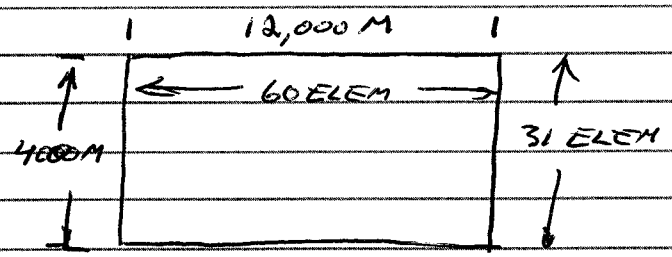
Page

GR = GEORGE RICE

2/18/94
MC

SIMULATING SATURATED-POROUS FLOW IN GRANITE WITH VTOUGH. PURPOSE - COMPARE RESULTS WITH RESULTS PRODUCED BY ~~PORFLOW~~ PORFLO (sp³).

MODEL DIMENSIONS:



GRID = 60 X 31, 60 ~~X~~ DR ELEMENTS IN HORIZONTAL DIRECTION, EACH 200 M WIDE, 31 ELEMENTS IN VERTICAL DIRECTION - VARIABLE THICKNESS, INCLUDING 2,10 M BOUNDARY LAYERS ON TOP + BOTTOM OF GRID.

SIMULATED REPOSITORY IS 2000 M LONG X 20 M THICK. TOP OF REPOSITORY AT DEPTH OF ~~1000~~ 990 M (NEGLECTING 10M BOUNDARY LAYER). REPOSITORY CENTERED HORIZONTALLY IN GRID (5000 M - 7000 M).

NAME OF INPUT FILE = GRAN01, FILE ON: /USER2/GOLIATH/rgreen/grice

SEE FIGURE ON NEXT PAGE

2/18/94
AR

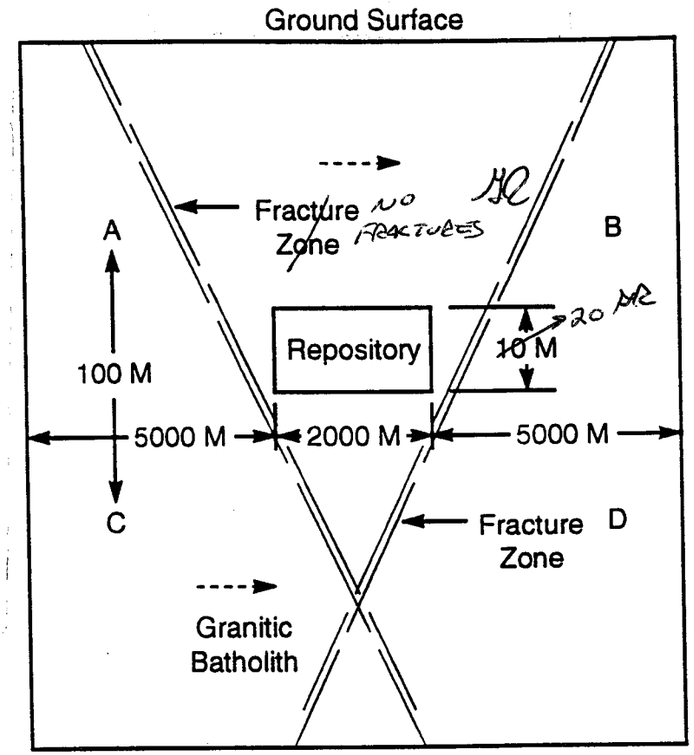
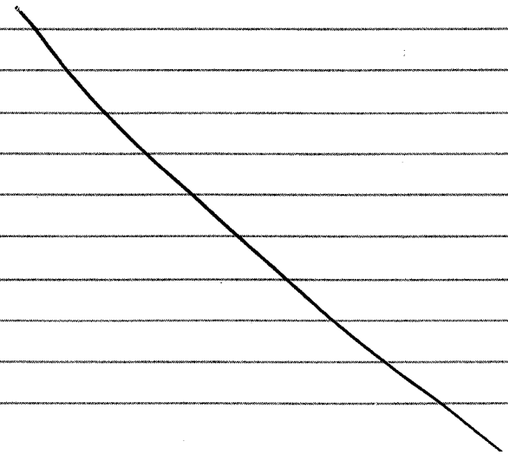


Figure 3-2. Granite conceptual model

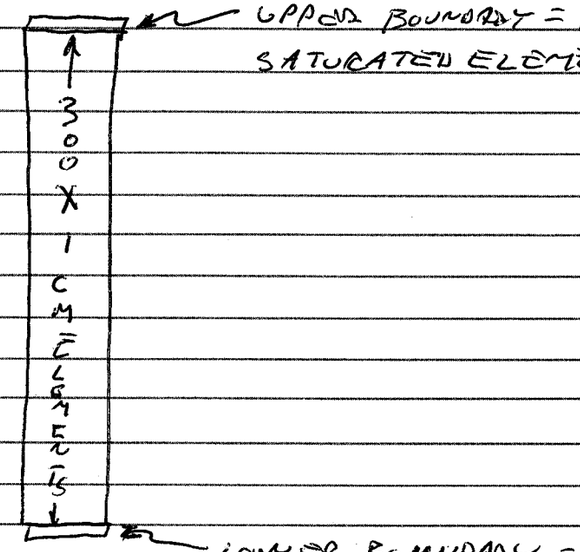


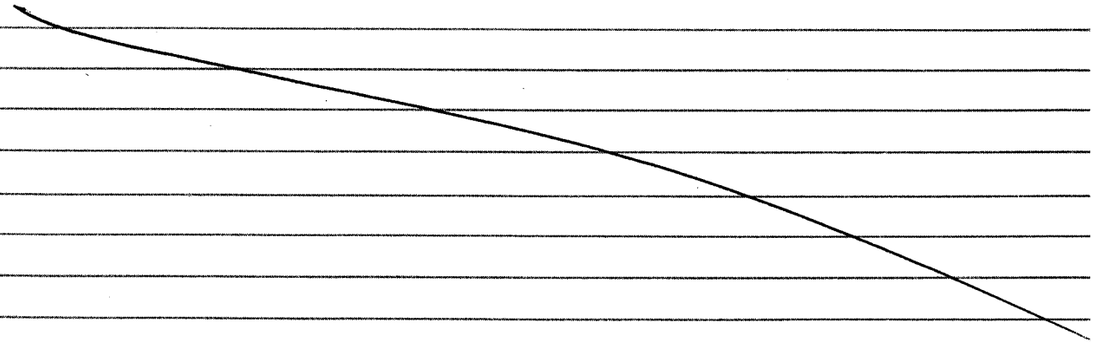
2/21/94
AR

VTOUGH - 1-D FLOW PROBLEM - PURPOSE: COMPARE WITH ABAQUS RUNS & ANALYTICAL SOLUTION. TWO PROBLEMS: 1.2 & 1.1. WORKING ON PROBLEM 1.2 FIRST.

INPUT FILE = 1d01i IN:
/USER2/GOLIATH/rgreen/grice

302 ELEMENTS:





2/23/94 AR

UTOUGH 1-D FLOW PROBLEM - REQUIRES PRESSURE = -2.5 M AT BOTTOM OF COLUMN. RUN RETC TO ESTIMATE WATER CONTENT AT THIS PRESSURE, FROM PROBLEM STATEMENT, VAN GENUCHTEN PARAMETERS:

θ_r = RESIDUAL WATER CONTENT = 0.055

θ_s = SATURATED WATER CONTENT = 0.288

α = 7.3/M (ALPHA)

n = 2.0304 (N)

$m = 1 - 1/n = 0.507$ (M)

RETC REQUIRES NORMALIZED VALUES OF $\theta_r + \theta_s$:

$\theta_r(N) = \frac{0.055}{0.288} = 0.19$ (WCR)

$\theta_s(N) = \frac{0.288}{0.288} = 1.00$ (WCS)

EXPO = 0.5 - ASSUMED VALUE FROM RETC MANUAL, PAGE 13, LAST PARAGRAPH, = 1. (EXPO)

(CONDS) = SATURATED HYDRAULIC CONDUCTIVITY IS NORMALIZED TO 1.00.

USING OPTION #3: RETENTION/CONDUCTIVITY MODEL:

RETENTION = VAN GENUCHTEN WITH $m = 1 - 1/n$

CONDUCTIVITY = MAULEM

NO FITTING - FORWARD PROBLEM.

2/23/94 AR

-2.5 M PRESSURE HEAD:

10.31 M WATER/ATM

$\frac{10.31\text{ M} - 2.5\text{ M}}{10.31\text{ M}} = 0.758\text{ ATM} \Rightarrow 7.65 \times 10^4\text{ Pa}$

FROM RETC: 0.757 ATM

NOTE - DISCOVERD THAT RETC RUNS ARE UNNECESSARY BECAUSE THE SATURATION SPECIFIED IN THE PROBLEM IS NORMALIZED AND REPRESENTS SATURATION THROUGHOUT THE COLUMN AT TIME = 0.

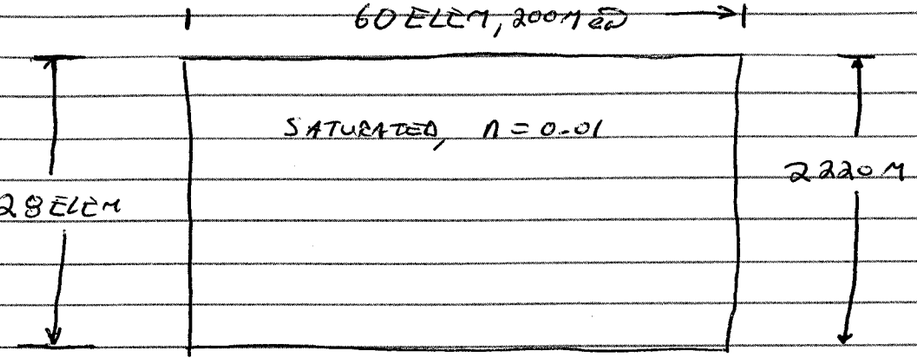
ALSO, THE PRESSURE IN RETC OUTPUT IS GIVEN AS METERS OF SUCTION.

→ THUS, THE INITIAL WATER CONTENT FOR PROBLEM 1-2 = 0.3 (0.288) = 0.0864.

RUNNING PROBLEM WITH INPUT FILE = 1d01i /USER2/GOLIATH/BGREEN/GRICE

2/23/94 DR

- CHANGED GRANITE PROBLEM:



EVERYTHING ELSE THE SAME JUST "CHOPPED-OFF" BOTTOM 3 LAYERS, 1800M

OUTPUT WITH HEATSOURCE + G-WHITMEYER'S TIMES:

ABS-RICE.OUT, LEVELS = 49, 3.65×10^3 DAYS
69, 1.461×10^4 "
82, 3.2873×10^4 "
101, 6.94×10^4 "
138, 1.79×10^5 DAYS
170, 3.62×10^5 "
172, 3.65×10^5 "

TECPLOT STYLE SHEET FOR THIS PROBLEM = gran-hs.sty (HEAT SATURATED)

BUILDING GRANΦ4 WITH RZGRID-NEWX: OPTIONS:
1,0,1,0,1,3,1,1,26,1,0, 0.000001, 0.000001, 10, 65,
0.000001, 0.000001, 2220, 0.01, 1, - INPUT CANCELLED

2/23/94 DR

- PRESSURE STAYS SAME, T + SAT SWITCH
BUILD GRANΦ4; W/ RZGRID-NEWX AGAIN:
1,0,1,0,1,3,1,1,26,1,0,0,0, ~~201~~ 101000, 21600000,
10, 65, 2220, 0.01, 0, 0

PRESSURE @ 2220 M:

$$\frac{1000\ Kg}{M^3} \cdot \frac{9.8\ M}{S^2} \cdot 2220\ M = 2.16 \times 10^7 \frac{N}{M^2}, \quad P_a = \frac{N}{M^2}$$

ρ_{H_2O} @ 40°C = 992.24 Kg/M³

g = 9.80665 M/S²

PRESSURE @ 2220 M:

$$\frac{992.24\ Kg}{M^3} \cdot \frac{9.80665\ M}{S^2} \cdot 2220\ M = 2.16 \times 10^7 \frac{N}{M^2}$$

PRESSURE @ 0M = 100,000 Pa

1,0,1,0,1,3,1,1,26,1,0,0,0,100000, 21600000,
10, 65, 2220, 0.01, 0, 0

THIS ↗ RZGRID-NEWX WAS USED TO BUILD GRANΦ4 IN:
/USER2/GOLIATH/RGREEN/GRICE/GRANITE

2/25/94
AR

- VTOUGH INPUT FILE GRANϕ4i DOES NOT RUN. THIS FILE CREATED AFTER GRANϕ3i (WHICH RAN - DESCRIBED ON pg 6) WAS ACCIDENTLY DESTROYED. SEARCHING GRANϕ4i FOR PROBLEMS.

CHANGES:

- IN CARD PARAM 2, 2nd VALUE OUT OF PLACE - MOVED IT OVER.

- IN CARD PARAM 2.1, ADDED AN INITIAL TIME STEP LENGTH OF 1.0E-1.

- IN CARD TIMES I CHANGED ITE FROM 8 TO 7 SO ITE NOW = ITI.

- DELETED TIMESTEP LINE IN PARAM — TOUGH2

- PUT IN STARTING & MAX TIME STEP IN PARAM, 1.e1 & 1.e8

- REVISING GRID FOR GRANITE PROBLEM TO ELIMINATE ELEMENTS SMALLER (LESS) THAN 20 M THICK - WILL CALL IT GRANϕ5i

- Regrid-newx FOR granϕ5i:

NOTE ACCESSED FROM --- GOLIATH/1green/GRIDS/gMESH
SEE EX-CALC ON pg 7

1,0,1,0,1,3,1,1,23,1,0,0,0,100000,24423680,
10,72.75,2510,0.01,0,0

2/15/94
AR

ZONE.DAT
VERTICAL GRID FOR granϕ5i:

DEPTH (m)	ELEM #	Bottom of ELEM #	
10	1	1	UPPER BOUNDARY LAYER
30	2	2	
70	3	3	
150	4	4	
250	5	5	
350	6	6	
450	7	7	
550	8	8	
650	9	9	
750	10	10	
850	11	11	
900	12	12	
950	13	13	
980	14	14	
1000	15	15	
1020	REPOSITORY 1000-1020m	16	
1040		17	
1070		18	
1120		19	
1200		20	
1300		21	
1500		22	
1900		23	
2500		24	
2510		25	LOWER BOUNDARY LAYER

2/25/94 JR

ONE-DIMENSIONAL INFILTRATION PROBLEM (SEE Pg 3). FILE IS ON SNEEZY IN /AS4D. 1ST FILE = run2i. (FROM PETER L.)

VALUES FOR BLOCK RPCAP:

2ND ~~MR~~ LINE: ~~MR~~ AR

ICP ~~IRP~~ = ~~7~~ 11, RP(1) = $\lambda = m = 1 - \frac{1}{n} = 1 - \frac{1}{2.0304} = 0.5075$

~~MR~~ RP(2) = S_{lr} = RESIDUAL SATURATION (NORMALIZED) = Θ_r ON PROBLEM STATEMENT = 0.055.

AR RP(3) = $\alpha = \beta$ ON PROBLEM STATEMENT = 2.9227/M

RP(4) = UNUSED

RP(5) = S_{ls} (NORMALIZED PER PETER L's INPUT IN run2i = 1.0

RP(6) = 0 - PER run2i

1ST LINE:

IRP = 7,

FILE run3i CREATED USING run2i.

BLOCK RPCAP WILL BE MODIFIED AS FOLLOWS:

1ST LINE:

IRP = 7

RP(1) = λ = ~~β ON PROBLEM STATEMENT SHEET~~ = 2.9227/M → SEE CP(1) ON NEXT PAGE

*RP(2) = S_{lr} = NORMALIZED RESIDUAL LIQUID SATURATION = Θ_r ON PROBLEM STATEMENT SHEET = ~~0.055~~ /MR

SEE NEXT PAGE

2/25/94 JR

RP(3) = S_{ls} = NORMALIZED LIQUID SATURATION (PER run2i) = 1.0

2ND LINE

ICP = 11 (FROM V-TOUGH DOCUMENTATION)

CP(1) = $\lambda = m = 1 - \frac{1}{n}$, n = 2.0304 ON PROBLEM STATEMENT SHEET, λ = 0.5075

*CP(2) = S_{lr} = ~~ER 0.055~~ MR

CP(3) = $\alpha = \beta$ ON PROBLEM STATEMENT SHEET = 2.9227/M

CP(4) = UNUSED

CP(5) = S_{ls} = 1.0

CP(6) = 0.0, PER PETER L's run2i.

*NOTE - SPOKE WITH GOOD LUCK, Θ_r HAS NOT BEEN NORMALIZED AS GIVEN IN PROBLEM STATEMENT SHEET.

S_{lr} = 0.055/0.3 = 0.183

→ THIS CHANGE MADE IN run4i. PATH = /SNEEZY/AS4D/run4i.

ALSO CHANGE INITIAL AIR SATURATION IN PARAM 4 FROM 0.9136 (USED UN-NORMALIZED WATER CONTENT) TO 0.726.

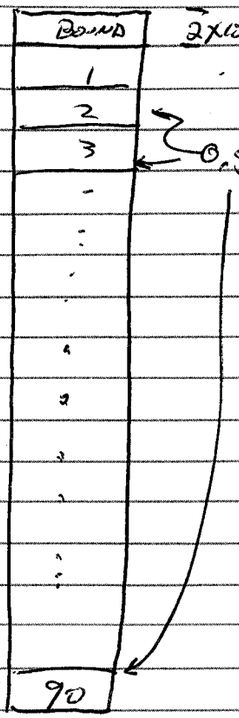
AREA OF INTERFACE = (0.03M)(0.05M) = $1.5 \times 10^{-3} M^2$

VOLUME OF ELEMENT = $1.5 \times 10^{-3} M^2 (0.5) = 7.5 \times 10^{-4}$

2/25/94 NE

FOR RUN2i, RUN3i, RUN4i:

90 ELEMENTS:



FOR RUN5i:

- IN CONNE: CHANGED AREA + COSINE OF GRAVITY FROM 1.0 + 0.0 TO 1.5×10^{-3} + 1.0, RESPECTIVELY

- IN CONNE, MADE THICKNESS OF EACH ELEMENT = 0.1 M — STRANGE RESULTS, WETTING FRONT PENETRATED ONLY ≃ 0.2 M IN 10^7 s, VS ≃ 8 M (6 M) FOR ~~ALL~~ RUN 4i WHERE ELEMENTS

2/25/94 NE

ARE 0.5 M THICK!

— RUN6i, CHANGE ELEMENT THICKNESS TO 0.2 M.

FOR RUN6i, WETTING FRONT ONLY PENETRATED 2 ELEMENTS (0.4 M) IN ≃ 116 DAYS (10^7 s).

— RUN7i, CHANGE ELEMENT THICKNESS TO 0.3 M.

PENETRATION OF WETTING FRONT = 2 ELEMENTS = 0.6 M.

— RUN8i, CHANGE ELEMENT THICKNESS TO 0.4 M

PENETRATION OF WETTING FRONT = 2 ELEMENTS = 0.8 M.

— RUN9i, CHANGE ELEMENT THICKNESS TO 0.5 M — THIS SHOULD BE IDENTICAL TO RUN4i.

BUT, IT IS NOT, WETTING FRONT ONLY PENETRATED 2 ELEMENTS IN 10^7 s!

NOTE, ALL RUNS THAT ONLY PENETRATED 2 ELEMENTS HAD INTERFACE AREA, COSINE OF GRAVITY ANGLE SET AS GIVEN HERE.

TO

2/25/94 MODIFY RUN4i AND

FOR RUN55i, WILL CHANGE INTERFACE AREA TO 1.5×10^{-3} M^2 BUT LEAVE GRAVITY = 0.

- WETTING FRONT ONLY PENETRATED 2 ELEMENTS (1M) IN 10^7s.

FOR RUN66i, WILL MODIFY RUN4i SO AREA = 1.0 (UNCHANGED) AND GRAVITY COSINE = 1.0

WETTING FRONT PENETRATED 13 ELEMENTS, SAME AS RUN4i.

2/28/94 RUN GRANϕ5i - OUTPUT STATES PARAMETERS CANNOT BE FOUND AT ELEMENT BD6 - RUN ABORTED.

- REDUCED TIMESTEP SIZE IN CARD PARAM 2 FROM 1.e1 TO 1.eϕ.

→ CHANGE DOES NOT APPEAR TO AFFECT RESULTS - SAME ERROR MESSAGE GIVEN, CANNOT FIND PARAMETERS IN ELEMENT BD 6.

CREATED INPUT FILE 'GRANϕ6i' WHICH IS IDENTICAL TO 'GRANϕ5i' EXCEPT GENER BLOCK HAS BEEN REMOVED. - RUN ABORTED - SAME ERROR MESSAGE GIVEN.

2/28/94 CONSTRUCTING NEW GRANITE INPUT FILE USING RZGRID-NEWX - WILL CALL IT 'GRANϕ6i' - WILL BE A TWO-PHASE PROBLEM WITH AIR SATURATION $\simeq 10^{-6}$ - ESSENTIALLY A SATURATED PROBLEM. - THIS MAY GET AROUND PROBLEM THAT'S CAUSING RUNS TO ABORT.

RZGRID-NEWX FOR 'GRANϕ6i'

1,0,1,0,1,3,1,1,23,1,0,10,72.75,100000,24423680,
0.000001, 0.000001, 2510, 0.01, 0,0

GRANϕ6i RESULTS IN SAME ERROR MESSAGE. TEMP(72.5) OR PRESSURE (24.3 MPa) OUT OF RANGE.

SEE PAGE 30

WILL CREATE A NEW 'GRANϕ6i' WITH RZ GRID-NEWX BUT WILL LIMIT DEPTH TO $\simeq$ 2200 M.

→ $\simeq$ 2210 M. - SAME # OF ELEMENTS.

WATER PRESSURE @ 2210 M:

$$992.24 \frac{Kg}{M^3} \; 9.80665 \frac{M}{S^2} \; 2210 M = 2.15 \times 10^7 Pa$$

NEW RZ GRID FOR 'GRANϕ6i' - THIS TIME WILL NOT INTRODUCE ANY GAS.

~~1,0,1,0,1,3,1,1,23,1,0,100000~~ OR 0,0,10,62.5,

WRONG → 1,0,1,0,1,3,1,1,23,1,0,100000, 21500000, 0, 0,
10, 62.5, 2210, 0.01, 0, 0,

→ RESULTS IN PRESSURE @ SURFACE (AND EVERYWHERE ELSE) OF 0.0 Pa. IN FOLLOWING RZ GRID-NEWX

2/28/94 MR

INPUT I'LL SWITCH TEMP INPUT & GAS SATURATION INPUT.

1,0,1,0,1,3,1,1,23,1,0,0,0,100000,21500000,10,
62.5,2210,0.01,0,0

IT RUNS: GRAφ6i.

1-d PROBLEM 1.2 IS RUNNING

- 'run4i' - WETTING FRONT PENETRATES 13 ELEMENTS = 6.5M IN 116 DAYS (10^7s)
- 'run66i' IDENTICAL TO 'run4i' EXCEPT COSINE OF GRAVITY ANGLE = 1.0 INSTEAD OF 0.0. CHANGE DOES NOT APPEAR TO AFFECT OUTPUT MUCH.
- 'runφ1i' IDENTICAL TO 'run66i' EXCEPT ELEMENT THICKNESS = 0.1 M - WETTING FRONT PENETRATES 25 ELEMENTS 2.5 (M) IN 10^7s.
- 'runφ2i' IDENTICAL TO 'runφ1i' EXCEPT ELEMENT VOLUMES CHANGED TO REFLECT THICKNESS OF 0.1 M, WETTING FRONT PENETRATES 52 ELEMENTS (5.2 M) IN 10^7S.
- 'runφ3i' IDENTICAL TO 'runφ1i' EXCEPT THICKNESS OF EACH ELEMENT = 0.2 M + VOL = $3.0\times10^{-4}M^3$. WETTING FRONT PENETRATED 27 ELEMENTS (5.4 M) AFTER 10^7S

2/28/94 MR

'runφ4i' IDENTICAL TO RUN 'runφ1i' EXCEPT THICKNESS OF EACH ELEMENT = 0.3M + VOLUME CHANGED. WETTING FRONT PENETRATED 19 ELEMENTS = 5.7M IN 10^7S

runφ5i IDENTICAL TO runφ1i EXCEPT THICKNESS OF EACH ELEMENT = 0.4M + VOLUME OF EACH = $0.4(0.3)0.05\,m^3 = 6\times10^{-4}m^3$. WETTING FRONT PENETRATES 15 ELEMENTS (6 M) IN 10^7s

runφ6i IDENTICAL TO RUNφ1i EXCEPT THICKNESS OF EACH ELEMENT = 0.5M + VOLUME = $7.5\times10^{-4}m^3$. WETTING FRONT PENETRATES 13 ELEMENTS (6.5 M) IN 10^7s.

runφ7i IDENTICAL TO Runφ1i EXCEPT THICKNESS = 1.0M + VOLUME = $1.5\times10^{-3}m^3$. WETTING FRONT PENETRATES 8 ELEMENTS (8 M) IN 10^7s.

runφ8i IDENTICAL TO Runφ1i EXCEPT THICKNESS = 2.0M + VOLUME = $3.0\times10^{-3}M^3$ WETTING FRONT PENETRATES 5 ELEMENTS (10 M) IN 10^7s.

Runφ9i IDENTICAL TO Runφ1i EXCEPT THICKNESS = 4.0M + VOL. = $6.0\times10^{-3}M^3$. WETTING FRONT PENETRATES 3 ELEMENTS (12 M) IN 10^7S

3/1/94 GRANϕ6i RUNNING VERY SLOWLY, ≃ 900 DAYS IN 24 HRS. KILLED RUN

3/2/94 CREATED GRANϕ7i - IDENTICAL TO GRANϕ6i BUT ADDED HEAT SOURCE.

HAVING SAME PROBLEMS W/ GRANϕ7i AS W/ GRANϕ6i. IN OUTPUT - TEMPERATURES & PRESSURES ARE REPORTED INCORRECTLY. PRESSURE IN UPPERMOST ELEMENT (N-1) INCREASING WITH TIME. TEMPERATURE IS NOT INCREASING WITH DEPTH AS IT OUGHT TO.

RUNϕ8i - SAME AS RUNϕ7i EXCEPT:

- RUN AS 2-PHASE PROBLEM, AIR REACTION = 0.000001.
- IN CARD PARM 4: CHANGE AIR FRACTION AND TEMP FROM 0.56 & 20.0 TO 0.000001 & 10.0, RESPECTIVELY.

KILLED RUNϕ7i

TZGRID-NEWX FOR RUNϕ8i:

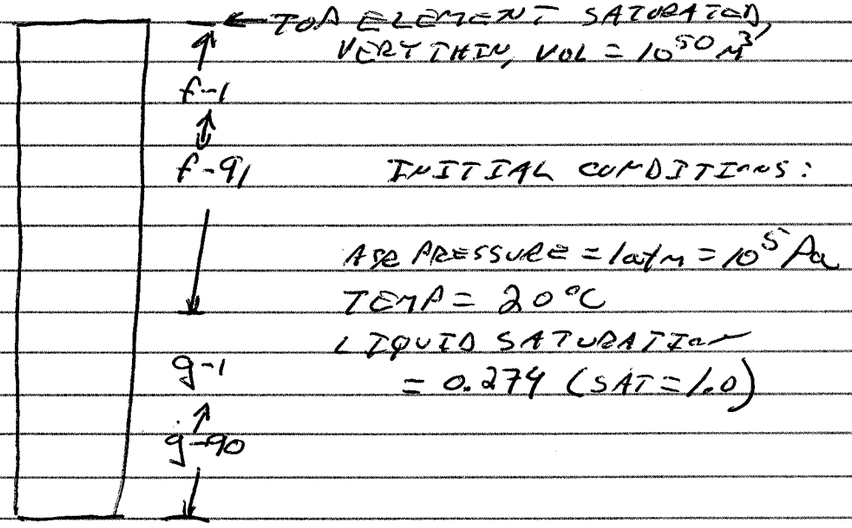
1,0,1,0,1,1,3,1,1,23,1,0,10,62.5,100000, ~~21,500000~~ 2,504520,

0.000001,0.000001,2810,0.01,0,0,

3/7/94 1-D PROBLEM: PROBLEM 1.2

THESE FILES ARE ON SNEEZY\ASAD

- RUN1ϕi IDENTICAL TO ~~RUNϕ2i~~ RUNϕ1i EXCEPT THICKNESS OF EACH ELEMENT, $\Delta z = 0.05$ M AND VOLUME = 7.5×10^{-4} M^3. WETTING FRONT ADVANCED BEYOND END OF COLUMN = 91 X 0.05 M = 4.55 M IN 10^7 s
- RUN11i: IDENTICAL TO RUN~~ϕ1~~10MRi EXCEPT COLUMN CONSISTS OF 181 ELEMENTS.



RUN11i - WETTING FRONT PENETRATED 97 ELEMENTS = 4.85 M.

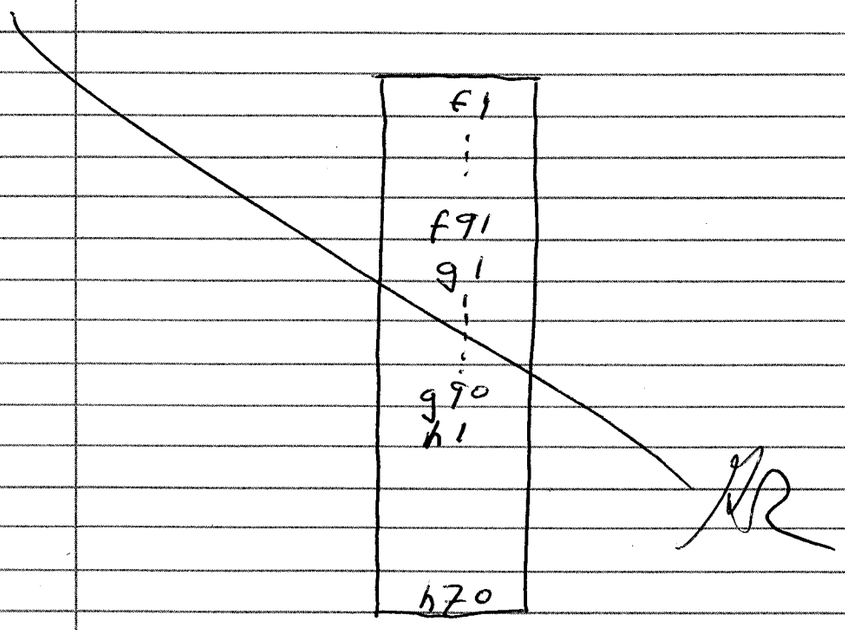
- RUN12i IDENTICAL TO RUN 11i EXCEPT ELEMENT THICKNESS = 0.04 M, VOLUME = 6×10^{-5} M^3. WETTING FRONT PENETRATED 122 ELEMENTS = 4.88 M. IN 8 s

3/7/94

- RUN 13i IDENTICAL TO RUN 11i EXCEPT ELEMENT THICKNESS = 0.03 M & VOLUME = $4.5 \times 10^{-5} M^3$. WETTING FRONT PENETRATED 159 ELEMENTS = 4.77 M. IN 10^7s

- RUN 14i IDENTICAL TO RUN 11i EXCEPT ELEMENT THICKNESS = 0.02M & VOLUME = $3 \times 10^{-5} M^3$. WETTING FRONT PENETRATED ENTIRE COLUMN.

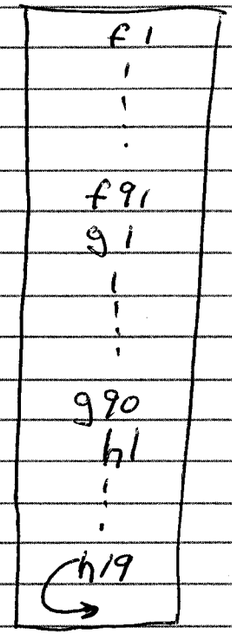
- RUN 15i IDENTICAL TO RUN 14i EXCEPT COLUMN IS 251 ELEMENTS LONG.



NO RUN! CANNOT HAVE MORE THAN 200 ELEMENTS ON THIS VERSION OF PROGRAM. WILL REVISE TO MAKE 200 ELEMENTS.

3/7/94

RUN 15i:



WETTING FRONT PENETRATED ENTIRE COLUMN.

- RUN 16i - IDENTICAL TO RUN 15i EXCEPT ELEMENT THICKNESS = 0.03 M & VOLUME = $4.5 \times 10^{-5} m^3$. WETTING FRONT PENETRATED 159 ELEMENTS = 4.77 M. IN 10^7s

- RUN 17i IDENTICAL TO RUN 15i EXCEPT ELEMENT THICKNESS = 0.026 M & VOLUME = $3.9 \times 10^{-5} m^3$. WETTING FRONT PENETRATED 184 ELEMENTS = 4.79 M. IN 10^7s

3/9/94 JR

1-D PROBLEM 1.2

FOUND ERROR IN INPUT FOR PROBLEM 1.2 - INITIAL AIR SATURATION SHOULD BE 0.712 - NOT 0.726. WILL RE-RUN SOME ~~EXAMPLES~~ RUNS TO SEE EFFECT ON DEPTH OF WETTING FRONT AFTER 10^7 s. (SEE 3/7/94)

- RUN 17i, CHANGED AIR SAT. VALUE. WETTING FRONT PENETRATED 188 ELEMENTS = 4.89 M IN 10^7 s. DIFFERENCE = 0.1 M

- REVISED RUN 16i (CHANGE AIR SAT TO 0.712). WETTING FRONT PENETRATED 164 ELEMENTS = 4.92 M. DIFFERENCE = 0.15

- RUN 18i, IDENTICAL TO RUN 16i EXCEPT ELEMENT THICKNESS = 0.025 M & VOLUME = 3.75×10^{-5} m^3.

ASIDE:
FOR 1-D PROBLEM 1.1 (20-5702-623)

$$K_{SAT} = 6.693 \times 10^{-12} \frac{m}{s} \; 1.02 \frac{\times 10^{-3}\ cm^2}{\frac{m}{s}} \; \frac{m^2}{10^4\ cm^2} = 6.8268 \times 10^{-19}\ m^2$$

K = INTRINSIC PERMEABILITY

~~K_{SAT}~~ FOR 1.1 = $6.8268 \times 10^{-19}\ m^2$

→ PENETRATION OF WETTING FRONT = 187 ELEMENTS = 4.68 M IN 10^7 s.

- REVISED RUN 12i: WETTING FRONT PENETRATED 126 ELEMENTS = 5.04 M, DIFFERENCE = 0.16 M.

3/9/94 JR

ASIDE: FOR PROBLEM 1.1:

-1000 M PRESSURE

$$10^3\ m \; 992.24 \frac{kg}{m^3} \; 9.80665 \frac{m}{s^2} = 9.73 \times 10^6 \frac{N}{m^2} = 9.73 \times 10^6\ Pa$$

- REVISED RUN 11i: WETTING FRONT PENETRATED 102 ELEMENTS = 5.10 M. DIFFERENCE = 0.25 M.

- REVISED RUN φ2i: WETTING FRONT PENETRATED 52 ELEMENTS = 5.2 M. DIFFERENCE = 0.0 M.

- REVISED RUN φ3i: WETTING FRONT PENETRATED 28 ELEMENTS = 5.6 M, DIFFERENCE 0.2 M.

- REVISED RUN φ6i: WETTING FRONT PENETRATED 13 ELEMENTS = 6.5 M. DIFFERENCE = 0.0 M.

BEGIN 1-D PROBLEM 1.1

- RUN 2-φ1i, I USED RUN 15i AS A BASE TO MODIFY.

TO PRINT: PRS T? 860 FILENAME, OR
PS 860 FILENAME

3/9/94

TYPICAL V TOUGH INPUT FILE FOR 1-D PROBLEM 1.2. ON SNEERY: /usr2/rgreen/ASAD/run11i.

```
3/7/94,1d using input from Peter,2/24/94,Asad-1.2,181 elem.
START     1-d infiltration after Philip (1955) - Ross et al. (1982)
START     van Genuchten parameters for capillary pressure and rel. perm.
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*---
MAT01     2200.0    .3        1.658E-12                      1.05      1030.
MAT02     2200.0    .3        1.658E-10                      1.05      10000.

START----1----*----2----*----3----*----4----*----5----*----6----*----7----*---
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*---
 8 29999 600   1000000000000000 4
0.        1.00e7    1.e9      3.e6      f   1
                                                    1.e-7
                1.e5          .712      20.
START----1----*----2----*----3----*----4----*----5----*----6----*----7----*---
RPCAP----1----*----2----*----3----*----4----*----5----*----6----*----7----*---
    7     0.5075    0.183     1.
   11     0.5075    0.183     2.9227              1.
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*---
    7     7      3.e7
4.00e2    4.32e3    8.64e3    1.745e4   3.14e4    3.97e5    1.00e7
ELEME----1----*----2----*----3----*----4----*----5----*----6----*----7----*---
f   1           MAT02     1.e50
f   2    89     1MAT01    7.5e-5
g   1    89     1MAT01    7.5e-5

CONNE----1----*----2----*----3----*----4----*----5----*----6----*----7----*---
f   1f   2                         1    1.e-10  000.025       1.        1.
f   2f   3    88    1    1    1    00.025    00.025        1.        1.
f  91g   1                         1    0.025     0.025       1.        1.
g   1g   2    88    1    1    1    0.025     0.025         1.        1.

INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*---
f   1
                1.e5                    20.

ENDCY----1----*----2----*----3----*----4----*----5----*----6----*----7----*---
```

10 UNCOMPRESS FILES

COMPRESS␣FILENAME
UNCOMPRESS␣FILENAME

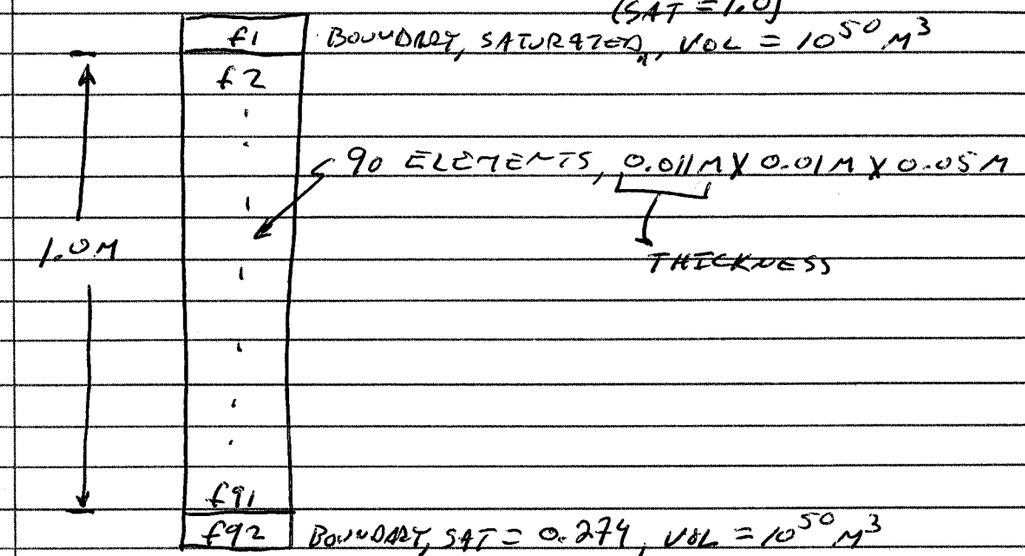
NOTE - DISCOVERED GRAVITY WAS 'TURNED OFF' ON ALL 1-D RUNS - WILL RE-RUN WITH GRAVITY SET TO 10.0 (PER PROBLEM STATEMENT). CARD = PARAM2, VARIABLE = GF

3/11/94

1-D PROBLEM 1.2 - INPUT FILE = run02i: NOW SET-UP SO THAT MODEL IS ONLY 3M THICK. ADDED HUGE (10^{50} M^3) BOUNDARY LAYER ON BOTTOM THAT HAS AN INITIAL WATER SATURATION OF 0.288.

- PROBLEM 1.1 - INPUT FILE = run111i.

- PROBLEM 1.2' SET-UP:



- PROBLEM 1.2 SET-UP IS THE SAME EXCEPT EACH ELEMENT IS 0.033 M THICK AND THE TOTAL THICKNESS IS 3.0 M. ELEMENT DIMENSIONS = 0.033 M X 0.03 X 0.05 M.

3/14/94 MF

1-D PROBLEM 1.1 OUTPUT = RUN111-2.OUT
TIMESTEPS = 9, 18, 28, 403

PATH = /USR2/rgreen/ASAD/ASAD2

PROBLEM 1.2 OUTPUT = RUNJ2-2.OUT
TIMESTEPS = 7, 46, 113,

3/16/94 MF

PROBLEM 1.1, ITOUGH INPUT FILE RUN111 ON SNEEZY: ASAD/ASAD2.

REPLACED BY 34. SEE JR

3/14/94,1d using input from Peter,2/24/94,Asad-1.1
START 1-d infiltration after Philip (1955) - Ross et al. (1982)
START van Genuchten parameters for capillary pressure and rel. perm.
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
MAT01 2200.0 0.0925 6.827E-19 1.05 1030.
MAT02 2200.0 .3 1.658E-10 1.05 10000.

START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
 8 199999000 99900000000000000 4
0. 4.16e7 1.e9 3.e6 f 1 10.0 1.e-7
1.e5 0.726 20.
START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
RPCAP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
 7 0.434 0.0724 1.
 11 0.434 0.0724 0.0072 1.
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
 7 7 3.e7
8.64e4 4.32e5 8.64e5 4.34e6 1.00e7 2.13e7 4.16e7
ELEME----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
f 1 MAT02 1.e50
f 2 89 1MAT01 5.56e-6
f 92 MAT02 1.0e50

CONNE----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
f 1f 2 1 1.e-10 5.556e-3 1. 1.
f 2f 3 88 1 1 1 5.556e-3 5.556e-3 1. 1.
f 91f 92 1 5.556e-3 1.0e-10 1. 1.

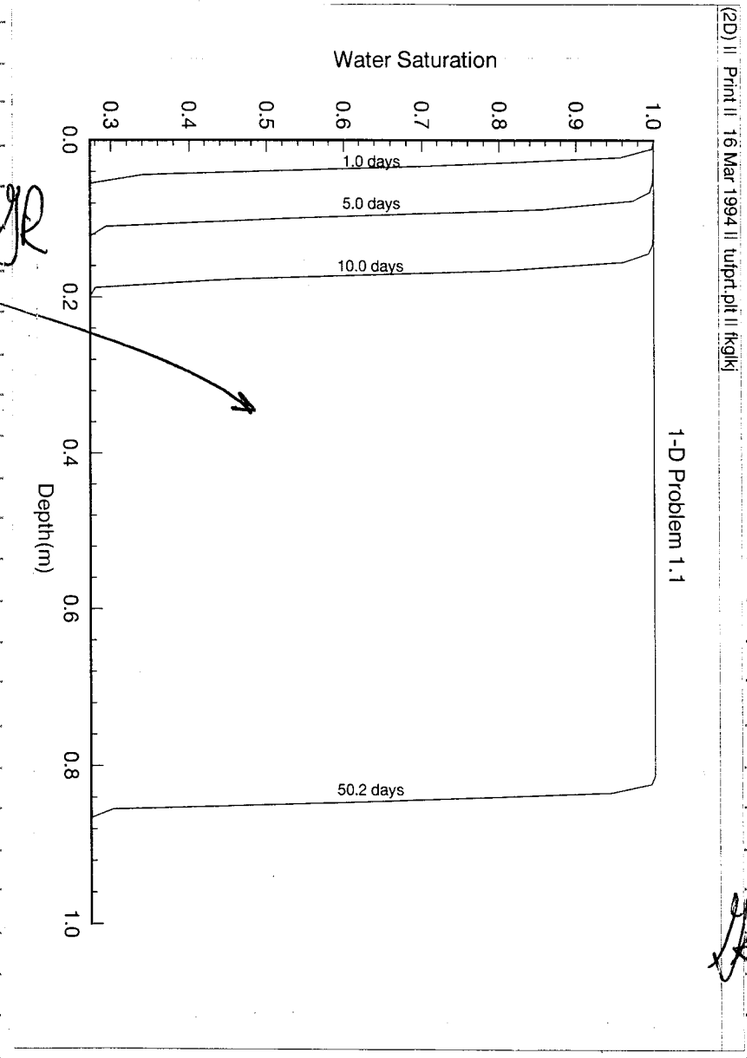
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
f 1
  1.e5 20.
f 92
1.e5 0.726 20.0

ENDCY----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8

3/16/94 MF

PROBLEM 1.1 OUTPUT FROM TECPLOT.
STYLESHEET = 1d1.1.STY, PRINTFILE = 1d1.1.PS. IN GOLIATH/RGREEN/GRIDE/1d.
DATAFILE = TC PLT1.T

REPLACED BY 35 SEE JR



3/16/94 MR

1-D PROBLEM 1.2 :

TIMESTEPS IN OUTPUT RUN02-2.OUT :
5, 40, 78, 117, 198, 249

MR

TECPLOT SET-UP

NOTE - TO GENERATE TUFPRT.DAT I ENTERED X → 92, Y → 1, DIMENSION = 2

ERROR - WILL SWITCH X+Y ;

WORKED ! W/ X=1, Y=92. — BUT ! INCORRECT IN TUFPRT.DAT. WILL CALL DIMENSION = 1.

ERROR - WILL SWITCH X+Y AGAIN, X → 92, Y → 1

WORKED ! X = 92, Y = 1, DIMENSION = 1.

3/16/94 MR

1-D PROBLEM 1.2 VTOUGH INPUT FILE RUN02.i

~~IN: USER1/GOLIATH~~ MR

IN: ~~DS~~ MR SNEEZY: ASAD/ASAD2

REPLACED SEE PG 37.

MR

```
3/14/94,ld using input from Peter,2/24/94,Asad-1.2
START     1-d infiltration after Philip (1955) - Ross et al. (1982)
START     van Genuchten parameters for capillary pressure and rel. perm.
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
MAT01     2200.0    .3        1.658E-12                        1.05      1030.
MAT02     2200.0    .3        1.658E-10                        1.05      10000.

START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
 8 19999     99900000000000000 4
0.          1.00e7    1.e9      3.e6      f  1      10.0
                                                              1.e-7
                  1.e5          .712      20.
START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
RPCAP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
    7     0.5075    0.183     1.
   11     0.5075    0.183     2.9227                 1.
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
    7     7         3.e7
1.00e0    1.00e1    2.00e1    3.00e1    5.00e1    7.00e1    1.00e2
OPTN
    0     1    0    0    0    0
DTSTP
         8.e5      0.25      20.       0.25
ELEME----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
f   1              MAT02     1.e50
f   2    89        1MAT01    5.0e-5
f  92              MAT02     1.0e50

CONNE----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
f   1f   2                   1    1.e-10  1.667e-2      1.        1.
f   2f   3    88    1    1    1  1.667e-2  1.667e-2      1.        1.
f  91f  92                   1  1.667e-2  1.0e-10       1.        1.

INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
f   1
                  1.e5              20.
f  92
1.e5                  0.712                 20.0

ENDCY----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
```

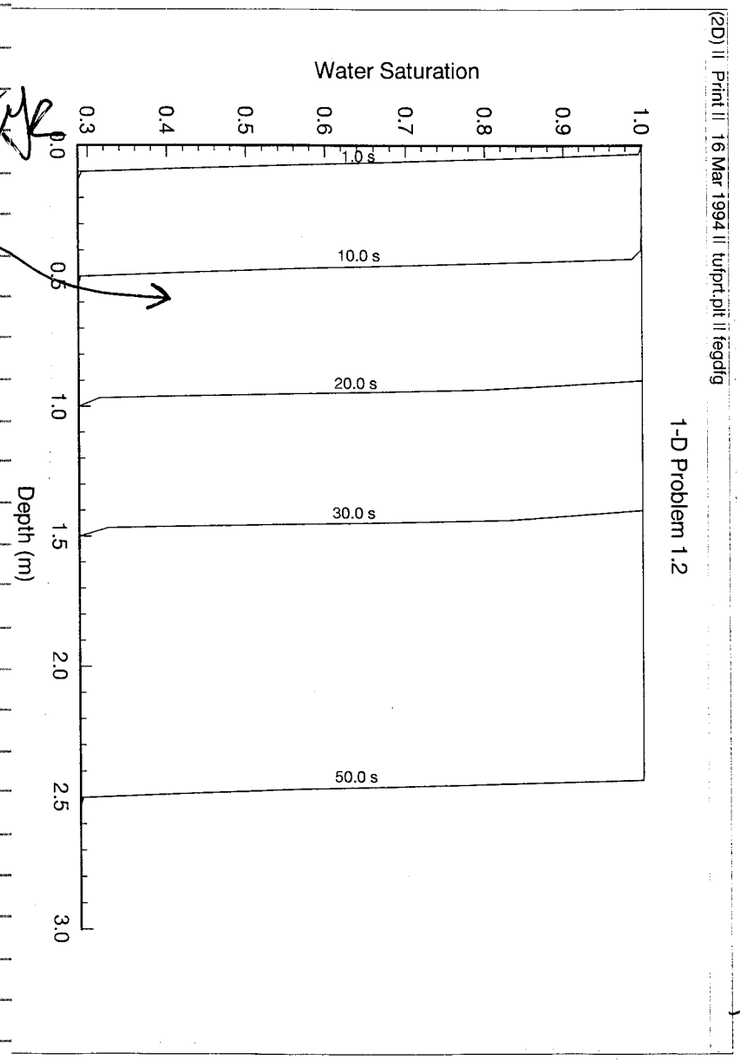
3/16/94 JR

1-D PROBLEM 1.2 OUTPUT FROM TECPLOT

STYLESHEET = 1d1.2.STY

PRINT FILE = 1d1-2.ps

DATA FILE = ~~TEG~~ TCPLT1.2
DR



REPLACED JR

SEE PAGES 38+39

JR

3/18/94 JR

GWTT, SATURATED GRANITE

-NOTE FOUND ERROR IN INPUT - I NEGLECTED TO ADD AIR PRESSURE (10^5 Pa) TO PRESSURE AT BOTTOM OF SYSTEM.

GRANϕ9i IS THE SAME AS GRANϕ7i EXCEPT:

- PRESSURE @ BOTTOM (2210 m) IS:

$$2210\,m \cdot \frac{992\,kg}{m^3} \cdot \frac{9.80665\,m}{s^2} + \frac{10^5\,kg\,m}{m^2\,s^2}$$

$= 2.16 \times 10^7$ Pa INSTEAD OF 2.15×10^7 Pa

- SPECIFIC HEATS FOR MATRI + MATR3 CHANGED FROM 10000 TO 1×10^{10} J/Kg °C

- OPTN LIVE CHANGED FROM: 0, 1, 0, 1, 1, 0
  TO: 0, 1, 0, 0, 0, 0

- DTSTP CHANGED FROM:
  $8.e^4$, 0.02, 10., 0.02
  TO:
  $8e^5$, 0.25, 20., 0.25

→ RZGRID-NEWX INPUT FOR GRANϕ9i:

1, 0, 1, 0, 1, 3, 1, 1, 23, 1, 0, 0, 0,
100000, 21600000, 10, 62.5, 2210,
0.01, 0, 0

3/18/94

GRID FOR GRAND6 THROUGH -Φ9:

GRID = 60 X 25

BOTTOM OF ELEMENT #	DEPTH OR ~~THICKNESS~~ (M)	WIDTH (M)			
1	10	200	200	200	----
2	30				
3	70				
4	150				
5	250				
6	350				
7	450				
8	550				
9	650				
10	750				
11	850				
12	900				
13	950				
14	980				
15	1000				
16	1020	RESERVOIR = 1000 - 1020 M DEPTH			
17	1040				
18	1070				
19	1120				
20	1200				
21	1300				
22	1500				
23	1900				
24	2200				
25	8210				

3/21/94

- START GRAND9 TOUGH RUN BUT KILL IT AFTER ≈ 10 MIN. MACHINE TIME - OTHER RUNS USING GOLIATH.

3/22/94

1-D PROBLEM - FOUND ERROR IN INPUT FOR BOTH PROBLEMS, 1.1 & 1.2. WRONG UNITS, 3RD VAN GENUCHTEN PARAMETER IN 2ND LINE OF RPCAP SHOULD BE IN UNITS OF 1/Pa, NOT 1/M.

FOR PROBLEM 1.1, 0.0072/m ⇒ $7.40e^{-7}$/Pa
PROBLEM 1.2, 2.9727/m ⇒ $3.004e^{-4}$/Pa

ALSO CHANGED 3RD VALUE IN 2ND LINE OF PARAM FROM $1.e^{9}$ TO $1.e^{0}$ IN BOTH PROBLEMS.

INPUT FOR PROBLEM 1.1 = RUN111i.
" " " 1.2 = RUNΦ2i.

3/23/94 MP

1-D PROBLEM 1.1 RUN BY RON G. = INPUT = rTEST1, OUTPUT = TEST3.OUT, 100 1-CM THICK ELEMENTS.

TIMESTEPS = 23, 30, 33, 41, 47, 53, ~~60~~ 61

→ ~~TECPLOT DATA FILE~~ = ASADII-TCPLT.DAT

TO PRINT A TECPLOT PLOT:

PRINT → FILE PATH (HOME/SWEEGY/DGREEN/ASADII/ASADII)
ROUTE TO → ASADII.PS
→ ~~GO PRINT~~ PAPER: LANDSCAPE
GO PRINT: SCALE → .8
→ GO PRINT.

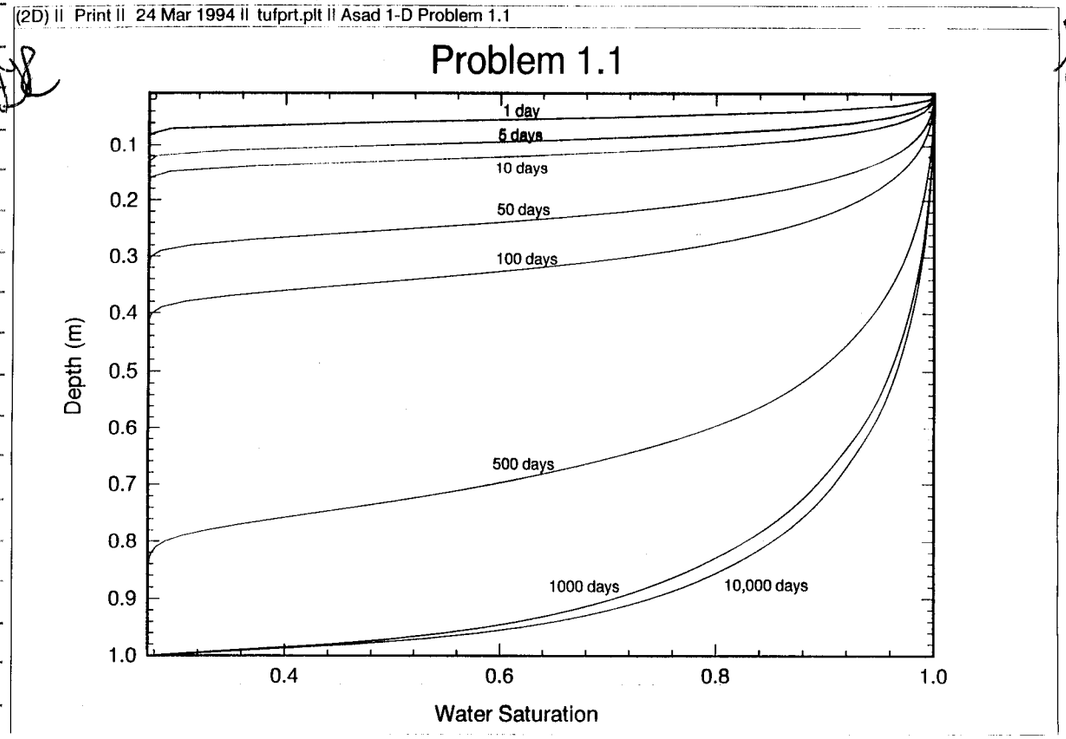
3/23/94 1-D PROBLEM 1.2 RUN BY RON GREEN
OUTPUT = ASAD12.OUT, 100 3-cm THICK ELEMENTS. INPUT = ~~ASAD12i~~ DIR RUNf2i IN DIR ASAD

TIME STEPS = 15, 28, 34, 44, 59, 187, 194

3/24/94 1-D PROBLEM 1.1 - INPUT = ASAD11i IN SNEEZY/rgreen/ASAD/ASAD2, VTOUGH INPUT

```
3/24/94,1d using input from Peter,2/24/94,Asad-1.1
START     1-d infiltration after Philip (1955) - Ross et al. (1982)
START     van Genuchten parameters for capillary pressure and rel. perm.
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
MAT01    22200.0    0.0925    6.827E-19 6.827E-19 6.827e-19 1.05      1030.
                    1.05      0.0
    7    0.434      0.0724    1.
   11    0.434      0.0724    0.74e-6              1.         0.09

START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
 8 199999000 99900000000000000 4         2.13E-5   1.8
0.         8.64e8    1.e0      3.e6      f  20      10.0
1.E-5      1.                                              1.e-7
1.e5                 0.726               20.
START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
RPCAP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
    7      0.434     0.0724    1.
   11      0.434     0.0724    0.74e-6              1.         .1
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
    7      7      4.e8
8.64e4     4.32e5    8.64e5    4.32e6    8.64e6    4.32e7    8.64e7
ELEME----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
f   1              MAT01      1.e50
f   2    97        1MAT01     1.0e-6
b   1              MAT01      1.0e50

CONNE----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
f   1f   2                         1    1.e-10  5.000e-3 1.0e-4       1.
f   2f   3    96    1    1         1  5.000e-3  5.000e-3 1.0e-4       1.
f  99b   1                         1  5.000e-3  5.0e-10  1.0e-4       1.

INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
f   1
1.e5                 20.                 0.0
b   1
1.e5                 0.726               20.0

ENDCY----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
```


3/24/94 1-D PROBLEM 1.1 OUTPUT FILE IN SNEEZY/RGREEN/ASAD/ASAD2 = ASAD11-0324.OUT. ASSOCIATED TECPLOT FILES = ASAD1.1.STY (% SAT), ASAD1.1-2.STY (CAP PRESSURE), ASAD11.PS (% SAT) ASAD11-2.PS (CAP PRESSURE), COORD1.1.DAT, ASAD11-TcPLT.DAT

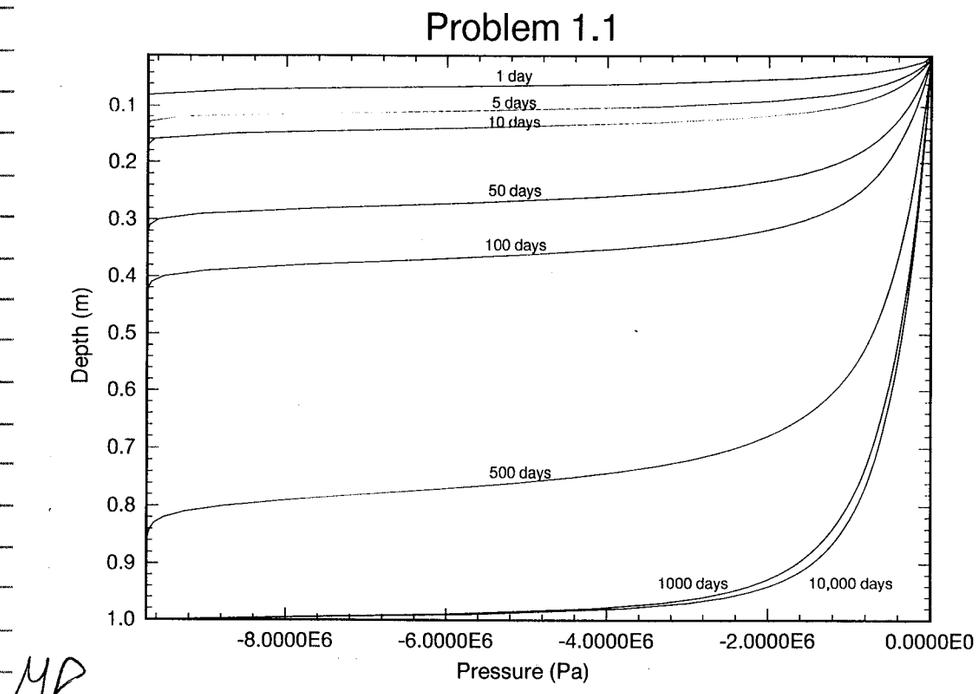


3/24/94 AL

MORE 1-D PROBLEM 1.1 OUTPUT, SEE pgs34&35 FOR INFO RE INPUT + OUTPUT FILES

GR

(2D) II Print II 24 Mar 1994 II tufprt.plt II Asad 1-D Problem 1.1



MR

GRID FOR 1-D PROBLEM 1.1 :

98 1-CM THICK ELEMENTS

← ELEMENT #1 REMAINS SATURATED AT ALL TIMES ~~1.5~~ JR
2
3
.
.
.
99
← ELEMENT #100 REMAINS AT 0.274 SATURATION AT ALL TIMES.

3/24/94 AL

1-D PROBLEM 1.2 (TOUGH INPUT) FILE IN SNEEZY/Rgreen/ASAD/ASAD2 = ASAD12i

```
3/24/94,ld using input from Peter,2/24/94,Asad-1.2
START     1-d infiltration after Philip (1955) - Ross et al. (1982)
START     van Genuchten parameters for capillary pressure and rel. perm.
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
MAT01     2200.0    .3        1.658E-12                          1.05      1030.

START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
 8 19999     9990000000000000 4
0.         1.00e7    1.e0      3.e6      f  20      10.0
                                                              1.e-7
                 1.e5          .712      20.
START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
RPCAP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
    7     0.5075    0.183     1.
   11     0.5075    0.183     3.004e-4              1.
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
    7     7      3.e7
4.32e2    4.32e3    8.64e3    1.296e4   2.16e4    4.32e4    8.64e4
ELEME----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
f   1           MAT01     1.e50
f   2   97      1MAT01    2.7e-5
b   1           MAT01     1.0e50

CONNE----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
f   1f  2                         1    1.e-10  1.500e-2 9.00e-4      1.
f   2f  3   96    1    1          1  1.500e-2  1.500e-2 9.00e-4      1.
f  99b  1                         1  1.500e-2  1.0e-10  9.00e-4      1.

INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
f   1
                 1.e5              20.
b   1
1.e5                  0.712              20.0

ENDCY----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
```

GR

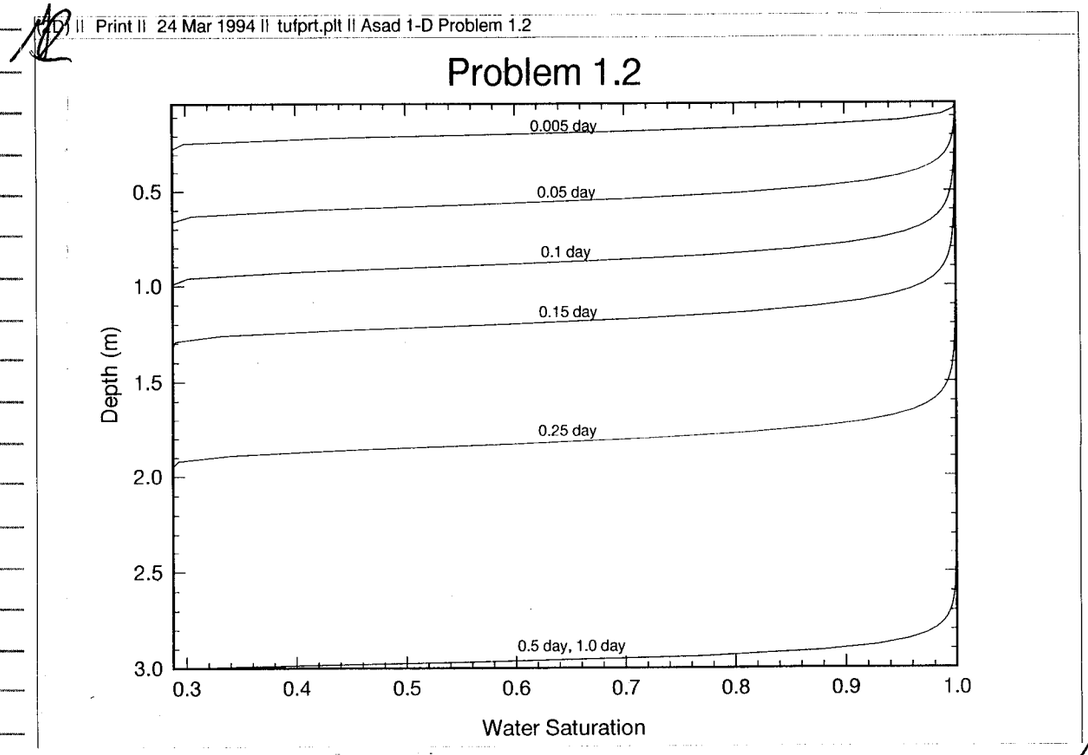
GRID FOR 1-D PROBLEM 1.2

98 3-CM THICK ELEMENTS

← ELEMENT #1 REMAINS SATURATED AT ALL TIMES
2
3
.
.
.
98
99
← ELEMENT #100 REMAINS AT A SATURATION OF 0.288 AT ALL TIMES.

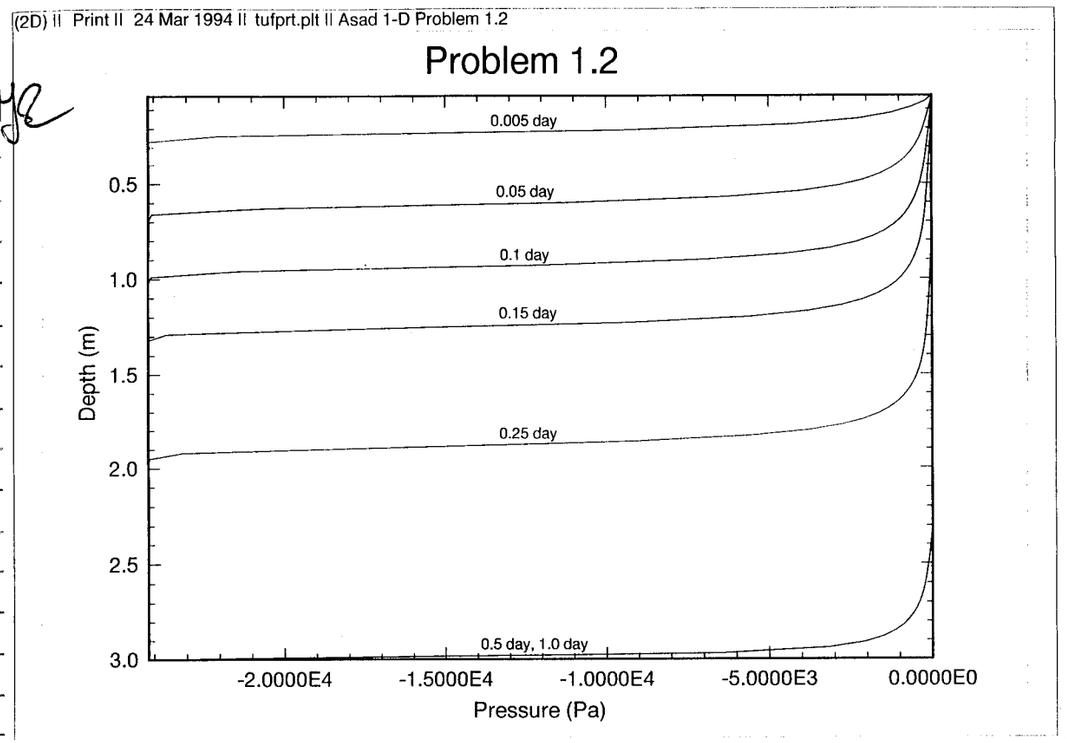
3/24/94 JR

1-D PROBLEM 1.2, OUTPUT FILE IN: SNEEZY/grieen/ASAD/ASAD2. = ASAD12-032494.OUT. ASSOCIATED TECPLOT FILES = COORD1.2.DAT, ASAD1.2.STT (% SAT), ASAD1.2-2.STT (CAP PRESSURE), ASAD12.PS (SATURATION), ASAD12-2.PS (CAP PRESSURE), ASAD12-TCPLT.DAT.



3/24/94 JR

1-D PROBLEM 1.2 OUTPUT:



3/25/94 GWTT - GRANITE - CONSTRUCT DM6 NEW INPUT FILE USING GRIDDER.X INSTEAD OF RZGRID-NEWX - TEMP @ 2210 SHOULD = 10°C + 2210 M (2.5°C/100M) = 65.25°C

*NOTE: TEMP & GAS SATURATION INPUT SWITCHED FOR REALISTIC SINGLE PHASE

INPUT:

1,0,1,0,1,3,1,1,23,1,0,10*,0*,100000,21600000,
10**,65.25,2210,0.01,0,0

CALL INPUT: GRANIØi

3/25/94

GWTT - GRAN1ϕ1:

GRID FOR GRAN1ϕ1 IS SAME AS SHOWN ON Pg 32.

TO PRINT:

prt860 = NORMAL FILE

ps 860 = POSTSCRIPT FILE

- GRAN11 - REMOVE HEAT SOURCE + GEOTHERMAL GRADIENT.

GRIDDER INPUT:

1,0,1,0,1,3,1,1,23,1,0,0,0,100000,

2160000,10,10,2210,.01,0,0

3/28/94

1-D PROBLEM - MODIFYING INPUT SO DENSITY OF WATER WILL = 1000 Kg/m^3 - MEANS CHANGING T TO 5°C - SEE TABLE NEXT PAGE. ALSO, WILL CHANGE PERMEABILITY SO IT IS BASED ON ρ = 1000 Kg/m^3, $\mu = \mu(5°C)$, g = 10.0 m/s^2

VALUES TAKEN FROM TABLE ON NEXT PAGE.

3/28/94

Appendix A • Thermodynamic and Thermophysical Properties of Matter—S.I. Units 425

Table A–9 Properties of Saturated Water[3*]

T °C	c_p kJ/kg-°C	ρ kg/ms3	$\mu \times 10^6$ kg/m-s	$\nu \times 10^6$ m^2/s	k W/m-°C	$\alpha \times 10^7$ m^2/s	$\beta \times 10^3$ 1/°K	Pr
0	4.218	999.8	1.791	1.792	0.5619	1.332	−0.0853	13.45
5	4.203	1000.0	1.520	1.520	0.5723	1.362	0.0052	11.16
10	4.193	999.8	1.308	1.308	0.5820	1.389	0.0821	9.42
15	4.187	999.2	1.139	1.140	0.5911	1.413	0.148	8.07
20	4.182	998.3	1.003	1.004	0.5996	1.436	0.207	6.99
25	4.180	997.1	0.8908	0.8933	0.6076	1.458	0.259	6.13
30	4.180	995.7	0.7978	0.8012	0.6150	1.478	0.306	5.42
35	4.179	994.1	0.7196	0.7238	0.6221	1.497	0.349	4.83
40	4.179	992.3	0.6531	0.6582	0.6286	1.516	0.389	4.34
45	4.182	990.2	0.5962	0.6021	0.6347	1.533	0.427	3.93
50	4.182	998.0	0.5471	0.5537	0.6405	1.550	0.462	3.57
55	4.184	985.7	0.5043	0.5116	0.6458	1.566	0.496	3.27
60	4.186	983.1	0.4668	0.4748	0.6507	1.581	0.529	3.00
65	4.187	980.5	0.4338	0.4424	0.6553	1.596	0.560	2.77
70	4.191	977.7	0.4044	0.4137	0.6594	1.609	0.590	2.57
75	4.191	974.7	0.3783	0.3881	0.6633	1.624	0.619	2.39
80	4.195	971.6	0.3550	0.3653	0.6668	1.636	0.647	2.23
85	4.201	968.4	0.3339	0.3448	0.6699	1.647	0.675	2.09
90	4.203	965.1	0.3150	0.3264	0.6727	1.659	0.702	1.97
95	4.210	961.7	0.2978	0.3097	0.6753	1.668	0.728	1.86
100	4.215	958.1	0.2822	0.2945	0.6775	1.677	0.755	1.76
120	4.246	942.8	0.2321	0.2461	0.6833	1.707	0.859	1.44
140	4.282	925.9	0.1961	0.2118	0.6845	1.727	0.966	1.23
160	4.339	907.3	0.1695	0.1869	0.6815	1.731	1.084	1.08
180	4.411	886.9	0.1494	0.1684	0.6745	1.724	1.216	0.98
200	4.498	864.7	0.1336	0.1545	0.6634	1.706	1.372	0.91
220	4.608	840.4	0.1210	0.1439	0.6483	1.674	1.563	0.86
240	4.770	813.6	0.1105	0.1358	0.6292	1.622	1.806	0.84
260	4.991	783.9	0.1015	0.1295	0.6059	1.549	2.130	0.84
280	5.294	750.5	0.0934	0.1245	0.5780	1.455	2.589	0.86
300	5.758	712.2	0.0858	0.1205	0.5450	1.329	3.293	0.91
320	6.566	666.9	0.0783	0.1174	0.5063	1.156	4.511	1.02
340	8.234	610.2	0.0702	0.1151	0.4611	0.918	7.170	1.25
360	16.138	526.2	0.0600	0.1139	0.4115	0.485	21.28	2.35

*c_p, ρ, μ, β computed from equations recommended in *ASME Steam Tables*, 3rd ed., New York, Am. Soc. Mech. Engrs., 1977. k computed from equation recommended in J. Kestin, "Thermal Conductivity of Water and Steam," *Mech. Eng.*, Aug. 1978, p. 47.

FOR PROBLEM 1.1 — @ 5°C

$$K = \frac{k\rho g}{\mu} = 6.693 \times 10^{-12}\ m/s$$

$$K = \frac{k\mu}{\rho g} = \frac{6.693 \times 10^{-12}\ m^3}{1000\ kg\ s} \frac{1.52 \times 10^{-3}\ kg}{m\ s} \frac{s^2}{10.0\ m} \left(\frac{kg\ m^4 s^2}{kg\ m^2 s^2}\right)$$

$$= 1.02 \times 10^{-18}\ m^2$$

AS SPECIFIED IN PROBLEM

3/30/94

INTRINSIC PERMEABILITY @ 20°C (1-D PROBLEM 1.1)

$K = \frac{k\rho g}{\mu}$, $k = \frac{K\mu}{\rho g}$,

$K = 6.693 \times 10^{-12}$ m/s, $g = 10.0$ m/s^2 - AS SPECIFIED IN PROBLEM.

$\mu = 1.003 \times 10^{-3}$ Kg/m-s

$\rho = 998.3$ Kg/m^3

$k = \frac{6.693 \times 10^{-12} \text{ m} \quad 1.003 \times 10^{-3} \text{ Kg} \quad \text{m}^3 \text{ s}^2}{998.3 \text{ Kg} \quad \text{s} \quad \text{m-s} \quad 10.0 \text{ m}}$

$= 6.725 \times 10^{-19}$ m^2

[IF $g = 9.8$ m/s^2; $K = 6.862 \times 10^{-19}$ m^2]

FOR PROBLEM 1.2 @ 20°C:

$k = \frac{K\mu}{\rho g} = \frac{1.625 \times 10^{-5} \text{ m} \quad 1.003 \times 10^{-3} \text{ Kg} \quad \text{m}^3 \text{ s}^2}{9983 \text{ Kg} \quad \text{s} \quad \text{m-s} \quad 10.0 \text{ m}}$

$= 1.633 \times 10^{-12}$ m^2

4/1/94

1-D PROBLEM

PROBLEM 1.1 - INPUT WITH PROPERTIES FOR 20 °C, $g = 10.0$ m/s^2.

$\rho = 998.3$ Kg/m^3

$\mu = 1.003 \times 10^{-3}$ Kg/m-s

PERMEABILITY = 6.725×10^{-19} m^2

INPUT FILE = 1alti, OUTPUT = 1alt.out, IN SUBDIR/green/asad/asad2

VAN GENUCHTEN PARAMETER ICP(3) (AIR ENTRY VALUE) = 7.212×10^{-7} (VALUE FROM GOODLUCK). HOW CALCULATED?

PROBLEM 1.1 TIME STEPS = 23, 30, 33, 41, 46, 60, 75, 335 (1 DAY) (5) (10) (50) (100) (500) (1 day) (1 mo)

PROBLEM 1.2 - INPUT W/PROPERTIES @ 20 °C

PERM = 1.633×10^{-12} m^2

ICP(3) = 2.928×10^{-4}

INPUT FILE = 12alti, OUTPUT = ~~1talti~~, IN ~~DIR~~ SUBDIR/green/asad/asad2

→ 12alt.out

PROBLEM 1.2 TIME STEPS:

15, 27, 35, 41, 53, 2064 (64), 4614 (614)

(0.005 DAY) (0.05) (0.1) (0.15) (0.25) (0.5) (1.0)

7-11-94

IN DIR /GRID2 :

- GWTT - TUFF, MAKE XZONE.DAT FILE, 14 Km WIDE

XZONE:

200	6800
400	6900
600	6950
:	6975
:	7000 — 50 M WIDE FAULT THROUGH CENTER OF REPOSITORY
13600	7025
13800	7050
14000	7100
	7200

- RUN gridderx :

1, 0, 1, 0, 1, 1, 0, 10, 52, 0, 16 409 820,

0, 0, 1675, 0.11, 0, 0

TEMPERATURE @ 1675 M:

GEOTHERMAL GRADIENT ≈ 2.5 °C / 100 M

$$\frac{2.5\,^{\circ}C}{100\,M}\ 1675\,M = 41.875\,^{\circ}C + 10\,^{\circ}C \quad (\text{SURF TEMP.})$$

$$\approx 52\,^{\circ}C$$

7-11-94

HYDROSTATIC PRESSURE @ 1675 M:

$$1\ ATM = 14.7\ psi = 33.92\ FT\left(\frac{lEI^3}{FT^2} - \frac{62.4\,\cancel{lb_F}}{FT^2}\right)$$

$$= 10.34\ M = 1.013 \times 10^5\ Pa$$

$$10.34\,M\ \frac{1000\,Kg}{M^3}\ \frac{9.8\,M}{S^2} = 1{,}013\,\frac{N}{M^2}$$

$$\frac{1675\,M}{\Delta}\ \frac{1.013 \times 10^5\,Pa}{10.34\,M} = 16{,}409{,}820\,Pa$$

- MAKE FILE INCON :

cp tufgrid.dat ␣ incon

- RUN stripx — CORE DUMPED — MAKE FILE: incon.in

DOESN'T WORK W/ STRIPX ?

COPY strip.f DATO GRID2

WHILE IN GRID2 : cp ␣ ~/programs/strip.f ␣␣ .

NEED TO MODIFY COORD.DAT?

MODIFIED COORD.DAT, ADDED "numdat" TO TOP OF INCON.IN FILE (numdat = # OF LINES OF DATA?, SEE LINE 23 OF strip.f)

IMMEDIATELY AFTER RUNNING stripx — GOT MESSAGE: dofio: [-1] endoffile
IOT trap (CORE DUMPED)

— BUT, incon.out LOOKED OK — SO WILL :

7-11-94

- PUT INCON.OUT IN PLACE OF INCON IN tufgrid.dat.
- TOUGH INPUT FILE MADE - CALLED:

new114i

xgrid.dat:

A	200	Z 5200		
B	400	AA 5400		
C	600	AB 5600		
D	800	AC 5800		
E	1000	AD 6000		
F	1200	AE 6200	1	
G	1400	AF 6400	2	
H	1600	AG 6600	3	R
I	1800	AH 6800	4	E
J	2000	AI 6900	5	P
K	2200	AJ 6950	6	O
L	2400	AK 6975	7	S
M	2600	AL 7000	8	I
N	2800	AM 7025	9	T
O	3000	AN 7050	10	O
P	3200	AO 7100	11	R
Q	3400	AP 7200	12	Y
R	3600	AQ 7400	13	
S	3800	AR 7600	14	
T	4000	AS 7800	15	
U	4200	AT 8000	16	
V	4400	AU 8200		
W	4600	AV 8400		
X	4800	⋮		
Y	5000			

FAULT

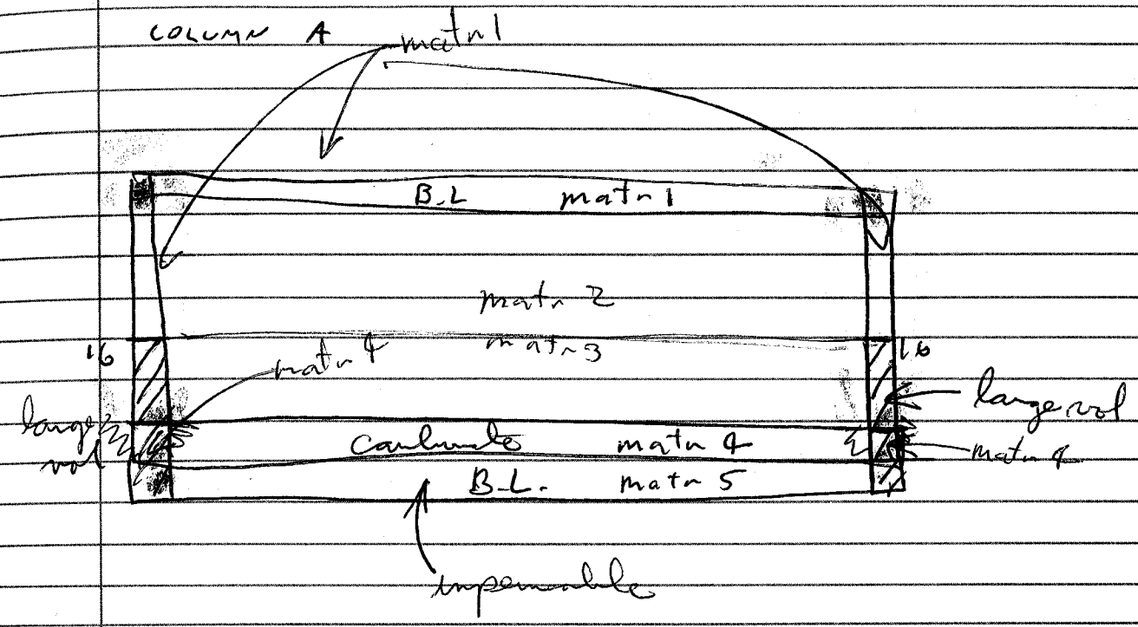
14000

END

7-11-94

cp jungreen/FILENAME

CNTRL G — IDENTIFY LINE #



: start line, finish line ␣ 5/oldstring/newstring/

② END OF GENER: BA → BX

1 MATRL
14 " 2
10 " 3
2 " 4
1 " 5

RELOCATE TOUGH INPUT FILE "new114i" USING 5 MATERIALS.

7-11-94

JR - START FROM GRIDDERX:

STEP 1 • GRIDDERX: GENERATES tufgrid.dat

1, 0, 1, 0, 1, 5, 1, 1, 14, 10, 2, 1, 9, 10, 52,
0, 16409820, 0, 0, 1675, 0.11, 0, 0

STEP 2 • CREATE temp FROM tufgrid.dat – REMOVE INCON FROM temp.

CALL INCON incon.in ; 1ST LINE IN incon.in MUST BE # OF DATA LINES TO BE READ BY stripx (numdat).

NOTE – stripx MUST HAVE A coord.dat FILE TO WORK ON.

STEP 3 • RUN stripx → RENAME temp → incon.in

stripx CREATES incon.out

REPLACE INCON IN tufgrid.dat w/ incon.~~out~~

STEP 4 • COPY TOUGH INPUT FILE (new114i) INTO temp, ~~RE~~ DELETE ALL EXCEPT INFO ABOVE ELEM + PUT INTO tufgrid.dat

STEP 5 • COPY TOUGH INPUT FILE (new114i) INTO temp, DELETE ALL EXCEPT GENER + PUT INTO tufgrid.dat & JUST ABOVE INCON

STEP 6 • RENAME tufgrid.dat ~~new114i~~ 114fli
MR 7-11-94

7-12-94

TO CONVERT PERMEABILITY (cm^2) TO HYDRAULIC CONDUCTIVITY (M/s)

$K = \frac{k \rho g}{\mu}$, let:

$k = 1\,cm^2$

$\rho = 1000 \frac{Kg}{M^3}$

$g = 9.8 \frac{M}{s^2}$

$\mu = 1.124\,cP = 1.124 \times 10^{-3} \frac{N \cdot s}{M^2}$

$$K = \frac{1\,cm^2 \; 9.8\,M \; 1000\,Kg \; M^2 \; M^2}{s^2 \; M^3 \; 1.124 \times 10^{-3} N \; s \; 10^4 cm^2}$$

$$= 872 \frac{cm^2 \; M \; Kg \; M^2 \; s^2 \; M^2}{s^2 \; M^3 \; Kg \; M \; s \; cm^2}$$

$$= 872 \frac{M}{s} \Rightarrow cm^2$$

$$1 \frac{M}{s} \Rightarrow 1.15 \times 10^{-3} cm^2$$

NOTE, FREEZE + CHERRY HAVE:

$$1\,cm^2 = 980 \frac{M}{s}, \quad 1 \frac{M}{s} = 1.02 \times 10^{-3} cm^2$$

I ASSUME THEY USED A VISCOSITY OF 1.0 cp.

$1\,cm^2 = 1.0 \times 10^8$ DARCY $= 980 \frac{M}{s}$, $1\,DARCY = 9.70 \times 10^{-6} \frac{M}{s}$

$1\,nD = 9.7 \times 10^{-9} M/s$

7-12-94

MR

TO CONVERT THE VAN GENUCHTEN PARAMETER α (IN 1/m) TO 1/Pa:

$$\frac{1}{m}\ \frac{10.34\,m}{ATM}\ \frac{ATM}{1.013\times10^{5}\,Pa} = \frac{1.021\times10^{-4}}{Pa}$$

ON pg 15 OF NITAO (5/88):

$$\alpha = \frac{1.2857}{m} \Rightarrow \frac{1.312\times10^{-4}}{Pa}$$

CALCULATE K_b (FROM pg 15 OF NITAO)

$$K_b = K_f \phi_f + K_m (1-\phi_f)$$

GIVEN:

$K_f = 1.0\times10^{-11}\ m^2$
$\phi_f = 1.8\times10^{-3}$
$K_m = 1.9\times10^{-18}\ m^2$
$\phi_m = 0.10$

$$K_b = [1.0\times10^{-11}(1.8\times10^{-3}) + 1.9\times10^{-18}(1-1.8\times10^{-3})]\ m^2$$

MR 7-12-94

$$\simeq 1.8\times10^{-14}\ m^2$$

MR 7-12-94

CHANGES MADE TO NEW114i:

IN LAYERS 1, 2, & 3 - CORRECTED BULK PERMEABILITY (K_b) AS SHOWN ABOVE.
IN LAYERS #4 #5 MADE K_ms & K_fs CONSISTENT W/ K_bs.

CHANGED MATRIX POROSITY FROM 0.11 TO 0.10.

7-13-94

MR

- INPUT (ct114i, MODIFIED VERSION OF NEW114i) RUNS ON RORY BUT NOT ON BILBO.

- WILL CALL ROSS B. & TRY TO GET ACCOUNT ON SISYPHUS.

- ROSS HAS 4 PEOPLE ON SISYPHUS ALREADY HE WILL EMAIL ALFRED TO GET ME AN ACCOUNT. I'LL CONTACT ALFRED TOMORROW

7-14-94

MR

- GOT SISYPHUS ACCOUNT, MY PW = PASS+WORD

TO GET TO SISYPHUS, ftp, & RUN ctough:

→ GET TO SISYPHUS FROM BILBO:

> SISY

→ ONCE IN SISYPHUS:

```
% ftp bilbo
      NAME
      PW
PROMPTS
      ftp > GET ctough
      ftp > GET ...
      ftp > by ——→ RETURNS TO SISYPHUS
```

→ TO MAKE ctough AN EXECUTABLE FILE IN SISYPHUS:

CHMOD␣+X␣ctough

→ TO RUN: NICE␣ctough7␣test.out

7-14-94

→ ctough MUST HAVE INPUT FILE NAMED "tough1"

- ~~TERMCAP~~

RECIEVED MESSAGE:

STOP** INSUFFICIENT WORK SPACE

test.out SAID INCREASE HALF-BANDWIDTH BY 1

- I CHANGED VALUE IN dim.h TO 13

- RECOMPILED ctough : MAKE ctough

- ftp'D NEW ctough - RN - GOT MESSAGE:

TERMINATING BY ...
RECEIVED SIGNAL 11 (SIGSEGV)
SEGMENTATION FAULT (CORE DUMPED)

- NOW - CANNOT READ test.out OR tough.OUT - ASCII CHARACTERS - LOOK LIKE EXECUTABLE FILES.

- CALL PETER L : 6084 - LEFT MESSAGE

FROM pg 199 OF 1ST BLUE BOOK:

- TO PUT JOB IN BACKGROUND:
  1Z
  bg
  LOGOUT

TO KILL JOB:
KILL - 9 PID#

PS - AUX

SHIFT!! = REPEAT

7-14-94

1515 - PETER L, X 6084 - NO ANSWER

- CAN I GET IN TO TECPLOT? - YES FROM /grice/tecplot

1530 - PETER L: NO ANSWER - I GO HOME

MR

7-15-94

NC

- ATTEMPT TO RUN ctough ON BILBO w/o GUI - SPOKE W/ PETER LICATA - HE SAID COMMAND TO RUN IS:

nice␣ ctough␣ INPUT FILE (w/o i)

GOT SAME ERROR - SEGMENTATION FAULT

- CHANGE 1/2 BANDWIDTH BACK TO 12 & RECOMPILED. COMPILE COMMAND:

make␣ ctough

- STOP - INSUFFICIENT WORK SPACE

- FOUND PROBLEM - nz + nx VALUES SWITCHED IN LAST 2 LINES OF INPUT.

- GOT SAME MESSAGE: ~~NOT ENOUGH~~ INSUFFICIENT WORK SPACE, INCREASE HALF-BANDWIDTH BY 1

- INCREASED 1/2 BW IN dim.h FROM 12 TO 13; RECOMPILE ctough.

MAKE␣ ctough

- RUN W/ 12 BAND W. OF 13:

CRASHED AFTER 1-2 MIN., SAME ERROR MESSAGE AS BEFORE - SEGMENTATION FAULT.

- CORRECTED INPUT FILE IN SISYPHUS TO SEE IF IT WILL RUN (1/2 BW = 13)

7-15-94

NC

- GOT SAME ERROR MESSAGE: SEGMENTATION FAULT WILL RECOMPILE ctough W/ 1/2-BW OF 12, PORT TO SISYPHUS, CHMOD␣ +x␣ ctough, & TRY TO RUN.

- SAME MESSAGE: INSUFFICIENT WORK SPACE

- PETER SAYS DON'T USE ARROW >, USE:

nice␣ ctough␣ ct114

- CRASHED AGAIN - BUT SAW OUTPUT ON SCREEN SO IT RAN. WILL INCREASE 1/2 BW TO 13.

- NEW MESSAGE IN BILBO - NOT ENOUGH MEMORY

- TRY IN SISYPHUS W/ 1/2 BW = 13 & NO (>). RUN IN G1

AFTER ␣ & WILL PUT IN BACKGROUND

ftp FROM BILBO .chrc
CALL chrc 2
DO DIFF

→ WHEN START RUN: nice␣ ctough␣ ct114␣ &

NC

7-18-94 AL

- CTOUGH SIMULATION ON SISYPHUS ENDED.
  ELAPSED TIME = CALCULATION TIME = 1.6×10^5 S

STOPPED @ TIME STEP 9900, 5.57 (YRS?),
TIME STEP = 2×10^{-16} YRS

MESSAGE: "...FLOATING-POINT EXCEPTIONS OCCURRED AND WERE NEVER CLEARED; see ieee_flags(3M): INEXACT; UNDERFLOW;

- ct114.OUT LISTS INCORRECT VALUES FOR HORIZONTAL DISTANCES?

SHOWN VALUE	CORRECT VALUE	
6700	6800	
6850	6900	NOTE, VALUES REPORTED IN ct114.out ARE LOCATIONS OF BOUNDARIES BETWEEN THE ELEMENTS.
6925	6950	
6962	6975	
6988	7000	
7012	7025	
7038	7050	
7075	7100	
7150	7200	
7300		
7500		

TEMPERATURE = 0.000 ??? SEE LINE 14655 OF ct114.SAVE

→ NEW PLAN: RUN PROBLEM W/O HEAT SOURCE - PETER L. SAYS SHOULD DO THIS UNTIL STEADY STATE IS REACHED (≃ 10^6 YRS) - THEN USE EQUILIBRATED

7-19-94 AL

- SYSTEM W/ HEAT SOURCE. OTHERWISE RESULTS INVALID BECAUSE HEAT SOURCE IS ACTING ON SYSTEM AS IT ATTEMPTS TO EQUILIBRATE.

- BEGIN RUN W/O HEAT SOURCE. INPUT FILE NAME = ct114-2i → RUNNING!

MKDIR = MAKE DIRECTORY

TO CONVERT TOUGH FILES TO CTOUGH FILES (UNIX):

CONVERT␣ <OLDFILE>␣ NEWFILE

TO COPY FILE FROM ANOTHER DIRECTORY WHILE IN DESTINATION DIRECTORY:

cp␣ ~/DIR1/DIR2/DIR3/FILENAME DIR3␣␣.

~ = HOME (e.g., home/bilbo/grice)

DIR1/DIR2/DIR3 = PATH FROM HOME, DIR3 = SOURCE DIRECTORY, TOTAL PATH = /HOME/BILBO/GRICE/DIR1/DIR2/DIR3/

AL 7-18-94

. = KEEP, ~~FILE NAME SA~~ NAME OF COPY SAME AS ORIGINAL.

7-18-94 JR

MAKING A SMALL (AND FAST RUNNING) INPUT FILE:

"SMALLφli"

X | 200, 400, 600 ---- 4800, 5000

Z ← 25 ELEMENTS →

19 ELEMENTS ↑

Z
50
100
150
200
250
290
320
340
360
→ 380
410
450
500
550
600
700
800
900
1000

PRESSURE @ Z=0 = 1.013×10^5 Pa

PRESSURE @ Z=1000M = 1000/10.34

(1.01×10^5) Pa = 9.797×10^6 Pa JR 7-18-94

TEMPERATURE @ Z=0 = 10.0 °C JR 7-18-94

TEMPERATURE @ Z=1000M ~~= (1000/25) + 10.0~~

= (1000/100) 2.5 + 10.0 °C

= 35.0 °C

INPUT TO GEIDDER X:

1,0,1,0,1,3,1,1,14,0,10,35,101300,9797000,
0,0,1000,.10,0,0,

→ GENERATES "tufgrid.dat"

→ COPY tufgrid.dat TO incon.in

→ REMOVE ALL DATA BUT INCON DATA FROM incon.in;
ADD 1ST LINE: # OF LINES TO BE READ (numdat in sinap).

7-18-94 JR

- RUN STRIPX: → GENERATES "incon.out"

- INSERT incon.out IN PLACE OF INCON BLOCK IN ~~incon.in~~ tufgrid.dat. JR 7-18-94

: r␣ incon.out

- INSERT ROCK+MATRIAL PROPERTY LINES INTO tufgrid.dat

- RENAME "tufgrid.dat" TO "SMALLφli"

- CONVERT SMALLφli TO ctough INPUT:

convrt␣ <SMALLφli>␣ cpSMALLφli JR 7-18-94

CONVERT: COMMAND NOT FOUND!

TRY: convrt␣ --- WORKED!

BUT, ERRORS IN CONVERTED FILE! - FIXED!

- LOOKS LIKE STARTING RUN IN BILBO KILLED RUN IN SISYPHUS:

- PUT GENERATION OF WATER BACK INTO PROBLEM. - NOTE, PROBLEM RAN ≃ 3 SECS, GOT TO > 10 YRS. (TIME STEP ≃ 150)

- RUNNING ≃ 1420, BEGINS @ 5.7×10^{11} YRS

- ACCIDENTALLY KILLED, RESTART ≃ 1500.

7-18-94

NOTE - FILE "ctSMALLfli" DID NOT GET A BLOCK THAT STATED THE # OF ELEMENTS IN THE X & Z DIRECTIONS -

THE SOLVE BLOCK.

WILL PUT ONE IN FROM "ct114i".

- ATTEMPT TO RUN ON BILBO W/O GUI. RUNS! - KILLED W/ 1C.

- BEGIN RUN ON SISYPHUS W/ "ct114-2i" @ 15:25

- RECOMPILING ctough IN BILBO W/ 1/2 BANDWIDTH = 8. SEE IF IT WILL RUN UNDER GUI. - IT WON'T - NOT ENOUGH MEMORY.

7-19-94

- ctough JOB DONE (INPUT = "ct114-2i"), CALCULATION TIME = 13,817 s (≃ 3 HR 50 MIN)

- FRACTURE - MAKE IT A 7-11 MODEL

FOR 11 $S_s^* = 1.1e^{-3}$ DR 7-19-94

- $\lambda = 1 - \frac{1}{b}$, $b = n$

$\lambda = 1 - \frac{1}{4.23} = 0.7636$

- FAULT IS 50 M WIDE & OCCURS IN COLUMNS AL & AM (6975 N - 7025 N)

TO REPORT LINE # IN vi:

CNTRL G

TO REPLACE INFO IN vi FILE:

: START LINE#, END LINE# ␣ S/OLD STRING/NEW STRING/

- FAULT PASSES THROUGH ALL MATERIALS EXCEPT MAT#5 = BOTTOM LAYER, IMPERMEABLE.

≃1025 - BEGIN ctough RUN w/ "ct114-3i" - NO RUN!

TO COMPARE FILES:

MAN ␣ diff ␣ FILENAME ␣ FILENAME ␣ > OUTPUT FILE

7-19-94

- NOTE, "ct114-3i" PROBABLY WON'T RUN BECAUSE I FORGOT TO CHANGE PERMEABILITY VALUES IN INCON BLOCK

- CANNOT GET "ct114-3i" TO RUN WITH IRP=7 + ICP=11 — GOING TO RUN IT WITH IRP=9 + ICP=9, BUT WITH FRACTURE PROPERTIES IN BOTH "9" LINES

BULK PERMEABILITY, K_b:

$$K_b = K_f \phi_f + K_m (1 - \phi_f)$$

$$= 1\times10^{-11} m^2 (1.8\times10^{-3}) + \cancel{1.8\times10^{-3}} \; 1\times10^{-11} m^2 (1 - 1.8\times10^{-3})$$

$$= 1.0\times10^{-11} m^2$$

- BEGIN RUN DESCRIBED ABOVE ≃ 1340
  KILLED RUN ≃ 1355, PETER L. SUGGESTED PROBLEM MAY BE CAUSED BY UNUSED ICP(4) IN ICP=11 → INSERTED A ϕ FOR ICP(4) — FILE CALLED "ct114-4i"
  → IT RUNS!

- MESSAGE @ TIMESTEPS 35 TO ___ :
  WARNING: NO CONVERGENCE IN SUBROUTINE PP

- CALLED PETER L.

- RUN CRASHED.

≃1510 - STARTED RUN WITH FAULT REPRESENTED BY IDENTICAL 9's (IRP & ICP). INPUT FILE = "ct114-3i".

7-20-94

- RUN w/ "ct114-3i" COMPLETED (IRP & ICP = 9)

- CHANGE "ct114-4i", ICP=11, CHANGE S*(cp(6)) FROM 1.1E-3 TO 1.2E-3. SEE IF RUNS.

- BEGIN RUN @ 0950

NOTE: "FAULT" PASSES THROUGH LAYERS 1-27. DOES NOT PASS THROUGH IMPERMEABLE LAYER ON BOTTOM (#28).

- ≃ 1020, RUN GIVING NO CONVERGENCE MESSAGE.

- KILLED RUN w/ IC (ct114-3i), SIMULATION TIME = 551s.

- CHANGED INPUT FILE SO FAULT DOES NOT PASS THROUGH PERMEABLE LIMESTONE LAYERS AT BASE OF MODEL (LAYERS 26 & 27)

- START RUN ≃ 1030 (ct

- ≃ 1055 — GET NO CONVERGENCE MESSAGE, SIMULATION TIME = 560s — KILLED RUN

- CHANGE S* IN ICP=11 TO 1.5.

- BEGIN RUN w/ ct114-4i @ ≃ 1100

- CHANGED VARIABLES IN "ct114-4i" (NORMALIZED TO 1.0)
  CHANGED FROM VOLUMETRIC WATER CONT TO SATURATION
  MATR 6, IRP=7; 1.0×10^{-3} → 0.556, 1.8×10^{-3} → 1.0
  ICP=11; 1.0×10^{-3} → 0.556, 1.8×10^{-3} → 1.0, 1.1×10^{-3} → 0.611

- BEGIN RUN w/ REVISED ct114-4i @ ≃ 1150.

- PATH IN SISYPHUS: /HOME2/SISYPHUS/GRICE

7-20-94

TO PRINT A TECPLOT FILE

~~ps 860 JR~~
7-20-94

ps860␣FILENAME → XXX--X.ps
MUST ~~HAVE~~ THIS EXTENSION

TO PRINT A "REGULAR" FILE

prt860␣FILENAME

TO SET-U A PRINT FILE IN TECPLOT:

FILE → PRINT → PAPER (ENTER SIZE → LETTER)
→ ROUTE TO (ENTER, e.g., /home2/sisyphus/GRICE/test$1.ps)
→ FILEPATH (ENTER SAME ↑ (WHOLE PATH))
→ GOPRINT → SCALE → RELATIVE
(ENTER 0.8) → POSITION (HIT ENTER)
→ GOPRINT (HIT ENTER, YES, OVERWRITE)
→ QUIT (OR MINIMIZE)

- RUN "ct114-4i" ENDED O.K. - COMPLETED

FILE "FAULT7-11i" IS IDENTICAL TO "ct114-4i" — I'LL RUN THIS FOR 10^6 YRS.

7-21-94

20740 - BEGIN a tough RUN, INPUT = fault7-11i, 10^6 yrs.

- PUT RUN IN BACKGROUND + STARTED TECPLOT — NO PROBLEM EXCEPT COULDN'T THEN PUT TECPLOT IN BACKGROUND — SO, OPENED A 2ND SISYPHUS WINDOW BUT COULDN'T CONNECT TO TECPLOT UNTIL I ENTERED THE FOLLOWING:

setenv␣DISPLAY␣bilbo:0

- IN 10,000 YR RUN OF "FAULT7-11i" TEMPERATURES & SIDE BOUNDARIES ARE PERTURBED. WILL ATTEMPT TO MOVE PERTURBATIONS AWAY FROM REPOSITORY BY MAKING A 20 Km-LONG MODEL:

- INPUT FILE = FAULT7-11-STRI IN:
/HOME2/SISYPHUS/GRICE/GWTT/STRETCH

X| A B C ... AW AX AY AZ BA BB BC BD BE
200, 400, 600 ... 9800, 9900, 9950, 9975, 10,000, ~~10025~~, 10050, 11000, 10200)
← ~~10400, 10600 ... 20000~~

Z
50
100
150
200
250
290
320
340
360
380
410
450
500
550
600
700
800
900
1000
⋮
1600
1625
1650
1675

28 ELEMENTS (1675 M)

← 106 ELEMENTS →
(20,000 M)

REPOSITORY AT: AS9 THROUGH BH9.

FAULT AT: AZ1 THROUGH ~~BB1~~ BA1 JR 7-26-94,
pr THROUGH ~~BA25~~ BB25 JR 7-26-94
7-26-94 ~~AZ25~~ THROUGH ~~BB25~~.

FAULT AT: BA1 THROUGH BA25, AND BB1 THROUGH BB25.

7-21-94

- RUN GRIDDER FOR "fault7-11stri":

INPUT:

1,0,1,0,1,5,1,1,14,10,2,1,0,10,52,

~~10130~~ 7-21-94 103000, 16409820, 0, 0,

1675, .1, 0, 0

- REMOVE INCON BLOCK FROM tufgrid.dat - CALL IT INCON.in.

- NOTE - GRIDDER DID NOT GIVE COMPLETE NAMES TO 'X' ELEMENTS BEYOND B2. INSTEAD OF NAMING THEM CA 1, CB 1, etc, IT SIMPLY NAMED THEM 1, 2, 3, etc.

- WILL STOP WORK ON THE 20 Km LONG PROBLEM UNTIL I DISCUSS IT W/ROB G.

- TO CONVERT M/S TO M^2:

FROM pg 29 OF FREEZE & CHERRY:

$\frac{M}{S}(1.02 \times 10^{-3}) = cm^2$, $cm^2 \frac{10^{-4} m^2}{cm^2} = M^2$

$\frac{M}{S}(1.02 \times 10^{-7}) = M^2$.

- RUN FIXED GRIDDER (TEMPORARILY CALLED a.out) RUNNING GRIDDER FOR "fault7-11stri"

1,0,1,0,1,5,1,1,14,10,2,1,0,10,52,

103000, 16409820, 0, 0, 1675, 0.10, 0, 0

7-21-94

- COPY tufgrid.dat (GENERATED BY GRIDDER) TO incon.in & REMOVE EVERYTHING BUT INCON BLOCK, ADD ON 1ST LINE # OF DATA LINES TO FOLLOW. ~~OR # OF VALUES TO READ?~~

- ENTER # OF VALUES TO READ (IN THIS CASE = 1/2 # OF LINES).

- STRIPX TAKES INCON.IN & GENERATES incon.out

- PUT incon.out INTO INCON BLOCK OF tufgrid.dat

- BEGIN RUNNING "fault7-11stri" - GOT ERROR MESSAGE: NO. ELEMENTS EXCEEDS MAX DIMENSION OF 2200 — IN BILBO, CHANGE dim.h, NELM = 2200 → 3000

NBHMX = 8, → 14

- TO COMPILE: make clough

- ANOTHER ERROR MESSAGE, # OF CONNECTIONS EXCEEDS MAX DIMENSION OF 4200, CHANGE IN DIM.h TO 6000.

- COMPILE AGAIN.

- RUN IT: "fault7-11stri" - WITHOUT A FAULT - WILL INCLUDE FAULT IF IT RUNS O.K.

7-26-94 MR

- NOTE - RUN OF 7-22 ("fault7-11stoi") UNSUCCESSFUL BECAUSE INCORRECT NUMBER OF 'X' ELEMENTS STATED IN INPUT (76 INSTEAD OF 106). RUN GOT TO $\simeq 10^{-12}$ yrs IN 9900 TIME STEPS. PROBLEM CORRECTED; PROGRAM RUNNING @ $\simeq$ 0830.

- NOTE - BULK PERMEABILITY IN "fault7-11stoi" IS INCORRECT FOR ALL MATERIALS. WILL CORRECT SO ALL ARE CONSISTENT WITH THE FOLLOWING RELATIONSHIP:

$$K_b = K_f \phi_f + K_m (1 - \phi_f)$$

- KILL RUN, REPLACE WITH CORRECTED INPUT - NOTE: AFTER 42 TIMESTEPS TIME $= 3.6 \times 10^{-14}$ YRS!

- $KILL_{LL} - 9_{LL}$ 8629 @ $\simeq$ 0915

- BEGIN $\simeq$ 0915

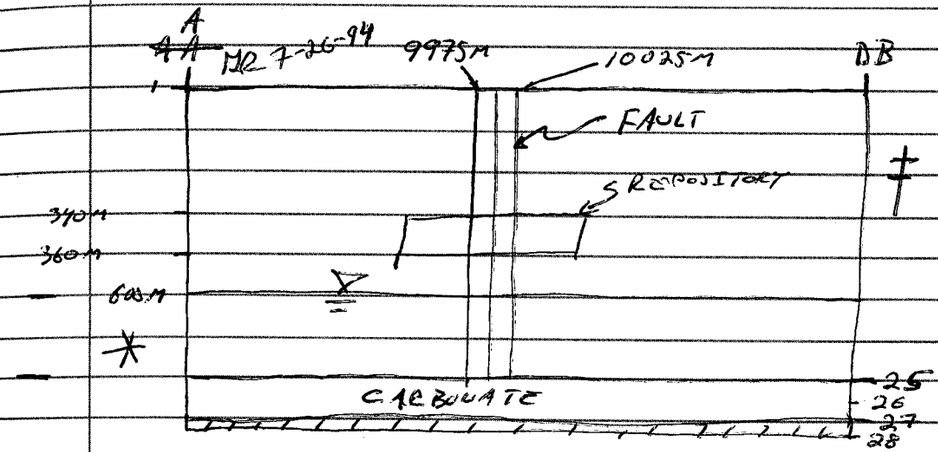
→ INCREASE ELEMENT SIZE ON EITHER END TO MAKE CONSTANT HEAD BOUNDARIES FROM ELEMENT 16 THROUGH 25 (WATER TABLE TO TOP OF CARBONATE). SIZE FROM $\simeq 10^3 \rightarrow 10^{13}$.

→ CHANGE ELEMENTS ON EITHER SIDE OF GRID (CA & DB) TO MATERIAL 7 SO THE HIGH SPECIFIC HEAT WILL RESULT IN CONSTANT TEMPERATURE BOUNDARIES.

→ NOTE: DID NOT CORRECT 1st PROBLEM MENTIONED ON PAGE BECAUSE CHANGED LINES AFTER ACTIVE INPUT (ENDCY)! NOW CORRECTED - BEGIN RUN @ $\simeq$ 1005

7-26-94 MR

- RUN ("fault7-11stoi") APPEARS TO BE RUNNING WELL. I WILL KILL IT AND INSERT THE FAULT IN ELEMENTS ~~AZ1 THROUGH AZ25, AND~~ MR 7-26-94 BA1 THROUGH BA25, (X = 9975 → 10,000) AND BB1 THROUGH BB25, (X = 10,000 → 10025).



- KILLED RUN @ 1055, TIME STEP = 28, TIME = 5.3×10^{-6} YR.

- BEGIN RUN ~~"faultf"~~ MR 7-26-94 "fault7-11stoi" $\simeq$ 1050.

* TUFF ELEMENTS BELOW THE WATER TABLE ARE KEPT AT CONSTANT HEAD BY ASSIGNING THEM A HUGE VOLUME (10^{13} M^3, ELEMENTS A16 - A25 AND DB16 - DB25)

* $\simeq$ 150M OF HEAD ADDED TO ELEMENTS A16 - A25.

† BOTH SIDE BOUNDARIES OF GRID HAVE BEEN MADE CONSTANT TEMPERATURE BOUNDARIES BY ASSIGNING THEM A SPECIFIC HEAT OF 10^{19}.

7-26-94

- BUILDING A LAYERED 2D ROUGH MODEL:
  28 X 76 ELEMENTS, 8 MATERIAL TYPES:

0 — ~~TIVA CANYON~~: $K_M = 4.4 \times 10^{-17} m^2$, $K_f = 1.6 \times 10^{-13} m^2$ (DATA FROM THAT GATHERED FOR HYDROSTRATIGRAPHIC MODEL.

100 — $K_b = K_f \phi_f + K_M (1 - \phi_f)$, ϕ_f ASSUMED = 0.002
$= 1.6 \times 10^{-13} (0.002) + 4.4 \times 10^{-17} (0.998) \simeq 3.6 \times 10^{-16}$

0 — ~~TIVA CANYON~~

100 — ~~YUCCA MOUNTAIN & PAH CANYON~~

150 — TOPOPAH SPRING

500 — CALICO HILLS & PROW PASS

600 — BULLFROG

700 — TRAM + LITHIC RIDGE

1600 — CARBONATE UNITS

1650 — IMPERMEABLE UNITS

1675 —

7-26-94

- MATRIX PERMEABILITIES FOR EACH UNIT ARE TAKEN FROM DATA GATHERED FOR THE HYDROSTRATIGRAPHIC MODEL (K_M) (M^2)

- FRACTURE PERMEABILITIES ARE ~~ASSUMED~~ ALSO TAKEN FROM DATA GATHERED FOR HYDROSTRATIGRAPHIC MODEL (K_f, M^2). IF DATA UNAVAILABLE FOR A UNIT, K_f ASSUMED = $1.6 \times 10^{-13} M^2$

- MATRIX POROSITIES ARE ASSUMED TO = 0.1 ~~K_M~~ (ϕ_M), FRACTURE POROSITIES ASSUMED TO VARY FROM 0.001 TO 0.003 AMONG UNITS (ϕ_f)

- BULK PERMEABILITY IS CALCULATED FOR EACH UNIT AS SHOWN IN NITAO, 5/88:

$$K_b = K_f \phi_f + K_M (1 - \phi_f) \text{ - } (M^2)$$

- TIVA CANYON:
  $K_M = 4.4 \times 10^{-17} M^2$, $K_f = 1.6 \times 10^{-13} M^2$, $\phi_f = 0.002$
  $K_b = 1.6 \times 10^{-13} (0.002) + 4.4 \times 10^{-17} (0.998) = 3.6 \times 10^{-16} M^2$

- YUCCA MTN / PAH CANYON:
  $K_M = 1 \times 10^{-14} M^2$, $K_f = 1.6 \times 10^{-13} M^2$, $\phi_f = 0.003$
  $K_b = 1.6 \times 10^{-13} (0.003) + 1 \times 10^{-14} (0.997) = 1.0 \times 10^{-14} M^2$

- TOPOPAH SPRING
  $K_M = 1.7 \times 10^{-17} M^2$, $K_f = 1.6 \times 10^{-13} M^2$, $\phi_f = 0.001$
  $K_b = 1.6 \times 10^{-13} (0.001) + 1.7 \times 10^{-17} (0.999) = 1.8 \times 10^{-16} M^2$

- CALICO HILLS / PROW PASS
  $K_M = 6.8 \times 10^{-17} M^2$, $K_f = 1.6 \times 10^{-13} M^2$, $\phi_f = 0.002$
  $K_b = 1.6 \times 10^{-13} (0.002) + 6.8 \times 10^{-17} (0.998) = 3.9 \times 10^{-16} M^2$

7-26-94
AR

- BULLFROG:
  $K_M = 1.6\times10^{-16}$ / $K_f = 3.4\times10^{-13}$ $\phi_f = 0.003$
  $K_b = 3.4\times10^{-13}(0.003) + 1.6\times10^{-16}(0.997) = 1.2\times10^{-15}\ m^2$

- TRAM/LITHIC RIDGE
  $K_M = 7.5E\text{-}17$, $K_f = 1.0\times10^{-13}$, $\phi = 0.002$
  $K_b = 1.0\times10^{-13}(0.002) + 7.5\times10^{-17}(0.998) = 2.7\times10^{-16}\ m^2$

- CREATING etough INPUT FILE layersϕli

- GRIDDER X:

1,0,1,0,1,8,1,2,1,10,2,1,9,2,1,0,10,52,
101300,16409820,0,0,1675,0.10,0,0

- KILLED RUN "fault7-11stri" BECAUSE GENER SINKS SET AT BX ELEMENTS INSTEAD OF DB ELEMENTS.

- CORRECTED INPUT & RESTARTED "fault7-11stri" @ ≃ 1645

7-27-94
AR

- 0800 - RUN "fault7-11stri" @ 1782 TIME STEPS & 7.31 yrs - $\Delta t \simeq 10^{-16}$ yrs. KILLED.

- FINISHED INPUT FOR "ctlayersϕli" - BEGIN RUN @ ≃ 1030
- RUN ENDED @ TIME = 9.989×10^{-7} yr!

- BEGIN "ctlayersϕli" RUN AGAIN, CHANGED TIME IN PARAM FROM 3.15×10^{1}s TO 3.154×10^{11}s (10,000 yrs)

7-27-94
AR

- BEGIN "ctlayersϕli" @ ≃ 1100

- PETER LICHTNER RE GENERATING etough OUTPUT TO USE AS NEW INITIAL CONDITIONS: • SAVE IS INITIAL CONDITIONS FOR LAST TIMESTEP

- "ctlayersϕli" KILLED BECAUSE Δts WENT TO 10^{-11}s.

- NEW INPUT FILE: "layfaultϕli" IS ALTERED "fault7-11i". MATERIAL #1 HAS BEEN GIVEN TIVA CANYON PROPERTIES (SEE PAGE 71).

- RUN "layfaultϕli" @ 1130.

- INPUT "20kmstrϕli" IS A MODIFIED "fault7-11stri" EXCEPT THE FAULT HAS BEEN REMOVED.

- KILL "layfaultϕli" @ ≃ 1335 - GOT TO 8.37 yrs IN 132 TIMESTEPS - Δt REMAINS ≃ 0.2 yrs FOR MANY (>20) TIMESTEPS.

- RUN "20kmstrϕli" @ ≃ 1340 — RUNNING!

- NEW INPUT FILE: "layfaultϕ2i" SAME AS "layfaultϕli" EXCEPT: $K_f = 1.0\times10^{-17}$, $\phi_f = 0.0018$, $K_M = 1.0\times10^{-12}$
  $K_b = 1\times10^{-17}(0.0018) + 1.0\times10^{-12}(0.9$
  AR 7-27-94 AR 7-27-94

EXCEPT: $K_M = 1.9\times10^{-17}$, $\phi_f = 0.0018$, $K_f = 1.0\times10^{-12}$

$K_b = 1.0\times10^{-12}(0.0018) + 1.9\times10^{-17}(0.9982) = 1.8\times10^{-15}$

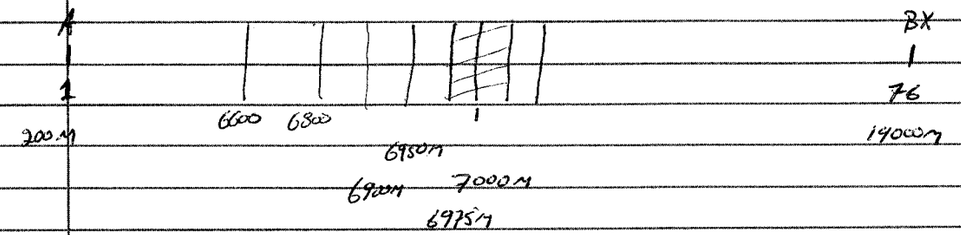
7-27-94

* KILLED RUN "20Kyrstrφ1i" BECAUSE IT GOT BOGGED DOWN w/ Δts ≃ 1×10^{-3} yr. (≃1425)

* BEGIN RUN w/ "layfaultφ2i" ≃ 1430

* IN: /Home2/sisyphus/grice/gwtt/infilt :

MODIFY "layfaultφ1i" TO INCLUDE A CONSTANT INFILTRATION RATE OF 1mm/yr CALL NEW INPUT: "infiltφ1i"



~~TOP OF ELEMENT~~ NR 7-27-94

ELEMENT	LENGTH OF TOP (m)	WIDTH (m)	AREA (m^2)
~~AK~~ NR 7-26-94	200	0.05	10
~~BZ~~ NR 7-26-94	200	0.05	10
⋮		⋮	⋮
AH	200	0.05	10
AI	100	0.05	~~10~~ 5
AJ	50	⋮	~~5~~ 2.5
AK	25	⋮	~~2.5~~ 1.25
AL	25	⋮	~~2.5~~ 1.25
AM	25	⋮	~~2.5~~ 1.25
AN	25	⋮	~~2.5~~ 1.25
AO	50	⋮	~~5~~ 2.5
AP	100	⋮	~~10~~ 5
AQ	200	⋮	10
AR	200	⋮	10
⋮	⋮	⋮	⋮
BX	200	0.05	10

FAULT

NR 7-27-94 NR 7-27-94

FLOW RATE THROUGH TOP OF COLUMN REQUIRED FOR RATE OF 1mm/YR

FOR AREA = $10\ m^2$:

$$\frac{10^{-3}\ m}{yr} \frac{10\ m^2}{} \frac{yr}{365\ days} \frac{day}{86400\ s} = 3.17 \times 10^{-10} \frac{m^3}{s}$$

THIS RATE WILL APPLY TO COLUMNS A THROUGH AH AND AQ THROUGH BX

FOR AREA = $5\ m^2$:

$$\frac{10^{-3}\ m}{yr} \frac{5\ m^2}{} \frac{yr}{365\ days} \frac{day}{86400\ s} = 1.59 \times 10^{-10} \frac{m^3}{s}$$

THIS RATE WILL APPLY TO COLUMNS AI AND AP

FOR AREA = $2.5\ m^2$, RATE = $7.9 \times 10^{-11}\ m^3/s$, APPLIES TO AJ AND AO

FOR AREA = $1.25\ m^2$, RATE = $4.0 \times 10^{-11}\ m^3/s$, RATE APPLIES TO COLUMNS AK THROUGH AN

ADD GENER LINES FOR EACH COLUMN IN "infiltφ1i".

* KILL RUN "layfaultφ2i" – BOGGED DOWN w/ Δts ≃ 10^{-1} yr.

* ≃ 1555 BEGIN RUNNING "Infiltφ1i" – CRASHED!

* RESTART "layfaultφ2i" – SEE WHAT HAPPENS OVERNIGHT.

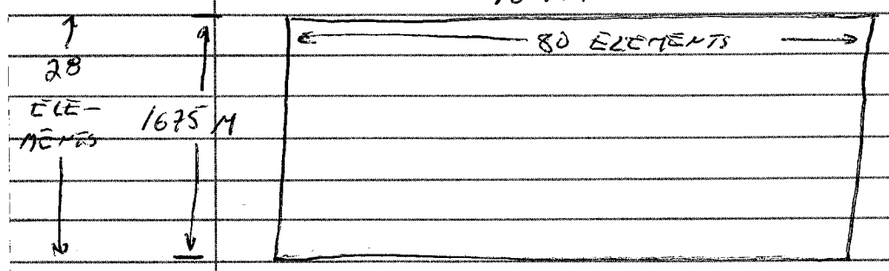
7-28-94 JR

- "layfaultϕ2i" RAN TO ≃1000 YRS - RUN DIED FOR LACK OF MEMORY.

PATH: /home2/sisyphus/grice/gwtt/layers

- RUN "infiltϕ1" — INFILTRATION RATE = 1mm/yr — IT RUNS!

- MAKE INPUT FILE "16Kmstoi" IN: /home2/sisyphus/grice/gwtt/stretch



GRIDDER X INPUT:

7 JR 7-28-94

1,0,1,0,1,~~6~~,1,1,14,3,1,6,2,1,0,10,52,

101300,16409820,0,0,1675,0.1,0,0

→ CONVERTED "16Kmstrϕ1i" TO "ct16Kmstrϕ1i"

- RUN "infiltϕ1i" DONE ≃ ~~1325~~ 1415 JR. 247 TIME STEPS = 10^6 YRS.

- BEGIN "ct16Kmstrϕ1i" @ 1415 — CRASHED.

- BEGIN "ct16Kmstrϕ1i @ 1800

8-1-94 JR

- KILLED "ct16Kmstrϕ1i" — STEP = 8940, TIME = 6.09 YRS, $\Delta t = 1 \times 10^{-16}$ YRS.

- ALTERED "layfaultϕ1i" — MADE SIDE BOUNDARIES CONSTANT TEMPERATURE, SPECIFIC HEAT = 1×10^{12}.

- BEGIN "layfaultϕ1i" @ ≃ 0845 — CORE DUMPED — SCREEN "LOCKED UP" WHEN I TRIED TO REMOVE (rm) CORE. DON'T KNOW WHAT HAPPENED

- BEGIN "layfaultϕ1i" AGAIN — NO CHANGES @ 0915, RUNS!?!? — FINISH ≃ 1400.

- BUILD "16Km5mt1ϕ1i" — IDENTICAL TO "16Kmstrϕ1i" EXCEPT 5 LAYERS INSTEAD OF 7.

GRIDDER X:

1,0,1,0,1,5,1,1,14,10,3,1,0,10,52,

101300,16409820,0,0,1675,0.1,0,0

- INFILTϕ1i: ~~6~~ 6 LAYERS, INCLUDING FAULT (7,11) (PERM = 1×10^{-11} m²)
  PERM LAYERS: 1 = 3.6×10^{-16}, 2 = 1.8×10^{-14}, 3 = 1.8×10^{-14}, 4 = 1.9×10^{-6}, 5 = 1.9×10^{-12}, ALL 9.9's.

- LAYFAULTϕ1i: 7 LAYERS, INCLUDING FAULT (7,11) (PERM = 1×10^{-11} m/s)
  1 = 3.6×10^{-16}, 2 = 1.8×10^{-14}, 3 = 1.8×10^{-14}, 4 = 1.9×10^{-6}, 5 = 1.9×10^{-12}, 6 = FAULT, 7 = 1.8×10^{-14}, spht = 10^{12}

- CONVERT "16Km5mt1ϕ1i" TO "ct16Km5mt1ϕ1i"

- BEGIN "ct16Km5mt1ϕ1i" ≃ 1405
- KILL @ ≃ 1715, $\Delta t \simeq 1 \times 10^{-7}$

8-1-94

- BUILD "14Km5mtlφli" - IDENTICAL TO "16Km5mtlφli" EXCEPT 14 KM WIDE (70 ELEMENTS) INSTEAD OF 16 Km (80 ELEMENTS)

- BEGIN "14Km5mtlφli" ≃ 1750 : ITERS.

8-2-94

- KILL "14Km5mtlφli" ≃1200, ON STEP 3680, YEAR = 5-84, $\Delta t \simeq 2 \times 10^{16}$ yr

- NOTE - DID NOT ENTER PROPERTIES FOR CARBONATE AQUIFER (MAT14) OR IMPERMEABLE LAYER (MAT15) IN "14Km5mtlφli" - WILL DO SO AND RUN AGAIN.

- INCORRECT / I MISREAD THE INPUT! HOWEVER, THE FRACTURE AND MATRIX PERMEABILITIES ARE INCONSISTENT WITH THE BULK PERMEABILITIES FOR THESE LAYERS. I WILL CORRECT.

- BEGIN SLIGHTLY CHANGED "14Km5mtlφli" RUN ≃1055

- KILLED "14Km5mtlφli" ≃1120, - DID NOT APPEAR PROMISING - Δt's POWERED IN 10^{-3} yr RANGE FOR > 20 ITERATIONS.

- QUESTION - WHY DOES "FAULTφ7-11i" RUN WHEN IT IS MORE "COMPLICATED" THAN "14Km5mtlφli"?

COMPARE

8-2-94

FAULTφ7-11i 14Km5mtlφli

76X28
6 MATERIAL
FAULT (COLUMNS AL+AM)
LATERAL BOUNDARIES NOT CONSTANT TEMP

70X28
5 MATERIALS
NO FAULT
LATERAL BOUNDARIES CONSTANT TEMP

- BEGIN BUILDING "16Km fault7-11i" - THIS WILL BE EXACTLY LIKE fault7-11i EXCEPT IT WILL BE 16Km WIDE INSTEAD OF 14 Km WIDE. FAULT WILL BE 50 M WIDE CENTERED @ 8000 M.

METERS IN X DIRECTION

200.
400.
600.
800.
1000.
1200.
1400.
1600.
1800.
2000.
2200.
2400.
2600.
2800.
3000.
3200.
3400.
3600.
3800.
4000.
4200.
4400.
4600.
4800.
5000.
5200.
5400.
5600.
5800.
6000.
6200.
6400.
6600.
6800.
7000.
7200.
7400.
7600.
7800.
7900.
7950.
7975.
8000. — FAULT
8025.
8050.
8100.
8200.
8400.
8600.
8800.
9000.
9200.
9400.
9600.
9800.
10000.
10200.
10400.
10600.
10800.
11000.
11200.
11400.
11600.
11800.
12000.
12200.
12400.
12600.
12800.
13000.
13200.
13400.
13600.
13800.
14000.
14200.
14400.
14600.
14800.
15000.
15200.
15400.
15600.
15800.
16000.

METERS IN Z DIRECTION

50. — 1
100.
150.
200.
250. — 5
290.
320.
340.
360.
380. — 10
410.
450.
500.
550.
600. — 15
700.
800.
900.
1000.
1100. — 20
1200.
1300.
1400.
1500.
1600.
1625.
1650.
1675.

8-2-94 LR

- GRIDDER X
5 RR
1, 0, 1, 0, 1, 6, 1, 1, 14, 10, 2, 1, 0, 10, 52,
10130 RR 16 409 820, 0, 0, 1675, .1, 0, 0
- CONVERTED TO: "ct16Kmfault7-11i",
- BEGIN RUN OF 5 RR ≃ 1815 - IT RUNS.

8-3-94 LR

- RUN "ct16Kmfault7-11i" STOPPED AFTER 1000 DAYS BECAUSE MACHINE OUT OF MEMORY. I WILL CHANGE INPT SO PROGRAM ONLY WRITES TO DISK 8 TIMES INSTEAD OF 16 TIMES.
- BEGIN "ct16Kmfault7-11i" ≃ 0870 - FAILED: ERROR READING FILE IMAGE
- ADD '8' IN PLACE OF BLANK IN 2ND TIMES FIELD. NOW READS 8 8 INSTEAD OF 8 ␣. RUNS.

→ CHECK INITIAL PRESSURES FOR ALL INPUT FILES RUN TO DATE:

DEPTH OF WATER TABLE = 550M.
- DEPTH of CENTER OF ELEMENT 16 = 650M
PRESSURE = $(1\times10^5 + (650-550)M\ 9.7306\times10^3\ Pa/M) = 1.07\times10^6$ Pa
CHECKS WITH INPUT!
- DEPTH OF CENTER OF ELEMENT 20 = 1050M
PRESSURE = 1×10^5 Pa + (1050M - 550M) 9.7306×10^3 Pa/M
$= 4.97\times10^6$ Pa, CHECKS WITH INPUT!

≃ 1800 - RUN "ct16Kmfault7-11i" ENDS SUCCESSFULLY @ 10,000 YRS.

8-3-94 LR

≃ 1830 BEGIN "BASICφ1i" = COPY OF "ct114-2i" EXCEPT WILL RUN TO 10^6 YRS INSTEAD OF 10^4 YRS.

8-4-94 LR

RUN "basicφ1i" COMPLETED - IN DIRECTORY:

/home2/sisyphus/grice/gwtt/basic

8/17/94 LR

TIME STEPS IN cnewa.out:
21, 25, 28, 30, 33, 34, 36, 39

21 = 10 DAYS, 25 = 50 DAYS, 28 = 20.0 DAYS, DR
30 = 50 DAYS 33 = 120 DAYS 34 = ~~480~~ 180 DAYS
36 = 365 DAYS, 39 = 1157 DAYS

- TOUGH OUTPUT FILE "cnewa.out" IS AT STEADY STATE BEFORE FIRST TIME STEP PRINTED (1 DAY). RUNNING SAME FILE WITH DIFFERENT PRINTED TIME STEPS IN ctough ON SISYPHUS. INPUT FILE NAME = "ctcgl-ai".
BEGIN RUN ≃ 1410
- RUN COMPLETED ≃ 1415

DATA FROM TECPLOT DISPLAY OF DATA (VAR = P)

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	INPUT FILE = "ctcgl-ai"
3.60×10^3	101,110	100,000	
1.08×10^4	101,700	100,000	
2.16×10^4	101,860	100,000	
3.24×10^4	101,890	100,000	
4.32×10^4	101,890	100,000	

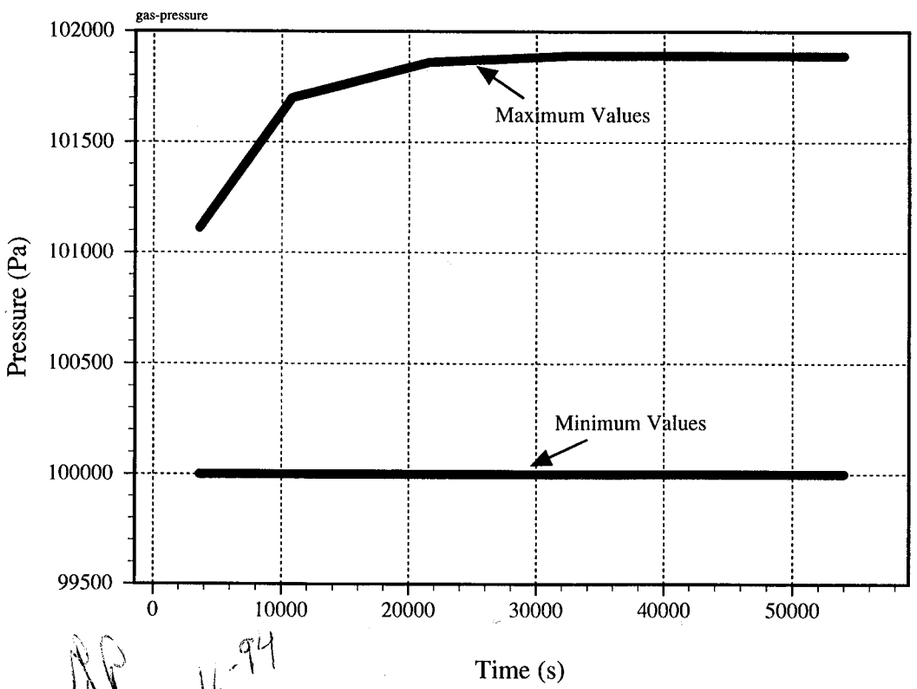
⇓

6/17/94 AL

TIME (s)	GAS PRESSURE (Pa)	GAS PRESSURE (Pa)
5.4×10^4	101,890	100,000
6.48×10^4	101,890	100,000
7.56×10^4	101,890	100,000
8.64×10^4	101,890	100,000
1.728×10^5	101,890	100,000
4.32×10^5	101,890	100,000
8.64×10^5	101,890	100,000
1.728×10^6	101,890	100,000
4.32×10^6	101,890	100,000

MC 8-16-94

Gas Pressure vs Time



MC 8-16-94

6/13/94 AL

The following data was taken from CNWRA notebook # 098, pages 12 through 15. The experiment from which these data are derived is described on pages 10 and 11 of the notebook.

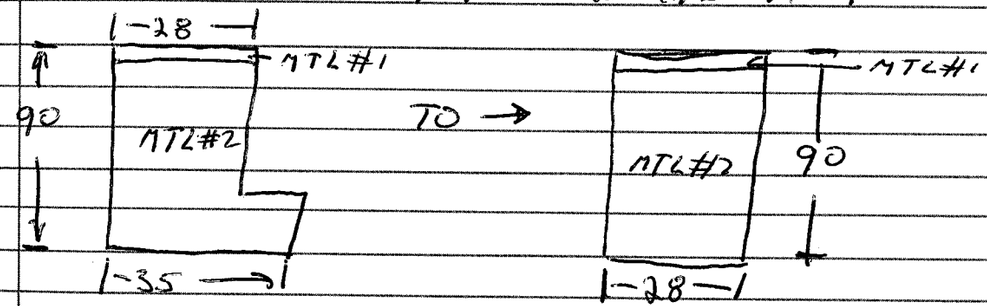
Date	Time	Watts	Internal Pressure (psig)	External Pressure (psig)	Internal Temperature (C)	External Temperat (C)
6/29/94	0943	40.6			68	
	0945				80	
	0949				93	
	1022		0.35		108	
	1027	66.5				
	1037		0.5	0	152	
	1128	55.1				
	1514	55	2.6		199	
	1850	47.7	2.77		215.5	
6/30/94	1325	47.4	1.436		191.4	
7/01/94	0945		-0.07(?)		193	
			0.1			
	1009	48				
7/05/94	????	48	0.07	-0.1	193	
7/06/94	0930	48	0.05	0.03	192	
7/07/94	0825	46.9				
7/08/94	0755				192.8	
	0835	TURNED OFF HEATER				

AL 8-16-94

8-16-94

8/13/94 • CONVERT INPUT FILE FROM ROM ("fmid2i") TO ctough FORMAT ("ctfmid2i")

CHANGE SHAPE OF FLOW DOMAIN FROM:



- BEGIN RUNNING "ctfmid2" @ ≈ 1420

- STEVE SVEDEMAN = X 3002
- LARRY BISHOP

MC

8/19/94 NR

- RUN "effmid2i" STOPPED - RAN OUT OF ROOM. - DELETE FILES - BEGIN AGAIN @ 1235.

- RETURN TO CYLINDER EXPERIMENT. SEE TO OF PAGE 83 FOR DESCRIPTION. LOCATION OF FILES USED IN CYLINDER RUNS:

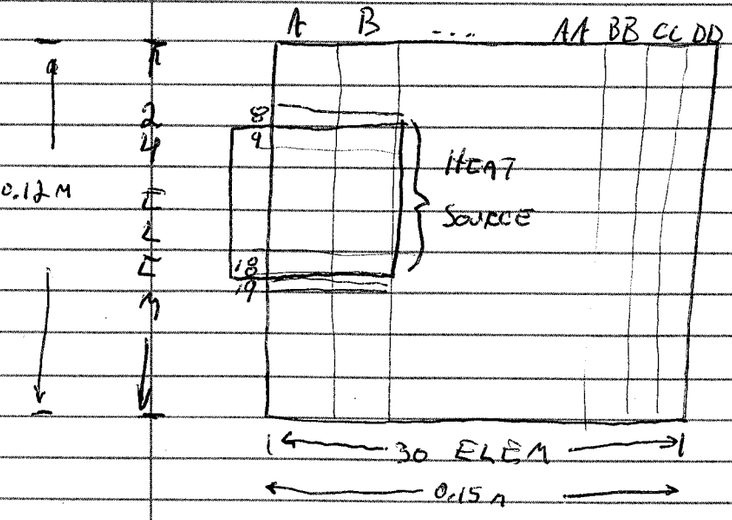
/home2/sisyphus/grice/cyl

- EXAMPLE CALCULATION - GENER TABLE, WATTS PER ELEMENT (DATA IN FILE "heat-cyl.in"). HEAT SOURCE IN ELEMENTS:

A-9 , B-9

↓

A-18 , B-18

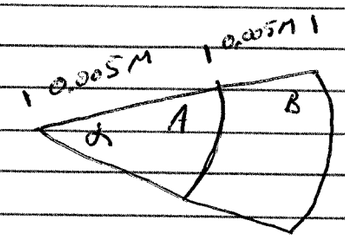


8/19/94 NR

- LET TOTAL HEAT SOURCE = W (IN WATTS)

- HEAT SOURCE IS DISTRIBUTED OVER 10 LAYERS OF MODEL, HEAT PER LAYER = W/10.

- EACH ELEMENT IS A PORTION OF A "PIE SLICE":



NR 8/19/94

VOL A / VOL B =

- PORTION OF W/10 TO ALLOCATE TO ELEMENT A & B:

For ~~AREA~~ ELEMENT A: NR 8/19/94

$$\frac{\text{AREA of A}}{\text{AREA A + AREA B}}$$

FROM PROGRAM INPUT (ELEM)

$$\frac{A}{A+B} = \frac{\left(7.854\times10^{-5}\right)0.005}{\left[7.854\times10^{-5}+2.3562\times10^{-4}\right]0.005} = 0.25,$$

$$\therefore \frac{B}{A+B} = 0.75$$

PORTION OF HEAT TO ALLOCATE TO A = 0.25

" " " " " " B = 0.75

$A \rightarrow \frac{W}{10}\,0.25$, $B \rightarrow \frac{W}{10}\,0.75$ →

8/19/94

$A \rightarrow \frac{W}{10}\ 0.25$, $B \rightarrow \frac{W}{10}\ 0.75$,

$\alpha = 6.28 \times 10^{-2}$ RADIANS $\simeq 3.6°$, $\therefore$ OUR "PIE SLICE" IS 1/100TH OF A CIRCLE AND TOTAL POWER ALLOCATED TO EACH ELEMENT IS:

$A: \quad 0.01\ \frac{W}{10}\ 0.25$, $B: \quad 0.01\ \frac{W}{10}\ 0.75$,

IF $W = 40$ WATTS,

$A \rightarrow \quad 0.001\,(40)\,0.25 = \frac{0.01}{0.1}W$ NP 8/19/94

$B \rightarrow \quad 0.001\,(40)\,0.75 = \frac{0.03}{0.3}W$

FROM PAGE 83:

TIME (s)	TOTAL WATTS	A (WATTS)	B (WATTS)
0	40.6	1.015×10^{-2}	3.045×10^{-2}
2640	66.5	1.662×10^{-2}	4.988×10^{-2}
6300	55.1	1.378×10^{-2}	4.132×10^{-2}
19,860	55.0	1.375×10^{-2}	4.125×10^{-2}
32,820	47.7	1.192×10^{-2}	3.578×10^{-2}
99,720	47.4	1.185×10^{-2}	3.555×10^{-2}
174,400	48.0	1.200×10^{-2}	3.600×10^{-2}
686,500	46.9	1.172×10^{-2}	3.518×10^{-2}
773,500	0	0	0

- MODIFIED FILE "cyl-ai" BY REPLACING GENER TABLE WITH ONE CONTAINING ABOVE DATA — ATTEMPT TO SIMULATE

8/19/94 NP

EXPERIMENTAL CONDITIONS. NEW FILE CALLED: "cyl-a2i"

- CONVERT "cyl-a2i" TO ctough FORMAT. PATH:

/home2/sisyphus/grice/cyl/ctcyl-a2i

- BEGIN RUNNING "ctcyl-a2i" $\simeq$ 1640 — RUNTO.

8/20/94 NP

- "ctcyl-a2i" STOPPED BECAUSE TIMES IN GENER WERE NOT AS LONG AS TIMES IN TIME CHANGE INPUT:

IN PARM, $t_{MAX} \rightarrow 4.32 \times 10^6$s

IN TIMES: 3.6×10^3, 1.08×10^4, 2.16×10^4, 3.24×10^4, 5.4×10^4, 6.48×10^4, 8.64×10^4, 1.296×10^5, 1.728×10^5, 3.456×10^5, 8.640×10^5, 1.728×10^6, 4.32×10^6

IN GENER, ADD 2 TIMES + 2 POWER RATES TO ALL ELEMENTS:

TIME	WATTS
CNP 8/19/94	
8.64×10^5	0
4.32×10^6	0

CHANGE WATTS @ TIME = 7.735×10^5 FROM 0.0 TO 1.172×10^{-2} (SAME AS PREVIOUS TIME), FOR 'A' ELEMENTS, AND FROM 0.0 TO 3.518×10^{-2} FOR 'B' ELEMENTS (SAME AS PREVIOUS TIME).

- BEGIN RUNNING "ctcyl-a2i" $\simeq$ 1445

8/20/94 JR

IN PEMRAC - CREATING DIRECTORY:

/we/rgreen/grice/fran

- FTP TO SISYPHUS, GET ctcyl+ "ctfmid2i" ↳ (129.162.200.71)
- MOVED "ctfmid2i" + ctcyl TO PEMRAC: /we/rgreen/grice/fran — BEGIN RUNNING ≃ 15:00.

BOTH MODELS RUNNING IN BACKGROUND.

——— / ——— / ———

8/22/94 JR

- BOTH MODELS STOPPED RUNNING — "ctfmid2i" RAN TO END - ALL TIME STEPS COMPLETED. JR 8/22/94 "ctcyl-a2i" "ctfmid2i" QUIT AFTER ≃ 50 DAYS - DON'T KNOW WHY DID NOT RUN TO COMPLETION.

OUTPUT: /home2/sisyphus/grice/cyl/ctcyl-a2i
(INFO TAKEN FROM PLOTS IN TECPLOT)

TIME (s)	MIN GIS PRESSURE (Pa)	MAX GIS PRESSURE (Pa)
3600	100,000	293,500
10,800	100,000	280,040
21,600	100,000	278,490
32,400	100,000	253,240
43,200	100,000	249,820
54,000	100,000	249,500
64,800	100,000	249,230
75,600	100,000	249,090
86,400	100,000	248,870

8/22/94 JR

OUTPUT - CONTINUED

TIME (s)	~~MAX~~ MIN PRESSURE (Pa) DR 8/24/94	~~MIN~~ MAX PRESSURE (Pa) DR 8/22/94
129,600	100,000	249,100
172,800	100,000	250,960
345,600	100,000	249,860
864,000	100,000	100,330
1,728,000	99,999	100,000
4,320,000	99,999	100,000

- PEAK PRESSURE OCCURED BEFORE 10,800 s. WILL RE-RUN PROBLEM WITH DIFFERENT TIMES: NEW FILE =

/home2/sisyphus/grice/cyl/ctcyl-a3i

NEW PRINTOUT TIMES IN TIME(s):

60; 300; 1200; 2400; 3600; 4800; 9600; 20,000; 40,000; 100,000; 500,000; 1,000,000; 2,000,000; 3,000,000; 4320,000.

- BEGIN RUNNING "ctcyl-a3i" ≃ 1000.
- END ≃ 1110.

JR 8/22/94

8-22-94

SIDEBAR - CALCULATION OF % SATURATION.

IF WE KNOW: BULK DENSITY, (BD)
DRY BULK DENSITY, (DBD)
POROSITY (n)

VOLUME OF WATER = BULK DENSITY - DRY BULK DENSITY

% SATURATION = $\frac{\text{VOL WATER}}{\text{POROSITY}}$

EXAMPLE: ASSUME:

BD = 2.08 gm/cm³
DBD = 1.89 gm/cm³
n = 0.30

MASS OF WATER = 2.08 g − 1.89 g = 0.27 g

VOL OF WATER = $0.27\,g \frac{1.0\,cm^3}{g} = 0.27\,cm^3$

VOL OF VOIDS = n cm³

% SATURATION = $\frac{\text{VOL WATER}}{n} = \frac{0.27/100}{0.30}$

= 90%

8/22/94

8-22-94

OUTPUT: /home2/sisyphus/grice/cyl/ctcyl-a3i

TIME (s)	MIN GAS PRESSURE (Pa)	MAX GAS PRESSURE (PA)	MAX-MIN (Pa)
60	100,000	100,420	420
300	100,000	152,800	52,800
1200	100,000	222,390	122,390
2400	100,000	280,520	180,520
3600	100,000	293,510	193,510
4800	100,000	288,310	188,310
9600	100,000	279,340	179,340
20,000	100,000	281,470	181,470
40,000	100,000	250,050	150,050
100,000	100,000	248,620	148,620
500,000	100,000	248,210	148,210
1,000,000	99,999	100,000	1
2,000,000	99,999	100,000	1
3,000,000	99,999	100,000	1
4,320,000	99,999	100,000	1

≃1225 - BEGIN FRAN RUN - LAST RUN ENDED BEFORE ALL TIME STEPS WERE COMPLETED SAME FILE AS LAST TIME (ON PEMRAC):

lwe/rgreen/grice/fran/ctfmid2i

8-23-94

- RUN ENDED ON PEMRAC, LAST TIME STEP = 250, TIME = 0.224 YRS = 7.064×10^6 S.
ELAPSED TIME = 2.42×10^4 S. - STOPPED BECAUSE VARIABLE 'ICYC' IN PARM = 250 → I CHANGED TO 9999.

- BEGAN NEW "ctfmid2i" RUN ≃ 1045.

8-23-94 JR

PLANS FOR WORK ON THERMAL PROJECT UNTIL RUN GREEN RETURNS (≈ 9/5/94)

- RUN SIMULATIONS OF CEMENT CYLINDER HEATING EXPERIMENT (SEE TOP OF PAGE 83)

~~- DO~~ DR 8/23/94

FILE LOCATION:

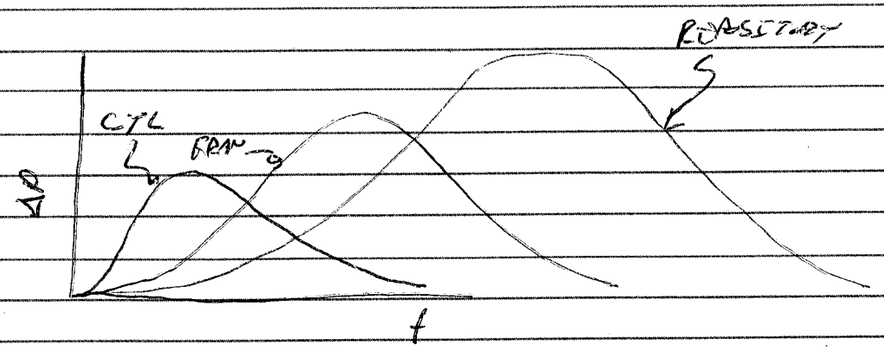
/home2/sisyphus/grice/cyl...

- RUNS IMULATIONS OF FRAN BLOCK

FILE LOCATION:

/we/ngreen/grice/fran...

- FOR BOTH SIMULATIONS, PRODUCE PLOT OF MAXIMUM GAS PRESSURE DIFFERENCE IN SYSTEM VS TIME:



ALSO, GET THIS ΔP INFORMATION FOR FRAN A RUN MADE BY RON C. FOR THE REPOSITORY. 8/23/94 DR

8-23-94 DR

FILE FOR REPOSITORY SIMULATION: 8/24/94 DR

CANNOT FIND OUTPUT - SEE PAGE 97

~~/home2/sisyphus/ngreen/gwtt/gwtt4i~~ DR 8/23/94

—1— END OF PLANS OVERVIEW —1—

- RE RUN CYLINDER EXPERIMENT SIMULATION:

/home2/sisyphus/grice/cyl/ctcyl-a3i:

TIMES(s):

500; 1000; 2000; 3000; 4000; 5000; 10,000; 20,000;

~~30,000~~ 8/23/94 DR; 30,000; 40,000; 50,000; 100,000;

500,000; 750,000; 1,000,000

- BEGIN enough RUN: "ctcyl-a3i" ≈ 1135

- END enough RUN "ctcyl-a3i" ≈ 1250

OUTPUT (FROM TECPLOT DISPLAYS):

TIME (s)	MIN GAS PRESSURE (Pa)	MAX GAS PRESSURE (Pa)	MAX − MIN (Pa)
500	100,000	174,950	74,950
1000	100,000	210,670	110,670
2000	100,000	262,260	162,260
3000	100,000	293,750	193,750
4000	100,000	292,480	192,480
5000	100,000	287,150	187,150
10,000	100,000	279,600	179,600

8-23-94
MR

OUTPUT (CONT.)

T (s)	MIN P (Pa)	MAX P (Pa)	MAX - MIN (Pa)
20,000	100,000	281,470	181,470
30,000	100,000	259,190	159,190
40,000	100,000	250,050	150,050
50,000	100,000	249,580	149,580
100,000	100,000	248,590	148,590
500,000	100,000	248,250	148,250
750,000	100,000	242,190	146,190
1,000,000	99,999	100,000	1

MR 8/23/94

- 1315 — KILLED "ctfmid2i" RUN -
  IT TOOK 1 TIMESTEPS = 3.17E-8 YRS
  FOR OVER AN HOUR - I'LL CHECK
  INPUT. WHEN KILLED:

  TIME = 1.693×10^{-5} YR
  TIME STEP = 535

- RUN NOT KILLED! - I DON'T KNOW HOW TO
  STOP IT

- CALL GORDON WITTMEYER - ASK HOW TO
  KILL RUN ON PEMRAC : X5082
  " "PS" TO GET RUN ID, THEN
  KILL ␣ -9 ␣ "RUNID"
  ↳ = PID #

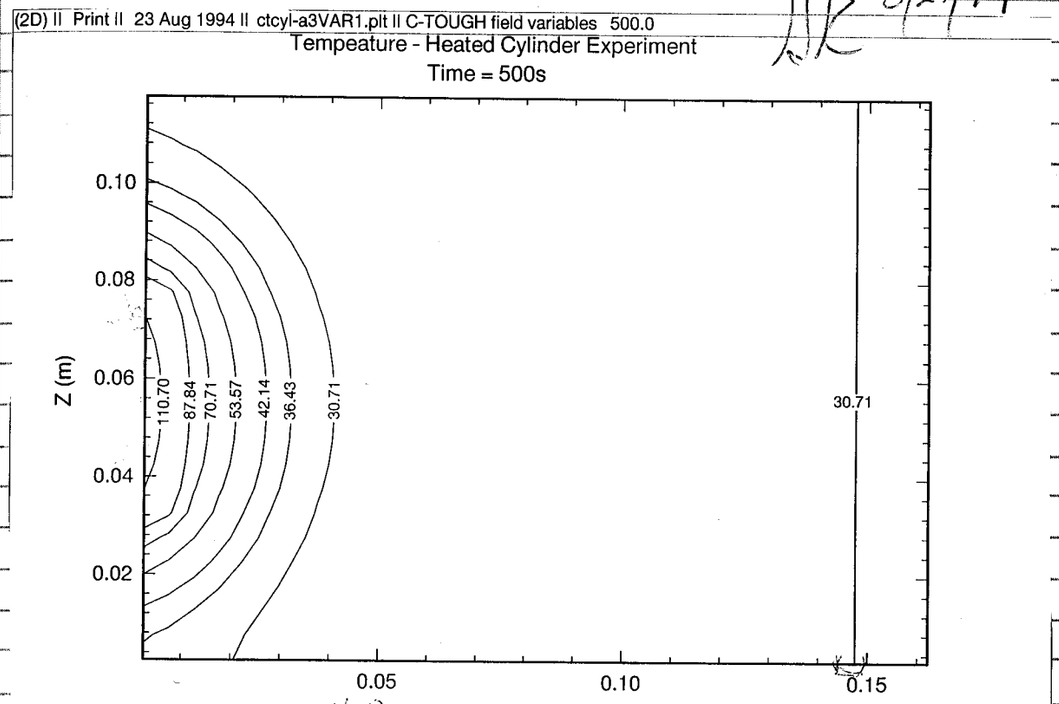
- BEGIN NEW "ctfmid2i" RUN ≃ 1335 - PROBLEM
  WITH PREVIOUS RUN - I DID NOT REMOVE ORIGINAL
  "CYC" VALUE IN PARAM BLOCK.

8-23-94
MR

OUTPUT (TODAY'S RUN): /home2/sisyphus/grice/cyl/ctcyl-a3i

HEATING HISTORY AS SHOWN ON PAGE 83

MR 8/23/94



MR 8/23/94

MR 8/23/94

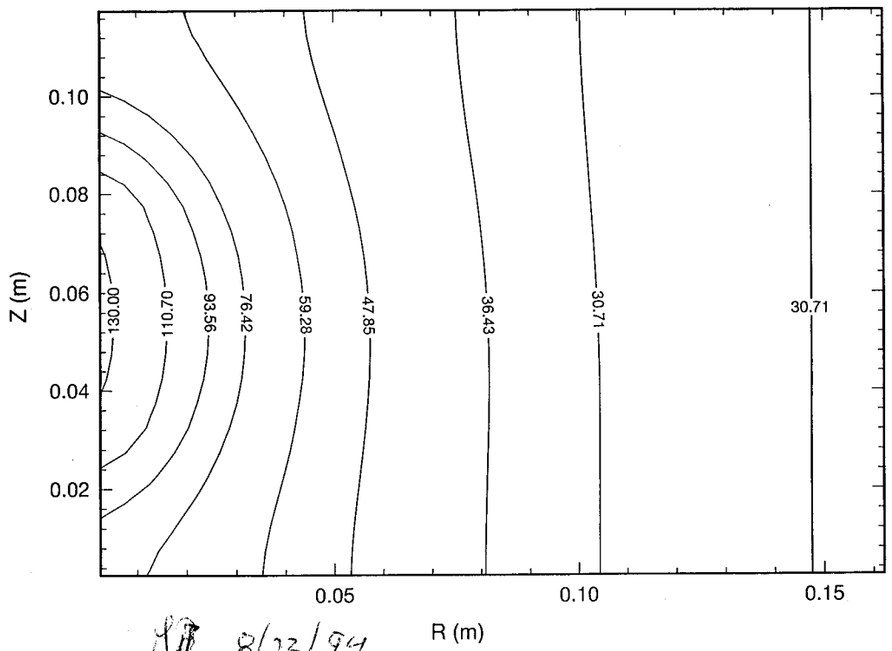
8-23-94 OUTPUT - AS ON PREVIOUS PAGE

NR 8/23/94

(2D) II Print II 23 Aug 1994 II ctcyl-a3VAR5.plt II C-TOUGH field variables 4000.

Tempeature(°C) - Heated Cylinder Experiment

Time = 4000s

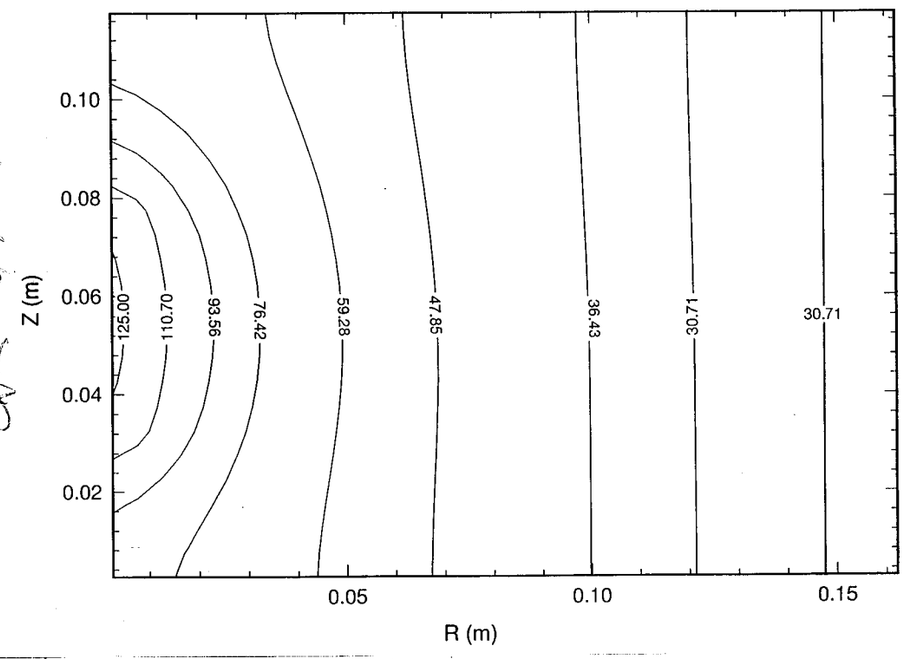


NR 8/23/94

(2D) II Print II 23 Aug 1994 II ctcyl-a3VAR13.plt II C-TOUGH field variables 5.0000E+05

Tempeature(°C) - Heated Cylinder Experiment

Time = 500,000s



NR 8/23/94

8-24-94
AR

- FRAN RUN ON PEMRAC STOPPED @ TIME STEP 586, SIMULATION TIME = 3.17 YRS ($\approx 10^8$ s)
ELAPSED MACHINE TIME = 5.5×10^4 s.

- UNABLE TO FIND OUTPUT FOR REPOSITORY RUNS MADE BY RON GREEN — I WILL RE-RUN ON SISYPHUS AS A ctough RUN. I WILL CONVERT THE FOLLOWING FILE TO ctough FORMAT:

/home2/sisyphus/rgreen/gwtt/gnew/gn1141

FILE COPIED AS:

ctnewgn1141

/home2/sisyphus/grice/thermal/repository/~~ctgn1141~~

DR 8/24/94

- STEVE SVEDEMAN: BOUNDARY TEMPERATURE OF CYLINDER EXPERIMENT = 20 °C

NOTE - ctough* + CONVRT* DON'T HANDLE MORE THAN 16 "TIMES" — I.E., "III" IN TIMES BLOCK MUST BE ≤ 16.

- BEGIN: /home2/sisyphus/grice/thermal/repository/ctnewgn1141 @ ~ 1435

→ RUN CRASHED OUT OF SPACE — BUT DON'T NEED TO RUN BECAUSE:

- RON GREEN CALLED. REPOSITORY OUTPUT IN: /usr2/sneezy/rgreen/gwtt/gnew/output4

8/23/94

6-24-94
AC

- AFTER PLOTTING DATA FOR ALL THREE CASES (CYLINDER, FRAN BLOCK, REPOSITORY), MAKE FRAN SIMULATIONS MORE REALISTIC:

  FOR ELEMENTS BELOW GROUND SURFACE (≥ 81) + ON OUTER BOUNDARY (AC(3)) AND ALONG BOTTOM ROW (90) : MAKE THEM VERY LARGE (≃ 10^6 m³) SO THEY ACT AS SOURCES/SINKS OF WATER + HEAT.

- OUTPUT: FILES TRANSFERED FROM PEMAC TO SISYPHUS:

  OLD I.D.: /we/rgreen/grice/fran/ctfnid2i

  NEW I.D.: /home2/sisyphus/grice/therm1/fran/ctfnid

  FROM TECPLOT DISPLAYS:

TIME (s)	~~MAX~~ MIN GAS PRESSURE (Pa)	MAX GAS PRESSURE (Pa)	MAX − MIN (Pa)
86,400	100,000	100,110	110
432,000	100,000	100,120	120
1,728,000	100,000	100,390	390
4,320,000	100,000	111,540	11,540
10,370,000	100,000	168,830	68,830
31,540,000	100,000	107,120	7,120
94,510,000	100,000	~~107~~ 100,750	750
100,000,000	100,000	100,680	680

MR 8/24/94

MR 8/24/94

8-29-94
JJ

- CYLINDER EXPERIMENT: MAXIMUM TEMPERATURE AT HEATER DURING MOST OF TEST ≃ 190 °C.

  SIMULATION GAVE MAXIMUM TEMPERATURE OF ≃ 125 °C FOR MOST OF TEST (home2/sisyphus/grice/.../cyl/plot#4)

  RON GREEN SAYS POWER INPUT (WATTS) SHOULD BE ADJUSTED UNTIL MAXIMUM SIMULATED TEMPERATURE ≃ 170 °C FOR MOST OF TEST.

  A NEW INPUT FILE WILL BE CREATED WITH THE FOLLOWING HEAT INPUTS (~~50%~~ DECREASE) DL 8/29/94

~~TIME~~ (s)	OLD INPUT (WATTS)	NEW INPUT (WATTS)

DL 8/29/94

TIME (s)	OLD INPUT A (WATTS)	OLD INPUT B (WATTS)	NEW INPUT A (WATTS)	NEW INPUT B (WATTS)
0	0.01015	0.0345	0.0142	0.0483
2640	0.01662	0.04988	0.0233	0.0698
6300	0.01378	0.04132	0.01929	0.0578
19,860	0.01375	0.04125	0.01925	0.0578
32,820	0.01197	0.03578	0.0167	0.0501
99,720	0.01185	0.03555	0.0166	0.0498
174,400	0.0120	0.0360	0.0168	0.0504
686,500	0.01172	0.03518	0.0164	0.0493
773,500	0.01172	0.~~03~~518	0.0164	0.0493
860,000	0	DL 4/27/94 0	0	0
4,320,000	0	0	0	0

NEW INPUT FILE:

/home2/sisyphus/grice/cyl/plot#5/ctcyl-a5i

6-29-94 MR

- BEGIN RUNNING "ctcy1--a5i" ≈ 1010
- "ctcy-a5i" RUN COMPLETED ≈ 1210

8-31-94 MR

OUTPUT FROM RESERVOIR SIMULATION:

/usr2/sneezy/rgreen/gwtt/gnew/output4

TIME (s)	X (M)	Z (M)	P_{MAX} (Pa)	P_{MIN} (Pa)	MAX ΔP (Pa)
8.64×10^4	4500	1200	1.0975×10^5	1.0398×10^5	
	6500	"	1.0973×10^5		
	6900	"	1.0972×10^5		
	7100	"	"		
	7300	"	"		
	7900	"	1.0971×10^5		
	10,700	"	1.0968×10^5		
	13,900	1150	1.1027×10^5		
1.728×10^5	4300	1200	1.0976×10^5	1.0398×10^5	
	6500	"	1.0973×10^5		
	6900	"	1.0972×10^5		
	7100	"	1.0972×10^5		
	7500	"	1.0972×10^5		
	10,700	"	1.0968×10^5		
	13,900	"	1.0964×10^5		
	"	1150	1.1027×10^5		

6.29×10^3 MR 8-31-94 6.29×10^{-2}

6.29×10^3 MR 8-31-94 6.29×10^{-2}

6.29×10^3 MR 8-31-94 6.29×10^{-2}

8-31-94 MR

CONTINUE TABLE:

T (s)	X (M)	Z (M)	P_{MAX} (Pa)	P_{MIN} (Pa)	MAX ΔP (Pa)
4.32×10^5	4300	1200	1.0976×10^5	1.0398×10^5	
	6500	"	1.0973×10^5		
	6900	"	1.0973×10^5		
	7100	"	"		
	7300	"	"		
	10,700	"	1.0968×10^5		
	13,900	"	1.0964×10^5		
	"	1150	1.1027×10^5		
8.64×10^5	4300	1200	1.0977×10^5	1.0399×10^5	
	6500	"	1.0975×10^5		
	6900	"	"		
	7100	"	1.0974×10^5		
	7500	"	"		
	10,700	"	1.0968×10^5		
	13,900	"	1.0964×10^5		
	"	1150	1.1027×10^5		
1.728×10^6	4300	1200	1.0978×10^5	1.0399×10^5	
	6500	"	"		
	6900	"	"		
	7100	"	1.0977×10^5		
	7500	"	"		
	10,700	"	1.0968×10^5		
	13,900	"	1.0964×10^5		
	"	1150	1.1027×10^5		
	100	1280	1.0876×10^5		
	"	1245	3.1352×10^5 (SUBMERGED)		

6.29×10^3 MR 8-31-94 6.29×10^{-2}

6.28×10^3 MR 8-31-94 6.28×10^{-2}

6.28×10^3 MR 8-31-94 6.28×10^{-2}

8-31-94 JR

TABLE - CONTINUED

T	X	Z	P_{MAX}	P_{MIN}	MAX ΔP
4.32×10^6	4300	1200	1.0979×10^5	1.0399×10^5	
	6500	"	1.0985×10^5		
	6900	"	"		
	7100	"	"		
	7500	"	1.0984×10^5		
	10,700	"	1.0968×10^5		
	13,900	"	1.0964×10^5		
	"	1150	1.1027×10^5		
8.64×10^6			1.0979 JR 8/31/94		
	4300	1200	~~1.098×10^5~~	1.0399×10^5	
	6500	"	1.0994×10^5		
	6900	"	"		
	7100	"	"		
	7700	"	1.0991×10^5		
	10,700	"	1.0968×10^5		
	13,900	"	1.0964×10^5		
	"	1150	1.1027×10^5		
1.728×10^7					
	4300	1200	1.0977×10^5	1.0399×10^5	
	6500	"	1.1006×10^5		
	6900	"	1.1007×10^5		
	7100	"	"		
	7500	"	1.1005×10^5 JR 8/31/94		
	10,700	"	~~1.09768×10^5~~ 1.0968×10^5		
	13,900	"	1.0964×10^5		
	"	1150	1.1027×10^5		

6.28×10^3 JR 8-31-94 ~~6.28×10^{-2}~~

6.28×10^3 JR 8-31-94 ~~6.28×10^{-2}~~

JR ~~6.28×10^{-2}~~ 8-31-94 6.28×10^5

8-31-94 JR

CONTINUING TABLE

T (s)	X (N)	Z (M)	P_{MAX} (Pa)	P_{MIN} (Pa)	MAX ΔP (Pa)
4.32×10^7					
	4300	1200	1.0976×10^5	1.0399×10^5	
	6500	"	1.1037×10^5		
	6900	"	1.1041×10^5		
	7100	"	"		
	7300	"	1.1039×10^5		
	10,700	"	1.0968×10^5		
	13,900	"	1.0969×10^5		
	"	1150	1.1027×10^5		6.42×10^3 JR 8-31-94 ~~6.42×10^{-2}~~
8.64×10^7					
	4300	1200	1.0977×10^5	1.0399×10^5	
	6500	"	1.1093×10^5		
	6900	"	1.1103×10^5		
	7100	"	"		
	7500	"	1.1092×10^5		
	13,900	"	1.0964×10^5		
	"	1150	1.1027×10^5		7.4×10^3
1.577×10^8					
	4300	1200	1.1401×10^5	1.0453×10^5	
	6900	1325	1.8417×10^5		
	7100	"	"		
	7300	"	1.8413×10^5		
	8300	1200	1.1708×10^5		7.964×10^4

8-31-94
MR

TABLE (CONTINUED).

T (S)	X (M)	Z (M)	P_{MAX} (Pa)	P_{MIN} (Pa)	MAX ΔP (Pa)
3.154×10^{9}	4300	1200	1.1541×10^{5}	1.0641×10^{5}	
	6700	1325	1.6118×10^{5}		
	6900	"	1.6122×10^{5}		
	7100	"	"		
	7300	"	1.6118×10^{5}		
	8300	1200	1.1715×10^{5}		5.481×10^{4}
1.577×10^{10}	4300	1200	1.1898×10^{5}	1.1222×10^{5}	
	6700	1280	1.4547×10^{5}		
	6900	"	1.4565×10^{5}		
	7100	"	1.4564×10^{5}		
	7300	"	1.4545×10^{5}		
	8300	1200	1.1918×10^{5}		3.343×10^{4}
3.154×10^{10}	4300	1200	1.1998×10^{5}	1.1373×10^{5}	
	6700	1280	1.4001×10^{5}		
	6900	"	1.4108×10^{5}		
	7100	"	"		
	7300	"	1.4001×10^{5}		2.735×10^{4}
1.577×10^{11}	4300	1200	1.1558×10^{5}	1.0962×10^{5}	
	6700	"	1.3621×10^{5}		
	6900	"	1.3833×10^{5}		
	7100	"	"		
	7300	"	1.3622×10^{5}		2.871×10^{4}
	8300	"	1.1539×10^{5}		

8-31-94
MR

T (S)	X (M)	Z (M)	P_{MAX} (Pa)	P_{MIN} (Pa)	MAX ΔP (Pa)
3.154×10^{11}	4300	1200	1.1260×10^{5}	1.0675×10^{5}	
	6700	"	1.2789×10^{5}		
	6900	"	1.2970×10^{5}		
	7100	"	1.2971×10^{5}		
	7300	"	1.2790×10^{5}		
	8300	"	1.1243×10^{5}		2.296×10^{4}
1.577×10^{12}	4300	1200	1.0442×10^{5}	9.8983×10^{4}	
	6700	"	1.0430×10^{5}		
	7100	"	1.0429×10^{5}		
	8300	"	1.0436×10^{5}		
	13,100	"	1.0429×10^{5}		
	13,900	"	1.0433×10^{5}		5.947×10^{3}
	"	1150	1.0493×10^{5}		
3.153×10^{12}	500	1245	1.1615×10^{5} (?)	9.3411×10^{4}	
	5300	1200	9.8507×10^{4}		
	6900	"	9.8481×10^{4}		
	7100	"	9.8480×10^{4}		
	8300	"	9.8495×10^{4}		
	13,900	"	9.8459×10^{4}		
	"	1150	9.9023×10^{4}		
	"	1100	3.57×10^{5} (?)		5.612×10^{3}

MR 8-31-94

8-31-94 MR

OUTPUT FOR: /home2/sisyphus/grrice/cyl/plotps/ctcyl-a5

INPUT SAME AS FOR RUNS SHOWN ON PAGES 95 + 96 EXCEPT POWER INPUT INCREASED BY 40 %. (SEE PAGE 99):

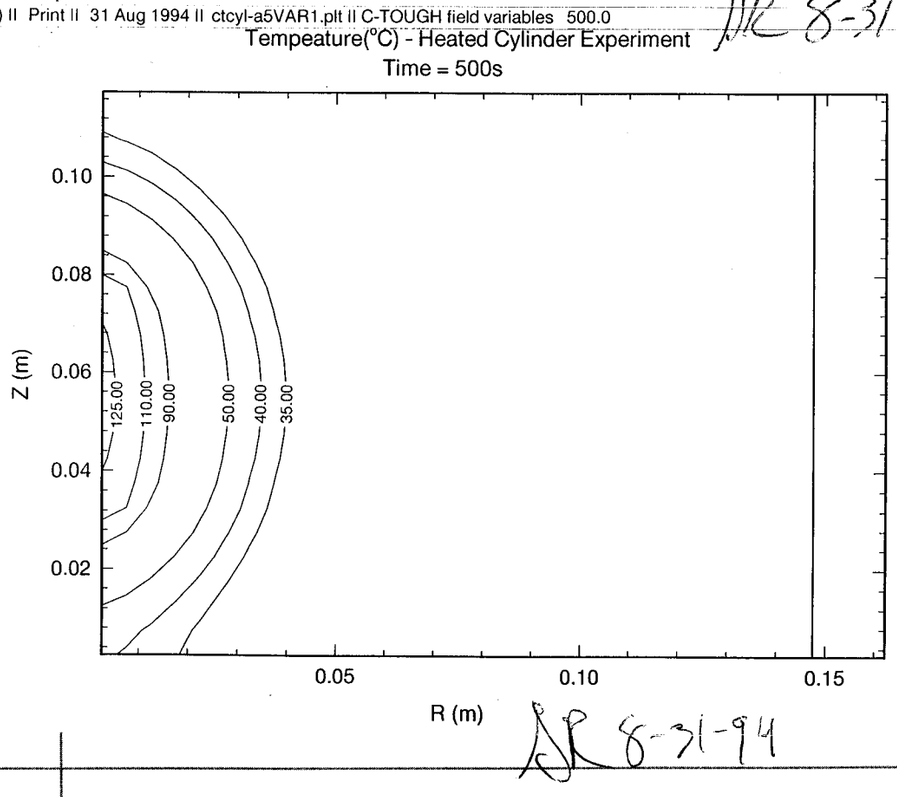
NEW POWER INPUT:

MR 8-31-94

```
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7
: el ne sl ns nsq nad nads ltb  itp    itb    gx          ex          hg
A    9 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  1.420000E-02  2.330000E-02  1.929000E-02  1.929000E-02
  1.670000E-02  1.660000E-02  1.680000E-02  1.640000E-02
  1.640000E-02  0.0000000000  0.0000000000
```

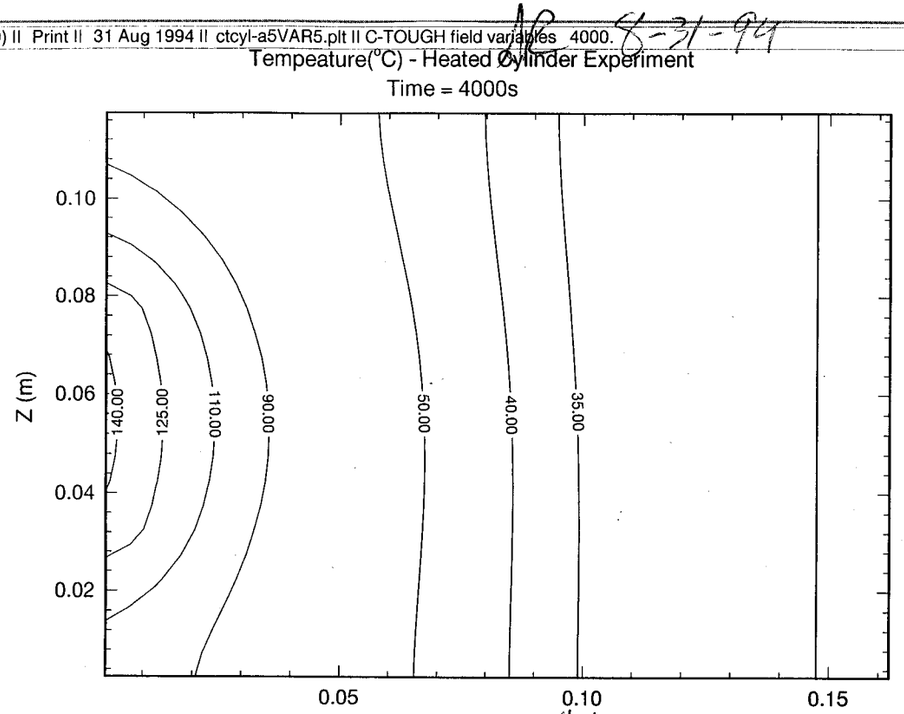
MR 8-31-94

MR 8-31-94



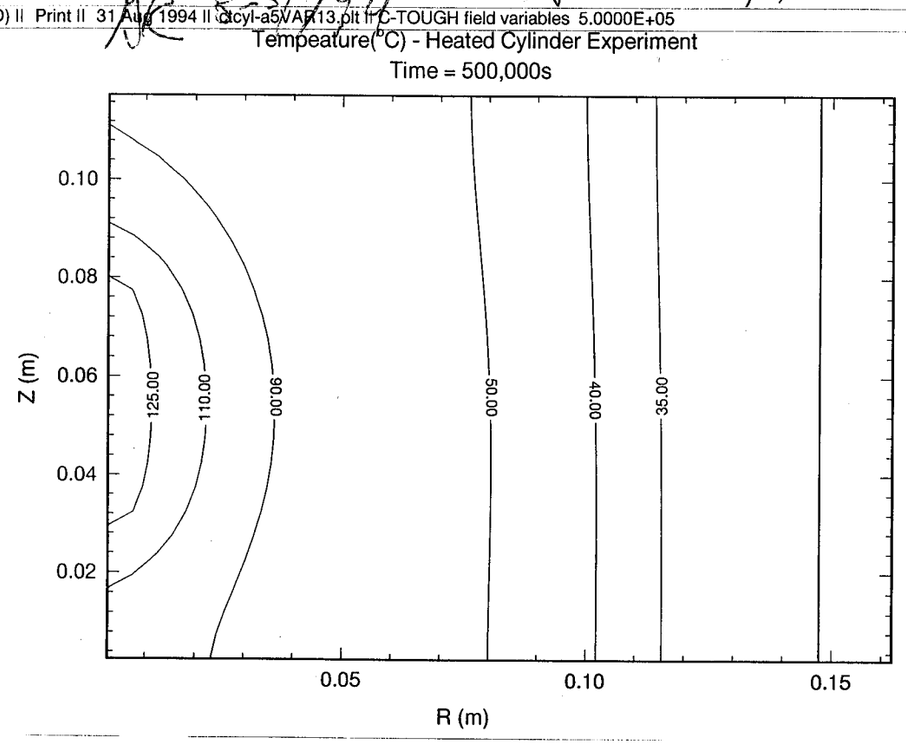
MR 8-31-94

8-31-94 MR



MR 8-31-94

MR 8-31-94



8-31-94

NEW SIMULATION OF CYLINDER EXPERIMENT:

/home2/sisyphus/grice/cyl/plot06/ctcyl-a6i

IDENTICAL TO /home2/.../cyl/ctcyl-a3i EXCEPT POWER INPUT IS TRIPLED IN COLUMNS A+B (SEE PAGE 84).

NEW GENER INPUT FOR "ctcyl-a6i":
PURPOSE - RAISE TEMPERATURE TO ≃ 170-180 °C

JR 8-31-94

```
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7-
: el ne sl ns nsq nad nads ltb  itp   itb   gx          ex          hg
A    9 HOT  1    0    0    0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  3.045000E-02  4.986000E-02  4.134000E-02  4.125000E-02
  3.576000E-02  3.555000E-02  3.600000E-02  3.516000E-02
  3.516000E-02  0.0000000000  0.0000000000
```

JR 8-31-94

```
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7-
: el ne sl ns nsq nad nads ltb  itp   itb   gx          ex          hg
B    9 HOT  1    0    0    0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  9.135000E-02  1.496400E-01  1.239600E-01  1.237500E-10
  1.073000E-01  1.066000E-01  1.080000E-01  1.055000E-01
  1.055000E-01  0.0000000000  0.0000000000
```

JR 8-31-94

- BEGIN "otcyl-a6i" ≃ 1150.
- RUN STOPPED ≃ 1350, AFTER 990 TIME STEPS, SIMULATED TIME = 2.611×10^4 yr.

8-31-94

- MAX TEMPERATURE @ t = 40005 FOR "ctcyl-a6i" RUN ≃ 165 °C.
- WILL MAKE NEW INPUT FILE WITH THE FOLLOWING CHANGES:

1) INCREASE POWER INPUT TO 3.5 TIMES ORIGINAL INPUT (i.e., ctcyl-a3i)

2) INCREASE NUMBER OF TIMESTEPS IN PARAM, MCYC, TO 9999.

- BEGIN "ctcyl-a7i" ≃ 1530:

/home2/sisyphus/grice/cyl/plot07/ctcyl-a7i

NOTE - UNABLE TO TELNET TO PEMRAC FROM EITHER RILBO OR SNEEBY. MESSAGE DISPLAYED = LOGIN INCORRECT.

- NEW FRAN BLOCK SIMULATION:

/home2/sisyphus/grice/thermal/fran/output3/cffmid3i

cffmid3i IS SAME AS cffmid2i WITH THE FOLLOWING CHANGES:

1) BOTTOM ROW (=90) IS A WATER & HEAT SINK OR SOURCE - MAKE VOLUME OF EACH ELEMENT VERY LARGE, ≃ $10^6 m^3$

2) MAKE ELEMENTS BELOW GROUND (>81) AND ON THE BOUNDARIES (A+AB) LARGE AS IN ITEM 1) ABOVE.

9-1-94 JR

- "ctcyl-a7i" STOPPED AFTER 2000 s SIMULATED TIME. REASON UNKNOWN. WILL RUN AGAIN.
- BEGIN "ctcyl-a7i" @ ≃ 0805
- POWER INPUT FOR SIMULATION "ctcyl-a7i" = 3.5 TIMES EXPERIMENTAL INPUT AS SIMULATED BY "ctcyl-a3i".

JR 9-1-94

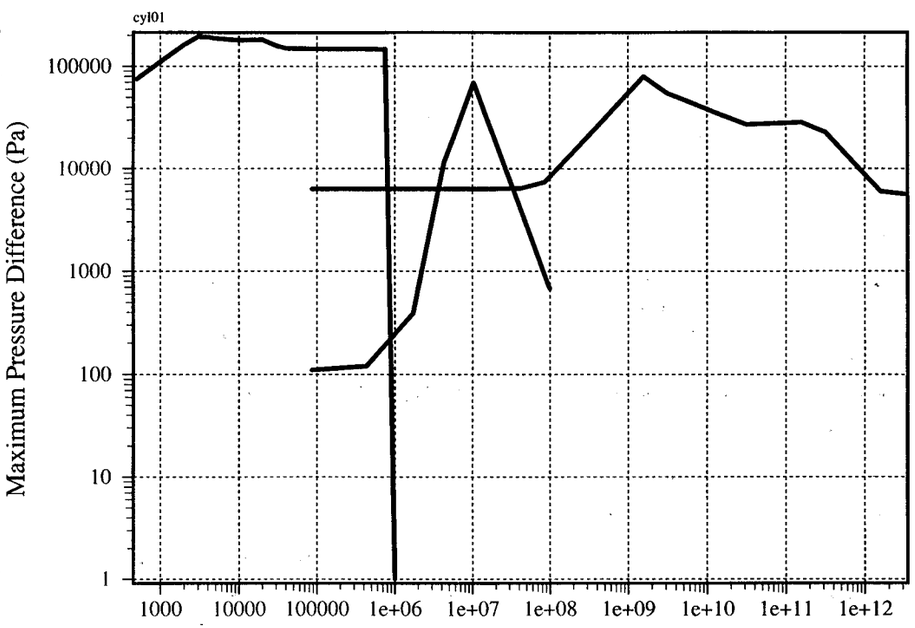
```
:
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7-
: el ne sl ns nsq nad nads ltb  itp    itb    gx          ex          hg
A    9 HOT  1    0    0    0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
   0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
   3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
   7.735000E+05  8.600000E+05  4.320000E+06
   3.552500E-02  5.817000E-02  4.823000E-02  4.812500E-02
   4.172000E-02  4.147500E-02  4.200000E-02  4.102000E-02
   4.102000E-02  0.0000000000  0.0000000000

B    9 HOT  1    0    0    0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
   0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
   3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
   7.735000E+05  8.600000E+05  4.320000E+06
   1.065750E-01  1.745800E-01  1.446200E-01  1.443750E-01
   1.252300E-01  1.244250E-01  1.260000E-01  1.231300E-01
   1.231300E-01  0.0000000000  0.0000000000
```

JR 9-1-94

- THE PLOT ON THE FOLLOWING PAGE REPRESENTS THE MAXIMUM PRESSURE DIFFERENCES SIMULATED AS A FUNCTION OF TIME IN THREE SYSTEMS TO WHICH HEAT IS APPLIED (POWER, WATTS): THE CYLINDER EXPERIMENT (/home2/sisyphus/grice/cyl/ctcyl-a3i - SEE PAGE 93), THE FRAN BLOCK (/home2/sisyphus/grice/fran/ctfmid2i - SEE PAGE 98) AND THE REPOSITORY (/usr2/sheezy/ngreen/gwtt/gnew/output4 - SEE PAGES 100-105).

JR 9-1-94

cylinder01 + fran01 + repository01



JR 9-1-94

- SIMULATION OF CYLINDER EXPERIMENT - POWER INCREASED BY FACTOR OF 3.5 TIMES ABOVE ACTUAL POWER INPUT.

JR 9-1-94

/home2/sisyphus/grice/cyl/plot07/ctcyl-a7i

- END "ctcyl-a7i" ≃ 1215

TIME (s)	MAX PRESSURE (Pa)	MIN PRESSURE (Pa)	ΔP (Pa)	MAX TEMP (°C)
0	1000,000	100,000	0	25
500	511,030	100,000	411,030	154
1000	573,720	100,000	473,720	159

9-1-94 JR

TABLE CONTINUED

TIME (s)	MAX PRESSURE (Pa)	MIN PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
2000	672,420	100,000	572,420	167
3000	731,240	100,000	631,240	175
4000	726,770	100,000	626,770	172
5000	714,760	100,000	614,760	170
10,000	691,990	100,000	591,990	167
20,000	689,630	100,000	589,630	167
30,000	644,040	100,000	544,040	163
40,000	628,640	100,000	528,640	162
50,000	628,230	100,000	528,640	162
100,000	626,710	100,000	526,710	162
~~500,000~~	~~625,580~~	~~100,000~~	JR 9-1-94	
500,000	625,580	100,000	525,580	162
750,000	621,930	100,000	521,930	162
1,000,000	100,000	99,999	1	25

- TEMPERATURES STILL NOT HIGH ENOUGH - WILL INCREASE POWER INPUT TO A FACTOR OF 5 TIMES GREATER THAN ORIGINAL
- NEW FILE FOR CYLINDER EXPERIMENT SIMULATION:

/home2/sisyphus/grice/cyl/output08/ctcyl-a8i

POWER INPUT FOR "ctcyl-a8i":

JR 9-1-94

9-1-94 JR

JR 9-1-94

```
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7-
: el ne sl ns nsq nad nads ltb  itp   itb   gx          ex          hg
A    9 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  5.075000E-02  8.310000E-02  6.890000E-02  6.875000E-02
  5.960000E-02  5.925000E-02  6.000000E-02  5.860000E-02
  5.860000E-02  0.0000000000  0.0000000000
B    9 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  1.522500E-01  2.494000E-01  2.066000E-01  2.062500E-01
  1.789000E-01  1.777500E-01  1.800000E-01  1.759000E-01
  1.759000E-01  0.0000000000  0.0000000000
```

JR 9-1-94

- BEGIN FRAN SIMULATION ≃ 1300:

/home2/sisyphus/grice/thermal/fran/output3/ctfmid3i

SEE PAGE 109 ≃ BOTTOM 1/3.

- FRAN SIMULATION STOPPED ≃ 1330 - NO ROOM ON DISK - RESTARTED ≃ 1340
- FRAN SIMULATION COMPLETED ≃ 1445
- BEGIN CYLINDER EXPERIMENT SIMULATION:

/home2/sisyphus/grice/cyl/output08/ctcyl-a8i

≃ 1450.

JR 9-1-94

9-1-94 JS

RESULTS OF FRAN BLOCK SIMULATION "ctfmid3i", SEE BOTTOM OF PAGE 109

TIME (s)	MIN GAS PRESSURE (Pa)	MAX GAS PRESSURE (Pa)	MAX-MIN PRESSURE (Pa)	MAX TEMP (°C) (MIN = 20°C)
86,400	100,000	100,030	30	39
432,000	100,000	100,060	60	55
1,728,000	100,000	100,260	260	82
4,320,000	100,000	102,260	2260	103
10,370,000	100,000	103,080	3080	116
31,540,000	99997	101,640	1643	120
94,510,000	99,998	100,990	992	122
100,000,000	99,998	100,960	962	122

9-2-94 JS

CYLINDER SIMULATION ENDED BEFORE COMPLETION — WENT THROUGH 9999 TIME STEPS AND MADE IT TO SIMULATED TIME OF 8.840×10^5 SECONDS ($\simeq 0.03$ DAYS, $\simeq 2800$ s). RUN I.D. = "ctcyl-a8i".

OUTPUT (FROM TECPLOT PLOTS)

TIME (s)	MAX PRESSURE (Pa)	MIN PRESSURE (Pa)	ΔP (Pa)	MAX TEMP (°C)
50	449,310	100,000	349,310	149
100	526,050	100,000	426,000	155
500	656,260	100,000	556,260	166
1000	729,730	100,000	629,730	178
2000	810,430	100,000	710,430	309

JS 9-2-94

9-2-94 JS

SIMULATED TEMPERATURE OF CYLINDER EXPERIMENT IS TOO HIGH. WILL REDUCE POWER INPUT TO FOUR TIMES MEASURED POWER (SEE PAGE 83). WILL ALTER ORIGINAL INPUT FILE: "ctcyl-a3i" NOW FILE:

/home2/sisyphus/grice/cyl/plot99/ctcyl-a9i

BEGIN "ctcyl-a9i" ≃ 1330

JS 9-2-94

```
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7-
: el ne sl ns nsq nad nads ltb  itp    itb    gx          ex          hg
A   9 HOT  1    0   0   0   11 HEAT     b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  4.060000E-02  6.648000E-02  5.512000E-02  5.500000E-02
  4.768000E-02  4.740000E-02  4.800000E-02  4.688000E-02
  4.688000E-02  0.0000000000  0.0000000000
B   10 HOT  1    0   0   0   11 HEAT     b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  1.218000E-01  1.995200E-01  1.652800E-01  1.650000E-01
  1.431200E-01  1.422000E-01  1.440000E-01  1.407200E-01
  1.407200E-01  0.0000000000  0.0000000000
```

JS 9-2-94

JS 9-2-94

9-2-94
JR

% SATURATION OF CEMENT CYLINDER USED IN EXPERIMENT (FROM THERMAL NOTEBOOK, # 087, = 47% SATURATED (WATER):

JR 9-2-94

113

Wt. of C4 chunk out of steratoam as it was used (same saturation level) in the densitometer experiments. SAMPLE LABELED C4x CHUNK.

3/94 $Wt_{(g)}$ = 75.608

Sample was placed in oven for 2 weeks.

wt dry 65.707 g.

m 6/6/94 Avg. porosity for C4 = 0.32
Avg. bulk density of C4 = 1.578

Volume of C4 chunk = 65.707 / 1.578 = 41.639 cm^3

65.707 × 0.32 = 21.03 g H_2O at saturation

75.608 - 65.707 = 9.901 gms water lost in drying.

9.901 / 21.03 = 0.4708

Before drying sample was 47.08 % saturated.

6/10/94 Length of SB-1 = 3.52 cm wt SAT = 110.53g

JR 9-2-94

9-3-94
MP

- CYLINDER EXPERIMENT SIMULATION COMPLETED:
/home2/sisyphus/grice/cg//plot99/ctcyl--9i

OUTPUT (FROM TECPLOT PLOTS)

TIME (s)	MAXIMUM GAS PRESSURE (P_a)	MINIMUM GAS PRESSURE (P_a)	ΔP (P_a)	MAX TEMPERATURE (°C)
10	100,610	100,000	610	69
50	363,740	100,000	263,740	141
100	440,190	100,000	340,190	148
500	562,240	100,000	462,240	158
1000	629,000	100,000	529,000	163
2000	739,240	100,000	639,240	178
3000	793,650	100,000	693,650	205
4000	792,040	100,000	692,040	189
5000	780,610	100,000	680,610	179
10,000	754,090	100,000	654,090	173
20,000	750,810	100,000	650,810	173
30,000	701,790	100,000	601,790	168
40,000	685,440	100,000	585,440	166
50,000	685,140	100,000	585,140	166
100,000	683,080	100,000	583,080	166
500,000	682,440	100,000	582,440	166
750,000	678,300	100,000	578,300	166
JR 9-3-94 ~~100,000~~ 1,000,000	100,000	99,999	1	25

- TEMPERATURE APPEARS TO BE "CLOSE ENOUGH" TO MEASURED TEMPERATURE OF ≈ 195 °C - WILL ASK RON GREEN, NEXT STEP -

1) INCREASE PERMEABILITY BY AN ORDER OF MAGNITUDE (TO 7.0×10^{-14} M^2) (IN ROCKS)

2) CHANGE % SATURATION TO 50% (IN INCON)

9-3-94
MR

- BEGIN "ctcyl-a/01" ≈ 1405 - "ctcyl-a/01 IS IDENTICAL TO "ctcyl#9i" EXCEPT FOR CHANGES NOTED ON BOTTOM OF PAGE 117.

/home2/sisyphus/grice/cyl/plot1#/ctcyl-a#i

OUTPUT

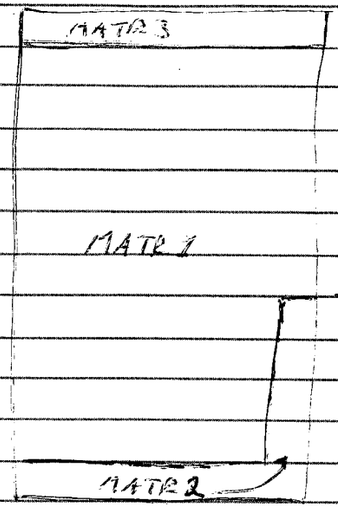
TIME (s)	MAXIMUM GAS PRESSURE (Pa)	MINIMUM GAS PRESSURE (Pa)	ΔP (Pa)	MAXIMUM TEMPERATURE (°C)
10	100,210	100,000	210	71
50	155,360	100,000	55,360	115
100	170,980	100,000	70,980	119
500	198,880	100,000	98,880	136
1000	213,570	100,000	113,570	181
3000	246,040	100,000	146,040	437

NOTE - : 9-4-94, RUN APPEARS TO HAVE STOPPED AT TIME STEP = 1552, SIMULATION TIME = 1.23X10^9 S (≈3900 S). HOWEVER, NO MESSAGE ON SCREEN INDICATING RUN WAS COMPLETED OR TERMINATED.

MR 9-4-94

9-3-94
MR

- CHANGE REAL BLOCK SIMULATION:



INPUT FILE I.D. REMAINS "ctemidi"

THERMAL CONDUCTIVITY OF MATR 2 = 0.2, SIZE OF MATR 2 ELEMENTS INCREASED BY FACTOR OF 10^4.

FILE PATH:

/home2/sisyphus/grice/thermal/fran/output3/ctfmid3i

```
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock       por       permx     permy     permz     cwet      spht
matr1   2  2.580E+03 1.000E-01 1.800E-14 1.800E-14 1.800E-14 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  9 1.9000E-18 5.8004E-07 1.7980E+00 1.1000E-01 1.0000E-03 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
  9 1.0000E-11 1.3147E-04 4.2300E+00 1.8000E-03 1.0000E-03 0.0000E+00 0.0000E+00
:
: mat  nad   drock       por       permx     permy     permz     cwet      spht
matr3   2  2.500E+03 5.000E-01 4.000E-02 0.000E+00 0.000E+00 2.000E-01 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  2.0000E-01  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  9 1.9000E-18 5.8004E-07 1.7980E+00 1.1000E-01 1.0000E-03 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
  9 1.0000E-11 1.3147E-04 4.2300E+00 1.8000E-03 1.0000E-03 0.0000E+00 0.0000E+00
:
: mat  nad   drock       por       permx     permy     permz     cwet      spht
matr2   2  2.500E+03 1.000E-04 1.800E-14 0.000E+00 0.000E+00 2.000E-01 1.000E-14
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  2.0000E-01  0.0000E+00
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  9 1.9000E-18 5.8004E-07 1.7980E+00 1.1000E-01 1.0000E-03 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
  9 1.0000E-11 1.3147E-04 4.2300E+00 1.8000E-03 1.0000E-03 0.0000E+00 0.0000E+00
```

MR 9-4-94

9-4-94 MR

- RUN "ctcyl-a1fi" RESULTED IN TEMPERATURE OF 437°C! - WILL REDUCE HEAT INPUT.
- BEGIN ALTERED FROM SITUATION ("ctfmid3i") ≃ 1215.
- NEW CYLINDER EXPERIMENT RUN. IDENTICAL TO "ctcyl-a1fi" EXCEPT HEAT REDUCED BY HALF (EQUAL TO TWICE THE HEAT INPUT IN ORIGINAL EXPERIMENT - "ctcyl-a3i". ~~NEW-PAGE~~ MR 9-4-94
  INPUT FILE: ~~ctcyl11~~ "ctcyl-a11i" MR 9-5-94

FROM OUTPUT - "ctfmid3i" - ALTERED - FROM TECPLOT PLOTS (see pg 119 MR 9-5-94)

TIME (s)	MAXIMUM GAS PRESSURE (Pa)	MINIMUM GAS PRESSURE (Pa)	ΔP (Pa)	MAXIMUM TEMPERATURE (°C) (MIN = 20°C)
66,400	100,030	100,000	30	39
432,000	100,060	100,000	60	55
1,728,000	100,320	100,000	320	84
4,320,000	103,610	100,000	3610	111
10,370,000	109,390	100,000	9390	132

- KILLED RUN ≃ 1610 - GET TO TIMESTEP 155, TIME = 0.685 YRS - STARTED "ctfmid3i", SEE PAGE 122
- RAN "ctcyl-a11i" ON pemac-ftp OUTPUT TO sisyphus (129.162.200.71)

mput ctcyl/*.*] - MULTIPLE PUT

COULDN'T PUT IN SISYPHUS - PUT IN /home/SNEEZY/rgreen/george

9-4-94 MR

OUTPUT FOR: "ctcyl-a11i" - RUN ON pemrac THEN PORTED TO SNEEZY (FROM TECPLOT PLOTS)
/home/sneezy/rgreen/george/

TIME (s)	MAXIMUM GAS PRESSURE (Pa)	MINIMUM GAS PRESSURE (Pa)	ΔP (Pa)	MAXIMUM TEMPERATURE (°C)
10	100,060	100,000	60	48
50	112,270	100,000	12,270	105
100	125,020	100,000	25,020	108
500	145,880	100,000	45,880	113
1000	157,250	100,000	57,250	116
3000	186,550	100,000	86,550	125
4000	189,940	100,000	89,940	125
5000	189,230	100,000	89,230	124
10,000	186,480	100,000	86,480	123
50,000	173,900	100,000	73,900	119
100,000	173,620	100,000	73,620	119
500,000	173,530	100,000	73,530	119
700,000	172,870	100,000	72,870	119
850,000	102,460	100,000	2,460	74
1,000,000	100,000	99,999	1	35

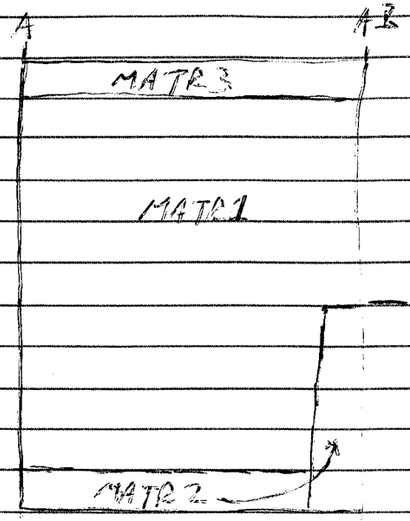
RUNS (RUN)

1) CLOSEST TO MEASURED PROPERTIES (K, % SAT)
   $K_{SAT} = 2 \times 10^{-13} m^2$, % SAT WATER = 0.3, THERMAL K = 1.7, 2-3 (WET)
   ~~HEAT INPUT AS RECORDED DURING EXPERIMENT.~~
2) ALTER THERMAL K TO GET MAX TEMP ≃ 180 °C
   ($K_{SAT} \simeq 2 \times 10^{-13} m^2$)
3) USE BEST (MEASURED) THERMAL K IN K_{SAT}
   ≃ $10^{-14} - 10^{-13} m^2$ MR 9-5-94
4) DECREASE % SAT (WATER) TO 30%

COMPRESS, FILENAME, UNCOMPRESS FILENAME

9-4-94
AP

* NEW FRAM SIMULATION: "ctfmid4i" IN: /home2/sisyphus/grice/thermal//frun/output4



SAME AS ctfmid3i (SEE PAGE 119) EXCEPT THERMAL CONDUCTIVITY IN MATR2 & MATR3 = 0.02 W/M-°K

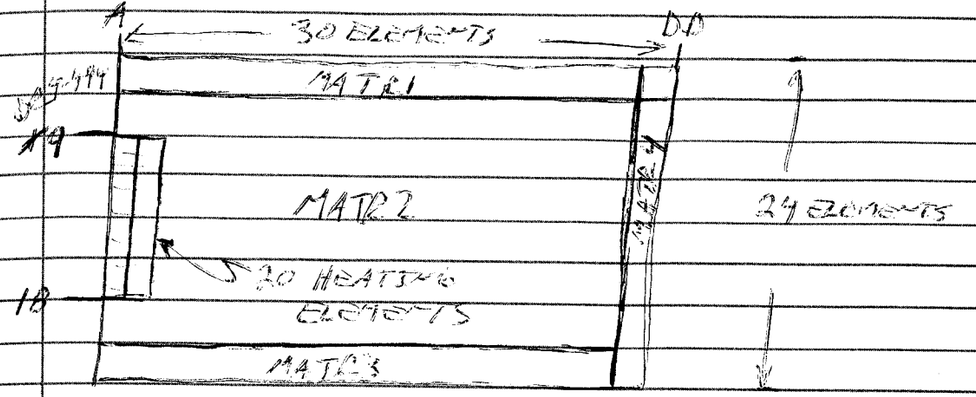
* BEGIN "ctfmid4i" ~ 1625

MATERIAL PROPERTIES:

```
ctfmid4,9/4/4vect,9-9,gen1.25,ks-14,top9-9,T(.2)ks(e-02),dead section out
:
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad  drock      por       permx     permy     permz     cwet      spht
matr1  2  2.580E+03 1.000E-01 1.800E-14 1.800E-14 1.800E-14 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  9 1.9000E-18 5.8004E-07 1.7980E+00 1.1000E-01 1.0000E-03 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
  9 1.0000E-11 1.3147E-04 4.2300E+00 1.8000E-03 1.0000E-03 0.0000E+00 0.0000E+00
:
: mat  nad  drock      por       permx     permy     permz     cwet      spht
matr3  2  2.500E+03 5.000E-01 4.000E-02 0.000E+00 0.000E+00 2.000E-02 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  2.0000E-02  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  9 1.9000E-18 5.8004E-07 1.7980E+00 1.1000E-01 1.0000E-03 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
  9 1.0000E-11 1.3147E-04 4.2300E+00 1.8000E-03 1.0000E-03 0.0000E+00 0.0000E+00
:
: mat  nad  drock      por       permx     permy     permz     cwet      spht
matr2  2  2.500E+03 1.000E-04 1.800E-14 0.000E+00 0.000E+00 2.000E-02 1.000E-14
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  2.0000E-02  0.0000E+00
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  9 1.9000E-18 5.8004E-07 1.7980E+00 1.1000E-01 1.0000E-03 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
  9 1.0000E-11 1.3147E-04 4.2300E+00 1.8000E-03 1.0000E-03 0.0000E+00 0.0000E+00
                                                    :reqd blank line
```


9-4-94
AP

CYLINDER EXPERIMENT - BASE CASE:



* k_{SAT} OF MATR1, MATR2, MATR3 = 3×10^{-16} m²
k_{SAT} OF MATR4 = 10^{-20} m²

* % WATER SATURATION = ~~0~~ 30% 9-4-94 AP

* THERMAL CONDUCTIVITY OF ALL MATERIALS = 2.3 W/m-°K (WET), 1.74×10^{-6} W/m-°K (DRY)

* HEAT INPUT SAME AS RECORDED DURING EXPERIMENT (SEE PAGE 83)

* POROSITY = 32% FOR MATERIALS 1, 2, & 3.

FILE = "basectfi" IN:

/home2/sisyphus/grice/cyl/basecase

* WILL RUN basectfi ON PCMAC - RENAME IN: /we/rgreen/grice - BUCK ~ 1720.

9-5-94 MP

- "BASEφ1i" STOPPED RUNNING ON PENRAC - 9999 TIME STEPS SIMULATED TIME = 2.692×10^{-2} yr, $\Delta t = 5 \times 10^{-7}$ yr.

- "baseφ1i" OUTPUT ftp'd TO SISYPHUS FROM PENRAC:

/home2/sisyphus/grice/cgl/bas/

OUTPUT - "baseφ1i" - FROM TECPLOT

TIME (s)	MAXIMUM GAS PRESSURE (Pa)	MINIMUM GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMP (°C)
500	1,119,300	88,812		153
1000	1,515,400	89,142		187
2000	1,441,200	89,331		234
3000	1,204,300	89,081		268
4000	1,028,100	88,986		269
5000	890,260	89,045		264
10,000	710,450	93,995		258
20,000	586,800	100,000		262
30,000	468,520*	100,000		240
* PRESSURE CONTOURS ASYMETRICAL NEAR HEAT SOURCES				
40,000*	424,040	100,000		231
50,000*	410,870	100,000		231
100,000*	374,330	100,000		231
500,000+	256,000	100,000		233
+ PRESSURE AT SIDES GREATER THAN PRESSURE AT HEAT SOURCE				
750,000	231,600	100,000		231

END OF SIMULATION - SEE TOP OF PAGE

- NOTE - FRAY SIMULATION "ctfmid4i" STILL RUNNING @ 1000 TIMESTEP = 675, TIME ≅ 0.28 yrs.

9-5-94 MP

"HIKφ1i" MP 9-5-94

- CREATE ~~"1000Kφ1i"~~ = SAME AS "baseφ1i" EXCEPT $K = 1 \times 10^{-14}$ m^2 FOR MATERIALS 1, 2, & 3.

PATH:

/home2/sisyphus/grice/cgl/hik/

- ftp'd "hikφ1i" TO PENRAC: /we/:green/grice, BEGAN SIMULATION ≅ 1030.

- FROM SIMULATION - "ctfmid4i" - OUTPUT (FROM TECPLOT PLOTS)

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	Δ P (Pa)	MAX TEMPERATURE (°C)
86,400	100,030	100,000	30	39
432,000	100,060	100,000	60	55
1,728,000	100,330	100,000	330	85
4,320,000	109,290	100,000	9,290	117
10,370,000	123,530	100,000	23,530	170
31,540,000	107,180	100,000	7,180	217
94,570,000	bef 9-12-94 ~~to~~ 124,360	100,000		226
100,000,000	— RUN STOPPED - NOT ENOUGH ROOM ON DISK			

- "hikφ1i" DONE @ 1105. ftp output FROM penrac TO SISYPHUS: /home2/sisyphus/grice/cgl/hik.

MP 9-5-94

9-5-94 AR

"hikφli" OUTPUT - FROM TECPLOT PLOTS
-CYLINDER EXPERIMENT

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMP (°C) (MIN = 25)
10	100,140	100,000	140	37
50	100,610	100,000	610	72
100	102,820	100,000	2820	98
500	120,870	100,000	20,870	149
1000	125,890	100,000	25,890	177
2000	126,020	100,000	26,020	227
3000	123,770	100,000	23,770	264
4000	121,760	100,000	21,760	265
5000	120,950	100,000	20,950	261
10,000	120,350	100,000	20,350	253
50,000	119,620	100,000	19,620	224
100,000	119,630	100,000	19,630	223
500,000	119,620	100,000	19,620	222
750,000	119,620	100,000	19,620	221
1,000,000	100,000	100,000	0	25

- NEW CYLINDER EXPERIMENT SIMULATION:

~~"bφ7aa"~~ AR 9-5-94

~~"φ.7baseφli"~~ AR 9-5-94

"φ.7basei" - IDENTICAL TO "baseφli" EXCEPT HEAT INPUT REDUCED TO 70% OF ORIGINAL.

PATH:

/home2/sisyphus/grice/cyl/baseclose/φ.7base/

9-5-94 AR

- BEGIN "φ.7basei" ON pemrac ~ 1245
Tu: /we/rgreen/grice

- INPUT FOR "φ.7basei":

```
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr1  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:    comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr2  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:    comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr3  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:    comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 2.300E+00 1.000E+06
:
:    comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  0.0000E+00
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
                                    :reqd blank line
:
```

AR 9-5-94

```
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne sl ns nsq nad nads ltb  itp   itb   gx          ex          hg
A    9 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
 0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
 3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
 7.735000E+05  8.600000E+05  4.320000E+06
 7.105000E-03  1.163400E-02  9.646000E-03  9.625000E-03
 8.344000E-03  8.295000E-03  8.400000E-03  8.204000E-03
 8.204000E-03  0.0000000000  0.0000000000
```

SR 9-5-94

```
B    9 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
 0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
 3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
 7.735000E+05  8.600000E+05  4.320000E+06
 2.131500E-02  3.491600E-02  2.892400E-02  2.887500E-02
 2.504600E-02  2.488500E-02  2.520000E-02  2.462600E-02
 2.462600E-02  0.0000000000  0.0000000000
```

AR 9-5-94

9-5-94 MR

"ctfmid4i"

- FCAN RUN STOPPED - RAN OUT OF ROOM ON DISK - GOT TO TIME STEP # 869, t = 2.95 yrs.

- "ϕ.7basei" DONE ON penrac - will ftp TO sisyphus: /home2/sisyphus/grice/cyl/basecase/ϕ.7base

"ϕ.7basei" OUTPUT - FROM TECPLOT PLOTS:

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
500	630,770	93,432		118
1000	848,920	93,475		138
2000	1,171,800	93,406		170
3000	1,100,000	93,301		193
4000	836,800	93,840		194
5000	699,610	93,435		191
10,000	566,460	95,996		186
20,000	471,440	100,000		189
30,000	379,450*	100,000		174
* PRESSURE CONTOURS ASYMETRICAL AROUND HEAT SOURCES				
40,000	345,590*	100,00		168
50,000	331,570*	100,000		168
100,000	293,740*	100,000		168
500,000	226,110+	100,000		169
+ PRESSURE HIGHER AT SIDES THAN AT HEAT SOURCES				
750,000	207,530+	100,000		168
1,000,000	107,840	1443.9 (!)		25
4,320,000	104,170	92,145		25

MR 9-5-94

9-5-94 MR

- NEW FCAN SIMULATION - "ctfmid5i" IN: /home2/sisyphus/grice/thermal/fcan/outputs/

- ATTEMPT TO REDUCE TEMPERATURES FROM "ctfmid4i" A BIT (TO ≤ 180°?) AND SEE WHAT HAPPENS AT TIMES 31,540,000 s + 94,570,000 s (SEE pg 125).

"ctfmid5i" IDENTICAL TO "ctfmid4i" EXCEPT THERMAL CONDUCTIVITY OF MAT2 + MAT3 = 0.03 w/m-°K INSTEAD OF 0.02 w/m-°K.

- ftp'd "ctfmid5i" TO penrac: /we/rgreen/grice. BEGIN RUNNING ≈ 2010.

- NEW CYLINDER EXPERIMENT SIMULATION: "ϕ.75basei" - IDENTICAL TO "ϕ.7basei" EXCEPT HEAT INPUT = 75% OF ORIGINAL — SEE page 83

- BEGIN "0.75basei" ≈ 2045

9-6-94 MR

- "ϕ.75basei" DONE - ELAPSED TIME ≈ 14,000 s

- "ctfmid5i" STILL RUNNING ON penrac @ 0815. TIME = 0.271 yrs, TIMESTEP = 450

MR 9-6-94

9-6-94 "0.75basei" INPUT.

JR 9-6-94

```
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr1  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:   comp       expan       cdry       tortx
  0.0000E+00 0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr2  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:   comp       expan       cdry       tortx
  0.0000E+00 0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr3  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:   comp       expan       cdry       tortx
  0.0000E+00 0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 2.300E+00 1.000E+06
:
:   comp       expan       cdry       tortx
  0.0000E+00 0.0000E+00  1.7400E+00  0.0000E+00
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
                                    :reqd blank line
:
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne sl ns nsq nad nads ltb  itp   itb    gx          ex          hg
A    9 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  7.612500E-03  1.246500E-02  1.033500E-02  1.031250E-02
  8.940000E-03  8.887500E-03  9.000000E-03  8.790000E-03
  8.790000E-03  0.0000000000  0.0000000000

B    9 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06

  2.283800E-02  3.741000E-02  3.099000E-02  3.093800E-02
  2.683500E-02  2.666200E-02  2.700000E-02  2.638500E-02
  2.638500E-02  0.0000000000  0.0000000000
```

JR 9-6-94

NOTE: OVERRIDDEN BY POROSITY IN INCR BLOCK @ 0.10

JR 9-6-94

• NEW CYLINDER EXPERIMENT SIMULATION:
"0.75hiki" - SAME INPUT AS "0.75basei"
EXCEPT KSAT FOR MATERIALS 1, 2, & 3
$= 2.0 \times 10^{-14}\ m^2$.

9-6-94

• BEGIN "0.75hiki" IN: /home2/sisyphus/grice/cyl/hik/0.75hik @ ~ 0900

• END "0.75hiki" @ 0930.

NOTE - CYLINDER EXPERIMENT BASE CASE:

"0.75basei"

- INPUT: '0.75hiki'

```
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr1  2  2.580E+03 3.200E-01 2.000E-14 2.000E-14 2.000E-14 2.300E+00 8.400E+02
:
:   comp       expan       cdry       tortx
  0.0000E+00 0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr2  2  2.580E+03 3.200E-01 2.000E-14 2.000E-14 2.000E-14 2.300E+00 8.400E+02
:
:   comp       expan       cdry       tortx
  0.0000E+00 0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr3  2  2.580E+03 3.200E-01 2.000E-14 2.000E-14 2.000E-14 2.300E+00 8.400E+02
:
:   comp       expan       cdry       tortx
  0.0000E+00 0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 2.300E+00 1.000E+06
:
:   comp       expan       cdry       tortx
  0.0000E+00 0.0000E+00  1.7400E+00  0.0000E+00
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00

GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne sl ns nsq nad nads ltb  itp   itb    gx          ex          hg
A    9 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  7.612500E-03  1.246500E-02  1.033500E-02  1.031250E-02
  8.940000E-03  8.887500E-03  9.000000E-03  8.790000E-03
  8.790000E-03  0.0000000000  0.0000000000

B    9 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  2.283800E-02  3.741000E-02  3.099000E-02  3.093800E-02
  2.683500E-02  2.666200E-02  2.700000E-02  2.638500E-02
  2.638500E-02  0.0000000000  0.0000000000
```

JR 9-6-94

GET LATEST PREVIOUS CASE

JR 9-6-94

9-6-94
AR

CYLINDER EXPERIMENT - ALTERED BASE CASE SIMULATION - INPUT IDENTICAL TO "0.75 BASEi" EXCEPT % SATURATION = 15%:

"0.75 BASE-0.15i" IN:

/home2/sisyphus/grice/cyl/basecase/0.7base/0.7base

- BEGIN RUNNING "0.75base-0.15i" ≃ 1000.

OUTPUT FROM TECPLOT PLOTS: "0.75 BASEi":

= BASE CASE :

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
10	105,950	99349		34
50	158,920	96,114		62
100	266,690	91,788		81
500	698,450	92,651		125
1000	946,590	92,750		146
2000	1,260,800	92,739		180
3000	1,118,900	92,650		206
4000	841,610	92,607		206
5000	723,890	92,721		203
10,000	587,960	95,653		198
20,000	491,140	100,000		201
50,000	342,910*	100,000		178
	* ASYMETRICAL PRESSURE CONTOURS NEAR HEAT SOURCE			
100,000	307,240+	100,000		178
500,000	231,210+	100,000		179
	+ PRESSURE HIGHER @ SIDE THAN NEAR HEAT SOURCE			
750,000	212,330+	100,000		178

NOTE: INCORRECT POROSITY USED IN INCON BLOCK PARAMETERS
SEE PAGE 137+138
AR 9-7-94

9-6-94
AR

OUTPUT FOR "0.75 Basei" CONTINUED

T (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMP (°C)
1,000,000	108,380	556.6 (!)		25
4,320,000	104,520*	91,561		25

- FRAN SIMULATION ON PEMRAC CRASHED - POWER WENT DOWN ("ctemid5i") - RESTARTED ≃ 1845.

9-7-94
AR

- "0.75base-0.15i" SIMULATION COMPLETED.

- NEW CYLINDER EXPERIMENT RUN: "0.75base-comparei" IS IDENTICAL TO "0.75basei" EXCEPT THE POROSITY IN THE ENTIRE INCON BLOCK HAS BEEN SET TO 0.0. THUS, THE POROSITY OF 0.32 IN THE ROCKS BLOCK IS THE ONLY VALUE THAT WILL BE USED (CAN BE USED) IN THE SIMULATION. THE RESULTS OF THIS SIMULATION WILL BE COMPARED TO THE RESULTS of THE "0.75basei" SIMULATION (PAGE 132).

- BEGIN "0.75base-comparei" @ ≃ 0800 IN:

/home2/sisyphus/grice/cyl/basecase/0.7base/0.75base/

AR 9-7-94

9-7-94

AR

OUTPUT FROM TECPLOT PLOTS:

"0.75base-0.15i"

NOTE - INCREASED PRESSURE USED IN INNER BLOCK. SEE PAGE 139

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMP (°C)
10	103,750	100,000	3,750	34
50	129,970	99,044		63
100	197,950	95,300		84
500	557,910	90,092		129
1000	690,740	92,552		152
2000	749,310	93,466		187
3000	709,890	92,266		213
4000	570,840	92,105		213
5000	485,740	92,641		209
10,000	385,310	92,645		204
20,000	324,600	93,970		206
50,000	230,000	100,000		183
100,000	210,340*	100,000		182

*CONTOUR LINES ASYMETRICAL AROUND HEAT SOURCES

500,000	174,500	100,000		183
750,000	174,510	100,000		181
1,000,000	141,780	100,000		25
4,320,000	105620*	100,000		25

OUTPUT FROM TECPLOT

"0.75hiki"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMP (°C)
10	100,050	100,000	50	34
50	100,180	100,000	~~180~~	60

180 AR 9-7-94

9-7-94

AR

OUTPUT - "0.75hiki" CONTINUED

NOTE - INCREASED PRESSURE USED IN INNER BLOCK. SEE PAGE 141.

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMP (°C)
100	100,470	100,000	470	79
500	109,620	100,000	9620	116
1000	113,280	100,000	13,280	134
2000	119,170	100,000	19,170	164
3000	119,900	100,000	19900	191
4000	119,390	100,000	19,390	193
5000	119,120	100,000	19,120	190
10,000	119,480	100,000	19,480	184
20,000	119,860	100,000	19,860	187
50,000	118,750	100,000	18,750	163
100,000	118,700	100,000	18,700	162
500,000	118,690	100,000	18,690	161
750,000	118,580	100,000	18,580	160
1,000,000	100,000	99,999	1	25
4,320,000	100,000	99,999	1	25

CHECK CALCULATION OF KSAT FOR CYLINDER EXPERIMENT

SEE NOTEBOOK 078, PAGE 230

SAMPLE I.D. NRG*BXy*5 - 1ST TEST

$$\Delta P = \frac{10\ Lb_f}{in^2}\ \frac{10^5\ N\ in^2}{m^2\ 14.504\ Lb_f}\ \frac{1.01972\ Kg\ m^2}{cm^2\ 10^5\ N} = 7.03\times10^{-1}\ \frac{Kg}{cm^2}$$

$\Delta L = 1.92$ cm (From K.M.)

$A = \pi (5.01\ cm)^2$ (From K.M.) $= 1.97\times10^{1}\ cm^2$

9-7-94 MR

$$Q = \frac{(7.95 - 5.10) + (22.10 - 19.85)}{2} \frac{ml}{119\,min} \frac{min}{60s} \frac{cm^3}{ml}$$

$$= 3.57 \times 10^{-4} \frac{cm^3}{s}$$

$$Q = K A \frac{\Delta P}{\Delta L}, \quad K = \frac{Q}{A} \frac{\Delta L}{\Delta P}$$

$$K = \frac{3.57 \times 10^{-4} cm^3}{s} \frac{1.92\,cm}{1.97 \times 10^{1} cm^2} \frac{1.92\,cm\,cm^2}{7.03 \times 10^{-1} kg} \frac{K_g}{10^3 cm^3}$$

$$= 4.95 \times 10^{-8} \frac{cm}{s} = \text{SAME AS K.A.'s RESULT.}$$

4.9MR 9-7-94

TO CONVERT cm/s TO M^2:

9-7-94 MR

$$\frac{4.95 \times 10^{-8} cm}{s} \frac{10^{-2} M}{10^2 cm} \frac{1.02 \times 10^{-3} cm^2 s}{M} \frac{10^{-4} M^2}{cm^2}$$

$$= 5.05 \times 10^{-17} M^2$$

CHECK:

* FROM FREEZE & CHERRY, PAGE 29

$$\frac{cm}{s} \rightarrow \frac{cm}{s} \frac{M}{10^2 cm} \frac{1.02 \times 10^{-3} cm^2}{M/s} \frac{M^2}{10^4 cm^2} \rightarrow 1.02 \times 10^{-9} M^2 \checkmark$$

MR 9-7-94

9-7-94 MR

INPUT FOR "0.75base-compare i" - SEE PAGE 133

MR 9-7-94

```
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por       permx      permy      permz      cwet       spht
matr1  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx      permy      permz      cwet       spht
matr2  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx      permy      permz      cwet       spht
matr3  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx      permy      permz      cwet       spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 2.300E+00 1.000E+06
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  0.0000E+00
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
                                        :reqd blank line
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne sl ns nsq nad nads ltb  itp    itb    gx         ex         hg
A    9 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  7.612500E-03  1.246500E-02  1.033500E-02  1.031250E-02
  8.940000E-03  8.887500E-03  9.000000E-03  8.790000E-03
  8.790000E-03  0.0000000000  0.0000000000

B    9 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  2.283800E-02  3.741000E-02  3.099000E-02  3.093800E-02
  2.683500E-02  2.666200E-02  2.700000E-02  2.638500E-02
  2.638500E-02  0.0000000000  0.0000000000
                                        :reqd blank line
:
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: el ne   nsq nadd        porx
A     1    0    0    0.0
:
:          x1                  x2                  x3
      1.00000000E+05      7.00000000E-01      2.50000000E+01
B     1    0    0    0.0
      1.00000000E+05      7.00000000E-01      2.50000000E+01
C     1    0    0    0.0
      1.00000000E+05      7.00000000E-01      2.50000000E+01
D     1    0    0    0.0
```

JR 9-7-94

9-7-94 JR

OUTPUT FOR "0.75base-compare1"

IN: /home2/sisyphus/grice/cyl/basecase/0.7base/0.75base/

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
10	106,690	99,218	7472	35
50	167,840	94,564	73,276	65
100	298,610	89399	209,211	84
500	938,890	89,535	849,355	126
1000	1,318,700	89,762	1,228,938	147
2000	1,935,300	89,396	1,845,904	181
3000	1,993,500	89,061	1,904,439	206
4000	1,527,900	88,660	1,439,240	207
5000	1,221,800	80,359	1,141,441	203
10,000	928,770	57,481	871,289	198
20,000	743,820	55,460	688,360	200
50,000	492,720	69,635	423,085	178
100,000	425,380*	78,954	346,426	178
500,000	336,370	100,000	236,370	179
750,000	303,020+	100,000	3,020	178
1,000,000	144,300	153		25
4,320,000	103,020+	76,156		25

BASE CASE

* CONTOUR LINES ASYMETRICAL AROUND HEAT SOURCES

+ PRESSURE HIGHER ALONG SIDES (TOP + BOTTOM) THAN AT HEAT SOURCES.

- CYLINDER EXPERIMENT "0.75base-compare1" DONE ≃ 1425 – ELAPSED TIME ≃ 2.2×10⁴s ≃ 6.1 HRS.

- NEW CYLINDER EXPERIMENT SIMULATION "0.75base-compare0.15i" IN:

9-7-94 JR

/home2/sisyphus/grice/cyl/basecase/0.7base/~~0.75base~~ 9-7-94 JR 0.75base/

IDENTICAL TO "0.75base-compare1" EXCEPT % SATURATION OF WATER = ~~0~~ JR 9-7-94 15% INSTEAD OF 30%

NOTE - FOR SOME REASON, SISYPHUS WOULD NOT ACCEPT NAME = "0.75base-compare0.15i" NAME CHANGED TO: "0.75bc0.15i"

BEGIN RUNNING "0.75bc0.15i" ≃ 1500

OUTPUT FROM FRAN SIMULATION: "cffmid5i"

IN: /home2/sisyphus/grice/thermal/fran/output5

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
86,400	100,030	100,000	30	39
432,000	100,060	100,000	60	55
1,729,000	100,330	100,000	330	85
4,320,000	108,260	100,000	8,260	116
10,370,000	120,970	100,000	20,970	163
~~31,370~~	JR 9-7-94			
31,540,000	105,000	100,000	5000	208
94,510,000	121,420	100,000	21,420	221
100,000,000	122,380	100,000	22,380	222

ΔP 9-8-94

NOTE - SEE PAGE 200 JR 11-23-94

9-8-94 JR

OUTPUT - CYLINDER EXPERIMENT SIMULATION: "0.75bc0.15i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
10	104,530	100,000	4,530	36
50	138,960	97,822	41,138	68
100	228,390	91,493	136,897	89
500	776,710	83,433	695,277	133
1000	1,043,100	86,058	957,042	155
2000	1,253,600	87,494	1,166,106	190
3000	1,203,700	86,137	1,117,563	216
4000	959,270	85,580	873,690	215
5000	807,440	86,263	721,177	211
10,000	609,210	76,031	533,179	205
20,000	503,620	56,620	ϕ 447,000 JR 9-8-94	206
50,000	319,710*	66,626	253,084	182
100,000	283,010*	67,688	214,322	182
500,000	206,520+	99,552	106,968	182
750,000	191,490+	100,000	91,490	181
1000,000	145,780	57,384	88,396	25
4,320,000	112,950*	99,543	13,407	25

* PRESSURE CONTAINS ASYMETRICAL AROUND HEAT SOURCES
+ PRESSURE LOWER NEAR HEAT SOURCES THAN TOP OR BOTTOM

• NEW CYLINDER EXPERIMENT SIMULATION - IDENTICAL TO "0.75base-comparei" EXCEPT INITIAL % WATER SATURATION = 50% INSTEAD OF 30%:

"0.75bc0.50i" IN:
/home2/sisyphus/grice/cyl/basecase/0.7base/0.75base/

JR 9-8-94

BEGIN "0.75bc0.50i" ~ ~~0120~~ 0920

• ~ 1015 - KILL "0.75bc0.50i" TO RUN:
"0.75hik-comparei"
↳ BEGIN ~ 1020 - DONE ~ 1040

9-8-94 JR

NEW CYLINDER EXPERIMENT SIMULATION:

~~"0.75~~ JR 9-8-94 "0.75hik-comparei" - IDENTICAL TO "0.75hiki" EXCEPT POROSITY IN INCON BLOCK = 0.0 → THUS, POROSITY IS AS GIVEN IN ROCKS = 32%.

IN: /home2/sisyphus/grice/cyl/hik/0.75hik/

INPUT: "0.75hik-comparei"

JR 9-8-94

```
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr1  2  2.580E+03 3.200E-01 2.000E-14 2.000E-14 2.000E-14 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr2  2  2.580E+03 3.200E-01 2.000E-14 2.000E-14 2.000E-14 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr3  2  2.580E+03 3.200E-01 2.000E-14 2.000E-14 2.000E-14 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 2.300E+00 1.000E+06
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  0.0000E+00
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
                                        :reqd blank line
:
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne sl ns nsq nad nads ltb  itp    itb    gx          ex          hg
A    9 HOT  1    0    0    0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  7.612500E-03  1.246500E-02  1.033500E-02  1.031250E-02
  8.940000E-03  8.887500E-03  9.000000E-03  8.790000E-03
  8.790000E-03  0.0000000000  0.0000000000

B    9 HOT  1    0    0    0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  2.283800E-02  3.741000E-02  3.099000E-02  3.093800E-02
  2.683500E-02  2.666200E-02  2.700000E-02  2.638500E-02
  2.638500E-02  0.0000000000  0.0000000000
```

JR 9-8-94

9-8-94 AR

INPUT "0.75hik-compare1" CONTINUED:

AR 9-8-94

```
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: el ne   nsq nadd        porx
A      1    0    0    0.0
:
:          x1                  x2                  x3
       1.00000000E+05      7.00000000E-01      2.50000000E+01
B      1    0    0    0.0
       1.00000000E+05      7.00000000E-01      2.50000000E+01
C      1    0    0    0.0
       1.00000000E+05      7.00000000E-01      2.50000000E+01
D      1    0    0    0.0
```

AR 9-8-94

BEGIN "0.75bc0.50i" AGAIN = 1045

OUTPUT: "0.75hik-compare1"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
10	100,170	100,000	170	35
50	100,540	100,000	540	63
100	101,440	100,000	1,440	82
500	112,310	100,000	12,310	115
1000	116,260	100,000	16,260	133
2000	121,310	100,000	21,310	164
3000	121,890	100,000	21,890	192
4000	120,760	100,000	20,760	195
5000	120,170	100,000	20,170	192
10,000	119,930	100,000	17,930	187
20,000	119,270	100,000	19,270	189
50,000	117,130	100,000	17,130	166
100,000	117,030	100,000	17,030	165
500,000	116,650*	100,000	16,650	164+
	* PRESSURE CONTOURS ASYMETRICAL AROUND HEAT SOURCES			
750,000	116,550*	100,000	16,550	164+
	+ TEMP. CONTOURS ASYMETRICAL AROUND HEATSOURCES			
1,000,000	100,000	99,721	279	25
4,320,000	100,000	99,999	1	25

AR 9-8-94

9-9-94 AR

INPUT - "0.75bc0.50i"

AR 9-9-94

```
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr1  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr2  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr3  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 2.300E+00 1.000E+06
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  0.0000E+00
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne sl ns nsq nad nads ltb  itp   itb   gx         ex         hg
A     9 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  7.612500E-03  1.246500E-02  1.033500E-02  1.031250E-02
  8.940000E-03  8.887500E-03  9.000000E-03  8.790000E-03
  8.790000E-03  0.0000000000  0.0000000000
B     9 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  2.283800E-02  3.741000E-02  3.099000E-02  3.093800E-02
  2.683500E-02  2.666200E-02  2.700000E-02  2.638500E-02
  2.638500E-02  0.0000000000  0.0000000000
B    10 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
:
```

AR 9-9-94

```
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: el ne   nsq nadd        porx
A      1    0    0    0.0
:
:          x1                  x2                  x3
       1.00000000E+05      5.00000000E-01      2.50000000E+01
B      1    0    0    0.0
       1.00000000E+05      5.00000000E-01      2.50000000E+01
C      1    0    0    0.0
       1.00000000E+05      5.00000000E-01      2.50000000E+01
```

9-9-94 MR

OUTPUT: "0.75bc0.50i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
10	106,660	99,126		34
50	163,530	95,343		61
100	281,590	90,613		79
500	832,220	91,072		121
1000	~~1,115~~ 1,158,500	90,973		141
2000	1,778,200	92,910		173
3000	2,338,900	90,783		196
4000	2,165,800	88,806		196
5000	1,769,600	80,976		193
10,000	1,362,100	60,959		190
20,000	1,056,100	59,513		193
50,000	680,990	73,534		173
100,000	562,450	82,590		173
500,000	402,370*	100,000		175
	* PRESSURE CONTOURS ASYMETRICAL AROUND HEAT SOURCES			
750,000	377990*	100,000		175
1,000,000	132,790	2,005 (1)		25
4,320,000	100,400	88,578		25

- NEW CYLINDER EXPERIMENT: "0.75bc0.70i" IS IDENTICAL TO "0.75bc0.50i" EXCEPT % SATURATION = 70% INSTEAD OF 50%.

IN: /home2/sisyphus/grice/cyl/basecase/0.7base/0.75base

- BEGIN "0.75bc0.70i" ≃ 1810.

MR 9-8-94

9-13-94 MR

- "0.75bc0.70i" COMPLETED
- NEW CYLINDER EXPERIMENT SIMULATION:

"0.75bc0.90i" - IDENTICAL TO "0.75bc0.70i" EXCEPT WATER SATURATION = 90% INSTEAD OF 70%.

IN: /home2/sisyphus/grice/cyl/basecase/0.7base/0.75base

- BEGIN "0.75bc0.90i" ≃ 1005.
- OUTPUT FOR "0.75bc0.70i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
10	106,180	99,248		33
50	156,100	96,117		58
100	257,280	92,477		75
500	691,330	93,098		116
1000	943,390	92,844		136
2000	1,435,800	92,922		167
3000	1,925,000	92,878		189
4000	1,958,500	90,567		189
5000	1,899,100	84,053		186
10,000	1,682,600	66,261		182
20,000	1,400,500	64,140		186
50,000	1,036,500	76,711		167
100,000	888,360	85,000		167
500,000	597,470	100,000		171
750,000	536,960	100,000		170
1,000,000	125,350	56,104		25
4,320,000	100,060*	99,870		25
	* PRESSURE CONTOURS ASYMETRICAL AROUND HEAT SOURCES			

9-16-94
MF

INPUT: "0.75bc0.90i"

```
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock       por       permx     permy     permz     cwet      spht
matr1  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:   comp        expan         cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock       por       permx     permy     permz     cwet      spht
matr2  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:   comp        expan         cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock       por       permx     permy     permz     cwet      spht
matr3  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:   comp        expan         cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock       por       permx     permy     permz     cwet      spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 2.300E+00 1.000E+06
:
:   comp        expan         cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  0.0000E+00
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
                                    :reqd blank line
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne sl ns nsq nad nads ltb  itp    itb    gx          ex          hg
A    9 HOT  1    0    0    0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  7.612500E-03  1.246500E-02  1.033500E-02  1.031250E-02
  8.940000E-03  8.887500E-03  9.000000E-03  8.790000E-03
  8.790000E-03  0.0000000000  0.0000000000
:
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: el ne   nsq nadd        porx
A     1    0    0    0.0
:
:          x1                  x2                  x3
      1.00000000E+05      1.00E-01       2.50000000E+01
B     1    0    0    0.0

      1.00000000E+05      1.00E-01       2.50000000E+01
C     1    0    0    0.0
      1.00000000E+05      1.00E-01       2.50000000E+01
```

9-16-94
MF

9-16-94
MF

- RUN "0.75bc0.90i" COMPLETED, TIME ≈ 16,000 s.

9-16-94
MF

- NEW CYLINDER EXPERIMENT FILE:

"0.75bc1.00i" - IDENTICAL TO "0.75bc0.90i" EXCEPT WATER SATURATION = 100%

- BEGIN RUNNING "0.75bc1.00i" ≈ 0815 - IN: /Home2/sisyphus/grice/cyl/basecase/0.7base/0.75base - OUTPUT: 0.75bc0.90i

0.75bc0.90i

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
10	105,860	99,724		32
50	149,950	98,404		55
100	226,450	97,591		72
500	482,890	97,536		112
1000	643,700	97,425		132
2000	1,001,800	97,594		162
3000	1,408,300	97,141		183
4000	1,464,200	93,873		184
5000	1,440,200	90,203		181
10,000	1,450,400	79,754		177
20,000	1,579,600	77,604		180
50,000	1,258,800	84,932		160
100,000	1,267,600	90,312		160
500,000	1,244,400	100,000		161
750,000	1,222,300	100,000		160
1,000,000	114,490	100,000		25
4,320,000	100,000	100,000		25

9-16-94
MF

9-22-94
MR

• RUN "0.756c1.00i" KILLED ON 9/17 - SYSTEM REBOOTED - BEGIN RUNNING AGAIN ≈ 0915

INPUT - "0.756c1.00i" MR 9-22-94

```
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr1  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:   comp        expan         cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr2  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:   comp        expan         cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr3  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:   comp        expan         cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 2.300E+00 1.000E+06
:
:   comp        expan         cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  0.0000E+00
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
                                    :reqd blank line
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne sl ns nsq nad nads ltb  itp   itb   gx          ex          hg
A    9 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  7.612500E-03  1.246500E-02  1.033500E-02  1.031250E-02
  8.940000E-03  8.887500E-03  9.000000E-03  8.790000E-03
  8.790000E-03  0.0000000000  0.0000000000
B    9 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  2.283800E-02  3.741000E-02  3.099000E-02  3.093800E-02
  2.683500E-02  2.666200E-02  2.700000E-02  2.638500E-02
  2.638500E-02  0.0000000000  0.0000000000
:
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
```

MR 9-22-94

```
: el ne   nsq nadd       porx
A     1    0    0    0.0
:
:          x1                    x2                    x3
      1.00000000E+05        1.00E-06        2.50000000E+01
B     1    0    0    0.0
      1.00000000E+05        1.00E-06        2.50000000E+01
C     1    0    0    0.0
      1.00000000E+05        1.00E-06        2.50000000E+01
```


9-22-94
MR

OUTPUT - "0.756c1.00i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMP. (°C)
10	1,973,200	99,999		32
50	2,426,100	99996		54
100	2,181,400	99,997		71
500	1,683,000	100,000		111
1000	2,04,300	100,000		131
2000	3,359,600	100,000		160
3000	4,790,700	100,000		182
4000				
5000				
10,000				
20,000				
50,000				
100,000				
500,000				
750,000				
1,000,000				
1,320,000				

RUN STOPPED - WENT TO 9999 TIMESTEPS?

9-27-94 - CREATE ~~"0.756c0.005"~~ MR 9-27-94 "0.756c0.05i" - IDENTICAL TO "0.756c1.00i" EXCEPT SATURATION = 5%.

• BEGIN RUNNING "0.756c0.05i" @ ≈ 1100.

MR 10-19-94

10-19-94
MR

PROJECT I.D. = 20-5704-191 MR 10-31-94

- GOT NEW VERSION OF ctough FROM PETER LICHTNER YESTERDAY. FTP'd TO: /home2/sisyphus/grice/newctough.

- NOW COMPILING newctough:

COMMAND = MAKE ctough - NOTE I WILL RECOMPILE USING NEW NAME:

newctough.

- CHANGE FOR INPUT TO NEW VERSION OF ctough - TIMES MUST BE IN YEARS, NOT SECONDS.

- NEW VERSION CAN HANDLE "ENHANCED" DIFFUSION. - WILL USE THIS OPTION ON CYL RUNS FOR RON.

- CALL PETER L. Re WHAT FILES TO DELETE AFTER COMPILING ctough: X 6804

↳ DON'T NEED TO DELETE ANY FILES, THEY WILL BE OVER WRITTEN.

- TO CHANGE NAME OF COMPILED FILE, MUST CHANGE NAME IN "Makefile".

- FOR BINARY DIFFUSION RUNS, CREATED NEW FILE:

TORTUOSITY = 0.50

"Basecaseφ1i" IS IDENTICAL TO THE BASECASE FILE: "0.75base-comparei"
- BUT, MUST CHANGE SECONDS TO YEARS TO RUN WITH newctough.

10-19-94
MR

- "basecaseφ1i" IN:

/home2/sisyphus/grice/cyl/newcyl/newcylφ1

- BEGIN RUNNING "basecaseφ1i" ∂ ≃ 1150.

PROJECT I.D.- 20-5704-023

10-20-94
MR

- "basecaseφ1i" STOPPED RUNNING AFTER WAITING FIVE STEPS - I ASSUME MACHINE RAN OUT OF STORAGE.

OUTPUT FOR "basecaseφ1i" - IDENTICAL TO THE BASECASE USED FOR RON GREEN'S + FRANK DODGE'S WORK: "0.75base-comparei".

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMP (°C)
10 (9.997)	106690	99218		35.04
50 (50.14)	168160	94554		64.64
100 (99.97)	298520	89402		84.18
500 (501.4)	940230	89530		126.53
1000 (999.7)	1,318,500	89763		147.45

NEW CYLINDER RUN: "basecaseφ2i" IDENTICAL TO "0.75base-comparei" EXCEPT TORTUOSITY CHANGED FROM 0.50 TO 0.0. (BINARY DIFFUSION OFF)

IN: /home2/sisyphus/grice/cyl/newcyl/newcylφ2

- BEGIN "basecaseφ2i" ∂ ≃ 1020.

- DONE ("basecaseφ2i") BEFORE 1500

10-20-94
DR

- RE-RUN "basecaseφ1i" - GO THROUGH ALL TIMESTEPS. - BEGIN ≃ ~~13~~ HR 10-20-94 1510.

/ /

10-21-94
MR

- "basecaseφ1i" DONE

"basecaseφ1i" OUTPUT

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
	SEE PREVIOUS PAGE FOR TIMES THROUGH 1000 S.			
1999	1,935,100	89,396		181
2999	1,994,000	89,061		206
4005	1,526,000	88,654		207
5014	1,218,400	80,237		203
9997	928,830	57,486		198
19,994	743,930	55,458		200
50,142	492,440	69,670		178
99,969	425,400	78,949		178
501,420	336,130	100,000		179
750,560	302,960	100,000		178
999,690	144,330	152,8		25

MR 10-21-94

/ / (

10-25-94
MR

* CREATE NEW INPUT FILE FOR CYLINDER EXPERIMENT: "basecaseφ3i" - IDENTICAL TO "basecaseφ1i" EXCEPT "ENHANCED DIFFUSION" TURNED ON BY CHANGING TORTUOSITY IN "ROCKS" (tortx) FROM 0.5 TO A NEGATIVE NUMBER (-0.5)**
IN: home2/sisyphus/grice/cyl/newcyl/newcyl/φ3
* BEGIN "basecaseφ3i" ≃ 0955.

ERROR IN SET UP
MR 14/19/94

10-25-94
MR

OUTPUT FROM "basecaseφ2i" - (DIFFUSION OFF).

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
9.997	105,320	100,000		35
50.14	130,500	100,000		65
99.97	161,810	100,000		84
501.4	288,440	100,000		127
999.7	414,490	100,000		148
1999	918,010	100,000		181
2999	1,438,300	100,000		205
4005	1,178,600	100,000		205
5014	901,580	100,000		201
9997	581,680	100,000		196
19,994	440,290	100,000		197
50,142	232,250	100,000		175
99,969	209,310	100,000		174
501,420	161,970	100,000		174
750,560	156,270	100,000		173
999,690	100,080	100,000		25

/ /

10-26-94
MR

OUTPUT FROM "basecaseφ3i" - (ENHANCED DIFFUSION)

ERROR SEE P9 20F
MR 14/19/94

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
9.997	106,690	99,218		35 DR 10-26-94
50.14	168,160	94,554		65
99.97	298,520	89,402		84
501.4	940,230	89,530		127
999.7	1,318,500	89,763		147
1999	1,935,100	89,396		181
2999	1,994,000	89,061		206
4005	1,526,000	88,654		207

10-26-94

OUTPUT FOR "basecase$3i" CONTINUED

TIME (S)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
5014	1,218,400	80,237		203
9997	928,830	57,486		198
19,994	743,930	55,458		200
50,142	492,440	69,670		178
99,969	425,400	78,949		178
501,420	336,130	100,000		179
750,560	302,960	100,000		178
999,690	144,330	15-3		25-

PROJECT I.D. = 20-5704-191

NEW PROJECT - PEÑA BLANCA ROCK RUNS (PA RESEARCH)

WORKING IN: /ory:

/home2/rorg/rgreen/pena-nu/gn01.

CONVERTED TOUGH INPUT FILE "pcompi" TO ctough FORMAT BY COMMAND:

convrt␣ <pcompi>␣ cpcompi

NEW FILE: /home2/rorg/rgreen/pena-nu/nrg1,

FILE NAME = "nrg1-1i", IDENTICAL TO "pcompi" EXCEPT:

- FRACTURE WIDTH = 1 MICRON
- MATRIX PERMEABILITY = 9.49×10^{-8} cm/s
  $\longrightarrow 1.06 \times 10^{-16}$ m²
- POROSITY = ~~0.256~~ 0.29

~~AL~~ 10-26-94

10-26-94

FOR "nrg1-1i", FRACTURE PERMEABILITY:

$K = \frac{\rho_w g b^2}{12\mu}$, WHERE: (FROM DOMENICO & SCHWARTZ)

$\rho_w = 1 g/cm^3$

$g = 980 cm/s^2$

b = FRACTURE WIDTH

$\mu = 1 \times 10^{-2}$ g/s-cm

NR 10-26-94

$K = \frac{1\,g}{cm^3} \frac{980\,cm}{s^2} \frac{(0.001\,cm)^2}{12\ 0.01\,g} \frac{s\,cm}{}$ NR 10-25-94

$= \frac{0.98 \times 10^{-3}}{0.12} \frac{cm}{s} = 8.17 \times 10^{-3}$ cm/s

$K = \frac{1\,g}{cm^3} \frac{980\,cm}{s^2} \frac{(1 \times 10^{-4}\,cm)^2}{(12)1 \times 10^{-2}\,g} \frac{s\,cm}{}$

$= 8.17 \times 10^{-5}$ cm/s $= 8.17 \times 10^{-7} \frac{m}{s}$

$1 m/s = 1.02 \times 10^{-3} cm^2 = 1.02 \times 10^{-7} m^2$ (SEE PG 49)

$\frac{8.17 \times 10^{-7} m}{s} = \underline{8.33 \times 10^{-14} m^2}$.

FRACTURE POROSITY = 2×10^{-6}

NR 10-26-94

10-26-94
MR

BULK PERMEABILITY:

$$K_b = K_F \phi_F + K_M (1-\phi_F)$$

WHERE:

K_b = BULK K
K_F = FRACTURE K
K_M = MATRIX K
ϕ_F = FRACTURE POROSITY

$$K_b = 8.33\times10^{-14}(2\times10^{-6}) + 1.06\times10^{-16}(1-2\times10^{-6})$$

$$= 1.06\times10^{-16}\ m^2$$

MR 10-26-94

VAN GENUCHTEN PARAMETERS:

$\alpha(\frac{1}{m}) = 0.12$, $n = 2.00$

↑

VALUES USED IN "pcompi" WILL BE USED FOR ALL RUNS — FRACTURES ONLY, ∴ VALUES WILL BE USED FOR MATRIX.

BULK POROSITY:

$$\phi_b = \phi_F + (1-\phi_F)\phi_M$$

$$= 2\times10^{-6} + (1-2\times10^{-6})0.29 = 0.29$$

TO CONVERT α's FROM $\frac{1}{m}$ TO P_c:

FROM PAGE 50: $\frac{1.2851}{m} = \frac{1.312\times10^{-4}}{P_c}$

$$\frac{.12}{m} = 1.225\times10^{-5}/P_c.$$

10-26-94
AR

- BEGIN "avg1-li" ≃ 1640.
  ↳ WON'T RUN — NUMBER OF ELEMENTS EXCEEDS 1200 — WILL RECOMPILE newctough — INCREASE "NELM" IN dim.h TO 2000 FROM 1200.
- BEGIN "avg1-li" ≃ 1700 — → WON'T RUN, NUMBER OF CONNECTIONS EXCEEDS 2500. RECOMPILE newctough — CHANGE "NCONN" IN dim.h FROM 2800 TO 3600.
- BEGIN RUNNING "avg1-li" ≃ 1705 — STOPPED! HALF BANDWIDTH TOO SMALL — NEED TO INCREASE FROM 24 TO AT LEAST 40. - CHANGED "NBHMX" IN dim.h FROM 24 TO 42.
- BEGIN "avg1-li" @ 1720 — RUNNING!

MR
10-26-94

10-26-94 INPUT = "nrg1-1i" IN: /home2/rory/rgreen/pena-no/nrg

```
nrg1-1i,10/26/94,40x40,bulk perm=1.06e-16&por,cnsth A-E,1,A-AN,40,frac=1micron
:
:
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad    drock       por       permx      permy      permz      cwet       spht
matr1   2  2.580E+03 2.900E-01 1.060E-16 1.060E-16 1.060E-16 2.300E+00 8.400E+02
:
:    comp        expan         cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  9 1.0600E-16 1.2251E-05 1.7640E+00 2.9000E-01 2.0000E-02 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
  9 8.3300E-14 1.3147E-04 4.2300E+00 2.0000E-06 1.0000E-03 0.0000E+00 0.0000E+00
:
: mat  nad    drock       por       permx      permy      permz      cwet       spht
matr2   2  2.580E+03 1.000E-02 1.000E-94 1.000E-94 1.000E-94 2.300E+00 8.400E+02
:
:    comp        expan         cdry       tortx
  0.0000E+00  0.0000E+00  1.7000E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 4.3300E-01 2.0000E-02 9.7000E-01 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 4.3300E-01 2.0000E-02 8.5000E-07 0.0000E+00 9.7000E-01 1.0000E-01 0.0000E+00
:
: mat  nad    drock       por       permx      permy      permz      cwet       spht
matr3   2  1.000E+00 9.900E-01 1.000E-02 1.000E-02 1.000E-02 1.000E-01 1.000E+01
:
:    comp        expan         cdry       tortx
  0.0000E+00  0.0000E+00  1.7000E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 4.3300E-01 2.0000E-02 9.7000E-01 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 4.3300E-01 2.0000E-02 2.0000E+00 0.0000E+00 9.7000E-01 1.0000E-01 0.0000E+00
                                    :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo      texp       (mop(i),i   =1,17)
:                                             1 2 3 4 5 6 7 8 9 10111213141516 17
  0  1 9900    0 5000  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart       timax       deltn      deltmx     elst       gf        redlt       scale
 0.000E+00  2.740E-03  1.000E-13  0.000E+00 B   15  9.807E+00 0.000E+00 0.000E+00
:
:    rel         re2         u           wup        wnr        dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
:
:          dep(1)                dep(2)                dep(3)
       1.00000000E+05        3.50000000E+01        0.00000000E+00
:
START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
RPCAP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  9 1.0000E-13 5.8004E-07 1.7980E+00 1.1000E-01 1.0000E-03 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
  9 1.0000E-11 1.3147E-04 4.2300E+00 1.8000E-03 1.0000E-03 0.0000E+00 0.0000E+00
:
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  iti  ite   delaf       tinter
:  tis(1)     tis(2)     tis(3) ......
 1.370E-03 2.740E-03 5.479E-03 1.370E-02 2.740E-02 5.479E-02 1.370E-01 2.740E-01
:
OPTN ----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  ilimsl idsolc  knudsn ipctem ivplow ilopt
       0      1       0      1      1      0
:
DTSTP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:    dpgmx      dsgmax     dtmax      dxmax
:
 8.000E+05 1.000E-01 0.000E+00 0.000E+00
:
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: el ne   nsq nadd       porx
A       1    0    0    0.0
:
:           x1                  x2                  x3
       1.00000000E+05        2.50000000E+01        0.00000000E+00
```

MR 10-26-94

MR 10-26-94

10-27-94 AR

- "nrg1-1i" STOPPED AFTER SIMULATING 2.74x10^-3 yrs. I CHANGED "timax" IN PARAM TO 2.74 YRS & RE-STARTED ≈ 0930.

- NOTE - STORING OUTPUT FROM rory ON sneezy - ALL FILES WILL GO INTO:

/usr2/sneezy/rgreen/pena/adit,

"nrg1-1i" OUTPUT WILL GO INTO /usr2/--/adit/nrg1

- "nrg1-1i" SHOWED LITTLE CHANGE IN SATURATION OVER ≈ 2.7 YRS. I WILL CHANGE RUN TO 10 YRS & SEE WHAT HAPPENS. FILE NAME STILL "nrg1-1i".

- BEGIN "nrg1-1i" @ 1045. - INPUT SAME AS SHOWN ON pg 158 EXCEPT FOR PARAM (timax) AND TIMES:

MR 10-27-94

```
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo      texp       (mop(i),i   =1,17)
:                                             1 2 3 4 5 6 7 8 9 10111213141516 17
  0  1 9900    0 5000  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart       timax       deltn      deltmx     elst       gf        redlt       scale
 0.000E+00  1.000E+01  1.000E-13  0.000E+00 B   15  9.807E+00 0.000E+00 0.000E+00
:
:    rel         re2         u           wup        wnr        dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
:
:          dep(1)                dep(2)                dep(3)
       1.00000000E+05        3.50000000E+01        0.00000000E+00
:
START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
RPCAP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  9 1.0000E-13 5.8004E-07 1.7980E+00 1.1000E-01 1.0000E-03 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
  9 1.0000E-11 1.3147E-04 4.2300E+00 1.8000E-03 1.0000E-03 0.0000E+00 0.0000E+00
:
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  iti  ite   delaf       tinter
    8    8  1.0000E+12  0.0000E+00
:
:  tis(1)     tis(2)     tis(3) ......
 5.000E-01 1.000E-00 2.000E-00 3.000E-00 4.000E-00 6.000E-00 8.000E-00 1.000E+01
:
```

AR 10/27/94

MR 10-27-94

10-27-94 JR

PROJECT I.D. 20-5704-023:

INPUT FOR "basecaseφ1i" - CYLINDER RUN-IN:

/home2/sisyphus/grice/cyl/newcyl/newcyl/φ1

JR 10-27-94

```
cyl,10/19/94,20 heat elements,ksat=2e-18m^2,%sat(water)=30
:
:
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr1  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr2  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr3  2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 2.300E+00 1.000E+06
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  0.0000E+00
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E-01 0.0000E+00
                                    :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo      texp       (mop(i),i   =1,17)
:                                             1 2 3 4 5 6 7 8 9 1011121314151617
  0  1  9999   0  550  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart       timax      deltn      deltmx     elst     gf       redlt      scale
 0.000E+00  1.390E-01 -1.000E+00  0.000E+00  B  1  9.807E+00 0.000E+00 0.000E+00
:     dlt(i)..
 1.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
:
:    rel        re2        u          wup        wnr       dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
:
:          dep(1)              dep(2)              dep(3)
       1.00000000E+05      2.00000000E-01      2.00000000E+01
```

JR 10-27-94

JR 10-27-94

10-27-94 JR

INPUT FOR "baseeasecaseφ1i" - CONTINUED

JR 10-27-94

```
:
START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
RPCAP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0000E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0000E-01 0.0000E+00 1.1000E-05 1.0000E+05 1.0000E+00 3.5000E-01 0.0000E+00
:
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  iti  ite   delaf       tinter
   16   16  3.1700E+00  2.0000E+00
:
:  tis(1)     tis(2)     tis(3) .....
 3.170E-07 1.590E-06 3.170E-06 1.590E-05 3.170E-05 6.340E-05 9.510E-05 1.270E-04
 1.590E-04 3.170E-04 6.340E-04 1.590E-03 3.170E-03 1.590E-02 2.380E-02 3.170E-02
:
OPTN ----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  ilimsl idsolc  knudsn ipctem ivplow ilopt
      0      1      0      1      1      0
:
DTSTP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:   dpgmx     dsgmax     dtmax      dxmax
:
 8.000E+02 2.500E-01 2.000E+01 2.500E-01
:
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne sl ns nsq nad nads ltb  itp   itb   gx         ex         hg
A    9 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  7.612500E-03  1.246500E-02  1.033500E-02  1.031250E-02
  8.940000E-03  8.887500E-03  9.000000E-03  8.790000E-03
  8.790000E-03  0.0000000000  0.0000000000
B    9 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  2.283800E-02  3.741000E-02  3.099000E-02  3.093800E-02
  2.683500E-02  2.666200E-02  2.700000E-02  2.638500E-02
  2.638500E-02  0.0000000000  0.0000000000
:
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: el ne   nsq nadd       porx
A     1    0    0   0.0
:
:          x1                  x2                  x3
      1.00000000E+05      7.00000000E-01      2.50000000E+01
B     1    0    0   0.0
      1.00000000E+05      7.00000000E-01      2.50000000E+01
```

JR 10-27-94

"NOCAP2" DIFFUSION ON

- CYLINDER EXPERIMENT - NEW FILE - "basecaseφ4i" - IDENTICAL TO "basecaseφ1i" EXCEPT THE PERMEABILITIES OF MATR1, matr2, & matr3 ARE 2.0×10^{-14} INSTEAD OF 2.0×10^{-18}.

IN: /home2/sisyphus/grice/cyl/newcyl/newcyl/φ4

- BEGIN RUNNING "basecaseφ4i" ~ 1130.

10-27-94
MR

PROJECT I.D 20-5704-191:

NEW FILE: "nrg1-2i" IDENTICAL TO "nrg1-1i" EXCEPT FRACTURE WIDTH IS 10 MICRONS INSTEAD OF 1 MICRON

$$\text{NEW } K = \frac{\rho_w g b^2}{12\mu}$$

$$= \frac{1g}{cm^3}\ \frac{980\,cm}{s^2}\ \frac{(0.001\,cm)^2\ s\text{-}cm}{(12)\,0.01\,g}$$

$$= 1.18\,cm/s = 1.18\times10^{-2}\,\frac{m}{s}$$

MR 9-27-94

$$= \frac{1.18\times10^{-2}\,m}{s}\ \frac{1.02\times10^{-7}\,m^2}{m}\ s = 1.12\times10^{-9}\,m^2$$

$$= 8.17\times10^{-3}\,\frac{cm}{s} = 8.17\times10^{-5}\,\frac{m}{s} = 8.33\times10^{-12}\,m^2$$

FRACTURE POROSITY = 2×10^{-5}

BULK CONDUCTIVITY:

$$K_b = K_F\phi_F + (1-\phi_F)K_m$$

$$= 8.33\times10^{-12}(2\times10^{-5}) + (1-2\times10^{-5})\,1.06\times10^{-16}$$

$$= 2.73\times10^{-16}\,m^2$$

BULK POROSITY:

$$\phi_b = \phi_F + (1-\phi_F)\phi_m = 2\times10^{-5} + (1-2\times10^{-5})0.29$$

$$= 0.29$$

10-27-94
MR

- BEGIN RUNNING "nrg1-2i" ON RORY ≈ 1200. WILL PUT OUTPUT IN: /usr2/sneezy/rgreen/pena/adit/~~nrg2~~ nrg1 DR 10-27-94

- "nrg1-2i" RUN COMPLETED

- CREATE NEW FILE: "nrg1-3i" - IDENTICAL TO "nrg1-1i" EXCEPT FRACTURE WIDTH IS 100 MICRONS.

$$\text{NEW } K = \frac{\rho_w g b^2}{12\mu}$$

$$= \frac{980\,cm}{s}\ \frac{1g}{cm^3}\ \frac{(0.01\,cm)^2\ s\,cm}{12\,(0.01)\,g}$$

$$= 8.17\times10^{-1}\,cm/s = 8.17\times10^{-3}\,m/s$$

$$= 8.17\times10^{-3}\,m/s\,[1.02\times10^{-7}\,m^2/m/s] = 8.33\times10^{-10}\,m^2$$ MR 10-24-94

FRACTURE POROSITY = 2×10^{-4}

BULK CONDUCTIVITY:

$$K_b = 8.33\times10^{-10}(2\times10^{-4}) + (1-2\times10^{-4})\,1.06\times10^{-16} = 1.67\times10^{-13}\,m^2$$

BULK POROSITY:

$$\phi_b = 2\times10^{-4} + (1-2\times10^{-4})\,0.29 = 0.29$$

- BEGIN RUNNING "nrg1-3i" ≈ 1515

10-27-94 JR

INPUT FILE: "nrgl-3i", RAN ON NORY BUT OUTPUT FTP'd TO:
/usr2/sneezy/rgreen/pena/adit/nrgl

JR 10-27-94

```
nrgl-3i,10/27/94,40x40,bulk perm=1.67E-13&por,cnsth A-E,1 A-AN,40 frac=100micron
:
:
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por       permx      permy      permz      cwet       spht
matr1  2  2.580E+03 2.900E-01 1.670E-13 1.670E-13 1.670E-13 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  9 1.0600E-16 1.2251E-05 1.7640E+00 2.9000E-01 2.0000E-02 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
  9 8.3300E-10 1.3147E-04 4.2300E+00 2.0000E-04 1.0000E-03 0.0000E+00 0.0000E+00
:
: mat  nad   drock      por       permx      permy      permz      cwet       spht
matr2  2  2.580E+03 1.000E-02 1.000E-94 1.000E-94 1.000E-94 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7000E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 4.3300E-01 2.0000E-02 9.7000E-01 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 4.3300E-01 2.0000E-02 8.5000E-07 0.0000E+00 9.7000E-01 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx      permy      permz      cwet       spht
matr3  2  1.000E+00 9.900E-01 1.000E-02 1.000E-02 1.000E-02 1.000E-01 1.000E+01
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7000E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 4.3300E-01 2.0000E-02 9.7000E-01 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 4.3300E-01 2.0000E-02 2.0000E+00 0.0000E+00 9.7000E-01 1.0000E-01 0.0000E+00
                                    :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo      texp       (mop(i),i   =1,17)
:                                             1 2 3 4 5 6 7 8 9 1011121314151617
  0  1 9900     0 5000  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart       timax      deltn      deltmx     elst      gf         redlt      scale
 0.000E+00  1.000E+01  1.000E-13  0.000E+00 B   15  9.807E+00 0.000E+00 0.000E+00
:
:    rel        re2        u          wup        wnr        dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
:
:          dep(1)                dep(2)                dep(3)
       1.00000000E+05        3.50000000E+01        0.00000000E+00
:
START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
RPCAP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  9 1.0000E-13 5.8004E-07 1.7980E+00 1.1000E-01 1.0000E-03 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
  9 1.0000E-11 1.3147E-04 4.2300E+00 1.8000E-03 1.0000E-03 0.0000E+00 0.0000E+00
:
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  iti  ite   delaf        tinter
!
     8    8  1.0000E+12  0.0000E+00
:
:  tis(1)     tis(2)    tis(3) ......
 5.000E-01 1.000E-00 2.000E-00 3.000E-00 4.000E-00 6.000E-00 8.000E-00 1.000E+01
:
OPTN ----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  ilimsl idsolc  knudsn ipctem ivplow ilopt
       0      1       0      1      1      0
:
DTSTP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:   dpgmx      dsgmax     dtmax      dxmax
:
 8.000E+05 1.000E-01 0.000E+00 0.000E+00
```

JR 10-27-94

JR 10-27-94

10-27-94 JR

JR 10-27-94

- ~~THE~~ "nrgl-2i" ONLY RAN FOR 2.7 YEARS. RE-RUNNING IT ON SISYPHUS (/home2/sisyphus/grice/adit) FOR 20 YEARS. BEGN ≅ 1605.

PROJECT I.D. 20-5704-023:
OUTPUT FOR "basecaseϕ4i" IN:
/home2/sisyphus/grice/cyl/newcyl/newcylϕ4-
IDENTICAL TO "basecaseϕ1i" EXCEPT PERMEABILITIES $= 2\times10^{-14}\ m^2$ INSTEAD OF $2\times10^{-18}\ m^2$ (SEE PGS 160 & 161)

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
9.997	100,170	100,000		35
50.14	100,550	100,000		63
99.97	101,470	100,000		82
501.4	112,340	100,000		115
999.7	116,180	100,000		133
1999	121,370	100,000		164
2999	121,940	100,000		192
4005	120,710	100,000		195
5014	120,300	100,000		192
9997	119,940	100,000		187
19,994	119,250	100,000		189
50,142	117,120	100,000		166
99,969	117,020	100,000		165
501,420	116,660	100,000		165
750,560	116,500	100,000		163
999,690	100,000	99,718		25

PROJECT I.D. 20-5704-191:

- nrgl-2i RUN COMPLETED ≅ 1640 - FTP'd OUTPUT TO: /usr2/sneezy/rgreen/pena/adit/nrgl.

- RE-RUNNING "nrgl-1i" FOR 30 YEARS
BEGN RUN ≅ 1705

JR 10-27-94

10-28-94
JR

PROJECT I.D. 20-5704-191
JR 10-28-94

- "nrg1-1i" + "nrg1-2i" FINISHED RUNNING OVERNIGHT. OUTPUT POSTED (FTP'd) TO: /usr2/sneezy/rgreen/pena/adit/nrg1.

- NEW ROCK SAMPLE — nrg2

- MAKE NEW FILE: "nrg2-1i" — IDENTICAL TO "nrg1-1i" EXCEPT FOR MATERIAL PROPERTIES:
  - RESIDUAL SATURATION = 0.00 (FROM RON)
  - POROSITY OF MATRIX = 0.25
  - VAN GENUCHTEN $\beta = 1.60$
    " " $\alpha = 0.175/m$ ≙ FROM Pg 50: DR 10-28-94
    $\frac{1.2851}{m} = \frac{1.312\times10^{-4}}{Pa}$
    $\frac{1}{m} = \frac{1.02\times10^{-4}}{Pa}$
    $\frac{0.175}{m} = \frac{1.7866\times10^{-5}}{Pa}$
  - $K = 4.23\times10^{-8}$ cm/s $= 4.23\times10^{-10}\ \frac{m}{s}$
    $\frac{4.23\times10^{-10}\ m}{s}\ \frac{1.02\times10^{-7}\ m^2}{m/s} = 4.31\times10^{-17}\ m^2$

- PROPERTIES OF FRACTURES REMAIN SAME AS THOSE FOR 1 MICRON APERTURE - SEE Pg 158

10-28-94
MR
DR 10-28-94

- BULK ~~CONDUCT~~ PERMEABILITY?

K = PERMEABILITY, ϕ = POROSITY
F = FRACTURE, M = MATRIX

$K_b = K_F\phi_F + K_M(1-\phi_F)$,

$= 8.33\times10^{-14}\,2\times10^{-6} + 4.31\times10^{-17}(1-2\times10^{-6})$

$= \underline{4.33\times10^{-17}\ m^2}$

- BULK POROSITY:

$\phi_b = \phi_F + (1-\phi_F)\phi_M$

$= 2\times10^{-6} + (1-2\times10^{-6})0.25 = \underline{0.25}$

- BEGIN "nrg2-1i" ≃ 0850 — NOTE, HAD TO HAVE A NON-ZERO RESIDUAL SATURATION TO GET PROGRAM TO RUN — MADE IT 1×10^{-5}.

- MAKE NEW FILE: "nrg2-2i" — IDENTICAL TO "nrg2-1i" EXCEPT FRACTURE APERTURE = 10 MICRONS.
  - FRACTURE $K = 8.33\times10^{-12}\ m^2$
  - FRACTURE POROSITY = 2×10^{-5}

BULK PERMEABILITY = $K_b = K_F\phi_F + K_M(1-\phi_F)$

$= 8.33\times10^{-12}\,2\times10^{-5} + 4.31\times10^{-17}(1-2\times10^{-5})$
$= \underline{2.10\times10^{-16}\ m^2}$

BULK POROSITY = $\phi_b = \phi_F + (1-\phi_F)\phi_M$

$= 2\times10^{-5} + (1-2\times10^{-5})0.25 = \underline{0.25}$

- BEGIN RUNNING "nrg2-2i" @ ≃ 1100.

10-28-94 MR

NOTE - ALL WORK DONE THIS FAR TODAY IS FOR 20-5704-191.

THE FOLLOWING DATA WAS PROVIDED BY ROB GREEN & IS BEING USED IN THIS WORK:

RESIDUAL SATURATIONS:

nrg1 - 0.02
nrg2 - 0.00
nrg3 - 0.02
nrg4 - 0.02
nrg5 -0.04

MR 10-28-94

Porosity (Gravimetric)

Sample	NRG1	NRG2	NRG3	NRG4	NRG5
Mean	0.255	0.210	0.083	0.078	0.183
Coefficient Variation	0.029	0.061	0.229	0.149	0.060
Minimum	0.235	0.169	0.036	0.053	0.154
Median	0.256	0.213	0.089	0.074	0.188
Maximum	0.270	0.226	0.126	0.113	0.021

RK 10/25/94

Table 3-6. Pycnometric porosity of NRG1, NRG2, NRG3, NRG4, and NRG5 Nopal tuff subsamples

Porosity (Gas Pycnometric)

Sample	NRG1	NRG2	NRG3	NRG4	NRG5
Mean	0.295	0.264	0.083	0.128	0.211
Coefficient Variation	0.041	0.124	0.706	0.551	0.115
Minimum	0.28	0.23	0.02	0.04	0.18
Median	0.29	0.25	0.06	0.12	0.20
Maximum	0.32	0.34	0.18	0.31	0.26

MR 10-28-94

MR 10-28-94

10-28-94 MR

Saturated Hydraulic Conductivity (cm/s)

Sample	NRG1	NRG2	NRG3	NRG4	NRG5
Mean	9.49E–8	4.09E–8	1.09E–10	2.17E–10	1.95E–8
Coefficient Variation	0.556	0.191	0.995	0.312	0.509
Minimum	1.15E–8	2.78–8	6.22E–12	1.17E–10	9.67E–9
Median →	1.06E–7	4.23E–8	7.97E–11	2.42E–10	1.91E–8
Maximum	1.5E–7	5.19E–8	2.20E–10	2.65E–8	3.67E–8

LR 10-28-94

VAN GENUCHTEN PARAMETERS

RK 10/25/94

Sample	NRG1	NRG2	NRG3	NRG4	NRG5
α (m^{-1})	0.12	0.175	0.20	0.20	0.10
n	2.00	1.60	1.35	1.30	1.80

INPUT: "nrg2-1i" - WILL BE PUT IN: /usr2/sneezy/rgreen/pena/adit/nrg2

MR 10-28-94

```
nrg2-1i,10/28/94,40x40,bulk perm=4.33E-17&por,cnsth A-E,1,A-AN,40,frac<1micron
:
:
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matrl  2  2.580E+03 2.500E-01 4.330E-17 4.330E-17 4.330E-17 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  9 4.3100E-17 1.7866E-05 1.6000E+00 2.5000E-01 1.0000E-05 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
  9 8.3300E-14 1.3147E-04 4.2300E+00 2.0000E-06 1.0000E-03 0.0000E+00 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr2  2  2.580E+03 1.000E-02 1.000E-94 1.000E-94 1.000E-94 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7000E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 4.3300E-01 2.0000E-02 9.7000E-01 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 4.3300E-01 2.0000E-02 8.5000E-07 0.0000E+00 9.7000E-01 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr3  2  1.000E+00 9.900E-01 1.000E-02 1.000E-02 1.000E-02 1.000E-01 1.000E+01
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7000E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 4.3300E-01 2.0000E-02 9.7000E-01 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 4.3300E-01 2.0000E-02 2.0000E+00 0.0000E+00 9.7000E-01 1.0000E-01 0.0000E+00
                                                :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo      texp       (mop(i),i   =1,17)
:                                                1 2 3 4 5 6 7 8 9 10111213141516 17
  0  1 9900     0 5000  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart       timax      deltn      deltmx     elst      gf        redlt      scale
 0.000E+00  3.000E+01  1.000E-13  0.000E+00 B  15  9.807E+00 0.000E+00 0.000E+00
.
```

10-28-94
AR

INPUT FOR "nrg2-1i" - CONTINUED

AR 10-28-94

```
:
:   rel       re2       u         wup       wnr       dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
:
:         dep(1)              dep(2)              dep(3)
       1.00000000E+05      3.50000000E+01      0.00000000E+00
:
START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
RPCAP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  9 1.0000E-13 5.8004E-07 1.7980E+00 1.1000E-01 1.0000E-03 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
  9 1.0000E-11 1.3147E-04 4.2300E+00 1.8000E-03 1.0000E-03 0.0000E+00 0.0000E+00
:
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  iti  ite   delaf       tinter

    8    8  1.0000E+12  0.0000E+00
:
:  tis(1)     tis(2)    tis(3) .....
 5.000E-01 1.000E-00 6.000E-00 1.000E+01 1.400E+01 1.800E+01 2.000E+01 2.500E+01
:
OPTN ----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  ilimsl idsolc  knudsn ipctem ivplow ilopt
     0       1       0       1       1       0
:
DTSTP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:   dpgmx      dsgmax     dtmax      dxmax
:
 8.000E+05 1.000E-01 0.000E+00 0.000E+00
:
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: el ne   nsq nadd        porx
A      1    0    0    0.0
:
:             x1                  x2                  x3
       1.00000000E+05      2.50000000E+01      0.00000000E+00
B      1    0    0    0.0
       1.00000000E+05      2.50000000E+01      0.00000000E+00
```

AR 10-28-94

- CREATE NEW FILE: "nrg2-3i" - IDENTICAL TO "nrg2-1i" EXCEPT FRACTURE APERTURE = 100 MICRONS.

- FRACTURE PERMEABILITY = $8.33 \times 10^{-10}\ m^2$
- FRACTURE POROSITY = 2×10^{-4}

BULK CONDUCTIVITY:

$$K_b = K_F \phi_F + (1-\phi_F) K_M$$

10-28-94
AR

$$K_b = 8.33 \times 10^{-10}\, 2 \times 10^{-4} + (1-2\times10^{-4})\, 4.31 \times 10^{-17}$$
$$= 1.67 \times 10^{-13}\ M^2$$

BULK POROSITY:

$$\phi_b = \phi_F + (1-\phi_F)\phi_M$$
$$= 2\times10^{-4} + (1-2\times10^{-4})\,0.25 = 2.5\times10^{-1}$$

- BEGIN RUNNING "nrg2-3i" ≃ 1235

- NOTE - "nrg2-1i" RUNS - WETTING FRONT DID NOT REACH ADIT AFTER 30 YRS - WILL RUN FOR 100 YEARS.

- BEGIN RUNNING "nrg2-1i" ≃ 1300

- ALL OUTPUT FOR "nrg2-1i", "nrg2-2i", & "nrg2-3i" WILL BE FTP'd FROM rong OR sisyphus TO:
  /usr2/~~rgre~~ sneezy/rgreen/pena/adit/nrg2

10-28-94 ~~gRE 10-29-94~~
AR

THE WORK BELOW IS FOR:

20-5704-191

- RUNS "nrg2-1i" AND "nrg2-3i" FINISHED, OUTPUT FTP'd TO: /usr2/sneezy/rgreen/pena/adit/nrg2.
- MAKE NEW FILES FOR SAMPLE NR63:

10-29-94
DR

- NEW FILE: "nrg3-1i" - IDENTICAL TO "nrg2-1i" EXCEPT:

PERMEABILITY OF MATRIX = 7.97×10^{-11} cm/s (see Pg 169)

$= 7.97 \times 10^{-13} \frac{M}{s} \left(\frac{1.02 \times 10^{7} M^2}{M/s} \right)$

$= \underline{8.13 \times 10^{-20} M^2}$

- MATRIX POROSITY = 0.06 (see Pg 168)
- RESIDUAL MATRIX SATURATION = 0.02 (Pg 168)
- VAN GENUCHTEN α FOR MATRIX $= \frac{0.20}{M} \left[\frac{1.02 \times 10^{-4}}{Pa-M} \right]$ (Pg 169)

$= \underline{2.04 \times 10^{-5} / Pa}$

- VAN GENUCHTEN β FOR MATRIX = 1.35 (Pg 169)

/ /

FOR FRACTURE APETURE = 1 MICRON:

$K_F = 8.33 \times 10^{-14} M^2$ (Pg 155)

FRACTURE POROSITY = $2 \times 10^{-6} = \phi_F$

BULK PERMEABILITY:

$K_b = K_F \phi_F + (1 - \phi_F) K_m$ (Pg 156)

$= 833 \times 10^{-14} (2 \times 10^{-6}) + (1 - 2 \times 10^{-6}) 8.13 \times 10^{-20}$

$= \underline{2.48 \times 10^{-19} M^2}$.

11-29-94
AR

- BULK POROSITY:

$\phi_b = \phi_F + (1 - \phi_F) \phi_m = 2 \times 10^{-6} + (1 - 2 \times 10^{-6}) 0.02$ (Pg 158)

AR 10-29-94

$= 0.02 -$ [RUN 6] SEE BELOW

- BEGIN RUNNING "nrg3-1i" ON rory ≃ 0830

- NEW FILE: ~~nrg3~~ DR 10-27-94 "nrg3-2i" - IDENTICAL TO "nrg3-1i" EXCEPT FRACTURE APETURE = 10 MICRONS

- FRACTURE PERMEABILITY = $8.33 \times 10^{-12} M^2$ (Pg 162)
- FRACTURE POROSITY = 2×10^{-5}

BULK PERMEABILITY (Pg 156): $K_b = K_F \phi_F + (1 - \phi_F) K_m$

$= 8.33 \times 10^{-12} (2 \times 10^{-5}) + (1 - 2 \times 10^{-5}) 8.13 \times 10^{-20}$

$= \underline{1.67 \times 10^{-16} M^2}$

BULK POROSITY (Pg 156) = $\phi_b = \phi_F + (1 - \phi_F) \phi_m$

$= 2 \times 10^{-5} + (1 - 2 \times 10^{-5}) 0.06 = \underline{0.06}$

CORRECTED ϕ_b FOR "nrg3-1i"

$2 \times 10^{-6} + (1 - 2 \times 10^{-6}) 0.06 = .06$ - RESTART "nrg3-1i" ≃ 0850.

- BEGIN "nrg3-2i" ≃ 0900.
- nrg3 runs: "nrg3-1i", "nrg3-2i" & "nrg3-3i" WILL BE FTP'd TO: /usr2/sneezy/rgreen/penn/adit/nrg3.

10-29-94
MR

- Create NEW FILE: "nrg3-3i" IDENTICAL TO "nrg3-2i" EXCEPT FRACTURE APETURE = 100 MICRONS.

- FRACTURE PERMEABILITY = $8.33 \times 10^{-10} m^2$ (pg 163)
- FRACTURE POROSITY = 2×10^{-4}

BULK PERMEABILITY: $K_B = K_F \phi_F + (1-\phi_F) K_M$

$= 8.33 \times 10^{-10} (2 \times 10^{-4}) + (1 - 2 \times 10^{-4}) 8.13 \times 10^{-20}$

$= \underline{1.67 \times 10^{-13} m^2}$

BULK POROSITY $= \phi_F + (1-\phi_F)\phi_M$

$= 2 \times 10^{-4} + (1 - 2 \times 10^{-4}) 0.06 = \underline{0.06}$

- BEGIN RUNNING "nrg3-3i" ≃ 1025 on rorg

INPUT: "nrg3-3i"

```
nrg3-3i,10/29/94,40x40,bulk perm=1.67E-13&por,cnsth A-E,1,A-AN,40/fracs10micron
:
:
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr1  2  2.580E+03 6.000E-02 1.670E-13 1.670E-13 1.670E-13 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  9 8.1300E-20 2.0400E-05 1.3500E+00 6.0000E-02 2.0000E-02 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
  9 8.3300E-10 1.3147E-04 4.2300E+00 2.0000E-04 1.0000E-03 0.0000E+00 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr2  2  2.580E+03 1.000E-02 1.000E-94 1.000E-94 1.000E-94 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7000E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 4.3300E-01 2.0000E-02 9.7000E-01 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 4.3300E-01 2.0000E-02 8.5000E-07 0.0000E+00 9.7000E-01 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr3  2  1.000E+00 9.900E-01 1.000E-02 1.000E-02 1.000E-02 1.000E-01 1.000E+01
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7000E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 4.3300E-01 2.0000E-02 9.7000E-01 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 4.3300E-01 2.0000E-02 2.0000E+00 0.0000E+00 9.7000E-01 1.0000E-01 0.0000E+00
```


10-29-94
MR

"nrg3-3i" INPUT - CONTINUED

```
                                        :reqd blank line  MR 10-29-94
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo     texp      (mop(i),i   =1,17)
:                                          1 2 3 4 5 6 7 8 9 10111213141516 17
  0  1 9900    0 5000  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart       timax      deltn     deltmx     elst      gf       redlt      scale
 0.000E+00  1.000E+02  1.000E-13  0.000E+00 B  15  9.807E+00 0.000E+00 0.000E+00
:
:    rel        re2         u          wup        wnr       dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
:
:         dep(1)              dep(2)              dep(3)
      1.00000000E+05      3.50000000E+01      0.00000000E+00
:
START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
RPCAP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  9 1.0000E-13 5.8004E-07 1.7980E+00 1.1000E-01 1.0000E-03 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
  9 1.0000E-11 1.3147E-04 4.2300E+00 1.8000E-03 1.0000E-03 0.0000E+00 0.0000E+00
:
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  iti  ite   delaf       tinter

   16   16  1.0000E+12  0.0000E+00                    MR 10-29-94
:
:  tis(1)     tis(2)     tis(3) .....
 1.000E-02 5.000E-02 1.000E-01 5.000E-01 1.000E+00 5.000E+00 1.000E+01 1.400E+01
 1.800E+01 2.000E+01 3.000E+01 5.000E+01 7.000E+01 8.000E+01 9.000E+01 1.000E+02
:
OPTN ----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  ilimsl idsolc  knudsn ipctem ivplow ilopt
     0       1       0       1       1       0
:
DTSTP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:   dpgmx      dsgmax     dtmax      dxmax
:
 8.000E+05 1.000E-01 0.000E+00 0.000E+00
```

NEW FILE FOR NRG4 ROCK SAMPLE:
"nrg4-1i" IS IDENTICAL TO "nrg3-2i" EXCEPT FOR THE FOLLOWING MATERIAL PROPERTIES:

MATRIX CONDUCTIVITY = 2.42×10^{-10} cm/s (pg 169) $= 2.42 \times 10^{-12}$ m/s

MATRIX PERMEABILITY =

$$\frac{2.42 \times 10^{-12} m}{s} \left(\frac{1.02 \times 10^{-7} s^2}{m} \right) = \underline{2.47 \times 10^{-19} m^2}$$

MATRIX POROSITY = 0.12 (pg 168)

10-29-94
AR

MATRIX RESIDUAL SATURATION = 0.01 (pg 168)

MATRIX VAN GENUCHTEN ALPHA (pgs 50 & 169)

$$\frac{0.20}{\text{?}}\left[\frac{1.02\times10^{4}}{Pa/M}\right] = \frac{2.04\times10^{-5}}{Pa}$$

- MATRIX VAN GENUCHTEN BETA = 1.30 (Pg 169)

- FRACTURE PERMEABILITY FOR APETURE = 1 MICRON = $8.33\times10^{-14}\ m^2$ (Pg 155)

- MATRIX POROSITY = 2×10^{-6} - (GIVEN BY Bob G.)

- BULK PERMEABILITY = $K_b = K_f\phi_f + (1-\phi_f)K_m$ (Pg 156)

$= 8.33\times10^{-14}(2\times10^{-6}) + (1-2\times10^{-6})2.47\times10^{-19}$

$= \underline{4.14\times10^{-19}\ m^2}$

- BULK POROSITY = $\phi_f + (1-\phi_f)\phi_m$ (Pg 156)

$= 2\times10^{-6} + (1-2\times10^{-6})0.12 = \underline{0.12}$

- BEGIN RUNNING "nrg4-1i" ≃ 1240.

- "nrg4-1i" THROUGH "nrg4-3i" OUTPUT WILL BE FTP'd TO:

/usr2/sneezy/rgreen/pena/adit/nrg4.

10-29-94
MR

"NEW INPUT FILE FOR NRG4 SAMPLE: "nrg4-2i" IDENTICAL TO "nrg4-1i" EXCEPT FRACTURE APETURE = 10 MICRONS & MATERIAL PROPERTIES ARE AS FOLLOWS:

FRACTURE PERMEABILITY = $\underline{8.33\times10^{-12}\ m^2}$ (pg 162)
FRACTURE POROSITY = $\underline{2\times10^{-5}}$

BULK PERMEABILITY = $K_b = K_f\phi_f + (1-\phi_f)K_m$ (pg 50)

$= 8.33\times10^{-12}\,2\times10^{-5} + (1-2\times10^{-5})2.47\times10^{-19}$

$= \underline{1.67\times10^{-16}\ m^2}$

BULK POROSITY = $\phi_b = \phi_f + (1-\phi_f)\phi_m$

$= 2\times10^{-5} + (1-2\times10^{-5})0.12 = \underline{0.12}$

- BEGIN RUNNING "nrg4-2i" ≃ 2025

- NEW INPUT FILE FOR NRG4 SAMPLE: "nrg4-3i" IDENTICAL TO "nrg4-1i" EXCEPT: FRACTURE APETURE = 100 MICRONS
  - FRACTURE PERMEABILITY = $\underline{8.33\times10^{-10}\ m^2}$ (pg 163)
  - FRACTURE POROSITY = $\underline{2\times10^{-4}}$

BULK PERMEABILITY = $8.33\times10^{-10}\,2\times10^{-4} + (1-2\times10^{-4})2.47\times10^{-19}$

$= \underline{1.67\times10^{-13}\ m^2}$

BULK POROSITY = $\phi_p + (1-\phi_f)\phi_m$

$= 2\times10^{-4} + (1-2\times10^{-4})0.12 = \underline{0.12}$

MR
10-29-94

10/31-94 MR

THE FOLLOWING WORK FOR: 20-5704-191

- BEGIN RUNNING "nrg4-3i" ≃ 0800.
  - ON SISYPHUS.
- "nrg3-3i" & "nrg4-2i" OUTPUT FTP'd TO SNEEZY - /usr2/sneezy/rgreen/pena/adit/nrg3 AND nrg4, RESPECTIVELY.
- CREATE NEW INPUT FILE FOR SAMPLE PR65.

"nrg5-1i" - IDENTICAL TO "nrg4-1i" EXCEPT FOR THE FOLLOWING MATERIAL PROPERTIES:

- HYDRAULIC CONDUCTIVITY = 1.91×10^{-8} cm/s (pg 169)

$= 1.91 \times 10^{-10} \frac{m}{s} = \frac{1.91 \times 10^{-10} m}{s} \left(\frac{1.02 \times 10^{-7} m^2}{m/s} \right)$

MR 10-31-94

$= 1.95 \times 10^{-17}$

$= 1.95 \times 10^{-17} m^2$

- MATRIX POROSITY = 0.20 (pg 168)
- VAN GENUCHTEN ALPHA = 0.10/m (pg 169)

$= \frac{0.10}{m} \frac{1.02 \times 10^{-4} m}{Pa} = \frac{1.02 \times 10^{-5}}{Pa}$

- VAN GENUCHTEN BETA = 1.80 (pg 169)

MR 10-31-94

- RESIDUAL SATURATION = ~~1.80~~ = 0.04 (pg 168)

10-31-94 MR

- FOR "nrg5-1i", FRACTURE APETURE = 1 MICRON.

FRACTURE PERMEABILITY = $8.33 \times 10^{-9} m^2$ (Pg 158)
FRACTURE POROSITY = 2×10^{-6} - GIVEN BY RAN GREEN

- BULK PERMEABILITY = $k_b = k_f \phi_f + (1-\phi_f) k_m$ (Pg 52)

$= 8.33 \times 10^{-9} (2 \times 10^{-6}) + (1 - 2 \times 10^{-6}) 1.95 \times 10^{-17}$

$= 1.95 \times 10^{-17} m^2$

- BULK POROSITY = $\phi_b = \phi_f + (1-\phi_f) \phi_m$

$= 2 \times 10^{-6} + (1 - 2 \times 10^{-6}) 0.2 = 0.20$

- BEGIN RUNNING "nrg5-1i" ≃ 0855
- END "nrg5-1i" ≃ 2015
- FTP'd "nrg5-1i" OUTPUT TO:
  /usr2/sneezy/rgreen/pena/adit/nrg5
  WILL ALSO FTP "nrg5-2i" & "nrg5-3i" TO THIS DIRECTORY.
- CREATE NEW FILE: "nrg5-2i" - IDENTICAL TO "nrg5-1i" EXCEPT FRACTURE APETURE = 10 MICRONS:

FRACTURE PERMEABILITY = $8.33 \times 10^{-12} m^2$ (Pg 162)
FRACTURE POROSITY = 2×10^{-5} (RAN FOR GREEN)

BULK PERMEABILITY = $k_b = k_f \phi_f + (1-\phi_f) k_m$ (Pg 52)

$= 8.33 \times 10^{-12} 2 \times 10^{-5} + (1 - 2 \times 10^{-5}) 1.95 \times 10^{-17} = 1.86 \times 10^{-16}$

10-31-94
AR

- BULK POROSITY = $\phi_b = \phi_f + (1-\phi_f)0.20$

$= 2X10^{-5} + (1-2X10^{-5})0.20 = 0.20$

- BEGIN RUNNING "nrg5-2i" ≃ 1045 ON rory.

- NEW INPUT: "nrg5-3i" - IDENTICAL TO "nrg5-1i" EXCEPT FRACTURE APERTURE = 100 MICRONS.

- FRACTURE PERMEABILITY = $8.33X10^{-10}$ m² (pg 163)
- FRACTURE POROSITY = $2X10^{-4}$ (FROM RUN GREEN)

BULK POROSITY = $\phi_f + (1-\phi_f)\phi_m$

$= 2X10^{-4} + (1-2X10^{-4})0.20 = 0.20$

BULK PERMEABILITY = $K_b = K_f\phi_f + (1-\phi_f)K_m$ — FAR 10-31-94
(pg 50)

$= 8.33X10^{-10}2X10^{-4} + (1-2X10^{-4})1.95X10^{-17}$
$= 1.67X10^{-13}$ m²

- BEGIN RUNNING "nrg5-3i" ≃ 1210 - on rory.

- FTP'd OUTPUT FROM "nrg5-2i" TO:

/usr2/sneezy/rgreen/pena/adit/nrg5.

11-1-94
AR

- "nrg4-3i" FINISHED RUNNING ON SISYPHUS, OUTPUT FTP'd TO:

/usr2/sneezy/rgreen/pena/adit/nrg4

11-1-94
AR

PROJECT I.D. = 20-5704-191

- TEST RUN - MODIFY "nrg5-1i" - CHANGE RESIDUAL SATURATION OF FRACTURE FROM $1.0X10^{-3}$ TO $1.0X10^{-7}$ = ONE ORDER OF MAGNITUDE LESS THAN FRACTURE POROSITY. FILE NAME = "testϕ1i".

- BEGIN RUNNING testϕ1i ≃ ~~0800~~ AR 11-1-94 0800

- "nrg5-3i" DONE ≃ 0830 - FTP'd OUTPUT TO:
/usr2/sneezy/rgreen/pena/adit/nrg5.

- ~~AR~~ AR 11-1-94 "testϕ1i" DONE ≃ 0830 - RESULTS IDENTICAL TO "nrg5-1i" - SEE NEXT PAGE

- ANOTHER TEST RUN - "testϕ2i" IDENTICAL TO "nrg1-3i" EXCEPT RESIDUAL SATURATION OF FRACTURES = 10^{-5} INSTEAD OF 10^{-3}.

- BEGIN RUNNING "testϕ2i" ≃ 1020.

11-2-94
AR

RE-RUNNING ALL "nrg*-*i" RUNS USING NEW FRACTURE PERMEABILITIES FROM RUN GREEN:

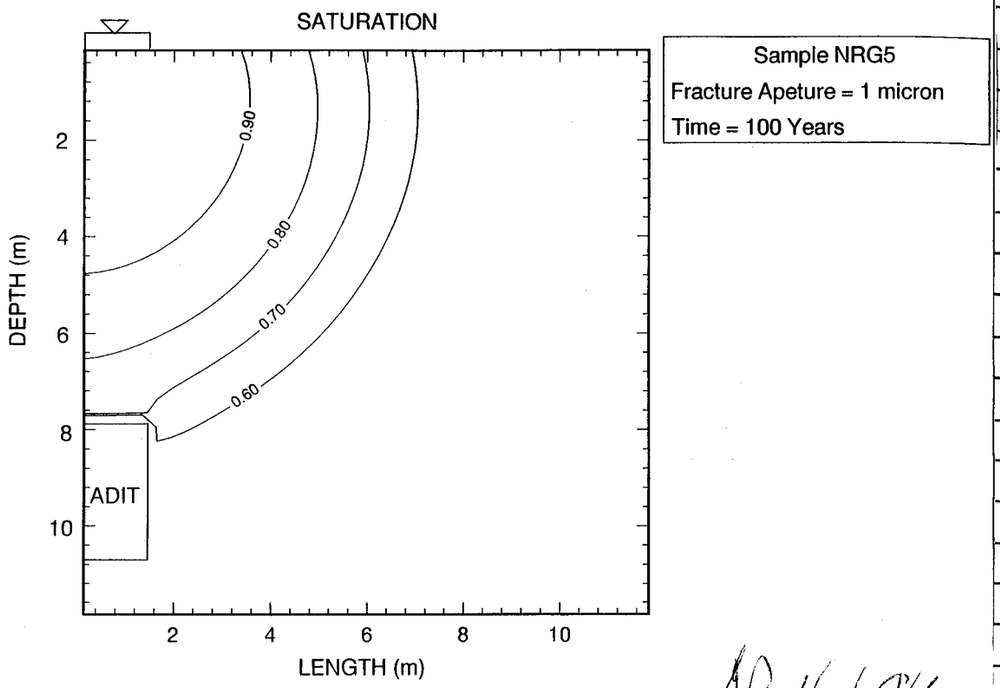
FRACTURE APERTURE	PERMEABILITY
1 MICRON	$K = 2\frac{m}{m^2}(1X10^{-6}m)^3\frac{1}{12} = 1.67X10^{-19}m^2$
10 MICRON	$K = 2\ m/m^2(1X10^{-5})^3\frac{1}{12} = 1.67X10^{-16}m^2$
100 MICRON	$K = 2\ m/m^2(1X10^{-4})^3\frac{1}{12} = 1.67X10^{-13}m^2$
1000 MICRON	$K = 2\ m/m^2(1X10^{-3}m)\frac{1}{12} = 1.67X10^{-10}m^2$

- RE-RUN "nrg1-1i" - CALL IT "revnrg1-1i"

FRACTURE PERMEABILITY = $1.67X10^{-19}m^2$

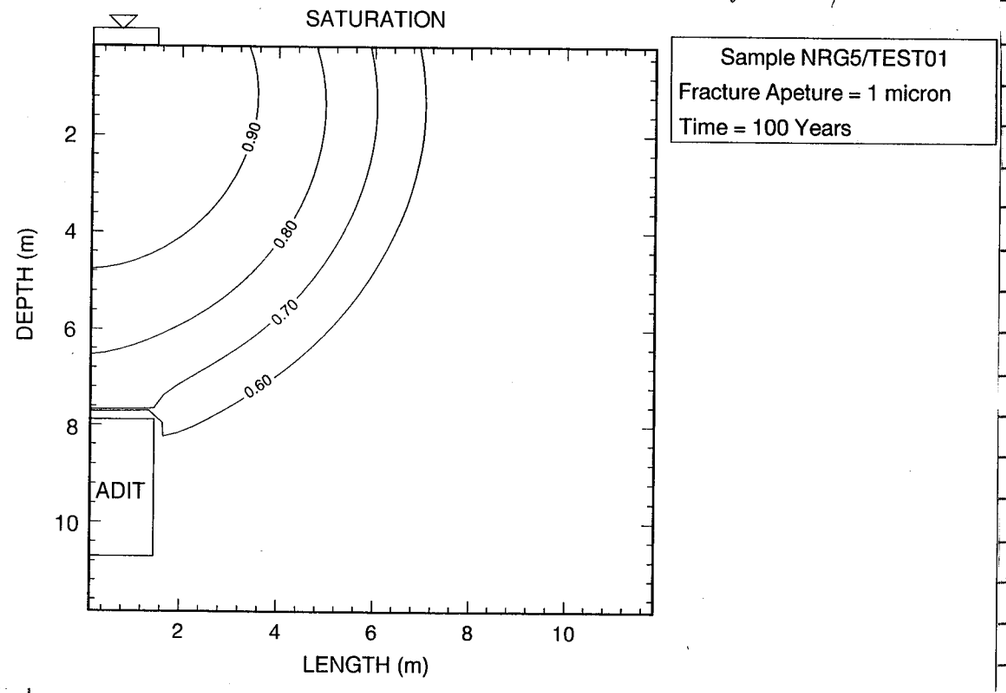
11-1-94 MR — COMPARE RUNS - "nrg5-1i" + "test01i" — SEE TOP OF PREVIOUS PAGE MR 11-1-94

(2D) II Print II 31 Oct 1994 II nrg5-1VAR13.plt II C-TOUGH field variables 3.1536E+09



MR 11-1-94

(2D) II Print II 1 Nov 1994 II test01VAR13.plt II C-TOUGH field variables 3.1536E+09



MR 11-1-94

11-2-94 MR

nrg1 1 micron

- BULK PERMEABILITY: $K_b = K_f \phi_f + (1-\phi_f) K_m$

$= 1.67\times10^{-19} m^2 \cdot 2\times10^{-6} + (1-2\times10^{-6}) 1.06\times10^{-16}$

$= 1.06\times10^{-16} m^2$

BULK POROSITY: $\phi_b = \phi_f + (1-\phi_f)\phi_m$

= SAME AS BEFORE

$= 2\times10^{-6} + (1-2\times10^{-6}) 0.29 = 0.29$

- NOTE: RESIDUAL SATURATION OF FRACTURE CHANGED TO BE ONE ORDER OF MAGNITUDE LESS THAN FRACTURE POROSITY
$= 2\times10^{-7}$.

- BEGIN RUNNING "revnrg1-1i" ON SISYPHUS ≃ 1420

- NEW FILE: "revnrg1-2i" IDENTICAL TO "nrg1-2i" EXCEPT:

nrg1 10 micron

- FRACTURE PERMEABILITY = $1.67\times10^{-16} m^2$ (Fig 81)
- FRACTURE RESIDUAL SATURATION = 2×10^{-6}
- BULK PERMEABILITY = $K_b = K_f \phi_f + (1-\phi_f) K_m$

$= 1.67\times10^{-16} 2\times10^{-5} + (1-2\times10^{-5}) 1.06\times10^{-16}$

$= 1.06\times10^{-16} m^2$

- BEGIN RUNNING "revnrg1-2i" ≃ 1445 ON RORY.

11-2-94
NR

nrg1
100 micron

- NEW FILE ~~rev~~nrg1-3i" IDENTICAL TO "nrg1-3i" EXCEPT: NR 11-2-94
- FRACTURE PERMEABILITY = $1.67 \times 10^{-13} m^2$ (pg 18)
- FRACTURE RESIDUAL SATURATION = 2×10^{-5}
- BULK PERMEABILITY = $K_B = K_F \phi_F + (1-\phi_F) K_m$ 4 NR 11-2-94 4

$= 1.67 \times 10^{-13} \, 2 \times 10^{-7} + (1 - 2 \times 10^{-7}) \, 1.06 \times 10^{-16}$

$= \underline{1.39 \times 10^{-16} \, m^2}$

- NEW FILE: "revnrg1-4i" - IDENTICAL TO "nrg1-3i" EXCEPT:

nrg1
1000 μm

- FRACTURE PERMEABILITY = $1.67 \times 10^{-10} m^2$
  → FRACTURE APERTURE = 1000 MICRONS
- FRACTURE POROSITY = 2×10^{-3}
- RESIDUAL FRACTURE SATURATION = 2×10^{-4}
- BULK PERMEABILITY = $K_B = K_F \phi_F + (1-\phi_F) K_m$

$= 1.67 \times 10^{-10} \, 2 \times 10^{-3} + (1 - 2 \times 10^{-3}) \, 1.06 \times 10^{-16}$

$= \underline{3.34 \times 10^{-13} \, m^2}$

- BULK POROSITY = $\phi_F + (1-\phi_F) \phi_m$ ~~M~~ NR 11-2-94

$= 2 \times 10^{-3} + (1 - 2 \times 10^{-3}) \, 0.29$

$= \underline{0.29}$

11-2-94
NR

- BEGIN RUNNING "revnrg1-3i" ON SISYPHUS ≃ 1615. NR 11-2-94
- "revnrg1-1 FINISHED RUNNING ≃ 1600 - FTP'd OUTPUT TO: /usr2/sneezy/ngreen/pena/adit/nrg

PROJECT I.D. = 20-5704-191 (PA-RESEARCH)

11-3-94
NR

- BEGAN RUNNING "revnrg1-4i" ≃ 0955 - NRG

nrg2
1 μm

- NEW INPUT FILE: "revnrg2-1i" IDENTICAL TO "nrg2-1i" EXCEPT:
- FRACTURE PERMEABILITY = $\underline{1.67 \times 10^{-19} m^2}$
- FRACTURE RESIDUAL SATURATION = $\underline{2 \times 10^{-7}}$
- BULK PERMEABILITY = $K_B = K_F \phi_F + (1-\phi_F) K_m$

$= 1.67 \times 10^{-19} (2 \times 10^{-6}) + (1 - 2 \times 10^{-6}) \, 4.13 \times 10^{-17}$

$= \underline{4.13 \times 10^{-17} \, m^2}$

- BEGIN RUNNING "revnrg2-1i" ON SISYPHUS ≃ 1015
- FTP'd OUTPUT FROM "revnrg1-2i" + "revnrg1-3i" TO: /usr2/sneezy/ngreen/pena/adit/nrg1.

NR 11-3-94

- CHANGE "~~nrg~~ revnrg1-3i" TO SIMULATE FLOW FOR 100 YEARS.
- BEGIN RUNNING CHANGED "revnrg1-3i" ≃ 1115:

11-3-94 MR

INPUT: "revnrg1-3i"

MR 11-3-94

```
revnrg1-3i,11/2/94,40x40,bulk perm=1.39E-16&por,cnsth A-E,1,A-AN,40,frac-100micr
:
:
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr1  2  2.580E+03 2.900E-01 1.390E-16 1.390E-16 1.390E-16 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  9 1.0600E-16 1.2251E-05 1.7640E+00 2.9000E-01 2.0000E-02 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
  9 1.6700E-13 1.3147E-04 4.2300E+00 2.0000E-04 2.0000E-05 0.0000E+00 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr2  2  2.580E+03 1.000E-02 1.000E-94 1.000E-94 1.000E-94 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7000E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 4.3300E-01 2.0000E-02 9.7000E-01 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 4.3300E-01 2.0000E-02 8.5000E-07 0.0000E+00 9.7000E-01 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr3  2  1.000E+00 9.900E-01 1.000E-02 1.000E-02 1.000E-02 1.000E-01 1.000E+01
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7000E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 4.3300E-01 2.0000E-02 9.7000E-01 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 4.3300E-01 2.0000E-02 2.0000E+00 0.0000E+00 9.7000E-01 1.0000E-01 0.0000E+00
                                    :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo      texp       (mop(i),i   =1,17)
:                                             1 2 3 4 5 6 7 8 9 10111213141516 17
  0  1 9900     0 5000  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart       timax      deltn      deltmx     elst      gf        redlt      scale
 0.000E+00   1.000E+02  1.000E-13  0.000E+00 B   15  9.807E+00 0.000E+00 0.000E+00
:
:    rel        re2         u          wup       wnr       dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
:
:         dep(1)              dep(2)              dep(3)
       1.00000000E+05      3.50000000E+01      0.00000000E+00
:
START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
RPCAP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  9 1.0000E-13 5.8004E-07 1.7980E+00 1.1000E-01 1.0000E-03 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
  9 1.0000E-11 1.3147E-04 4.2300E+00 1.8000E-03 1.0000E-03 0.0000E+00 0.0000E+00
:
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  iti  ite   delaf       tinter

    12   12   1.0000E+12  0.0000E+00
:
:  tis(1)     tis(2)     tis(3) .....
 1.000E-01 5.000E-01 1.000E-00 5.000E-00 1.000E+01 2.000E+01 3.000E+01 4.000E+01
 5.000E+01 6.000E+01 8.000E+01 1.000E+02
:
OPTN ----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
DTSTP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne   nsq nadd       porx
A      1    0    0   0.0
:
:          x1                  x2                  x3
       1.00000000E+05      2.50000000E+01      0.00000000E+00
B      1    0    0   0.0
       1.00000000E+05      2.50000000E+01      0.00000000E+00
C      1    0    0   0.0
       1.00000000E+05      2.50000000E+01      0.00000000E+00
D      1    0    0   0.0
```

AR 11-3-94

11-3-94 MR

INPUT: "revnrg1-3i" (CONT.)

MR 11-3-94

```
       1.00000000E+05      2.50000000E+01      0.00000000E+00
E      1    0    0   0.0
       1.00000000E+05      2.50000000E+01      0.00000000E+00
F      1    0    0   0.0
       1.00000000E+05      5.00000000E-01      2.50000000E+01
G      1    0    0   0.0
       1.00000000E+05      5.00000000E-01      2.50000000E+01
H      1    0    0   0.0
       1.00000000E+05      5.00000000E-01      2.50000000E+01
I      1    0    0   0.0
       1.00000000E+05      5.00000000E-01      2.50000000E+01
J      1    0    0   0.0
```

- "revnrg2-1i" FINISHED RUNNING — OUTPUT FTP'd TO: /usr2/sneezy/rgreen/pena/adit/nrg2
- NEW DAT FILE: "revnrg2-2i" IDENTICAL TO "nrg2-2i" EXCEPT:
  - FRACTURE PERMEABILITY = 1.67×10^{-16} m²
  - FRACTURE RESIDUAL SATURATION = 2.0×10^{-6}
  - BULK PERMEABILITY = $K_y = K_f \phi_f + (1 - 2 \times 10^{-5}) K_m$
    $= 1.67 \times 10^{-16} (2 \times 10^{-5}) + (1 - 2 \times 10^{-5}) 4.31 \times 10^{-17}$
    $= 4.31 \times 10^{-17}$ m²
  - BEGIN RUNNING "~~rev2-2~~" "revnrg2-2i" ON SISYPHUS = 1325

nrg2 10 µm

AR 11-3-94

→ • CREATE NEW DAT FILE: "revnrg2-3i" — IDENTICAL TO "nrg2-3i" EXCEPT:
  - FRACTURE PERMEABILITY = 1.67×10^{-13} m²
  - RESIDUAL SATURATION OF FRACTURE = 2×10^{-5}

11-3-94
MR
nrg 2
100 μm

- BULK PERMEABILITY = $K_b = K_f \phi_f + (1-\phi_f) K_m$

$= 1.67 \times 10^{-13} 2 \times 10^{-4} + (1 - 2 \times 10^{-4}) 4.31 \times 10^{-17}$

$= \underline{7.65 \times 10^{-17}}$

→ • CREATE "revnrg2-4i" - IDENTICAL TO "revnrg2-3i" EXCEPT FRACTURE APERTURE = 1000 MICRONS AND:

nrg 2
1000 μm

- FRACTURE PERMEABILITY = $\underline{1.67 \times 10^{-10} m^2}$

- FRACTURE POROSITY = $\underline{2 \times 10^{-3}}$

- FRACTURE RESIDUAL SATURATION = $\underline{2 \times 10^{-4}}$

- BULK PERMEABILITY = $K_b = K_f \phi_f + (1-\phi_f) K_m$

$= 1.67 \times 10^{-10} 2 \times 10^{-3} + (1 - 2 \times 10^{-3}) 4.31 \times 10^{-17}$

$= \underline{3.34 \times 10^{-13} m^2}$

- BULK POROSITY = $\phi_b = \phi_f + (1-\phi_f) 0.25$

$= 2 \times 10^{-3} + (1 - 2 \times 10^{-3}) 0.25 = \underline{0.25}$

→ • CREATE NEW INPUT FILE: "revnrg3-1i" IDENTICAL TO "nrg3-1i" EXCEPT:

nrg 3
1 μm

- FRACTURE PERMEABILITY = $\underline{1.67 \times 10^{-9} m^2}$

- FRACTURE RESIDUAL SATURATION = $\underline{2.0 \times 10^{-7}}$.

11-3-94
MR

- BULK PERMEABILITY = $K_b = K_f \phi_f + (1-\phi_f) K_m$

$= 1.67 \times 10^{-9} 2 \times 10^{-6} + (1 - 2 \times 10^{-6}) 8.13 \times 10^{-20}$

$= \underline{8.13 \times 10^{-20} m^2}$

- BEGIN RUNNING "revnrg3-1i" on SISYPHUS ≃ 1500

- "revnrg3-1i" DONE ≃ 1605 - OUTPUT FTP'd TO: /usr2/sneezy/rgreen/pena/adit/nrg3.

- BEGIN RUNNING "revnrg2-4i" ≃ 1610 on sisyphus.

11-4-94
MR

- RUN: "~~nrg~~ MR 11-4-94" "revnrg2-3i" BEGIN ≃ 1405

- Run "revnrg2-4i" DONE - OUTPUT FTP'd TO: /usr2/sneezy/rgreen/pena/adit/nrg2

→ CREATE NEW FILE: "revnrg3-2i" - IDENTICAL TO "nrg3-2i" EXCEPT:

nrg 3
10 μm

- FRACTURE PERMEABILITY = $\underline{1.67 \times 10^{-6} m^2}$

- FRACTURE RESIDUAL SATURATION = $\underline{2 \times 10^{-6}}$

- EFFECTIVE (BULK) PERMEABILITY = $K_b = K_f \phi_f + (1-\phi_f) K_m$

$= 1.67 \times 10^{-6} 2 \times 10^{-5} + (1 - 2 \times 10^{-5}) 8.13 \times 10^{-20}$

$= \underline{8.46 \times 10^{-20} m^2}$

11-4-94 MR

PROJECT I.D. = 20-5704-191 (PA RESEARCH)

- BEGIN "revnrg3-2i" ≃ 1530 ON RORY

→ • Create new DMT file: "revnrg3-3i" IDENTICAL TO "nrg3-3i" EXCEPT:

nrg3 100 μm

- FRACTURE PERMEABILITY = ~~1.67X10~~ MR 11-4-94 $1.67 \times 10^{-13} m^2$

- FRACTURE RESIDUAL SATURATION = 2×10^{-5}

- BULK PERMEABILITY = $K_b = K_f \phi_f + (1-\phi_f) K_m$ 3 DR 11-4-93

$= 1.67 \times 10^{-13} \; 2 \times 10^{-4} + (1 - 2 \times 10^{-4}) \; 8.13 \times 10^{-20}$

$= 3.35 \times 10^{-17} m^2$

11-5-94 MR

• BEGIN RUNMP-6 "revnrg3-3i" ≃ 1550 ON SISYPHUS

• OUTPUT from "revnrg1-4i" FTP'd TO: /usr2/sneezy/rgreen/pena/adit/nrg1

• OUTPUT from "revnrg2-3i" FTP'd TO: /usr2/sneezy/rgreen/pena/adit/nrg2

→ • CREATE NEW D-MAT FILE: "revnrg4-4i" IDENTICAL TO "revnrg3-3i" EXCEPT: 3 DR 11-4-94

nrg3 1000 μm

- FRACTURE PERMEABILITY = $1.67 \times 10^{-10} m^2$

- FRACTURE RESIDUAL SATURATION = 2×10^{-3} 4 DR 11-4-94

- FRACTURE POROSITY = 2×10^{-3}

11-4-94 MR

• BULK PERMEABILITY = $K_b = K_f \phi_f + (1-\phi_f) K_m$

$= 1.67 \times 10^{-10} \; 2 \times 10^{-3} + (1 - 2 \times 10^{-3}) \; 8.13 \times 10^{-20}$

$= 3.34 \times 10^{-13} m^2$

• BULK POROSITY = $\phi_b = \phi_f + (1-\phi_f) \phi_m$

$= 2 \times 10^{-3} + (1 - 2 \times 10^{-3}) \; 0.06$

$= 0.062$

11-5-94 MR

RUNS "revnrg3-2i" + "revnrg3-3i" DONE

- BEGIN RUNMP6 "revnrg3-4i" ON nrg ≃ 1600.

• FTP'd OUTPUT from "revnrg3-2i" + "revnrg3-3i" TO: /usr2/sneezy/rgreen/pena/adit/nrg3

• CREATE NEW FILE: "revnrg4-4i" - IDENTICAL TO "nrg4-3i" EXCEPT:

nrg4 1000 μm

• FRACTURE PERMEABILITY = $1.67 \times 10^{-10} m^2$ 10 MR 11-5-94

• FRACTURE POROSITY = 2×10^{-3}

• FRACTURE RESIDUAL SATURATION = 2×10^{-4}

• BULK PERMEABILITY = $K_b = K_f \phi_f + (1-\phi_f) K_m$

$= 1.67 \times 10^{-10} \; 2 \times 10^{-3} + (1 - 2 \times 10^{-3}) \; 2.47 \times 10^{-19}$

$= 3.34 \times 10^{-13} m^2$

11-5-94
MF

- BULK POROSITY = $\phi_b = \phi_F + (1-\phi_F)\phi_m$

  $= 2\times10^{-3} + (1-2\times10^{-3})0.12$

  $= \underline{0.12}$

BEGIN RUN #6 "revnrg4-4i" on sisyphus ≃ 1625

→ • CREATE NEW FILE: "revnrg4-3i" - IDENTICAL TO "nrg4-3i" EXCEPT:

nrg4
100 μm

- FRACTURE PERMEABILITY = $\underline{1.67\times10^{-13}\ m^2}$
- FRACTURE RESIDUAL SATURATION = $\underline{2\times10^{-5}}$
- BULK PERMEABILITY = $K_b = K_F\phi_F + (1-\phi_F)K_m$

  $= 1.67\times10^{-13}\ 2\times10^{-4} + (1-2\times10^{-4})\ 2.47\times10^{-17}$

  $= \underline{3.36\times10^{-17}\ m^2}$

→ • CREATE NEW FILE: "revnrg4-2i", IDENTICAL TO "nrg4-2i" EXCEPT:

nrg4
10 μm

- FRACTURE PERMEABILITY = $\underline{1.67\times10^{-16}\ m^2}$
- FRACTURE RESIDUAL SATURATION = $\underline{2\times10^{-6}}$
- BULK PERMEABILITY = $K_b = K_F\phi_F + (1-\phi_F)K_m$

  $= 1.67\times10^{-16}\ 2\times10^{-5} + (1-2\times10^{-5})\ 2.47\times10^{-19}$

  $= \underline{2.80\times10^{-19}\ m^2}$

11-6-94
DR

- RUNS "revnrg4-4i" AND "revnrg3-4i" COMPLETED AND FTP'd TO: /usr2/sneezy/rgreen/pena/adit/nrg4 & nrg3, RESPECTIVELY.

- BEGIN RUN "revnrg4-3i" on sisyphus ≃ 1640

nrg5
1000 μm

- CREATE NEW INPUT FILE: "revnrg5-4i" - IDENTICAL TO "nrg5-3i" EXCEPT:
- FRACTURE PERMEABILITY = $\underline{1.67\times10^{-10}\ m^2}$
- FRACTURE POROSITY = $\underline{2\times10^{-3}}$
- FRACTURE RESIDUAL SATURATION = $\underline{2\times10^{-4}}$
- BULK PERMEABILITY = $K_b = K_F\phi_F + (1-\phi_F)K_m$

  $= 1.67\times10^{-10}\ 2\times10^{-3} + (1-2\times10^{-3})\ 1.95\times10^{-17}$

  $= \underline{3.34\times10^{-13}\ M^2}$

- BULK POROSITY = $\phi_b = \phi_F + (1-\phi_F)\phi_m$

  $= 2\times10^{-3} + (1-2\times10^{-3})\ 0.20$

  $= \underline{0.202}$

- BEGIN RUNNING "revnrg5-4i" ON rorg ≃ 1700

11-7-94
DR

"revnrg4-3i" DONE - OUTPUT FTP'd TO: /usr2/sneezy/rgreen/pena/adit/nrg4

11-7-94
MR

PROJECT I.D. = 20-5704-191 (PA RESERVE)

- BEGIN RUNNING "revnrg4-2i" ON SISYPHUS ≃ 0845
- "revnrg5-4i" DONE RUNNING ≃ 0900

- CREATE NEW FILE: "revnrg4-1i" - IDENTICAL TO "nrg4-1i" EXCEPT:

nrg 4
1 μm

- FRACTURE PERMEABILITY = $1.67 \times 10^{-9} m^2$
- FRACTURE RESIDUAL SATURATION = 2.0×10^{-7}
- BULK ~~FRA~~ PERMEABILITY = $K_b = K_f \phi_f + (1-\phi_f) K_m$ DR 11-7-94

$= 1.67 \times 10^{-9} \, 2 \times 10^{-7} + (1 - 2 \times 10^{-7}) \, 2.47 \times 10^{-19}$ 6 MR 11-7-94 6

$= 2.47 \times 10^{-19} \, m^2$

- BEGIN RUNNING "revnrg4-1i" ON SISYPHUS ≃ 0935

- CREATE NEW INPUT FILE: "revnrg5-3i" - IDENTICAL TO "nrg5-3i" EXCEPT:

nrg 5
100 μm

- FRACTURE PERMEABILITY = $1.67 \times 10^{-13} m^2$
- FRACTURE RESIDUAL SATURATION = 2×10^{-5}
- BULK PERMEABILITY = $K_b = K_f \phi_f + (1-\phi_f) K_m$

$= 1.67 \times 10^{-13} \, 2 \times 10^{-4} + (1 - 2 \times 10^{-4}) \, 1.95 \times 10^{-17}$

$= 5.29 \times 10^{-17} \, m^2$

BULK POROSITY = $2 \times 10^{-4} + (1 - 2 \times 10^{-4}) \, 0.20 = 0.20$

11-7-94
MR

- BEGIN RUNNING "revnrg5-3i" ON rory ≃ 0950
- OUTPUT FROM "revnrg5-4i" FTP'd TO: /usr2/sneezy/rgreen/pena/adit/nrg5

- CREATE NEW INPUT FILE: "revnrg5-2i" - IDENTICAL TO "nrg5-2i" EXCEPT:

nrg 5
10 μm

- FRACTURE PERMEABILITY = $1.67 \times 10^{-16} m^2$
- FRACTURE RESIDUAL SATURATION = 2×10^{-6}
- BULK PERMEABILITY = $K_b = K_f \phi_f + (1-\phi_f) K_m$

$= 1.67 \times 10^{-16} \, 2 \times 10^{-5} + (1 - 2 \times 10^{-5}) \, 1.95 \times 10^{-17}$

$= 1.95 \times 10^{-17} \, m^2$

- BEGIN RUNNING "revnrg5-2i" ON SISYPHUS ≃ 1035

- CREATE NEW INPUT FILE: "revnrg5-1i" - IDENTICAL TO "nrg5-1i" EXCEPT:

nrg 5
1 μm

- FRACTURE PERMEABILITY = $1.67 \times 10^{-19} m^2$
- FRACTURE RESIDUAL SATURATION = 2×10^{-7}
- BULK PERMEABILITY = $K_b = K_f \phi_f + (1-\phi_f) K_m$

$= 1.67 \times 10^{-19} \, 2 \times 10^{-6} + (1 - 2 \times 10^{-6}) \, 1.95 \times 10^{-17}$

$= 1.95 \times 10^{-17} \, m^2$

MR 11-7-94

11-7-94
MR

- "revnrg5-3i" DONE ≃ 1120 - FTP'd OUTPUT TO:
  /usr2/sneezy/rgreen/pena/adit/nrg5

- "revnrg5-2i" DONE ≃ 1110, FTP'd OUTPUT TO:
  /usr2/sneezy/rgreen/pena/adit/nrg5

- BEGIN RUNNING "revnrg5-1i" ON SISYPHUS ≃ 1140 - GETTING MESSAGE ON SCREEN:
  "WARNING - NO CONVERGENCE IN SUBROUTINE PP.

→ VAN GENUCHTEN & MISSING FROM "9-FRACTURE" LINE REPLACED.

- BEGIN RUNNING "~~nrg~~ revnrg5-1i" ON SISYPHUS ≃ 1145 - RUNS O.K. MR 11-7-94

- "revnrg5-1i" DONE, OUTPUT FTP'd TO:
  /usr2/sneezy/rgreen/pena/adit/nrg5.

11-15-94
MR

- RERUN: "revnrg2-4i" & "revnrg3-4i" TO SEE WHAT HAPPENS AT EARLIER TIMES.

- BEGIN RUNNING "revnrg2-4i" ON SISYPHUS ≃ 1020

- SKIPPY ADDRESS = 129.162.200.83

- BEGIN RUNNING "revnrg3-4i" ON SKIPPY ≃ 1035

MR 11-16-94

11-16-94
MR

- RUNS "revnrg2-4i" & "revnrg3-4i" DONE, FTP'd TO:
  /usr2/sneezy/rgreen/pena/adit/mods

- RE-RUN "revnrg3-2i" & "revnrg4-2i" FOR LONGER TIMES (≃ 10^4 YRS) TO SEE GREATER ADVANCE OF WETTING FRONTS.

- BEGIN RUNNING "revnrg4-2i" ON SISYPHUS ≃ 1015

- BEGIN RUNNING "revnrg3-2i" ON SKIPPY ≃ 1025

- FTP'd OUTPUT FROM "revnrg4-2i" & "revnrg3-2i" TO:
  /usr2/sneezy/rgreen/pena/adit/mods.

- RE-RUN: "revnrg4-3i" TO SEE FRONT UP TO 80 YRS.

- BEGIN RUNNING "revnrg4-3i" ON SISYPHUS ≃ 1205

- RE-RUN "revnrg5-2i" TO SEE FRONT BETWEEN 50 & 100 YEARS.

- BEGIN RUNNING "revnrg5-2i" ON SKIPPY ≃ 1230

- RE-RUN "revnrg5-4i" TO SEE FRONT BETWEEN 5×10^{-3} YR & 1×10^{-2} YR. BEGIN RUNNING ON SKIPPY ≃ 1300.

- FTP'd OUTPUT FROM "revnrg5-2i" TO:
  /usr2/sneezy/rgreen/pena/adit/mods.

- FTP'd OUTPUT FROM "revnrg4-3i" TO:
  /usr2/sneezy/rgreen/pena/adit/mods.

11-17-94
AR

PROJECT I.D. = 20-5704-191 (PA-RESEARCH)

- "revarg5-4i" POSTRUNNING - OUTPUT FTN'd TO:
  /usr2/sneezy/rgreen/pena/adit/mods.

11-22-94
AR

ALL FINAL PLOTS FOR PA-RESEARCH WORK MOVED TO:
/usr2/sneezy/rgreen/pena/adit/plots.

THERMAL PROJECT: 20-5704-023

- RE-RUNNING FRAN BLOCK:

  "ctfmid5i" - WILL INCLUDE ADDITIONAL PRINT TIMES TO BETTER DEFINE PEAK.

  Ctought IN:

  /home2/sisyphus/grice/gwtt/tools

- BEGIN "ctfmid5i" ON SISYPHUS:

  /home2/sisyphus/grice/thermal/fran/output5.

  ≃1020

11-23-94
MR

- "ctfmid5i" STILL RUNNING BUT HAS PRODUCED SOME OUTPUT (≃080)

MR
11-23-94

11-23-94
AR

INPUT: "ctfmid5i" - FRAN BLOCK

AR 11-23-94

```
ctfmid5i,11/22/4,ks-14,top9-9,T(.2)ks(e-02),dead section out
:
:
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr1  2  2.580E+03 1.000E-01 1.800E-14 1.800E-14 1.800E-14 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  9 1.9000E-18 5.8004E-07 1.7980E+00 1.1000E-01 1.0000E-03 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
  9 1.0000E-11 1.3147E-04 4.2300E+00 1.8000E-03 1.0000E-03 0.0000E+00 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr3  2  2.500E+03 5.000E-01 4.000E-02 0.000E+00 0.000E+00 3.000E-02 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  3.0000E-02  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  9 1.9000E-18 5.8004E-07 1.7980E+00 1.1000E-01 1.0000E-03 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
  9 1.0000E-11 1.3147E-04 4.2300E+00 1.8000E-03 1.0000E-03 0.0000E+00 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr2  2  2.500E+03 1.000E-04 1.800E-14 0.000E+00 0.000E+00 3.000E-02 1.000E-14
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  3.0000E-02  0.0000E+00
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  9 1.9000E-18 5.8004E-07 1.7980E+00 1.1000E-01 1.0000E-03 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
  9 1.0000E-11 1.3147E-04 4.2300E+00 1.8000E-03 1.0000E-03 0.0000E+00 0.0000E+00
                                      :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo     texp       (mop(i),i   =1,17)
:                                            1 2 3 4 5 6 7 8 9 1011121314151617
  0  1 9999 0   250  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart       timax     deltn     deltmx    elst     gf        redlt     scale
 0.000E+00  5.000E+07 -1.000E+00  0.000E+00  B  1  9.807E+00 0.000E+00 0.000E+00
:     dlt(i)..
 1.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
:
:   rel        re2        u          wup       wnr       dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
:
```

AR 11-23-94

```
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0000E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0000E-01 0.0000E+00 1.1000E-05 1.0000E+05 1.0000E+00 3.5000E-01 0.0000E+00
:
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  iti  ite    delaf       tinter
    16   16 1.0000E+10  3.1558E+08
:
:  tis(1)     tis(2)    tis(3) .....
 8.640E+04 4.320E+05 1.000E+06 2.000E+06 3.000E+06 4.000E+06 5.000E+06 6.00E+06
 7.000E+06 8.000E+06 9.000E+06 1.000E+07 2.000E+07 3.000E+07 4.000E+07 5.000E+07
:
OPTN ----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  ilimsl idsolc  knudsn ipctem ivplow ilopt
      0       1       0       1       1       0
:
ELEME----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne    nsq   nad mat ma2     volx
:
A       1     0     0  matr3    1.5000E+12
A       2     0     0  matr1    1.5000E-04
```

AR 11-23-94

11-23-94 JR

OUTPUT: FRAN BLOCK: "ctfmid5i" - TAKEN FROM TECPLOT

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
86,400	100,030	100,000	30	39
432,000	100,060	100,000	60	55
1,000,000	100,140	100,000	140	71
2,000,000	100,460	100,000	460	89
3,000,000	102,760	100,000	2,760	102
4,000,000	105,740	100,000	5,740	113
5,000,000	112,020	100,000	12,020	122
6,000,000	116,490	100,000	16,490	130
7,000,000	120,070	100,000	20,070	139
8,000,000	121,180	100,000	21,180	147
9,000,000	122,220	100,000	22,220	154
10,000,000	121,530	100,000	21,530	161

ALSO SEE pg 139 ΔP 11-23-94

REPOSITORY DATA - /usr2/sneezy/rgreen/yucca

OUTPUT FILE	TIME(S)	MAX PRESSURE (Pa)
ZEALLYVAR1.dat	3.156×10^7	
" 2. "	1.578×10^8	
" 3. "	3.156×10^8	
" 4. "	6.307×10^8	
" 5. "	9.461×10^8	
" 6. "	1.261×10^9	
" 7. "	1.578×10^9	1.4168×10^5, 245.5m
" 8. "	1.8922×10^9	1.4189×10^5, 246.5m
" 9. "	2.207×10^9	1.4146×10^5, 249.5m
" 10. "	2.523×10^9	1.4050×10^5, 251.5m
" 11. "	2.838×10^9	

NOTE, T = 177.4°C @ X = 325

Δt = 1.8922×10^9 s
MAX P = 1.4189×10^5 Pa
MAX T = 112°C (WHEN P = MAX)
X = 246.5m

DR 11-23-94

Pages 1 through 200 of this Scientific Notebook were reviewed for compliance with QAP-001 in response to Corrective Action Request 94-02. Corrections and clarifications were made as appropriate. In some cases, the date of a change will reflect the date of this review rather than the date of the original Scientific Notebook entry.

Randy Tolbert 11/28/94

12 JR 12-13-94

12-6-94 JR

FIGURES FOR PA RESEARCH - FRACTURES / ANIT IN:

/usr2/sneezy/rgreen/pena/edit/plots/...

12-13-94 JR

THERMAL PROJECT: 20-5704-023

- ALTER XPLOTS OF GAS PRESSURE VS DISTANCE TO REFLECT PRESSURE DIFFERENCE INSTEAD OF TOTAL PRESSURE.

- FOR FRANBLOCK - RUN = "ctfmid5i", time = 9×10^6 s - LOW (AMBIENT PRESSURE) = 100,000 Pa ("ctfmid5VAR11.plt")
IN: /home2/sisyphus/grice/therma1/~~post~~/output5/...
→ fran
"fran-press-9e6s" JR 12/13/94

- FOR REPOSITORY RUN IN:

/usr2/sneezy/rgreen/yucca/..

RUN = ZEALLYVAR9.dat

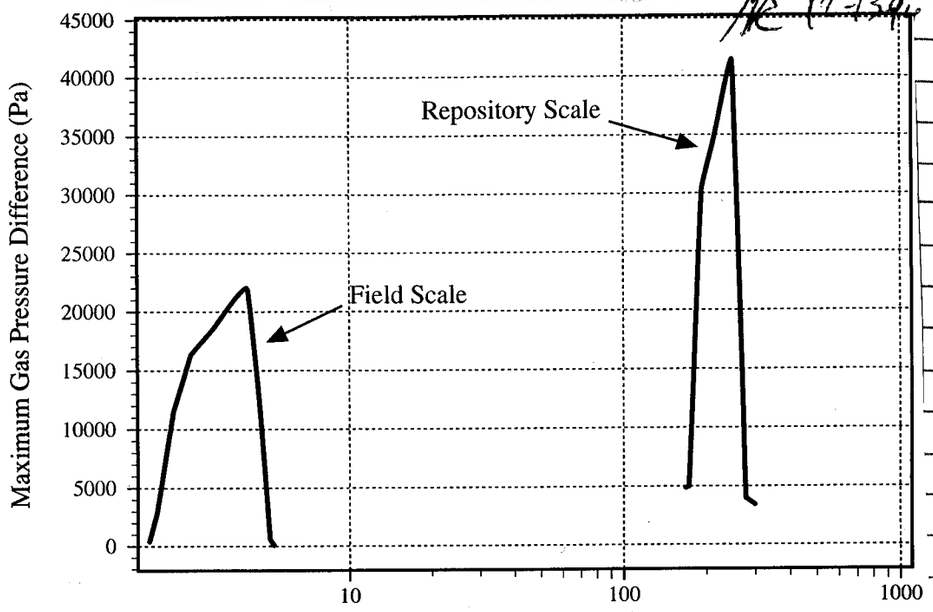
MINIMUM PRESSURE @ 2.2×10^9 s = 99,755
→ 100,000 Pa - CALL IT 10^5.

"repository-2.2e9s"

12-13-94
MR

OUTPUT - THERMAL PROJECT - FOR PAPER

MR 12-13-94



MR 12-13-94

12/19/94
MR

THERM PROJECT - ERROR RUNNING ENHANCED DIFFUSION.

- BEGIN RUNNING "basecaseϕ3i" ≃ 1510.

* INPUT FOR ENHANCED DIFFUSION -

MAKE diffo NEGATIVE - NOT tort!

"basecaseϕ3i" IN:

/home2/sisyphus/grice/cyl/newcyl/newcyl/ϕ3 MR 12/19/94

- NEW DIRECTORY ON SNEEZY - WILL RUN LOW TEMPERATURE CYLINDER ~~EXAMPLE~~ SIMULATIONS.

MR 12/19/94

12/19/94
MR

DIRECTORY = /usr2/sneezy/rgreen/grice/cyl-lowtemp...

FTP'd "basecaseϕ1i" FROM Sisyphus - WILL

CUT POWER INPUT BY 1/2 AND RUN REGULAR & ENHANCED DIFFUSION SIMULATIONS.

NEW FILE NAME: "lowtemp0.5-01i" - IDENTICAL TO "basecaseϕ1i" EXCEPT FOR "GENER" INPUT - ALL POWER INPUTS CUT BY 50%.

- BEGIN "lowtempϕ5-ϕ1i" ≃ 1620

SUBREGIONAL WORK: # 20-5704-176

FILES FROM TOOLS TO: /home2/sisyphus/grice → → SUBREG:

coord.dat, ctough, gridderX, stripX, Xzone.dat, zzone.dat

12/20/94
MR

- "lowtempϕ5-ϕ1i" DONE - MAKE NEW FILE:

"lowtempϕ5-ϕ2i" - IDENTICAL TO "lowtempϕ5-ϕ1i" EXCEPT ENHANCED DIFFUSION TURNED ON BY MAKING "diffo" IN "PARAM" NEGATIVE.

- BEGIN RUNNING "lowtemp05-02i" ≃ 0655

MR 12/20/94

12/20/94

OUTPUT FROM TECPLOT FOR "basecase φ3i"
WITH ENHANCED DIFFUSION - NEGATIVE diffo
IN PARAM.

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMP (°C)
10	106690	99218		35.0
50	168160	94554		64.6
100	298520	89402		84.2
.				
.				
.				
.				
5000	1,218,400	80,237		
.				
.				
.				
500,000	336,130	100,000		178.8
750,000	302,960	100,000		177.7
1,000,000	144,330	152.8		25.0

OUTPUT: "lowtemp05-01i" ("REGULAR DIFFUSION)

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMP (°C)
10	103190	99682		30
50	124010	98427		44.75
100	163,000	96862		54.6

12-20-94

"lowtemp05-01i" OUTPUT CONTINUED

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMP (°C)
500	366430	96422		75.9
1000	489370	96433		86.4

MR ~~106~~
12-20-94
MR

OUTPUT FOR "lowtemp05-02i" (ENHANCED DIFFUSION)

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMP (°C)
10	103190	99682		30.0
50	124010	98427		44.75
100	163000	96862		54.6
500	366430	96422		75.9
1000	489370	96433		86.4

MR
12-21-94

12-21-94
JR

SUBREGIONAL PROJECT, # 20-5704-176

- RUN SIMULATIONS WITH ctough (OR newctough) TO SEE EFFECT OF NUMBER OF ELEMENTS ON EXECUTION TIME.

FIRST ATTEMPT – "small.2i":

GRIDDER DAT:

1,0,1,0,1,2,19,1,0,10,60,100000,19342350,

0.001, 0.001, 2000, 0.2, 0.

INITIAL CHART: PURPOSE AS STATED
DETERMINE WHETHER CTOUGH WOULD BE A PRACTICAL MODEL TO USE FOR BOSS & MT. ZOGUOI'S SUBREGIONAL ANALYSES. JR 3-15-94 DISCONTINUED 3-15-94

10,000 m

	A	B	C	D	...			Y	
1									1
2	400m	ALL ΔX = 400 m						400m	2
3	100m	ALL ΔZ = 100 m							:
:									:
	100m								2000 m
									:
18	SOURCE							SINK	18
19	SOURCE							SINK	19
20	20	IMPERMEABLE						20	20

COLUMS A & Y = VERY LARGE CELLS, VOLUME = $2 \times 10^9 m^3$

NOTE – "small.2i" SIMULATED ± OK yes IN 9999 TIMESTEPS.

IN: /usr2/sneezy/rgreen/grice/subreg/small

12-21-94
JR

NEW SYSTEM = "SMALL.3i" – IDENTICAL TO "SMALL.2i" EXCEPT SOURCE IMPOSED ON TOP LAYER (A1, B1 .... Y1) – EACH CELL IN TOP = $2 \times 10^9 m^3$

10,000 m

	A1	$10^9 m^3$ B1	...	% SAT WATER = 100	Y1
9					
2000 m					

JR 12-21-94

ANOTHER CHANGE FROM "small.2i" – SET WATER ~~GAS~~ PRESSURE IN ALL ELEMENTS ABOVE WATER TABLE ($Z \leq 10$) TO ATMOSPHERIC = 100000 Pa.

- BEGIN RUNNING "SMALL.3i" @ ≈ 1845 —

NOTE – HYDROSTATIC PRESSURES BELOW WATER TABLE STILL NEED TO BE CHANGED SO THAT PRESSURE @ 1ST SATURATED NODE = $\frac{50 m}{10.34 m}(10^5 Pa) + 10^5 Pa$,

PRESSURE AT ANY NODE = $\left(\frac{Z(m)}{10.34 m} 10^5 + 10^5\right) Pa$

"small.3i"
IN: /home2/sisyphus/grice/subreg/small.

MK
12-22-94

12-22-94
DR

THERMAL PROJECT

- NEW CYLINDER RUN:

"lowtemp025-φ1i" - IDENTICAL TO "lowtemp05-01i" EXCEPT POWER OUTPUT IS 25% OF ORIGINAL

- BEGIN RUNNING "lowtemp025-φ1i" ≃ 1310 IN:
/usr2/sneezy/rgreen/grice/cyl-lowtemp/0.25power

12-23-94
DR

- "lowtemp025-φ1i" DONE RUNNING

- MAKE NEW INPUT FILE:

"lowtemp025-φ2i" - IDENTICAL TO 'φ1i' EXCEPT ENHANCED DIFFUSION TURNED ON BY MAKING 'diffo' IN 'PARAM' NEGATIVE

- BEGIN RUNNING "lowtemp025-φ2i" ≃ 0815

- NOTE - "Small φ3i" FINISHED RUNNING JUST AS "Small φ2i" DID - 9999 TIMESTEPS ≃ 0.07 YRS (?)

- NEW INPUT: "Small φ4i" - IDENTICAL TO "Small φ2i" EXCEPT "INCON" FOR ROWS 1-10 TAKEN FROM "ct16kmfault7-11i" - IN THIS INPUT, PRESSURES IN THE UNSATURATED ZONE ARE AT STEADY STATE.

- BEGIN RUNNING "Small φ4i" ≃ 0915

12 DR 12-23-94
12-23-94
DR

OUTPUT FROM "lowtemp025-φ1i" - "NORMAL" DIFFUSION

TIME (s)	MAX GAS PRESSURE (Pa)	MAX WATER SATURATION (NO UNITS)	MAX TEMPERATURE (°C)
10	101570	0.3002	27.5
50	110070	0.30085	34.8
100	124240	0.30129	39.7
500	200540	0.3019	50.5
1000	246860	0.30172	55.7
2000	315220	0.30224	64.1
3000	370610	0.30315	70.1
4000	376340	0.3037	70.0
5000	370300	0.30411	69.0
10,000	356170	0.30527	67.5
20,000	351730	030601	67.8
50,000	274180	0.30619	62.3
100,000	236640	0.30557	62.2
500,000	180000	0.30473	63.1
750,000	169290	0.30634	62.3
1,000,000	108570	0.30545	25.0

OUTPUT FROM "lowtemp025-φ2i" - "ENHANCED" DIFFUSION

TIME (s)	MAX GAS PRESSURE (Pa)	MAX WATER SATURATION	MAX TEMPERATURE (°C)
10	101570	0.3002	27.5
50	110070	0.30085	34.8
100	124240	0.30129	39.7
500	200540	0.3019	50.5
1000	246860	0.30172	55.7
2000	312220	0.30224	64.1
3000	370610	0.30315	70.1
4000	376340	0.3037	70.0

12-23-94
MR

OUTPUT FROM "lowtemp025-φ2i" (CONTINUED)

TIME (s)	MAX GAS PRESSURE (Pa)	MAX WATER SATURATION	MAX TEMPERATURE (°C)
5000	370300	0.30411	69.0
10,000	356170	0.30527	67.5
20,000	351730	0.30601	67.8
50,000	274180	0.30619	62.3
100,000	236640	0.30557	62.2
500,000	180000	0.30473	63.1
750,000	169290	0.30634	62.3
1,000,000	108570	0.30545	25.0

- NOTE - UNABLE TO RECOMPILE NEWCTOUGH WITH 10,000 ELEMENTS.

REDUCED # OF ELEMENTS IN dimh TO 8000, (w/ 40000 CONNECTIONS), WILL IT WORK?

NO - "FATAL ERROR - COMMAND FAILED FOR TARGET "tineh.o""

TRY TO COMPILE W/ 3000 ELEMENTS, 5000 CONNS.

↳ COMPILE SUCCESSFUL.

- BEGIN RUNNING "enhanced-diffi" ≃ 1635 - THIS IS IDENTICAL TO: "ct16kdefault7-11i" EXCEPT ENHANCED DIFFUSION HAS BEEN TURNED ON. IN:

/usr2/sneezy/rgreen/grice/cgl-lowtemp/regional

MR 1-2-94

1-2-94
MR

SUBREGIONAL HYDROLOGY - ISSUE - PRACTICALITY OF USING CTOUGH TO MODEL SUBREGIONAL FLOW (FLOW ON SUBREGIONAL SCALE). 20-5704-176

- BEGIN "TEST φ4i" ≃ 13 20 IN:

/usr2/sneezy/rgreen/grice/subreg/small : "test04i"

MR 1-2-94

```
test04i, 1/2/95
:
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr1  2  2.580E+03 2.000E-01 7.000E-15 7.000E-15 7.000E-15 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr2  2  2.580E+03 2.000E-01 7.000E-99 7.000E-99 7.000E-99 2.300E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
                                        :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo      texp       (mop(i),i   =1,17)
:                                             1 2 3 4 5 6 7 8 9 1011121314151617
  0  2   9999  0  550  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart      timax     deltn     deltmx    elst     gf        redlt     scale
 0.000E+00  1.000E+01 -1.000E+00  0.000E+00  B  1  9.807E+00 0.000E+00 0.000E+00
:     dlt(i)..
 1.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
:
:   rel       re2       u         wup       wnr       dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
:
:         dep(1)              dep(2)              dep(3)
      1.00000000E+05      2.00000000E-01      2.00000000E+01
:
START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
RPCAP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.0000E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.0000E-01 0.0000E+00 1.1000E-05 1.0000E+05 1.0000E+00 3.5000E-01 0.0000E+00
:
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  iti  ite   delaf       tinter
    7    7  1.0000E+08  6.3072E+07
:
:  tis(1)     tis(2)    tis(3) .....
 1.000E-06 1.0000E-05 5.000E-04 1.0000E-03 1.0000E-02 1.000E-01 1.000E+00
:
OPTN ----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  ilimsl idsolc  knudsn ipctem ivplow ilopt
```

MR 1-2-95

1-2-95 MR

"test04i" INPUT (cont)

MR 1-2-95

```
      0     1     0     1     1     0
:
DTSTP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:   dpgmx      dsgmax     dtmax      dxmax
:
 8.000E+02 2.500E-01 2.000E+01 2.500E-01
:
ELEME----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne    nsq   nad ma1 ma2     volx
:
A       1     0     0  matr1    2.0000E+09
A       2     0     0  matr1    2.0000E+09
A       3     0     0  matr1    2.0000E+09
B       7     0     0  matr1    2.0000E+03
B       8     0     0  matr1    2.0000E+03
B       9     0     0  matr1    2.0000E+03
B      10     0     0  matr1    2.0000E+03
B      11     0     0  matr1    2.0000E+03
: el ne sl ns nsq nad nads ltb  itp    itb   gx          ex          hg
A   18 SRC  1     0     0    0    0 WATE     b  0.500E-01 0.000E+00 0.000E+00
A   19 SRC  2     0     0    0    0 WATE     b  0.500E-01 0.000E+00 0.000E+00
Y   18 SNK  3     0     0    0    0 WATE     b -0.500E-01 0.000E+00 0.000E+00
Y   19 SNK  4     0     0    0    0 WATE     b -0.500E-01 0.000E+00 0.000E+00
                                              :reqd blank line
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: el ne    nsq nadd         porx
A       1     0    0    2.000000E-01
:
:            x1                  x2                  x3
         1.00E+05        4.50000000E-09       1.25000000E+01
B       1     0    0    2.0001E-01
         1.00E+05        4.50000000E-09       1.25000000E+01
C       1     0    0    2.0001E-01
A       2     0    0    2.0001E-01
         1.000E+05       0.05       1.50000000E+01
B       2     0    0    2.0001E-01
         1.000E+05       0.05       1.50000000E+01
C       2     0    0    2.0001E-01
         1.000E+05       0.05       1.50000000E+01
X       2     0    0    2.0001E-01
         1.000E+05       0.05       1.50000000E+01
Y       2     0    0    2.0001E-01
         1.000E+05       0.05       1.50000000E+01
A       3     0    0    2.0001E-01
         1.081E+06       3.50000000E-09       1.75000000E+01
B       3     0    0    2.0001E-01
         1.081E+06       3.50000000E-09       1.75000000E+01
C       3     0    0    2.0001E-01
         1.081E+06       3.50000000E-09       1.75000000E+01
D       4     0    0    2.0001E-01
         2.034E+06       3.00000000E-09       2.00000000E+01
E       4     0    0    2.0001E-01
         2.034E+06       3.00000000E-09       2.00000000E+01
F       4     0    0    2.0001E-01
         2.034E+06       3.00000000E-09       2.00000000E+01
G       4     0    0    2.0001E-01
         2.034E+06       3.00000000E-09       2.00000000E+01
H       4     0    0    2.0001E-01
```

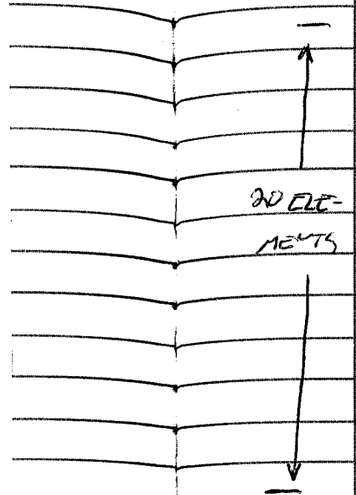
MR 1-2-95

```
M      20     0    0    2.000000E-01
         1.774E+07       6.00000000E+01       1.00000000E-05
N      20     0    0    2.000000E-01
```

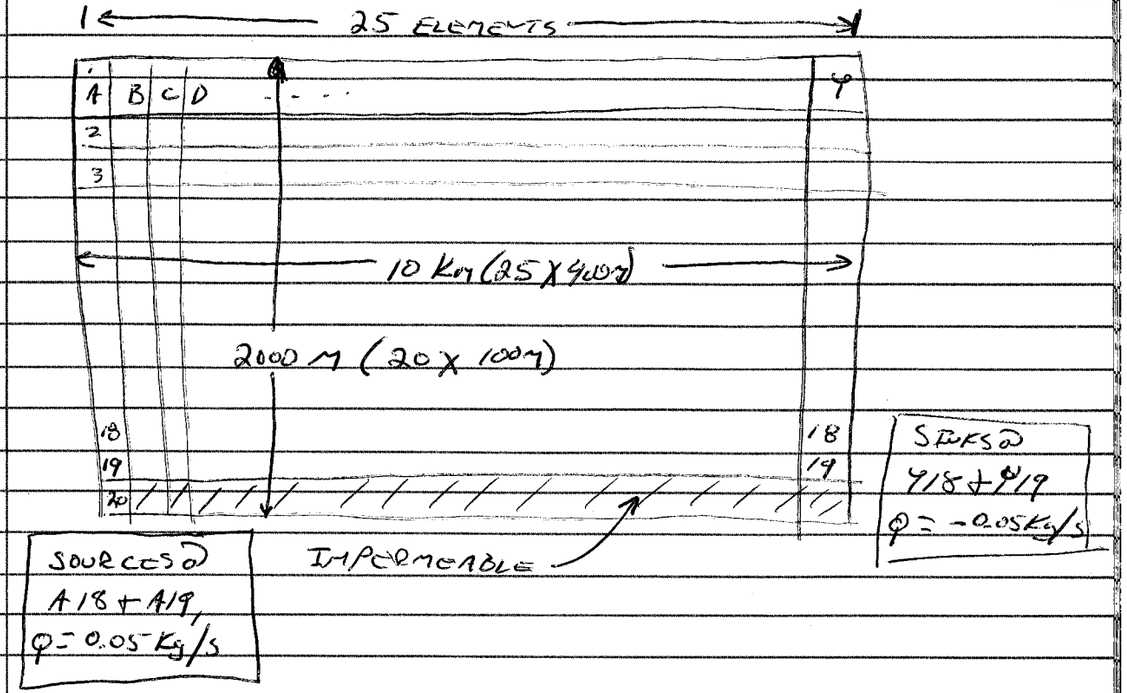
MR 1-2-95

MR 1-2-95

1-2-95 MR



SCHEMATIC - "test04i"



- ROW 1 (A1, B1, C1 ... Y1) IS A VERY LARGE SATURATED ZONE - THIS, PRESSURE = 1×10^5 Pa
- ROW 2 IS UNSATURATED (% SAT = 95), PRESSURE = 1×10^3 Pa
- ROWS 3 THROUGH 20 ARE SATURATED, P PRESSURE GOES FROM 1.081×10^6 Pa AT BOTTOM OF ROW 3 TO 1.77×10^7 Pa AT BOTTOM OF ROW 20.
- GEIDOR INPUT FOR MID-SIZE RUN (50 X 40 ELEMENTS)

1, 0, 1, 0, 1, 2, 1, 39, 1, 0, 10, 60, 100000, 17740000,

0.00001, 0.00001, 2000, 0.2, 0, 0,

1-2-95
NR

- MAKE NEW "newctaug94" ? - NO - WAS ABLE TO RUN "midφ2i" : 40X50 ELEMENTS.
- BEGIN RUNNING "midφ2i" @ ≃ 1545 IN: /home2/sisyphus/grice/subreg/mid.
- NOTE: KILLED RUN "testφ4i" ≃ 1715 - TIMESTEP ≃ 8450, t ≃ 7.5 X10^{-2}, Δt ≃ 1X10^{-5}
- BEGIN RUNNING "testφ2i" ≃ 1720

QUESTION - WHY DOES "testφ2i" RUN TO COMPLETION & "testφ4i" DOESN'T?

DR 1-2-95

1-2-95
DR

test02i, 12/21/94

```
:
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock       por       permx     permy     permz     cwet      spht
matrl  2  2.580E+03 2.000E-01 7.000E-15 7.000E-15 7.000E-15 2.300E+00 8.400E+02
:
:   comp        expan         cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock       por       permx     permy     permz     cwet      spht
matr2  2  2.580E+03 2.000E-01 7.000E-99 7.000E-99 7.000E-99 2.300E+00 8.400E+02
:
:   comp        expan         cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:                                        :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo      texp       (mop(i),i   =1,17)
:                                           1 2 3 4 5 6 7 8 9 10111213141516 17
  0  2   9999  0  550  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart       timax      deltn     deltmx    elst     gf        redlt      scale
 0.000E+00  1.000E+01 -1.000E+00  0.000E+00  B  1  9.807E+00 0.000E+00 0.000E+00
:      dlt(i)..
 1.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
:
:   rel        re2        u          wup       wnr       dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
:
:         dep(1)                dep(2)                dep(3)
       1.00000000E+05        2.00000000E-01        2.00000000E+01
:
START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
```

NR 1-2-95

"testφ2i" - INPUT (cont)

DR 1-2-95

NR 1-2-95

```
:
RPCAP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.0000E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.0000E-01 0.0000E+00 1.1000E-05 1.0000E+05 1.0000E+00 3.5000E-01 0.0000E+00
:
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  iti  ite   delaf       tinter
    7    7  1.0000E+08  6.3072E+07
:
:  tis(1)     tis(2)    tis(3) .....
 1.000E-06 1.0000E-05 5.000E-04 1.0000E-03 1.0000E-02 1.000E-01 1.000E+00
:
OPTN ----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  ilimsl idsolc  knudsn ipctem ivplow ilopt


      0      1      0      1      1      0
:
DTSTP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:   dpgmx      dsgmax     dtmax      dxmax
:
 8.000E+02 2.500E-01 2.000E+01 2.500E-01
:
ELEME----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne   nsq  nad ma1 ma2     volx
:
A       1    0    0  matr1   2.0000E+09
A       5    0    0  matr1   2.0000E+09
A      19    0    0  matr1   2.0000E+09
A      20    0    0  matr2   2.0000E+09
B       1    0    0  matr1   2.0000E+09
B       2    0    0  matr1   2.0000E+03
A   18 SRC  1    0    0    0    0 WATE     b  0.500E-01 0.000E+00 0.000E+00
A   19 SRC  2    0    0    0    0 WATE     b  0.500E-01 0.000E+00 0.000E+00
Y   18 SNK  3    0    0    0    0 WATE     b -0.500E-01 0.000E+00 0.000E+00
Y   19 SNK  4    0    0    0    0 WATE     b -0.500E-01 0.000E+00 0.000E+00
                                          :reqd blank line
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: el ne    nsq nadd       porx
A       1    0    0  2.000000E-01
:
:            x1                    x2                    x3
       1.06212000E+06        4.50000000E-09        1.25000000E+01
B       1    0    0  2.0001E-01
       1.06212000E+06        4.50000000E-09        1.25000000E+01
C       1    0    0  2.0001E-01
       2.02424000E+06        4.00000000E-09        1.50000000E+01
G       2    0    0  2.0001E-01
       2.02424000E+06        4.00000000E-09        1.50000000E+01
H       2    0    0  2.0001E-01
       1.06833000E+07        3.75000000E+01        1.00000000E-05
I      11    0    0  2.000000E-01
       1.06833000E+07        3.75000000E+01        1.00000000E-05
B      18    0    0  2.000000E-01
       1.74181000E+07        5.50000000E+01        1.00000000E-05
```

NR 1-2-95

- CREATE NEW FILE: "SMALLφ1 - simple1"
  CHANGE: → NOW CALLED "φ1i"

1,0,1,0,1,2,1,19,1,0,25,25,100000,19635780,0,0,
2000,0.2,0,0

1-2-95
JR

- BEGIN RUNNING "φ1i" ≈ 1910 IN:

/usr2/sneezy/rgreen/jrice/subreg/simple/sm.4

— Δt ≈ 5X10⁻⁵ YR @ TIMESTEP #30 —

KILL RUN — ADD VERY LARGE CELLS ON SIDE BOUNDARIES.

- ADDED "GENER" SOURCE & SINK TO "φ1i" —

LET RUN — STILL TAKING Δt's ≈ 5X10⁻⁵.

SEE WHAT HAPPENS. — REMOVED SOURCE & SINK IN GENER — THIS IS THE SIMPLEST OF RUNS — NOTHING SHOULD HAPPEN!

pR 1-3-95

1 / — / —

2-3-95
JR

- KILLED "mid φ2i" — AFTER 3224 TIMESTEPS — t = 6.84X10⁻⁵ YR, Δt = 2.151X10⁻⁸ YR

- "φ1i" STOPPED RUNNING AFTER 990 TIMESTEPS — t = 4.18X10⁻⁸ YR, Δt = 5.6X10⁻¹¹ YR

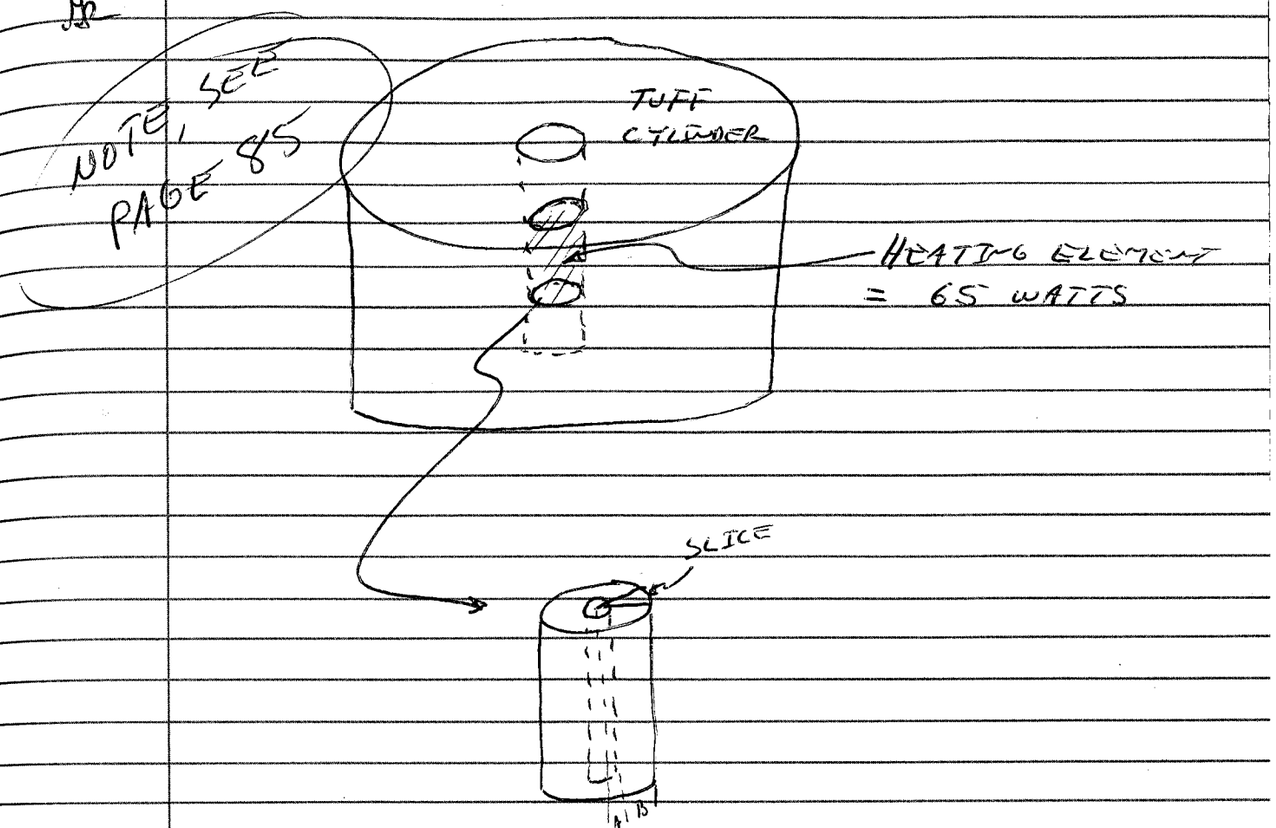
— / — / —

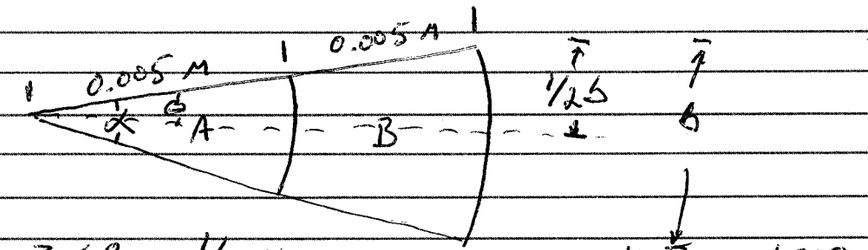
THERMAL PROJECT — 20-5704-023

TUFF CYLINDER EXPERIMENT

GEOMETRY — SEE PAGES 84 & 85

1 DR 1-3-95
2-3-95
JR





$\alpha = 3.6° = 1/100^{TH}$ OF CIRCLE, $\theta = \frac{1}{2}\alpha = 1.8°$

AREA $A+B = \frac{1}{2} b h$

$\sin\theta = \frac{0.5b}{0.01} = \sin 1.8° = 3.14\times10^{-2}$, $b = \frac{3.14\times10^{-2}(0.01)}{0.5}$

$b = 6.28\times10^{-4}$ m

1-3-95 MR

AREA $A+B = \frac{1}{2} b h$

$= \frac{1}{2}(6.28\times10^{-4} m)\ 0.01 m = 3.141\times10^{-6} m^2$

AREA OF A:

$A_A = \frac{1}{2} b h = \frac{1}{2} b (0.005 m)$.

DR 1-3-95

$\sin 1.8° = \frac{0.5b}{0.005} = 1 \quad b = \frac{0.005}{2} \sin 1.8° = 7.853\times10^{-5} m$

AREA $A = 2\left[\frac{1}{2} b h\right] = 2\left[\frac{1}{2}\ 7.853\times10^{-5}(0.005)\ m^2\right]$

$=$

$\frac{0.5b}{0.005} = \sin 1.8° = 3.14\times10^{-2}$

$b = \frac{3.14\times10^{-2}\ (0.005 m)}{0.5} = 3.14\times10^{-4} m$

AREA OF $A = \frac{1}{2} b h = \frac{1}{2}(3.14\times10^{-4} m)\ 0.005 m$

$= 7.853\times10^{-7} m^2$

$= \frac{1}{4}$ OF $A+B$, 2.356 MR 1-3-95

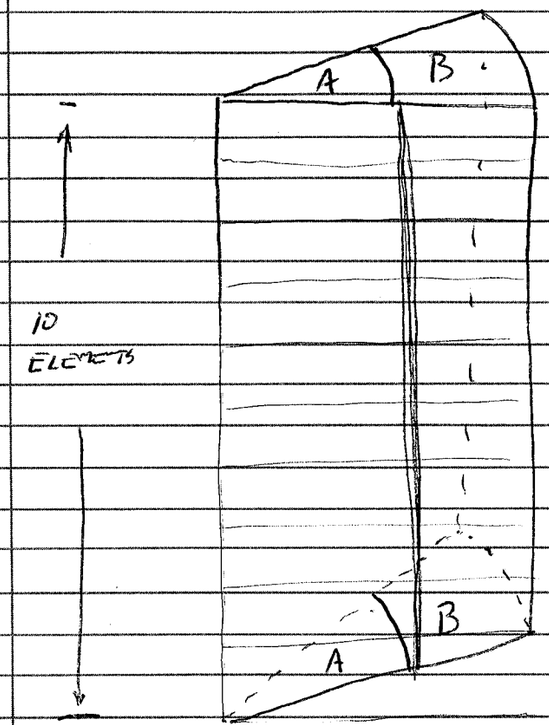
$\therefore$ AREA OF $B = 2.36\times10^{-6} m^2$

1-3-95 DR

THE HEATING ELEMENT PRODUCES 65 W -

THE SLICE WE'RE MODELING IS 1/100TH OF THE ELEMENT, $\therefore$ ~~6.5 WATTS~~ DR 1-3-95

0.65 WATTS ARE PRODUCED BY THE SLICE



THERE ARE 10 'A' ELEMENTS & 10 'B' ELEMENTS.

BECAUSE EACH 'A' ELEMENT IS 1/4 THE SIZE OF EACH 'B' ELEMENT,

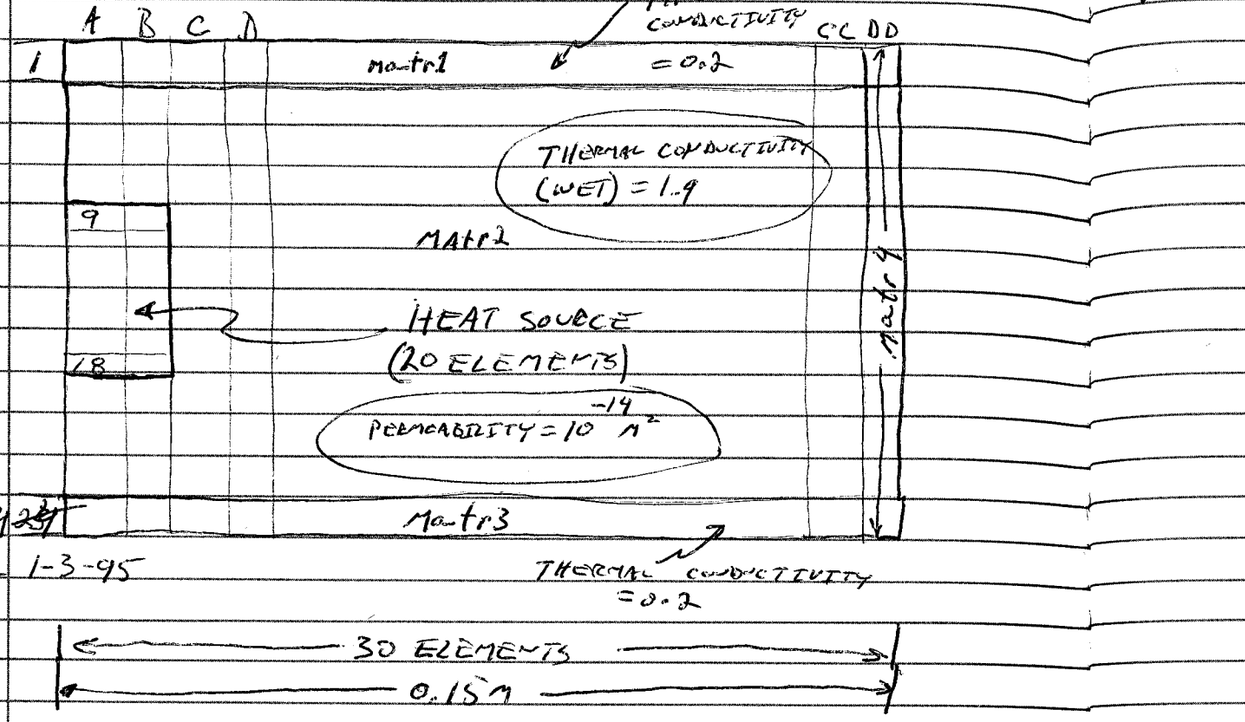
1/4 (0.65 W) GETS DISTRIBUTED OVER 10 'A' ELEMENTS = 0.1625 W - EACH 'A' ELEMENT GETS 1.625×10^{-2} W

EACH B ELEMENT GETS $3 \times 1.625\times10^{-2} W = 4.875\times10^{-2} W$

FOR THIS EXPERIMENT (SIMULATION = "cyl-tuff4ii") THE HEAT IS ON FOR 7 DAYS (STEADY) & COOL-DOWN PERIOD IS 68 DAYS.

1-3-95 MR

TUFF CYLINDER MODEL: ["cyl-tuff$ii"]



MR 1-3-95

VAN GENUCHTEN PARAMETERS (FROM KRISTIAN):

$\lambda = 1 - \frac{1}{n}$, $n = 1.26$, $\lambda = 1 - \frac{1}{1.26} = 0.206$

$\alpha = 0.0224/kPa \rightarrow 2.24 \times 10^{-5}/Pa$

MODEL IN:

/usr2/sneezy/rgreen/grice/cyl1-95

55 JR 1-3-94

~~BEGIN RUNNING "cyl-tuff$ii" ≃ 1140. NOTE~~

ALTHOUGH NEWTOUGH REQUIRES TIMES TO BE INPUT AS YEARS - TIMES IN GENER MUST BE IN SECONDS

1-3-95 MR

- CHANGED NAME OF INPUT FILE TO:

"cyl-tuff$\overset{20}{50}$i" - 20% SATURATED WITH WATER

- BEGIN RUNNING "cyl-tuff20i" ≃ 1200

- → DONE @ 1320 OR BEFORE

-1325- BEGIN RUNNING "cyl-tuff50i" - 50% SATURATED WITH WATER. -OTHERWISE- IDENTICAL TO → "cyl-tuff20i" INPUT.

JR 1/3/95

```
tuff experiment, cyl,1/3/95,20 heat elements, 65 Watts for 7 days, 68 days cool-
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: mat  nad   drock      por      permx      permy      permz      cwet      spht
matrl  2  2.580E+03 7.000E-02 1.000E-15 1.000E-15 1.000E-15 2.000E-01 8.400E+02
:   comp       expan       cdry       tortx
  0.0000E+00  0.0000E+00  2.0000E-01  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+00 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx      permy      permz      cwet      spht
matr2  2  2.580E+03 7.000E-02 1.000E-15 1.000E-15 1.000E-15 1.900E+00 8.400E+02
:
:   comp       expan       cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx      permy      permz      cwet      spht
matr3  2  2.580E+03 7.000E-02 1.000E-15 1.000E-15 1.000E-15 2.000E-01 8.400E+02
:
:   comp       expan       cdry       tortx
  0.0000E+00  0.0000E+00  2.000E-01  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx      permy      permz      cwet      spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 2.000E-01 1.000E+06
:
:   comp       expan       cdry       tortx
  0.0000E+00  0.0000E+00  2.0000E-01  0.0000E+00
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
                                        :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo      texp       (mop(i),i   =1,17)
:                                             1 2 3 4 5 6 7 8 9 1011121314151617
  0  1  9999   0  550  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart      timax      deltn      deltmx     elst       gf        redlt      scale
 0.000E+00  2.060E-01 -1.000E+00  0.000E+00   B  1  9.802E+00 0.000E+00 0.000E+00
:     dlt(i)..
 1.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
```

JR 1/3/95

1-3-95 NR

"CTI-tuff20i" INPUT (cont)

NR 1-3-95

```
:
:   rel        re2        u          wup        wnr        dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
:
:         dep(1)                dep(2)                dep(3)
      1.00000000E+05        2.00000000E-01        2.00000000E+01
:
START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
RPCAP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
```

NR 1-3-95

```
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
   7 2.0000E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
  11 2.0000E-01 0.0000E+00 1.1000E-05 1.0000E+05 1.0000E+00 3.5000E-01 0.0000E+00
:
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  iti  ite   delaf       tinter
   16   16  3.1700E+00  2.0000E+00
:
:  tis(1)     tis(2)    tis(3) .....
 1.000E-07 1.000E-06 1.000E-05 1.000E-04 1.000E-03 3.000E-03 7.000E-03 1.000E-02
 2.000E-02 3.000E-02 4.000E-02 6.000E-02 8.000E-02 9.000E-02 1.000E-01 2.050E-01
:
OPTN ----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  ilimsl idsolc  knudsn ipctem ivplow ilopt
       0       1       0       1       1       0
:
DTSTP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:   dpgmx      dsgmax     dtmax      dxmax
:
 8.000E+02 2.500E-01 2.000E+01 2.500E-01
:
ELEME----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne    nsq  nad ma1 ma2     volx
:
A       1     0     0  matr1    3.9270E-09
A       2     0     0  matr2    3.9270E-09
A       3     0     0  matr2    3.9270E-09
A       4     0     0  matr2    3.9270E-09
A      24     0     0  matr3    3.9270E-09
B       1     0     0  matr1    1.1780E-08
B       2     0     0  matr2    1.1780E-08
A       5  B     5  0  0  0  1  2.500E-03 2.500E-03 7.854E-07 0.000E+00  0
A       6  B     6  0  0  0  1  2.500E-03 2.500E-03 7.854E-07 0.000E+00  0
B       6  C     6  0  0  0  1  2.500E-03 2.500E-03 2.356E-06 0.000E+00  0
B       7  C     7  0  0  0  1  2.500E-03 2.500E-03 2.356E-06 0.000E+00  0
B       8  C     8  0  0  0  1  2.500E-03 2.500E-03 2.356E-06 0.000E+00  0
CC     24  DD   24  0  0  0  1  2.500E-03 2.500E-03 4.477E-05 0.000E+00  0
A       1  A     2  0  0  0  1  2.500E-03 2.500E-03 7.854E-07 1.000E+00  0
A       2  A     3  0  0  0  1  2.500E-03 2.500E-03 7.854E-07 1.000E+00  0
B       1  B     2  0  0  0  1  2.500E-03 2.500E-03 2.356E-06 1.000E+00  0
B       2  B     3  0  0  0  1  2.500E-03 2.500E-03 2.356E-06 1.000E+00  0
DD     23  DD   24  0  0  0  1  2.500E-03 2.500E-03 4.634E-05 1.000E+00  0
                                                    :reqd blank line
:
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne sl ns nsq nad nads ltb  itp   itb   gx         ex         hg
A     9 HOT  1     0   0   0    3 HEAT    b  0.000E+00 0.000E+00 0.000E+00
   0.000000E+00  6.048E+05      6.480E+06
   0.01625       0.0000000000  0.0000000000
B     9 HOT  1     0   0   0    3 HEAT    b  0.000E+00 0.000E+00 0.000E+00
   0.000000E+00  6.048E+05      6.480E+06
   0.04875       0.0000000000  0.0000000000
                                                    :reqd blank line
:
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
```

NR 1-3-95

1-3-95 NR

"cyl-tuff20i" INPUT (cont)

NR 1-3-95

```
: el ne   nsq nadd       porx
A      1    0    0    0.0
:
:          x1                  x2                  x3
      1.00000000E+05        0.80        2.50000000E+01
B      1    0    0    0.0
      1.00000000E+05        0.80        2.50000000E+01
C      1    0    0    0.0
      1.00000000E+05        0.80        2.50000000E+01
CC    24    0    0    0.0
      1.00000000E+05        0.80        2.50000000E+01
DD    24    0    0    0.0
      1.00000000E+05        0.80        2.50000000E+01
```

NR 1-3-95

"cyl-tuff20i" OUTPUT - FROM TECPLOT

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
3.15	100970	100000	31.26
32	108020	100000	80.65
315	136900	100000	220.1
3154	111370	100000	301.4
31,536	134160	100000	332.1
94,608	142510	100000	300.2
220,750	149310	100000	

END EXAMINATION OF OUTPUT - TEMP TOO HIGH - WILL MAKE SAME RUN BUT WITH THERMAL CONDUCTIVITY OF TOP & BOTTOM (matr1 & matr2) = 1.0

cyl-tuff50i - OUTPUT FROM TECPLOT

TIME	MAX GAS PRESSURE	MIN GAS PRESSURE	MAX TEMPERATURE
3.15	100710	100000	31.0
31.54	105310	100000	78.3
315	341980	100000	196.9

END FOR SAME REASON AS ABOVE

1-3-95 JR

- CREATED NEW FILE: "cyl-tuff20-2i"

IDENTICAL TO "cyl-tuff20i" EXCEPT THAT THE TOP + BOTTOM (mato1 + mato3) ARE VERY LARGE AND THEIR THERMAL CONDUCTIVITIES HAVE BEEN INCREASED FROM 0.2 TO 1.0.

- SUBREGIONAL FLOW -

- MAKING "SAMPLE3i" - SAME AS IN TOUGH DOCUMENTATION PAGE 53

GEIDDER INPUT:

1,0,1,0,1,1,0,20,20,100000,100000,0.6,0.6,0.4

0.45,0,0,

- "cyl-tuff20-2i" OUTPUT FROM TECPLOT

TIME (s)	MAXIMUM GAS PRESSURE (Pa)	MINIMUM GAS PRESSURE (Pa)	MAXIMUM TEMPERATURE (°C)
3.15	100970	100000	31.3
31.5	107930	100000	80.6
315	136400	100000	220
3150	106750	100000	287

END EXAMINATION OF OUTPUT - TEMPERATURE TOO HIGH.

JR 1-3-95

JR 1-3-95

- NEW INPUT - REDUCED HEAT LOAD -

IDENTICAL TO "cyl-tuff20-2i" EXCEPT TOTAL HEAT LOAD IS 40WATTS INSTEAD OF 65.

"cyl40-20i"

- BEGIN RUNNING "cyl40-20i" ≃ 1740

INPUT: "cyl40-20i" JR 1-3-95

```
tuff experiment, cyl,1/3/95,20 heat elements, 40 Watts for 7 days, 68 days cool-
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr1  2  2.580E+03 7.000E-02 1.000E-15 1.000E-15 1.000E-15 1.000E-00 8.400E+02
:
:    comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.0000E-00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+00 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr2  2  2.580E+03 7.000E-02 1.000E-15 1.000E-15 1.000E-15 1.900E+00 8.400E+02
:
:    comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr3  2  2.580E+03 7.000E-02 1.000E-15 1.000E-15 1.000E-15 1.000E-00 8.400E+02
:
:    comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.000E-00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 1.000E-00 1.000E+06
:
:    comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.0000E-00  0.0000E+00
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
                                                :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo      texp       (mop(i),i   =1,17)
:                                              1 2 3 4 5 6 7 8 9 10111213141516 17
  0  1  9999   0  550  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart       timax      deltn      deltmx     elst       gf         redlt      scale
 0.000E+00  2.060E-01 -1.000E+00  0.000E+00  B  1  9.807E+00 0.000E+00 0.000E+00
:     dlt(i)..
 1.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
:
:    rel        re2        u          wup        wnr       dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
:
:          dep(1)                dep(2)                dep(3)
       1.00000000E+05        2.00000000E-01        2.00000000E+01
:
START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
```

JR 1-3-95

1-3-95 MR

INPUT: "cyl40-20i" (cont.) MR 1-3-95

```
RPCAP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0000E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0000E-01 0.0000E+00 1.1000E-05 1.0000E+05 1.0000E+00 3.5000E-01 0.0000E+00
:
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  iti  ite   delaf       tinter
   16   16  3.1700E+00  2.0000E+00
:
:  tis(1)     tis(2)    tis(3) ......
 1.000E-07 1.000E-06 1.000E-05 1.000E-04 1.000E-03 3.000E-03 7.000E-03 1.000E-02
 2.000E-02 3.000E-02 4.000E-02 6.000E-02 8.000E-02 9.000E-02 1.000E-01 2.050E-01
:
OPTN ----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  ilimsl idsolc  knudsn ipctem ivplow ilopt
     0       1       0       1       1       0
:
DTSTP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:   dpgmx      dsgmax     dtmax      dxmax
:
 8.000E+02 2.500E-01 2.000E+01 2.500E-01
:
ELEME----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne   nsq  nad mal ma2     volx
:
A       1     0     0  matr1    3.9270E+09
A       2     0     0  matr2    3.9270E-09
A       3     0     0  matr2    3.9270E-09
A      22     0     0  matr2    3.9270E-09
A      23     0     0  matr2    3.9270E-09
A      24     0     0  matr3    3.9270E+09
B       1     0     0  matr1    1.1780E+08
B       2     0     0  matr2    1.1780E-08
B      24     0     0  matr3    1.1780E+08
C       1     0     0  matr1    1.9630E+08
DD     24     0     0  matr4    2.3170E+05
                                        :reqd blank line
:
CONNE----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el n1 e2    n2 nsq nd1 nd2 isot   d1         d2          areax       betax
:
A       1  B     1  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 0.000E+00   0
B      10  C    10  0   0   0   1  2.500E-03 2.500E-03 2.356E-06 0.000E+00   0
C       2  D     2  0   0   0   1  2.500E-03 2.500E-03 3.927E-06 0.000E+00   0
                                        :reqd blank line
:
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne sl ns nsq nad nads ltb  itp    itb   gx          ex          hg
A     9 HOT  1     0   0   0    3 HEAT     b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  6.048E+05     6.480E+06
  0.0100        0.0000000000  0.0000000000
B     9 HOT  1     0   0   0    3 HEAT     b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  6.048E+05     6.480E+06
  0.0300        0.0000000000  0.0000000000
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
```

AR 1-3-95

```
: el ne   nsq nadd       porx
A       1     0     0   0.0
:
:          x1                    x2                  x3
        1.00000000E+05          0.80        2.50000000E+01
B       1     0     0   0.0
        1.00000000E+05          0.80        2.50000000E+01
C       1     0     0   0.0
        1.00000000E+05          0.80        2.50000000E+01
CC     24     0     0   0.0
        1.00000000E+05          0.80        2.50000000E+01
DD     24     0     0   0.0
        1.00000000E+05          0.80        2.50000000E+01
```

AR 1-3-95

1-3-95 MR

OUTPUT FROM "cyl40-20i" - TECPLOT

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
3.15	100570	100000	28.9
31.5	102320	100000	58.6
315	121490	100000	144
3150	104770	100000	184
31,500	100700	100000	180
94,608	100260	100000	165
1-4-95 MR 220,000	100090	100000	134
315,000	100040	99948	104
631,000	100000	99864	35.1

NEW INPUT: "cyl40-50i" - IDENTICAL TO "cyl40-20i" EXCEPT % SATURATION (WATER) = 50% INSTEAD OF 20%. IN:

/usr2/sneezy/rgreen/grice/cyl2-95/40watts

- BEGIN "cyl40-50i" ≃ 1025
- BEGIN RE-RUNNING "cyl-tuff20i" ≃ 1050 IN:

/home2/sisyphus/grice/cyl1/cyl-1-95 - RERUN BECAUSE ERASED OUTPUT - WILL ALSO RERUN "cyl-tuff50i" + "cyl-tuff20-2i" FOR SAME REASON

MR 1-4-95

1-4-95 BL

OUTPUT FROM TECPLOT - "cyl40-50i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAXIMUM TEMPERATURE (°C)
3.15	100420	100000	28.7
31.5	101520	100000	57.2
315	196820	100000	135
3150	145270	100000	180
31500	105590	100000	178
94600	102030	100000	163
221000	101000	100000	133
315000	100610	100000	103
631000	100000	99953	25.1

NEW INPUT FILE - "cyl40-80i" - IDENTICAL TO "cyl40-50i" EXCEPT WATER SATURATION = 80% & INITIAL TEMPERATURE THROUGHOUT SYSTEM = 22°C INSTEAD OF 25°C. IN: /usr2/sneezy/rgreen/grice/cyl1-95/40WATTS

OUTPUT FROM TECPLOT - "cyl40-80i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
3.15	100200	100000	25.6
15.8	100320	100000	39.0
31.5	100550	100000	53.5
94.6	104350	100000	91.3
158	147610	100000	110
221	194750	100000	119
315	240090	100000	126
946	275470	100000	146
1580	263560 ✓	100000	157
2210	265080	99999	160
3154	261980	99999	162
9461	236300	99998	165

1-4-95

1-4-95 BL

"cyl40-80i" OUTPUT (CONT)

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
15800	227170	99998	164
31500	222040	99998	161
315000	108070	100000	95.9
6460000	100000	100000	22

- NEW INPUT: "alphaϕ140-20i" - IDENTICAL TO "cyl40-20i" EXCEPT THE VAN GENUCHTEN ALPHA HAS BEEN REDUCED FROM 2.24×10^{-5} TO 2.24×10^{-6} IN MATERIALS 1, 2, & 3, AND THE SPECIFIC HEAT (sph't) OF MATERIALS 1 & 3 HAS BEEN CHANGED FROM 840 TO 1000. ALSO - AMBIENT TEMPERATURE IS 22 INSTEAD OF 25. IN: /usr2/sneezy/rgreen/grice/cyl1-95/40WATTS/alphaϕ1
- BEGIN RUNTIME "alphaϕ140-20i" ~ 1315

OUTPUT: "alphaϕ140-20i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
3.15*	100410	99989	
3.15	100400	99991	25.9
15.8	100600	99982	40.3
31.5	100890	99980	56.0
94.6	105030	99981	95.8
221	114190	99982	129
315	112830	99981	141

BL 1-4-95

* AMBIENT T = 25°C

1-4-95 MR

• NEW INPUT FILE: "e-17-20i"
IDENTICAL TO "cy140-20i" EXCEPT PERMEABILITY CHANGED FROM 10^{-15} TO 10^{-17}, AND AMBIENT TEMPERATURE = 22°C INSTEAD OF 25°C
IN:

/usr2/sneezy/rgreen/grice/cy11-95/40WATTS/e-17

OUTPUT OF "e-17-20i" FROM TECPLOT

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
3.15	101930	99983	25.9
15.8	112610	99688	40.6
31.5	135540	99035	56.6
158	398020	96990	118
315	560840	97919	142
940	458890	99255	168
2208	324520	99575	179
3154	300610	99655	181
9461	208400	100 000	182
15,800	179480	100 000	180
22,100	164080	100 000	179
31,500	150270	100 000	176

• NEW INPUT FILE: "e-17-2-20i"
IDENTICAL TO "e-17-20i" EXCEPT THE THERMAL CONDUCTIVITIES OF MATERIALS 1&3 ARE 0.5 INSTEAD OF 1.0.

INPUT FILE (EXCERPT)
"e-17-2-20i":

1-4-95 MR

```
tuff experiment, cyl,1/4/95,20 heat elements, 40 watts for 7 days, 98 days cool-
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por       permx      permy      permz      cwet       spht
matr1  2  2.580E+03 7.000E-02 1.000E-17 1.000E-17 1.000E-17 5.000E-01 8.400E+02
:
:   comp       expan       cdry       tortx
  0.0000E+00  0.0000E+00  5.0000E-01  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+00 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx      permy      permz      cwet       spht
matr2  2  2.580E+03 7.000E-02 1.000E-17 1.000E-17 1.000E-17 1.900E+00 8.400E+02
:
:   comp       expan       cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx      permy      permz      cwet       spht
matr3  2  2.580E+03 7.000E-02 1.000E-17 1.000E-17 1.000E-17 5.000E-01 8.400E+02
:
:   comp       expan       cdry       tortx
  0.0000E+00  0.0000E+00  5.000E-01  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx      permy      permz      cwet       spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 5.000E-01 1.000E+06
:
:   comp       expan       cdry       tortx
  0.0000E+00  0.0000E+00  5.0000E-01  0.0000E+00
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
                                        :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo      texp       (mop(i),i   =1,17)
:                                             1 2 3 4 5 6 7 8 9 10111213141516 17
  0  1  9999   0  550  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart       timax      deltn      deltmx     elst      gf         redlt      scale
 0.000E+00  2.060E-01 -1.000E+00  0.000E+00  B  1  9.807E+00 0.000E+00 0.000E+00
:     dlt(i)..
 1.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
:
:   rel        re2        u          wup        wnr        dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
:
:          dep(1)                dep(2)                dep(3)
       1.00000000E+05        2.00000000E-01        2.00000000E+01
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  iti  ite   delaf       tinter
   16   16  3.1700E+00  2.0000E+00
:
:  tis(1)     tis(2)    tis(3) .....
 1.000E-07 5.000E-07 1.000E-06 5.000E-06 1.000E-05 3.000E-05 7.000E-05 1.000E-04
 3.000E-04 5.000E-04 7.000E-04 1.000E-03 5.000E-03 1.000E-02 1.000E-01 2.050E-01
ELEME----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne   nsq  nad mal ma2    volx
:
A      1    0    0  matr1   3.9270E+09
A      2    0    0  matr2   3.9270E-09
A     23    0    0  matr2   3.9270E-09
A     24    0    0  matr3   3.9270E+09
B      1    0    0  matr1   1.1780E+08
B      2    0    0  matr2   1.1780E-08
B     23    0    0  matr2   1.1780E-08
B     24    0    0  matr3   1.1780E+08
C      1    0    0  matr1   1.9630E+08
```

MR 1-3-95

MR 1-4-95

MR 1-4-95

1-4-95 JSR

INPUT: "e-17-2-20i" (cont)

JC 1-4-95

```
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: el ne   nsq nadd       porx
A     1    0    0   0.0
:
:          x1                  x2                  x3
      1.00000000E+05        0.80        2.200E+01
B     1    0    0   0.0
      1.00000000E+05        0.80        2.200E+01
C     1    0    0   0.0
      1.00000000E+05        0.80        2.200E+01
```

JR 1-4-95

OUTPUT FROM TECPLOT - "e-17-2-20i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
3.15	101930	99983	25.9
15.8	112610	99688	40.6
31.5	135540	99035	56.6
158	398020	96990	118
315	560860	97918	142

SUBREGIONAL - CREATE NEW FILE: 20X25:

GRIDDER INPUT:

1, 0, 1, 0, 1, 1, 0, 20, 20, 180000, 100000, 0.6, 0.6, 0.1, 0.45, 0, 0

946	459750	99243	168
2210	327900	99586	180
3154	304600	99692	182
9461	211850	100000	183
15,800	182510	100000	182
22,100	166690	100000	180
31,500	152700	100000	178

1-6-95 JR

NEW INPUT FILE - BASECASE FOR TUFF CYLINDER EXPERIMENT:

"basefli" IN:

/usr2/sneezy/rgreen/grice/cg1.7-95/base

SAME SET-UP AS SHOWN ON Pages 217-220

- HEAT INPUT = 64 WATTS
- PERMEABILITY = 1×10^{-17} M2 *
- THERMAL CONDUCTIVITY OF TUFF = 1.9 (wet) & 1.74 (DRY)
- % SATURATION = 30%
- POROSITY = 0.07
- THERMAL CONDUCTIVITY OF TOP & BOTTOM LAYERS = 0.5 (WET & DRY) *
- SPECIFIC HEAT OF TOP & BOTTOM LAYERS = 10^4 * changed to 5×10^{17} to 0.1 & 1
- TOP & BOTTOM LAYERS ARE HUGE - VOLUME OF EACH ELEMENT $\simeq 10^8$ M3
- VAN GENUCHTEN $\alpha = 2.24 \times 10^{-5}$
- BEGIN "basefli" = 0845

see page 236

OUTPUT - "basefli" - FROM TECPLOT

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
3.15	103520	99901	31.1
31.5	189910	96920	79.8
158	1,029,200	95478	176
315	1,061,500	96886	214
946	625,520	98808	258
2210	517,840	99291	277
3154	424,650	99615	281
9461	297,140	100000	283

JR 1-6-95

NOTE - INCORRECT THERMAL CONDUCTIVITY INPUT - SEE PGS 234 & 236

1-6-95 JR

INPUT: "base01i"

```
tuff experiment, cyl,1/6/95,20 heat elements, 64 Watts for 7 days, 68 days cool-
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: mat  nad   drock       por        permx      permy      permz      cwet       spht
matr1  2  2.580E+03 7.000E-02 1.000E-17 1.000E-17 1.000E-17 5.000E-01 1.000E+04
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  5.0000E-01  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+00 1.0000E+00 1.0000E-01 0.0000E+00
: mat  nad   drock       por        permx      permy      permz      cwet       spht
matr2  2  2.580E+03 7.000E-02 1.000E-17 1.000E-17 1.000E-17 1.900E+00 8.400E+02
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
: mat  nad   drock       por        permx      permy      permz      cwet       spht
matr3  2  2.580E+03 7.000E-02 1.000E-17 1.000E-17 1.000E-17 5.000E-01 1.000E+04
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.000E-00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
: mat  nad   drock       por        permx      permy      permz      cwet       spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 5.000E-01 1.000E+04
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  5.0000E-01  0.0000E+00
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo     texp        (mop(i),i   =1,17)
:                                             1 2 3 4 5 6 7 8 9 1011121314151617
  0  1  9999   0  550  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart        timax      deltn      deltmx     elst     gf         redlt      scale
 0.000E+00  2.060E-01 -1.000E+00  0.000E+00  B  1  9.807E+00 0.000E+00 0.000E+00
:     dlt(i)..
 1.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
:
:    rel        re2        u          wup        wnr        dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
:
:          dep(1)                dep(2)                dep(3)
       1.00000000E+05        2.00000000E-01        2.00000000E+01
:
START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
RPCAP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.0000E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.0000E-01 0.0000E+00 1.1000E-05 1.0000E+05 1.0000E+00 3.5000E-01 0.0000E+00
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:  iti  ite   delaf       tinter
   16   16  3.1700E+00  2.0000E+00
:
:  tis(1)     tis(2)     tis(3) .....
 1.000E-07 1.000E-06 5.000E-06 1.000E-05 3.000E-05 7.000E-05 1.000E-04 3.000E-04
 7.000E-04 1.000E-03 3.000E-03 7.000E-03 1.000E-02 5.000E-02 1.000E-01 2.050E-01
ELEME----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne    nsq  nad mal ma2     volx
:
A       1    0    0  matr1   3.9270E+09
A       2    0    0  matr2   3.9270E+09
A      22    0    0  matr2   3.9270E+09
A      23    0    0  matr2   3.9270E+09
A      24    0    0  matr3   3.9270E+09
B       1    0    0  matr1   1.1780E+08
B       2    0    0  matr2   1.1780E+08
B      23    0    0  matr2   1.1780E+08
B      24    0    0  matr3   1.1780E+08
C       1    0    0  matr1   1.9630E+08
C       2    0    0  matr2   1.9630E+08
DD     20    0    0  matr4   2.3170E+05
DD     24    0    0  matr4   2.3170E+05
```

JR 1-6-95

wrong value - see pgs 235-236

JR 1-6-95

JR 1-6-95

1-6-95 JR

```
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne sl ns nsq nad nads ltb  itp    itb   gx          gy          gz
A     9 HOT  1    0    0    0    3 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  6.048E+05     6.480E+06
  0.01600       0.0000000000  0.0000000000
B     9 HOT  1    0    0    0    3 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  6.048E+05     6.480E+06
  0.04800       0.0000000000  0.0000000000
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne    nsq nadd        porx
A       1    0    0   0.0
:          x1                  x2                  x3
       1.00000000E+05      0.70       2.50000000E+01
B       1    0    0   0.0
       1.00000000E+05      0.70       2.50000000E+01
A       2    0    0   0.0
       1.00000000E+05      0.70       2.50000000E+01
B       2    0    0   0.0
       1.00000000E+05      0.70       2.50000000E+01
```

JR 1-6-95

OUTPUT FROM A CHANGED VERSION OF "cyl-tuff20i" DIFFERENCE BETWEEN THIS VERSION & ONE ON PAGE 223 IS IN THERMAL CONDUCTIVITY OF BOUNDARIES. CHANGED VARIABLE IS 1.0 INSTEAD OF 0.2. (RUN AT /home2/sisyphus/grice/cyl/cyl-1-95/)

JR 1-6-95

THERMAL CONDUCTIVITY 0.2

MAXIMUM PRESSURE

TIME	MAXIMUM PRESSURE	THERMAL K = 0.2	THERMAL K = 1.0
3.15	100 970		100970
31.5	108 020		107930
315	136 900	→	136400
3154	111 370		106750
31536	134 160		100900
94608	142 570		100320
220750	149 310		100100
			100050

JR 1-6-94

1-6-95
MR

- NEW RUN "baseϕ2i" - IDENTICAL TO "baseϕ1i" EXCEPT THERMAL CONDUCTIVITY OF BOUNDARIES = 0.2 INSTEAD OF ~~1.0~~ MR 1-6-95 0.5.

- BEGIN RUNNING "baseϕ2i" ≈ 1330 IN: /home/SKIPPY/mgreen/cy/1-7-95
- BEGIN RUNNING CORRECTED "baseϕ1i" ≈ 1340

- CHANGED BASE CASE: "baseϕ1i" NOW HAS K_{SAT} = 5X10^{-17} & $K_{THERMAL}$ OF BOUNDARY = 0.2.

- BEGIN CHANGED BASECASE 2) ≈ 1415

OUTPUT - "baseϕ1i" - FROM TECPLOT

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP	MAX TEMPERATURE (°C)
3.15	103220	100000	3220	31.1
31.5	154490	100000	54490	79.8
158	776410	100000	676410	173
315	519860	100000	419860	214
946	371180	100000	271180	259
2208	273550	100000	173550	281
3154	240670	100000	140670	286
9461	172140	100000	72140	291
22075	140850	100000	40850	287
31536	131580	100000	31580	283
94608	113520	100000	13520	255
220750	105530	100000	5530	201
315,360	103090	99711	~~3090~~ 379 ΔP	157 → 3579
1,576,800	100,030	99246	~~30~~ 784 ΔP 1-8-95	25 → 7840
3,153,600	100,010	99654	~~10~~ 356 ΔP	25 → 356
6,464,900	100,000	99849	151	25

1-8-95 MR

1-6-95
MR

INPUT - "baseϕ1i"

MR 1-6-94

```
tuff experiment, cyl,1/6/95,20 heat elements, 64 watts for 7 days, 68 days cool
:
:
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----
:
: mat  nad  drock      por       permx      permy      permz      cwet       spht
matr1  2  2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 2.000E-01 1.000E+04
:
:   comp       expan       cdry       tortx
  0.0000E+00  0.0000E+00  2.0000E-01  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+0(
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+00 1.0000E+00 1.0000E-01 0.0000E+0(
:
: mat  nad  drock      por       permx      permy      permz      cwet       spht
matr2  2  2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 1.900E+00 8.400E+02
:
:   comp       expan       cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+0(
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+0(
:
: mat  nad  drock      por       permx      permy      permz      cwet       spht
matr3  2  2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 2.000E-01 1.000E+04
:
:   comp       expan       cdry       tortx
  0.0000E+00  0.0000E+00  2.000E-01  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+0(
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+0(
:
: mat  nad  drock      por       permx      permy      permz      cwet       spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 2.000E-01 1.000E+04
:
:   comp       expan       cdry       tortx
  0.0000E+00  0.0000E+00  2.0000E-01  0.0000E+00
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+0(
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+0(
                                        :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----
:noit kdt cyc sec  cypr  diffo      texp       (mop(i),i   =1,17)
:                                             1 2 3 4 5 6 7 8 9 1011121314151617
  0  1  9999   0  550  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart      timax      deltn      deltmx     elst       gf         redlt      scale
 0.000E+00  2.060E-01 -1.000E+00  0.000E+00  B  1  9.807E+00 0.000E+00 0.000E+0(
:     dlt(i)..
 1.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+0(
:
:   rel        re2        u          wup        wnr        dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
:
:         dep(1)              dep(2)              dep(3)
      1.00000000E+05      2.00000000E-01      2.00000000E+01
```

MR 1-6-94

FOR SUBREGIONAL FLOW - CREATING 40X50 INPUT FILE - IDENTICAL TO "500i" EXCEPT EACH ELEMENT HAS BEEN DIVIDED INTO QUARTERS. GEIDOR INPUT:

1,0,1,0,1,1,0,20,20,100000,100000,0.6,0.6,0.1,0.45,0,0

→ "2000i"

1-6-95
MR

• OUTPUT = "base φ2i" - FROM TECPLOT

TIME (S)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
3.15	103520	99901	31.1
31.5	189910	96820	79.8
158	1,029,200	95478	176
315	1,062,400	96882	214
946	630,000	98750	259
2208	521,770	99321/1-6-94	280
3154	448,370	~~9932~~ 99835	286
9461	316,340	100000	291
22,085	233040	100000	286
31,536	208710	100000	282
94,608	153880	100000	255
220,750	124460	100000	198
315,360	114560	99673	155
1,576,800	100100	96681	25
3,153,600	100060	98445	25
6,469,900	100020	99280	25

NEW INPUT FILE: IDENTICAL TO "base φ1i" EXCEPT PERMEABILITY = 1.0×10^{-16} INSTEAD OF 5.0×10^{-17}?

"base φ3i".

• BEGIN RUNNING "base φ3i" ≈ 1750 IN:
/usr2/sneezy/rgreen/grice/cy1-6-95/base

• NEW FILE: "base φ4i" - IDENTICAL TO "base φ1i" EXCEPT PERMEABILITY = ~~1.0×10^{-16}~~ MR 1-6-94 ~~5.0×10^{-16}~~ m^2
MR 1-6-95 = 5.0×10^{-16} m^2.

• BEGIN RUNNING "base φ4i" ≈ 1820 IN:
/home/sleepy/rgreen/cy1-1-95

1-6-94
MR

INPUT - "base φ3i"

```
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock       por       permx     permy     permz     cwet      spht
matr1  2  2.580E+03 7.000E-02 1.000E-16 1.000E-16 1.000E-16 2.000E-01 1.000E+04
:
:   comp        expan       cdry       tortx
  0.0000E+00  0.0000E+00  2.0000E-01  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+00 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock       por       permx     permy     permz     cwet      spht
matr2  2  2.580E+03 7.000E-02 1.000E-16 1.000E-16 1.000E-16 1.900E+00 8.400E+02
:
:   comp        expan       cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock       por       permx     permy     permz     cwet      spht
matr3  2  2.580E+03 7.000E-02 1.000E-16 1.000E-16 1.000E-16 2.000E-01 1.000E+04
:
:   comp        expan       cdry       tortx
  0.0000E+00  0.0000E+00  2.000E-01  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock       por       permx     permy     permz     cwet      spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 2.000E-01 1.000E+04
:
:   comp        expan       cdry       tortx
  0.0000E+00  0.0000E+00  2.0000E-01  0.0000E+00
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
                                        :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo      texp       (mop(i),i   =1,17)
:                                             1 2 3 4 5 6 7 8 9 1011121314151617
  0  1  9999   0  550  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart       timax      deltn      deltmx     elst      gf         redlt      scale
 0.000E+00  2.060E-01 -1.000E+00  0.000E+00  B  1  9.807E+00 0.000E+00 0.000E+00
:      dlt(i)..
 1.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
:
:   rel        re2         u          wup        wnr        dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
:         dep(1)                dep(2)                dep(3)
       1.00000000E+05        2.00000000E-01        2.00000000E+01
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
                                                                    1-6-94
: el ne sl ns nsq nad nads ltb  itp    itb    gx          ex          hg
A    9 HOT  1    0    0    0   3 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  6.048E+05     6.480E+06
  0.01600       0.0000000000  0.0000000000
B    9 HOT  1    0    0    0   3 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  6.048E+05     6.480E+06
  0.04800       0.0000000000  0.0000000000
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne   nsq nadd       porx
A      1    0    0   0.0
:          x1                  x2                  x3
       1.00000000E+05       0.70       2.50000000E+01
```

MR
1-6-94

1-7-95 MR

- FOR SUBREGIONAL FLOW WORK - "500i" DATA, STARTED 2000i ≈ 0930 IN: /home2/sisyphus/~~grice~~ subreg/subreg/SAMPLE MR 1-7-94

- "baseφ3i" DONE - NEW INPUT FILE: "baseφ5i" - IDENTICAL TO "baseφ2i" EXCEPT PERMEABILITY = 1.0×10^{-15}

- BEGIN "baseφ5i" ≈ 0990

- "baseφ4i" - DONE - NEW INPUT FILE: "baseφ6i" - IDENTICAL TO "baseφ1i" EXCEPT PERMEABILITY = 5.0×10^{-15} IN: /home/skippy/ngreen/cg/1-1-95

- BEGIN "baseφ5i" ≈ 1010

OUTPUT - "baseφ3i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
3.15	102890	100000	31.1
31.5	138410	100000	79.7
158	495230	100000	173
315	334790	100000	214
946	275500	100000	259
2208	210160	100000	281*
3154	187240	100000	286
9461	142160	100000	291+
22075	122280	100000	287
94608	106980	100000	256
220750	102840	100000	201
315,360	101580	99910	159
1,576,800	100010	99608	25

*SURFACE TEMP = 41°C, +SURF TEMP = 41.7 °C

1-7-95 MR

OUTPUT "baseφ4i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
3.15	101440	100000	31.1
31.5	112860	100000	79.4
158	253510	100000	173
315	208420	100000	
946	157750	100000	25-9

- NEW FILE "baseφ7i" IDENTICAL TO "baseφ4i" EXCEPT PERMEABILITY = 1.0×10^{-18} IN: /usr2/sneezy/ngreen/grice/cg/1-95/base

- NEW FILE "baseφ8i" IDENTICAL TO "baseφ1i" EXCEPT PERMEABILITY = 1.0×10^{-18} & THERMAL CONDUCTIVITY OF BOUNDRIES = 0.4 - NOTE ALSO CHANGED INITIAL TEMPERATURE FROM ~~20~~ MR 1-7-95 25°C TO 22°C.

- BEGIN "baseφ8i" ≈ 1140

OUTPUT - "baseφ5i" → SEE pg 245

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP	MAX TEMPERATURE (°C)
3.15	100900	100000	900	31.1
31.5	107120	100000	7120	79
158	182010	100000	82010	173
315	174540	100000	74540	212
946	134560	100000	34560	259
2208	118870	100000	18870	281*
3154	115170	100000	15170	286
9461	105410	100000	5410	292
22,075	102640	100000	2640	287
31,536	101950	100000	1950	283

*SURFACE TEMP = 41°C

1-7-95 NR

OUTPUT: "baseφ6i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
3.15	100230	100000	31.1
31.5	101540	100000	78.2
158	135540	100000	170
315	126930	100000	208
946	113690	100000	258
2208	105720	100000	280
3154	103790	100000	286
9461	101290	100000	292
22075	100610	100000	288
31,536	100440	100000	283

OUTPUT - "baseφ7i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
3.15	103980	99664	31.1
31.5	207480	86033	79.8
158	1,631600	66834	177
315	2,708,800	73325	214
946	2,245,700	84796	258

MR 1-7-95
BASECASE 5×10^{-17}, THERMAL @ BOUNDARY = 0.2, n =

NEW FILE: "baseφ9i" IDENTICAL TO "baseφ1i" EXCEPT POROSITY = 0.304
INITIAL TEMPERATURE = 22°C.

BEGIN RUNNING "baseφ9i" ≈ 1845

1-7-95 NR

OUTPUT: "baseφ8i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
3.15	103680	99728	28.1
31.5	198420	86050	76.8
158	1,570,500	64704	174
315	2,612,900	71695	211
946	2,219,500	84122	255
2208	1,310,900	92834	274
3154	1,294,200	96013	278

INPUT: "baseφ9i"

```
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr1  2  2.580E+03 3.000E-01 5.000E-17 5.000E-17 5.000E-17 2.000E-01 1.000E+04
:
:   comp       expan      cdry       tortx
  0.0000E+00  0.0000E+00  2.0000E-01  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+0
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+00 1.0000E+00 1.0000E-01 0.0000E+0
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr2  2  2.580E+03 3.000E-01 5.000E-17 5.000E-18 5.000E-17 1.900E+00 8.400E+02
:
:   comp       expan      cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+0
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+0
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr3  2  2.580E+03 3.000E-01 5.000E-17 5.000E-17 5.000E-17 2.000E-01 1.000E+04
:
:   comp       expan      cdry       tortx
  0.0000E+00  0.0000E+00  2.0000E-01  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+0
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+0
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 2.000E-01 1.000E+04
:
:   comp       expan      cdry       tortx
  0.0000E+00  0.0000E+00  2.0000E-01  0.0000E+00
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+0
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+0
                                    :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----
:noit kdt cyc sec  cypr  diffo      texp       (mop(i),i   =1,17)
:                                                1 2 3 4 5 6 7 8 9 10111213141516 17
  0  1  9999   0  550  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart       timax     deltn     deltmx     elst     gf      redlt     scale
 0.000E+00  2.060E-01 -1.000E+00  0.000E+00  B  1  9.807E+00 0.000E+00 0.000E+0
```

1-8-95
MR

OUTPUT - "Baseϕ9i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
315	103610	99986	28.8
31.5	194620	97988	81.7
158	974000	97015	174
315	1,001,700	98136	209
946	586,540	99334	257
2208	488,130	99623	277
3154	410,430	100000	282
9461	288,720	100000	287

- RE-RUN "cyl1-tuff20i" (see Pg 223) - MADE FROM MODIFIED "Baseϕ9i"

- BEGIN RUNNING CORRECTED "Baseϕ9i" ≃ 1135
  - CHANGED permy IN matr2 FROM 5E-18 TO 5E-17.

- OUTPUT - "cyl1-tuff20i"*

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
315	100650	100000	28.2
31.5	106490	100000	76.8
158	184750	100000	172
315	177640	100000	212
946	137990	100000	260
2208	127570	100000	286

* MADE FROM baseϕ9i - MAY NOT BE EXACTLY LIKE ORIGINAL

1-8-95
MR

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
3154	126720	100000	296
9461	134520	100000	323
22075	136600	100000	331
31536	136570	100000	328
94608	139340	100000	296
220750	139880	100000	234
315360	134900	100000	178

NOTE THE DIFFERENCES BETWEEN THESE RESULTS & THOSE ON Pg 223 MAY BE CAUSED BY THE VERY LARGE ELEMENTS ALONG THE RIGHT HAND BOUNDARY IN THIS RUN.

- NEW FILE: "base10i" - IDENTICAL TO "baseϕ1i" EXCEPT PERMEABILITY = 1×10^{-15} & POROSITY = [redacted] & INITIAL TEMP = 22°C
- BEGIN RUNNING "base10i" ≃ 1440 hr.
  /home/skippy/rgreen/cyl-1-95

- REMAINDER OF OUTPUT - "base-ϕ5i" - see Pg 241

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP	MAX TEMPERATURE (°C)
94608	100780	100000	780	259
220750	100340 (DELETED)	100000	340	200
315,360	100250	100000	250	160
1576800	100000	99966	34	25
3153600	100000	99987	13	25
6464900	100000	99996	4	25

MR
1-8-94

1-8-95
MR

OUTPUT: "base1φi"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAXIMUM TEMPERATURE (°C)
3.15	102300	100000	2300	28.8
31.5	124680	100000	24680	81.3
158	325900	100000	225900	161
315	246190	100000	146190	209
946	199700	100000	99700	255
2208	158310	100000	58310	277
3154	144180	100000	44180	282
9461	119100	100000	19100	287
22,075	109620	100000	9620	283
31,536	107250	100000	7250	279
94,608	102910	100000	2910	254
220,750	101110	100000	1110	197
315,360	100630	100000	630	156
1,576,800	100000	99851	149	22
3,153,600	100000	99934	66	22
6,464,900	100000	99972	28	22

1-9-95
MR

- NEW FILE: "base11i" - IDENTICAL TO "baseφi" EXCEPT VAN GENUCHTEN α = 2.24×10^{-3} INSTEAD OF 2.24×10^{-5}.

- BEGIN RUNNING "base11i" ≈ 1955

- OUTPUT: "base11i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
3.15	101420	100000	1420	28.8
31.5	104540	100000	4540	80.5
158	201500	100000	101500	176

1-8-94
MR

OUTPUT - base11i

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
315	188910	100000	88910	213
946	148450	100000	48450	256
2208	127060	100000	27060	275
3154	120360	100000	20360	280

- BEGIN RUNNING OLD CYLINDER RUN - "basecaseφ1i"
  IN: /home/skippy/rgreen/cg/1-1-95
  -KILLED-

- NEW INPUT FILE: "base12i" - IDENTICAL TO "base11i" EXCEPT THERMAL CONDUCTIVITY OF BOUNDARIES = 0.

- OUTPUT: "base12i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
3.15	101420	100000	1420	28.8
31.5	104540	100000	4540	80.5
158	201500	100000	101500	176
315	188960	100000	88960	213
946	150170	100000	50170	257
2208	133380	100000	33380	282
3154	128800	100000	28800	292
9461	124190	100000	24190	324

- NEW FILE: "base40-1i" - IDENTICAL TO "baseφ1i" EXCEPT PERMEABILITY = 1×10^{-15} & POWER = 40 WATTS - ALSO, AMBIENT TEMP. = 22°C, THERMAL CONDUCTIVITY OF BOUNDARIES = 0, SPECIFIC HEAT OF BOUNDARIES = 840 INSTEAD OF 10,000; LARGE CELLS ALONG BOUNDARIES ELIMINATED.

-9-95
MR

• BEGIN RUNNING "base40-1i" ≈ 0925 IN:
/home/skiffs/ngreen/cyl-1-95

• OUTPUT - "Base40-1i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
3.15	100570	100000	510	25.8
31.5	101920	100000	1920	55.0
158	160860	100010	60850	114
315	~~1995 14006~~ 140400	100060	40340	139

• 1215 - BEGIN RUNNING "base1φi" USING
old cfough MODEL IN:
/usr2/sneezy/ngreen/grice/cyl.1-95/oldcfough

• KILL "2000i" @ 1220 - RAN ≈ 2 DAYS
(2830 MIN) AT TIMESTEP #1097,
TIME = 7.851×10^{-3} SEC, $\Delta t = 2 \times 10^{-6}$ SEC

• OUTPUT "basecaseφ1i" - COMPARE WITH Page 5151+150

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
10	106690	99218		35.04
50	168160	94554		64.64
100	298520	89402		84.18
500	940230	89530		126.53
1000	1318500	89763		147.45
2000	1935100	89396		180.96
3000	1994000	89061		205.93
4000	1526000	88654		206.51

MR
1-9-95

1-9-95

• OUTPUT* FROM "base1φi" RUN WITH OLD cfough (SEE PAGE 246)

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
3.15	102300	100000		28.746
31.5	124620	100000		81.3
158	325370	100000		161.62
315	246250	100000		208.5

• NEW FILE: "modφ1-basecaseφ1i" - IDENTICAL TO "BasecaseφIi" EXCEPT BOUNDARIES CHANGED TO BE SAME AS ~~basecaseo~~ MR 1-9-95 "baseφ1i":
IN: /usr2/sneezy/ngreen/grice/cyl/1-95/more-base

• OUTPUT: "modφ1-basecaseφ1i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMPERATURE (°C)
10	106690	99218		35.04
50	168160	94554		64.64
100	298520	89402		84.18
500	940360	89530		127
1000	1,315,800	91796		147
2000	1,897,800	94434		179
3000	1,932,700	96367		201
4000	1,457,100	96250		198
5010	1,147,200	95052		192
10,000	796,810	98368		181
20,000	642,890	100000		182
50,000	422460	100000		162
100,000	352900	100000		162
500,000	224240	100000		163
750,560	198810	100000		162

* OUTPUT TIMES SLIGHTLY DIFFERENT FROM OUTPUT ON PAGE 246 (e.g. 31.54 vs 31.5)
MR 1-9-95

1-9-95 JR

NEW FILE: "mod#2-basecase01i" - IDENTICAL TO "mod01-basecase01i" EXCEPT PERMEABILITY OF INTERIOR (mat02) = 1×10^{-14}

INPUT: "mod01-basecase01i"

MODIFIED BASECASE01i 1/9/95 make boundaries same as base01i (i.e. size, perm, therm JR 1-9-95

```
:
:
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad    drock       por       permx      permy      permz      cwet       spht
matr1   2  2.580E+03 3.200E-01 5.000E-17 5.000E-17 5.000E-17 2.000E-01 1.000E+04
:
:    comp       expan        cdry       tortx
  0.0000E+00  0.0000E+00  2.0000E-01  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad    drock       por       permx      permy      permz      cwet       spht
matr2   2  2.580E+03 3.200E-01 2.000E-18 2.000E-18 2.000E-18 2.300E+00 8.400E+02
:
:    comp       expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad    drock       por       permx      permy      permz      cwet       spht
matr3   2  2.580E+03 3.200E-01 5.000E-17 5.000E-17 5.000E-17 2.000E-01 1.000E+04
:
:    comp       expan        cdry       tortx
  0.0000E+00  0.0000E+00  2.0000E-01  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad    drock       por       permx      permy      permz      cwet       spht
matr4   2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 2.000E-01 1.000E+04
:
:    comp       expan        cdry       tortx
  0.0000E+00  0.0000E+00  2.0000E-01  0.0000E+00
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
                                    :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo      texp        (mop(i),i   =1,17)
                                               1 2 3 4 5 6 7 8 9 10111213141516 17
  0  1  9999   0  550  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:    tstart       timax       deltn      deltmx     elst     gf         redlt      scale
 0.000E+00  1.390E-01 -1.000E+00  0.000E+00  B  1  9.807E+00 0.000E+00 0.000E+00
:     dlt(i)..
 1.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
:
:    rel        re2        u          wup        wnr        dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
:
:         dep(1)              dep(2)              dep(3)
       1.00000000E+05      2.00000000E-01      2.00000000E+01
```

DC 1-9-95

1-9-95 JR

"mod01-basecase01i" INPUT (CONT)

```
:
START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
RPCAP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.0000E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.0000E-01 0.0000E+00 1.1000E-05 1.0000E+05 1.0000E+00 3.5000E-01 0.0000E+00
:
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  iti  ite   delaf       tinter
   16   16  3.1700E+00  2.0000E+00
:
:  tis(1)     tis(2)    tis(3) .....
 3.170E-07 1.590E-06 3.170E-06 1.590E-05 3.170E-05 6.340E-05 9.510E-05 1.270E-04
 1.590E-04 3.170E-04 6.340E-04 1.590E-03 3.170E-03 1.590E-02 2.380E-02 3.170E-02
:
OPTN ----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  ilimsl idsolc  knudsn ipctem ivplow ilopt
       0      1       0      1      1      0
:
DTSTP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:   dpgmx      dsgmax     dtmax      dxmax
:
 8.000E+02 2.500E-01 2.000E+01 2.500E-01
:
ELEME----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne    nsq  nad mal ma2     volx
:
A       1     0     0  matr1   3.9270E+09
A       2     0     0  matr2   3.9270E-09
A      23     0     0  matr2   3.9270E-09
A      24     0     0  matr3   3.9270E+09
B       1     0     0  matr1   1.1780E+08
B       2     0     0  matr2   1.1780E-08
B      24     0     0  matr3   1.1780E+08
C       1     0     0  matr1   1.9630E+08
C       2     0     0  matr2   1.9630E-08
C       3     0     0  matr2   1.9630E-08
C       4     0     0  matr2   1.9630E-08
C       5     0     0  matr2   1.9630E-08
C       6     0     0  matr2   1.9630E-08
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne sl ns nsq nad nads ltb  itp    itb    gx          ex          hg
A    9 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  7.612500E-03  1.246500E-02  1.033500E-02  1.031250E-02
  8.940000E-03  8.887500E-03  9.000000E-03  8.790000E-03
  8.790000E-03  0.0000000000  0.0000000000
B    9 HOT  1    0   0   0  11 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  2.640000E+03  6.300000E+03  1.986000E+04
  3.282000E+04  9.972000E+04  1.744000E+05  6.865000E+05
  7.735000E+05  8.600000E+05  4.320000E+06
  2.283800E-02  3.741000E-02  3.099000E-02  3.093800E-02
  2.683500E-02  2.666200E-02  2.700000E-02  2.638500E-02
```

AL 1-9-95

```
  2.638500E-02  0.0000000000  0.0000000000
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: el ne   nsq nadd       porx
A       1     0    0   0.0
:
:          x1                  x2                  x3
       1.00000000E+05      7.00000000E-01      2.50000000E+01
B       1     0    0   0.0
       1.00000000E+05      7.00000000E-01      2.50000000E+01
C       1     0    0   0.0
       1.00000000E+05      7.00000000E-01      2.50000000E+01
```

DC 1-9-95

JR 1-9-95

1-9-95 DR

@ TPC1: "modϕ2-basecaseϕ1i"

TIME (S)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	ΔP (Pa)	MAX TEMP (°C)
10	100310	100000		34.9
50	101030	100000		63.1
100	102740	100000		82.1
500	118320	100000		118
1000	120820	100000		138
2000	124420	100000		169
3000	121720	100000		195
4000	117960	100000		194
5010	115550	100000		188
10000	112800	100000		177
20000	111360	100000		177
50140	109100	100000		157
100000	108240	100000		157
500000	105890	100000		158
750000	105590	100000		157
1,000,000	100000	99748		25

1-10-95 MR

1-10-95 MR

- KILLED "modϕ3-basecaseϕ1i" ≃ 0900 - MAKE NUMERICS "modϕ4-basecaseϕ1i" - IDENTICAL TO "modϕ3-basecaseϕ1i" EXCEPT POROSITY OF BODY = 0.07 → ALSO POROSITY OF BOUNDARIES = 0.07.

- KILL "2000i" ≃ 0900 - 47 TIMESTEPS, $t \simeq 5.43 \times 10^{-3}$ YR, $\Delta t \simeq 6.5 \times 10^{-6}$ YR

- BEGIN "modϕ4-basecaseϕ1i" ≃ 0920 IN: /home2/sissyPhus/grice/cg/cg-1-95/base

- NEW FILE: "modϕ5-basecaseϕ1i" - IDENTICAL TO "modϕ4-basecaseϕ1i" EXCEPT THERMAL CONDUCTIVITY OF BODY (mat#2) = 1.9

- BEGIN RUNNING "modϕ5-basecaseϕ1i" ≃ 0935 IN: /home/SKIPPY/rgreen/cg/1-95

1-10-95 MR

- MODEL "500i" COMPLETED - USING "SOLVE" OPTION
  CALCULATION TIME = 33,155 S, 45-31 TIMESTEPS REQUIRED
  - THIS COMPARES WITH 56,718 S CALCULATION TIME & 4531 TIMESTEPS WITHOUT THE "SOLVE" OPTION

- BEGIN 2000i ≃ 0505

- NEW FILE: "modϕ3-basecaseϕ1i" = IDENTICAL TO "modϕ1-basecaseϕ1i" EXCEPT PERMEABILITY OF BODY (mat#2) = 5×10^{-17} M². IN: /usr2/sneezy/rgreen/grice/cg/1-95/more-base

- BEGIN RUNNING "modϕ3-basecaseϕ1i" ≃ 0815

TO NEXT PAGE →

OUTPUT: "modϕ3-basecaseϕ1i" - KILLED RUN

TIME (S)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	105770	99947	35.03
50	149280	99544	64.6
100	210060	99190	84.0
500	404900	99568	126

OUTPUT: "modϕ4-basecaseϕ1i"

TIME (S)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	103980	100000	34.0
50	121660	100000	61.5
100	148480	100000	80.9
500	266120	100000	124

DR 1-10-95

1-10-95 MR

OUTPUT: "modϕ4-basecaseϕli" (cont)

1-10-95 MR

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
~~280~~ ER 1-10-95			
1000	280170	100000	146
2000	264330	100000	180
3000	234580	100000	203
4000	201530	100000	201
5010	179190	100000	195
10000	147430	100000	183
20,000	132320	100000	184

NEW FILE: "modϕ6-basecaseϕli" IDENTICAL TO "modϕ4-basecaseϕli" EXCEPT THERMAL CONDUCTIVITY OF BODY = 0.1.

- BEGIN RUNNING "modϕ6-basecaseϕli" ≃ 1050
  IN: /home2/sisyphus/grice/cyl/cyl-1-95/base

- NEW FILE: "modϕ7-basecaseϕli" - IDENTICAL TO "modϕ6-basecaseϕli" EXCEPT VAN GENUCHTEN $\alpha_s = 2.24 \times 10^{-5}$ & STORAGE OF 6.36×10^{-7}, $\gamma_s = 0.206$

- BEGIN RUNNING "modϕ7-basecaseϕli" ≃ 1110
  IN: /home/SKIPPY/rgreen/cyl-1-95

MR 1-10-95

OUTPUT: "modϕ5-basecaseϕli"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	104010	100000	34
50	122960	100000	62.7
100	154470	100000	84.1
500	302590	100000	134
1000	291830	100000	158
2000	272540	100000	195
3000	245940	100000	220
4000	209350	100000	217
5000	184990	100000	211

OUTPUT: "modϕ6-basecaseϕli"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	104170	100000	34.2
50	133960	100000	71.4
100	258310	100000	118

KILLED "modϕ6-basecaseϕli" ≃ 1155,
ITERATION = 853, $t \simeq 5.16 \times 10^{-6}$ yr, $\Delta t = 1.95 \times 10^{-9}$

NEW FILE: "modϕ8-basecaseϕli" - IDENTICAL TO "modϕ4-basecaseϕli" EXCEPT THERMAL CONDUCTIVITY OF BODY = 4.0. & THERMAL ~~COND~~ AND BOUNDARIES MR 1-10-95

- BEGIN RUNNING "modϕ8-basecaseϕli" ≃ 1200
  IN: /home2/sisyphus/grice/cyl/cyl-1-95/base

1-10-95 JR

OUTPUT: "modϕ8-basecaseϕ1i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMP (°C)
10	103720	100000	33.5
50	113750	100000	52.9
100	122270	100000	62.6
500	147360	100000	81.2
1000	162880	100000	90.2
2000	184070	100000	104.3
3000	179680	100000	114
4000	157500	100000	110

KILLED "modϕ8-basecaseϕ1i"

NEW FILE: "modϕ9-basecaseϕ1i" - IDENTICAL TO "modϕ8-basecaseϕ1i" EXCEPT THERMAL CONDUCTIVITY = 40.

- BEGIN RUNNING "modϕ9-basecaseϕ1i" ~ 1235

- OUTPUT: "modϕ9-basecaseϕ1i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	101420	100000	28.6
50	101600	100000	30.1
100	101560	100000	30.5
500	101510	100000	31.1
1000	101710	100000	31.8
2000	102060	100000	33.0
3~~4~~000	102340	100000	33.9
4000	102180	100000	33.5
5000	102030	100000	33.1
10000	101800	100000	32.5
20,000	101720	100000	32.5

1-10-95 JR

1-10-95 JR

NEW FILE: ~~K~~ "mod1ϕ-basecaseϕ1i" - IDENTICAL TO "modϕ8-basecaseϕ1i" EXCEPT THERMAL CONDUCTIVITY = 30

- BEGIN RUNNING "mod1ϕ-basecaseϕ1i" ~ 1440

- OUTPUT - "modϕ7-basecaseϕ1" - RUN KILLED - GETTING NON-CONVERGENCE MESSAGES.

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	104620	100000	34.2
50	139130	100000	71.4
100	276310	100000	117
500	572900	100000	464

OUTPUT - "mod1ϕ-baseϕ1i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	104620	100000	34.2
50	139130	100000	71.4
100	276310	100000	117
500	572900	98794	

JR 1-10-95 WRONG SET OF .plt FILES IN TECPLOT - SEE NEXT PAGE

- NEW FILE: "mod11-basecaseϕ1i - IDENTICAL TO ~~"modϕ5-basecaseϕ1i" EXCEPT THERMAL~~ "modϕ4-basecaseϕ1i" EXCEPT PERMEABILITY OF ~~ENTIRE~~ = 5×10^{-19}.

JR 1-10-95

- BEGIN RUNNING "mod11-basecaseϕ1i" ~ 1510 IN: /home/s/SKIPPY/rgreen/cyl-1-95

1-10-95 MR

OUTPUT: "mod10-basecase01i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	103860	100000	33.8
50	117090	100000	56.8
100	131600	100000	70.2
500	180850	100000	97.3
1000	208540	100000	110
2000	216940	100000	130
3000	200280	100000	142
4000	170270	100000	138
5000	152860	100000	133
10,000	132380	100000	125
20,000	122390	100000	125

OUTPUT "mod11-basecase01i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	10620	99226	34.0
50	15956O	94595	61.7
100	277740	89855	81.1
500	891310	89160	125
1000	1,252,500	91460	146
2000	1,809,300	94165	178
3000	1,813,200	96031	201
4000	1,363400	96747	199
5000	1,073,000	95607	193

- NEW FILE: "newbase01i" — SEE NEXT PAGE

- BEGIN RUNNING "newbase01i" ~1625 IN: /home2/sisyphus/grice/cyl/cyl-1-95/newbase

1-10-95 MR

INPUT: "newbase01i"

MODIFIED BASECASE01i 1/10/95 make boundaries same as base01i i.e.size,perm,therm
:Perm of Body (matr2)=5E-17, Poros Body & Bounds = 0.07, Therm Cond = 3.0
:
:
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat nad drock por permx permy permz cwet spht
matr1 2 2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 3.000E-00 1.000E+04
:
: comp expan cdry tortx
0.0000E+00 0.0000E+00 3.0000E-00 5.0000E-01
: irp rp(1) rp(2) rp(3) rp(4) rp(5) rp(6) rp(7)
7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp cp(1) cp(2) cp(3) cp(4) cp(5) cp(6) cp(7)
11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat nad drock por permx permy permz cwet spht
matr2 2 2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 3.000E+00 8.400E+02
:
: comp expan cdry tortx
0.0000E+00 0.0000E+00 3.000E+00 5.0000E-01
: irp rp(1) rp(2) rp(3) rp(4) rp(5) rp(6) rp(7)
7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp cp(1) cp(2) cp(3) cp(4) cp(5) cp(6) cp(7)
11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat nad drock por permx permy permz cwet spht
matr3 2 2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 3.000E-00 1.000E+04
:
: comp expan cdry tortx
0.0000E+00 0.0000E+00 3.0000E-00 5.0000E-01
: irp rp(1) rp(2) rp(3) rp(4) rp(5) rp(6) rp(7)
7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp cp(1) cp(2) cp(3) cp(4) cp(5) cp(6) cp(7)
11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat nad drock por permx permy permz cwet spht
matr4 2 2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 3.000E-00 1.000E+04
:
: comp expan cdry tortx
0.0000E+00 0.0000E+00 3.0000E-00 0.0000E+00
: irp rp(1) rp(2) rp(3) rp(4) rp(5) rp(6) rp(7)
7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp cp(1) cp(2) cp(3) cp(4) cp(5) cp(6) cp(7)
11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec cypr diffo texp (mop(i),i =1,17)
1 2 3 4 5 6 7 8 9 1011121314151617
0 1 9999 0 550 2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
: tstart timax deltn deltmx elst gf redlt scale
0.000E+00 1.390E-01 -1.000E+00 0.000E+00 B 1 9.807E+00 0.000E+00 0.000E+00
: dlt(i)..
1.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
:
: rel re2 u wup wnr dfac
1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
:
: dep(1) dep(2) dep(3)

1.00000000E+05 2.00000000E-01 2.00000000E+01

:
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: iti ite delaf tinter
16 16 3.1700E+00 2.0000E+00
:
: tis(1) tis(2) tis(3) .....
3.170E-07 1.590E-06 3.170E-06 1.590E-05 3.170E-05 6.340E-05 9.510E-05 1.270E-04
1.590E-04 3.170E-04 6.340E-04 1.590E-03 3.170E-03 1.590E-02 2.380E-02 3.170E-02

1-10-95
AR

OUTPUT "newbaseφ1i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	103860	100000	33.8
50	117090	100000	56.8
100	131600	100000	70.2
500	180850	100000	97.3
1000	208540	100000	110
2000	216940	100000	130
3000	200280	100000	142
4000	170270	100000	138
5000	152860	100000	133
10000	132380	100000	125
20000	122390	100000	125
50000	111550	100000	111
100000	108530	100000	111
500000	104110	100000	111
750000	103560	100000	110
1,000,000	100000	98631	25

• NEW FILE: "newbaseφ2i" - IDENTICAL TO "newbaseφ1i" EXCEPT WATER SATURATION = 70%

• BEGIN RUNNING "newbaseφ2i" @ 1715 IN:
/home4/sisyphus/green/cyl/cyl-1-95/newbase

1-11-95
MR

OUTPUT: "newbaseφ2i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	103020	100000	33.3
50	110650	100000	55.6
100	119780	100000	69.1

1-10-95
MR

OUTPUT: "newbaseφ2i" (cont)

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
500	160620	100000	96.8
1000	197380	100000	110
2000	291040	100000	129
3000	386120	100000	142
4000	351740	100000	138
5000	313170	100000	132
10000	263670	100000	124
20000	262890	100000	124
50000	205060	100000	111
100000	203660	100000	111
500000	203040	100000	110
750000	200440	100000	110
1,000,000	100000	100000	25

• NEW FILE: "newbaseφ3i" - IDENTICAL TO "newbaseφ1i" EXCEPT VANGENUCHTEN $\alpha = 2.24 \times 10^{-5}$ AND LAMBDA = 0.206

• BEGIN RUNNING "newbaseφ3i" @ 1820 IN:
/home/SKIPPY/ngreen/cyl-~~95~~ 1-95
MR 1-10-95

OUTPUT: "newbaseφ3i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	104290	100000	33.8
50	119910	100000	56.9
100	136430	100000	70.3
500	192800	100000	97.3
1000	231470	100000	110
2000	223940	100000	130

MR 1-11-95

1-11-95 JC

OUTPUT: "newbaseφ3i" (cont)

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
3000	179090	100000	143
4000	163270	100 000	138
5000	153940	100000	133

NEW FILE: "newbaseφ4i" - IDENTICAL TO "newbaseφ1i" EXCEPT SATURATION = 70 % AND VAN GENUCHTEN $\lambda = 6.36E-9$

• BEGIN RUNNING "newbaseφ4i" ≃ 0800 IN:
/home2/sisyphus/grice/cyl/cyl-1-95/newbase

NEW FILE:
"newbaseφ5i" - IDENTICAL TO "newbaseφ4i" EXCEPT POROSITY = 30%

• BEGIN RUNNING "newbaseφ5i" ≃ 0815 IN:
/home/SKIPPY/rgreen/cyl-1-95

OUTPUT: "newbaseφ4i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMP (°C)
10	101310	100000	33.3
50	102090	100000	54.8
100	103370	100 000	68.4
500	111330	100 000	96.3
1000	119580	100 000	110
2000	139640	100 000	130
3000	158470	100 000	143
4000	152000	100 000	137
5000	144210	100 000	133
10,000	133610	100000	125

1-11-95 JC

OUTPUT: "baseφ5i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	102580	100 000	32.8
50	106460	100 000	53.79
100	111030	100 000	67.6
500	134750	100 000	96.0
1000	153490	100 000	109
2000	191720	100 000	129
3000	223160	100 000	142
4000	212450	99993	138
5000	199370	99989	133
10,000	180830	100 000	125

• NEW INPUT: "newbaseφ6i" - IDENTICAL TO "newbaseφ4i" EXCEPT PERMEABILITY = 5×10^{-18}.

• BEGIN RUNNING "newbaseφ6i" ≃ 0925 IN:
/home2/sisyphus/grice/cyl/cyl-1-95/newbase

OUTPUT: "newbaseφ6i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	103290	100000	33.3
50	111660	100 000	55.7
100	121040	100 000	69.2
500	161710	100 000	96.9
1000	189500	100000	110
2000	242410	100 000	130
3000	283890	100 000	143
4000	268350	100 000	139
5000	250340	99963	133
10,000	225,330	100 000	125

1-11-95
AR

NEW INPT FILE: IDENTICAL TO "newbaseϕ1i"
EXCEPT % SATURATION = 90 : "newbaseϕ2i"

- BEGIN RUNNING "newbaseϕ2i" ~0950 IN:
/home/skippy/rgreen/cyl-1-95

OUTPUT: "newbaseϕ2i"

TIME (S)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	101810	100000	33.1
50	104470	100000	54.6
100	108410	100000	68.3
500	135170	100000	96.5
1000	168560	100000	110
2000	271820	100000	
3000	379330	100000	142
4000	341670	~~99996~~ 99996 MR 1-11-95	138
5000	297290	99994	133
10000	239580	100000	124

- NEW INPT FILE: "tuffbaseϕ1i"

- BEGIN RUNNING "tuffbaseϕ1i" ~ 1025 IN:
/home2/sisyphus/grice/cyl/cyl-1-95/1-11base

OUTPUT: "tuffbaseϕ1i"

TIME (S)	MAX GAS ~~PRESSURE TEMPERATURE~~ (Pa)	MIN GAS ~~PRESSURE TEMPERATURE~~ MR 1-11-95 (Pa)	MAX TEMPERATURE (°C)
10	109370	100000	43.5
50	172420	100000	92.0
100	256910	100000	119

1-11-95
MR

OUTPUT (CONT) "tuffbaseϕ1i"

500	344440	100000	163
1000	277440	100000	173
2000	218030	100000	178
3000	191550	100000	178
4000	177050	100000	178
5000	166910	100000	178

NEW INPUT: "tuffbaseϕ2i" - IDENTICAL TO "tuffbaseϕ1i" EXCEPT WATER SATURATION = 70 % & TEMP = 22 INSTEAD OF 25

- RUNNING "tuffbaseϕ2i" IN: /home/skippy/rgreen/cyl-1-95

OUTPUT: "tuffbaseϕ2i"

TIME (S)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	106810	100000	39.6
50	144270	100000	86.8
100	212650	100000	114
500	574830	100000	158
1000	686930	100000	167
2000	702290	100000	171
3000	682520	100000	172
4000	665320	100000	172
5000	652330	100000	172

MR 1-11-95
NEW INPUT: ~~"tuffb~~ "tuffbaseϕ3i" - IDENTICAL TO "tuffbaseϕ2i" EXCEPT POWER = 40 WATTS INSTEAD OF 64 WATTS

- BEGIN RUNNING "tuffbaseϕ3i" ~ 1240 IN:
/home2/sisyphus/grice/cyl/cyl-1-95/1-11base

1-11-95 MR

INPUT: "tuffbasephi"

MR 1-11-95

```
1/11/95
:Perm of Body (matr2)=5E-17, Poros Body & Bounds = 0.07, Therm Cond = 3.0
:
:
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr1  2  2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 3.000E-00 1.000E+04
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  3.0000E-00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr2  2  2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 3.000E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  3.000E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr3  2  2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 3.000E-00 1.000E+04
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  3.0000E-00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 3.000E-00 1.000E+04
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  3.0000E-00  0.0000E+00
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
                                        :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo     texp       (mop(i),i   =1,17)
:                                          1 2 3 4 5 6 7 8 9 1011121314151617
  0  1  9999   0  550  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart       timax      deltn     deltmx    elst     gf        redlt     scale
 0.000E+00  1.390E-01 -1.000E+00  0.000E+00  B  1  9.807E+00 0.000E+00 0.000E+00
:     dlt(i)..
 1.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00

TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  iti  ite   delaf       tinter
   16   16  3.1700E+00  2.0000E+00
:
:  tis(1)     tis(2)     tis(3) .....
 3.170E-07 1.590E-06 3.170E-06 1.590E-05 3.170E-05 6.340E-05 9.510E-05 1.270E-04
 1.590E-04 3.170E-04 6.340E-04 1.590E-03 3.170E-03 1.590E-02 2.380E-02 3.170E-02
ELEME----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne   nsq  nad mat1 mat2     volx
:
A       1    0    0  matr1   3.9270E+09
A       2    0    0  matr2   3.9270E-09
A       3    0    0  matr2   3.9270E-09
A       4    0    0  matr2   3.9270E-09
A      23    0    0  matr2   3.9270E-09
A      24    0    0  matr3   3.9270E+09
B       1    0    0  matr1   1.1780E+08
B       2    0    0  matr2   1.1780E-08
DD     23    0    0  matr4   2.3170E+05
DD     24    0    0  matr4   2.3170E+05
                                        :reqd blank line
```

MR 1-11-95

MR 1-11-95

MR 1-11-95

1-11-95 MR

INPUT: "tuffbasephi" (cont)

MR 1-11-95

```
:
CONNE----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el nl e2   n2 nsq ndl nd2 isot   d1         d2         areax      betax
:
A     1  B    1  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 0.000E+00  0
A     2  B    2  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 0.000E+00  0
A    24  B   24  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 0.000E+00  0
B     1  C    1  0   0   0   1  2.500E-03 2.500E-03 2.356E-06 0.000E+00  0
B     2  C    2  0   0   0   1  2.500E-03 2.500E-03 2.356E-06 0.000E+00  0
CC   23  DD  23  0   0   0   1  2.500E-03 2.500E-03 4.477E-05 0.000E+00  0
CC   24  DD  24  0   0   0   1  2.500E-03 2.500E-03 4.477E-05 0.000E+00  0
A     1  A    2  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 1.000E+00  0
A     2  A    3  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 1.000E+00  0
B     1  B    2  0   0   0   1  2.500E-03 2.500E-03 2.356E-06 1.000E+00  0
B     2  B    3  0   0   0   1  2.500E-03 2.500E-03 2.356E-06 1.000E+00  0
DD   22  DD  23  0   0   0   1  2.500E-03 2.500E-03 4.634E-05 1.000E+00  0
DD   23  DD  24  0   0   0   1  2.500E-03 2.500E-03 4.634E-05 1.000E+00  0
                                        :reqd blank line
:
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne sl ns nsq nad nads ltb  itp  itb   gx         ex         hg
A    9 HOT  1    0   0   0    3 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  6.048E+05     6.480E+06
  0.01600       0.0000000000  0.0000000000
B   10 HOT  1    0   0   0    3 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  6.048E+05     6.480E+06
  0.04800       0.0000000000  0.0000000000
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: el ne   nsq nadd       porx
A     1    0    0   0.0
:
:          x1                  x2                  x3
      1.00000000E+05      7.00000000E-01      2.50000000E+01
B     1    0    0   0.0
      1.00000000E+05      7.00000000E-01      2.50000000E+01
```

MR 1-11-95

OUTPUT: "tuffbasephi"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	103800	100000	32.9
50	115470	100000	62.2
100	131370	100000	79.3
500	190750	100000	108
1000	213760	100000	114
2000	226730	100000	117
3000	229500	100000	118
4000	230000	100000	118
5000	229820	100000	117
10000	227490	100000	117
20000	221210	100000	115
50000	203370	100000	110

MR 1-11-95

1-11-95 MR

NEW INPUT: "tuffbaseϕ4i" - IDENTICAL TO "tuffbaseϕ2i" EXCEPT POWER = 20 WATTS

- NEW INPUT: "tuffbaseϕ5i" - IDENTICAL TO "tuffbaseϕ2i" EXCEPT ~~POWER~~ MR 1-11-95 POROSITY = 30%

- BEGIN RUNNING "tuffbaseϕ4i" ≃ 1330 IN: /home2/sisyphus/grice/cyl/cyl-1-95/1-11base

- BEGIN RUNNING "tuffbaseϕ5i" ≃ 1340 IN: /home/skiffy/rgreen/cyl-1-95

OUTPUT: "tuffbaseϕ4i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMP (°C)
10	101730	100000	27.4
50	104640	100000	41.7
100	107340	100000	50.3
500	115370	100000	64.8
1000	118120	100000	68.0
2000	119670	100000	69.6
3000	120070	100000	69.9
4000	120170	100000	69.9
5000	120180	100000	69.9
10000	119950	100000	69.5
20000	119300	100000	68.8
50000	117290	100000	66.5

- NEW FILE: "tuffbaseϕ6i" - IDENTICAL TO "tuffbaseϕ2i" EXCEPT POWER = 10 WATTS

- BEGIN RUNNING "tuffbaseϕ6i" ≃ 1400 IN:

/home2/sisyphus/grice/cyl/cyl-1-95/1-11base

1-11-95 MR

OUTPUT: "tuffbaseϕ6i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	100820	100000	24.7
50	101830	100000	31.7
100	102510	100000	36.0
500	104030	100000	43.2
1000	104520	100000	45.0
2000	104790	100000	45.8
3000	104850	100000	46.0
4000	104870	100000	46.0
5000	104860	100000	46.0
10000	104820	100000	45.8

~~NEWFILE: "tuffbaseϕ4a1" = EDR~~ MR 1-11-95

NEWFILE: "tuffbaseϕ7i" - IDENTICAL TO "tuffbaseϕ2i" EXCEPT POWER = 15 WATTS

- BEGIN RUNNING ~~"tuffϕ7" MR 1-11-95~~ "tuffbaseϕ7i" ≃ 1430 IN: /home2/sisyphus/grice/cyl/cyl-1-95/1-11base

OUTPUT: "tuffbaseϕ7i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	101270	100000	26.1
50	103080	100000	36.6
100	104520	100000	43.1
500	108400	100000	54.0
1000	109680	100000	56.5
2000	110410	100000	57.7
3000	110590	100000	57.9
4000	110630	100000	58.0
10000	110520	100000	57.6
20000	110210	100000	57.1
50000	109220	100000	55.3

1-11-95
JR

OUTPUT: "tuffbaseϕ5i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	110270	100 000	38.4
50	183200	100000	83.9
100	275940	100000	111
500	615110	100000	156
1000	745020	100000	166
2000	794140	100000	170
3000	781480	100000	171
4000	759650	100000	172
5000	738730	100000	172

NEW FILE: "tuffbaseϕ8i" IDENTICAL TO "tuffbaseϕ2i" EXCEPT POWER = 30 WATTS

BEGIN RUNNING "tuffbaseϕ8i" IN /home2/sisyphus/grice/cyl/cyl-1-95/1-11base

OUTPUT: "tuffbaseϕ8i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
10	102730	100000	30.2
50	108970	100000	51.9
100	116250	100000	64.7
500	140920	100000	86.4
1000	149670	100000	91.2
2000	154640	100000	93.4
3000	155830	100000	93.8
4000	156130	100000	93.8
5000	156140	100000	93.7
10000	155390	100000	93.2
20000	153420	100000	92.1

1-11-95
JR

NEW FILE: "tuffbaseϕ8-ai" - IDENTICAL TO "tuffbaseϕ8i" EXCEPT DIFFERENT PRINTOUT TIMES.

OUTPUT: "tuffbaseϕ8-ai"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
1000	149660	100000	
3000	155810	100000	
4000	156120	100000	
5000	156140	100000	
6000	156040	100000	
7000	155900	100000	

NEW FILE: "tuffbaseϕ4-ai" - IDENTICAL TO "tuffbaseϕ4i" EXCEPT PRINTOUT TIMES

OUTPUT - "tuffbaseϕ4-ai"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)
1000	118050	100000
3000	120040	100 000
4000	120160	100 000
5000	120170	100 000
6000	120150	100 000
7000	120100	100 000
8000	120050	100000
9000	119990	100000
10,000	119930	100 000

JR
1-11-95

1-11-95 MR

INPUT: "tuffbase8-ai"

MR 1-11-95

```
1/11/95
:Perm of Body (matr2)=5E-17, Poros Body & Bounds = 0.07, Therm. Cond = 3.0
:Water Saturation = 70%, Power = 30 Watts
:
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr1  2  2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 3.000E-00 1.000E+04
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  3.0000E-00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr2  2  2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 3.000E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  3.000E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr3  2  2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 3.000E-00 1.000E+04
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  3.0000E-00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 3.000E-00 1.000E+04
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  3.0000E-00  0.0000E+00
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.7200E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.7200E-01 0.0000E+00 6.3600E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
                                    :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec   cypr  diffo      texp       (mop(i),i   =1,17)
                                              1 2 3 4 5 6 7 8 9 10111213141516 17
:
  0  1  9999   0  550  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart       timax      deltn     deltmx     elst      gf        redlt      scale
 0.000E+00  3.171E-04 -1.000E+00  0.000E+00   B  1  9.807E+00 0.000E+00 0.000E+00
:     dlt(i)..
 1.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
:
:    rel        re2        u          wup        wnr       dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
:
:         dep(1)                dep(2)                dep(3)

      1.00000000E+05        2.00000000E-01        2.00000000E+01
:
START----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
RPCAP----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0000E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0000E-01 0.0000E+00 1.1000E-05 1.0000E+05 1.0000E+00 3.5000E-01 0.0000E+00
:
```

MR 1-11-95

1-11-95 MR

INPUT: "tuffbase8-ai" (cont)

```
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  iti  ite   delaf       tinter
   8   8    3.1700E+00  2.0000E+00
:
:  tis(1)     tis(2)    tis(3) .....
 3.170E-05 9.510E-05 1.268E-04 1.585E-04 1.903E-04 2.220E-04 2.538E-04 2.854E-04
:
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne sl ns nsq nad nads ltb  itp   itb   gx         ex         hg
A    9 HOT  1    0   0   0    3 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  6.048E+05     6.480E+06
  0.00750       0.0000000000  0.0000000000
B    9 HOT  1    0   0   0    3 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  6.048E+05     6.480E+06
  0.02250       0.0000000000  0.0000000000
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: el ne   nsq nadd       porx
A      1    0    0   0.0
:
:          x1                 x2                 x3
       1.00000000E+05       0.30       2.200E+01
B      1    0    0   0.0
       1.00000000E+05       0.30       2.200E+01
C      1    0    0   0.0
       1.00000000E+05       0.30       2.200E+01
```

MR 1-11-95

NEW FILE: "tuffbase∅9i" - IDENTICAL TO "tuffbase∅8-ai" EXCEPT THERMAL CONDUCTIVITY OF BOUNDARIES = 0.4

RE-DO GENER FOR TUFF CYLINDER EXPERIMENT.

FOLLOWING METHOD SHOWN ON PAGES 217-219:

1) ENTIRE SLICE (20 TOTAL ELEMENTS) IS 1/100TH OF A CYLINDER, ∴ WATTS ALLOCATED TO SLICE = (1/100)(POWER INPUT) = SLICE IN

2) · EACH 'A' ELEMENT GETS $\frac{1}{4}\frac{1}{10}$ SLICE IN $= \frac{\text{SLICE IN}}{40}$

· EACH 'B' ELEMENT GETS $\frac{3}{4}\frac{1}{10}$ SLICE IN $= \frac{3\ \text{SLICE IN}}{40}$

· SLICE IN = TOTAL POWER/100

1-11-95 MR

TIME (s)	TOTAL POWER IN (WATTS)	SLICE IN (WATTS)	A (WATTS)	B (WATTS)
0	35.2	3.52	0.088	0.264
1260	41.8		0.1045	0.3135
2880	41.2		0.1030	0.309
3360	45.3		0.11325	0.33975
3720	45.2			
4500	46.5			
5160	47.1			
5760	47.2			
7920	47.1			
*9360	47.1			
10,440	46.8			
10,560	52.8			
12,120	52.5			
*13,260	52.5			
13,320	59.1			
14,460	59.2			
15,660	58.7			
15,720	66.1			
16,740	66.2			
19380	65.0			
20460	65.2			
21540	65.3			
22620	65.9			
25020	66.6			
27420	65.9			
82020	66.5			
93900	65.2			
111,420	64.9			
127,360	63.7			
606,480	65.0			
606,481	~~0~~			

MR 1-11-95

ALL VALUES ARE ORDER OF MAGNITUDE TOO LARGE!

SEE "GENER" TABLE ON NEXT PAGE

CORRECTED VALUES ON PAGE 279

* = NOT USED

1-11-95 MR

POWER INPUT DURING TUFF CYCLING EXPERIMENT, 10/31-11/7/94

MR 1-11-95

SEE PG 279

ALL POWER VALUES ARE ORDER OF MAGNITUDE TOO LARGE

MR 1-11-95

```
:                                                                    <-reqd blank line
GENER----1----*----2----*----3----*----4----*----5----*----
: el ne sl ns nsq nad nads ltb  itp   itb   gx          ex
A    9 HOT  1    0   0   0  29 HEAT    b  0.000E+00 0.000E+
  0.000000E+00  1.260000E+03  2.880000E+03  3.360000E+03
  3.720000E+03  4.500000E+03  5.160000E+03  5.760000E+03
  7.920000E+03  1.044000E+04  1.056000E+04  1.212000E+04
  1.332000E+04  1.446000E+04  1.566000E+04  1.572000E+04
  1.674000E+04  1.938000E+04  2.046000E+04  2.154000E+04
  2.262000E+04  2.502000E+04  2.742000E+04  8.202000E+04
  9.390000E+04  1.114200E+05  1.773600E+05  6.064800E+05
  6.064810E+05
  8.800000E-02  1.045000E-01  1.030000E-01  1.132500E-01
  1.130000E-01  1.162500E-01  1.177500E-01  1.180000E-01
  1.177500E-01  1.170000E-01  1.320000E-01  1.312500E-01
  1.477500E-01  1.480000E-01  1.467500E-01  1.652500E-01
  1.655000E-01  1.625000E-01  1.630000E-01  1.632500E-01
  1.647500E-01  1.665000E-01  1.647500E-01  1.662500E-01
  1.630000E-01  1.622500E-01  1.592500E-01  1.625000E-01
  0.000000E-00
B    9 HOT  1    0   0   0  29 HEAT    b  0.000E+00 0.000E+
  0.000000E+00  1.260000E+03  2.880000E+03  3.360000E+03
  3.720000E+03  4.500000E+03  5.160000E+03  5.760000E+03
  7.920000E+03  1.044000E+04  1.056000E+04  1.212000E+04
  1.332000E+04  1.446000E+04  1.566000E+04  1.572000E+04
  1.674000E+04  1.938000E+04  2.046000E+04  2.154000E+04
  2.262000E+04  2.502000E+04  2.742000E+04  8.202000E+04
  9.390000E+04  1.114200E+05  1.773600E+05  6.064800E+05
  6.064810E+05
  2.640000E-01  3.135000E-01  3.090000E-01  3.397500E-01
  3.390000E-01  3.487500E-01  3.532500E-01  3.540000E-01
  3.532500E-01  3.510000E-01  3.960000E-01  3.937500E-01
  4.432500E-01  4.440000E-01  4.402500E-01  4.957500E-01
  4.965000E-01  4.875000E-01  4.890000E-01  4.897500E-01
  4.942500E-01  4.995000E-01  4.942500E-01  4.987500E-01
  4.890000E-01  4.867500E-01  4.777500E-01  4.875000E-01
  0.000000E-00
```

MR 1-11-95

1-11-95 NR

DART: "real-powerφ1" - LATEST BASECASE
BEGIN RUN TO "real-powerφ1" ≈ 1955 IN:
/home2/sisyphus/grice/cyl/cyl-91-1-95/~~DART~~ power-
VARY-power
NR 1-11-95

```
tuff experiment, cyl,1/11/95,20 heat elements, Power input as recorded during
: experiment
:
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr1  2  2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 2.000E-01 1.000E+04
:
:   comp        expan         cdry       tortx
  0.0000E+00  0.0000E+00  2.0000E-01  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+00 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr2  2  2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 1.900E+00 8.400E+02
:
:   comp        expan         cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr3  2  2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 2.000E-01 1.000E+04
:
:   comp        expan         cdry       tortx
  0.0000E+00  0.0000E+00  2.000E-01  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 2.000E-01 1.000E+04
:
:   comp        expan         cdry       tortx
  0.0000E+00  0.0000E+00  2.0000E-01  0.0000E+00
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
                                    :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo     texp       (mop(i),i   =1,17)
:                                            1 2 3 4 5 6 7 8 9 10111213141516 17
  0  1  9999   0  550  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart      timax      deltn     deltmx    elst     gf       redlt      scale
 0.000E+00  2.060E-01 -1.000E+00  0.000E+00  B  1  9.807E+00 0.000E+00 0.000E+00
:     dlt(i)..
 1.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
:
:   rel        re2        u          wup       wnr       dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
```

1-11-95

```
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  iti  ite   delaf       tinter
   16   16  3.1700E+00  2.0000E+00
:
:  tis(1)     tis(2)    tis(3) .....
 1.000E-07 1.000E-06 1.000E-05 1.000E-04 1.000E-03 3.000E-03 7.000E-03 1.000E-02
 2.000E-02 3.000E-02 4.000E-02 6.000E-02 8.000E-02 9.000E-02 1.000E-01 2.050E-01
:
OPTN ----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
```


1-11-95 NR

DART: "real-powerφ1" (CONT)

```
ELEME----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne   nsq  nad mal ma2     volx
:
A       1    0    0  matr1   3.9270E+09
A       2    0    0  matr2   3.9270E-09
C      23    0    0  matr2   1.9630E-08
C      24    0    0  matr3   1.9630E+08
D       1    0    0  matr1   2.7490E+08
D       2    0    0  matr2   2.7490E-08
D      22    0    0  matr2   2.7490E-08
D      23    0    0  matr2   2.7490E-08
D      24    0    0  matr3   2.7490E+08
E       1    0    0  matr1   3.5340E+08
E       2    0    0  matr2   3.5340E-08
E       3    0    0  matr2   3.5340E-08
DD     23    0    0  matr4   2.3170E+05
DD     24    0    0  matr4   2.3170E+05
                                :reqd blank line
:
CONNE----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el nl e2   n2 nsq nd1 nd2 isot   d1       d2          areax       betax
:
A       1  B     1  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 0.000E+00  0
A       2  B     2  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 0.000E+00  0
A       3  B     3  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 0.000E+00  0
CC     22  DD   22  0   0   0   1  2.500E-03 2.500E-03 4.477E-05 0.000E+00  0
CC     23  DD   23  0   0   0   1  2.500E-03 2.500E-03 4.477E-05 0.000E+00  0
CC     24  DD   24  0   0   0   1  2.500E-03 2.500E-03 4.477E-05 0.000E+00  0
A       1  A     2  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 1.000E+00  0
A       2  A     3  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 1.000E+00  0
A       3  A     4  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 1.000E+00  0
```

```
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne sl ns nsq nad nads ltb  itp    itb    gx          ex          hg
A     9 HOT  1    0   0   0  29 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  1.260000E+03  2.880000E+03  3.360000E+03
  3.720000E+03  4.500000E+03  5.160000E+03  5.760000E+03
  7.920000E+03  1.044000E+04  1.056000E+04  1.212000E+04
  1.332000E+04  1.446000E+04  1.566000E+04  1.572000E+04
  1.674000E+04  1.938000E+04  2.046000E+04  2.154000E+04
  2.262000E+04  2.502000E+04  2.742000E+04  8.202000E+04
  9.390000E+04  1.114200E+05  1.773600E+05  6.064800E+05
  6.064810E+05
  8.800000E-02  1.045000E-01  1.030000E-01  1.132500E-01
  1.130000E-01  1.162500E-01  1.177500E-01  1.180000E-01
  1.177500E-01  1.170000E-01  1.320000E-01  1.312500E-01
  1.477500E-01  1.480000E-01  1.467500E-01  1.652500E-01
  1.655000E-01  1.625000E-01  1.630000E-01  1.632500E-01
  1.647500E-01  1.665000E-01  1.647500E-01  1.662500E-01
  1.630000E-01  1.622500E-01  1.592500E-01  1.625000E-01
  0.000000E-00
B    18 HOT  1    0   0   0  29 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  1.260000E+03  2.880000E+03  3.360000E+03
  3.720000E+03  4.500000E+03  5.160000E+03  5.760000E+03
  7.920000E+03  1.044000E+04  1.056000E+04  1.212000E+04
  1.332000E+04  1.446000E+04  1.566000E+04  1.572000E+04
  1.674000E+04  1.938000E+04  2.046000E+04  2.154000E+04
  2.262000E+04  2.502000E+04  2.742000E+04  8.202000E+04
  9.390000E+04  1.114200E+05  1.773600E+05  6.064800E+05
  6.064810E+05
  2.640000E-01  3.135000E-01  3.090000E-01  3.397500E-01
  3.390000E-01  3.487500E-01  3.532500E-01  3.540000E-01
  3.532500E-01  3.510000E-01  3.960000E-01  3.937500E-01
  4.432500E-01  4.440000E-01  4.402500E-01  4.957500E-01
  4.965000E-01  4.875000E-01  4.890000E-01  4.897500E-01
  4.942500E-01  4.995000E-01  4.942500E-01  4.987500E-01
  4.890000E-01  4.867500E-01  4.777500E-01  4.875000E-01
  0.000000E-00
                                :reqd blank line
:
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: el ne   nsq nadd        porx
A       1    0    0   0.0
:
:          x1                  x2                  x3
      1.00000000E+05        0.70        2.50000000E+01
B       1    0    0   0.0
      1.00000000E+05        0.70        2.50000000E+01
```

6 pcs
10X 700
HIGH.
SEE AJ
279

1-12-95
MR

"real-powerϕ1i" WENT THROUGH 9999 TIMESTEPS - MADE IT TO $\simeq 10^{-6}$ yrs

"real-powerϕ2i" - NEW INPUT FILE - IDENTICAL TO "real-powerϕ1i" EXCEPT PERTURBATION = 5×10^{-15}.

- BEGIN RUNNING "real-powerϕ2i" $\simeq$ 0750 IN: /home2/sisyphus/grice/cg11/cg1-1-95/vary-power

- NOW FILE: "newGenerϕ4i" - IDENTICAL TO "newbaseϕ4i" EXCEPT HAS GENER AS SHOWN ON pg 275

- KILLED "real-powerϕ2i" $\simeq$ 0900, TIMESTEPS = 803, TIME = 7.96×10^{-7}, $\Delta t = 1.6 \times 10^{-9}$

- NEW FILE: "mod-powerϕ1i" - IDENTICAL TO "real-powerϕ1i" EXCEPT USES GENER TABLE AS SHOWN ON NEXT PAGE

- BEGIN RUNNING "mod-powerϕ1i" $\simeq$ 0950 IN: /home2/sisyphus/grice/cg11/cg1-1-95/VARY-Power KILLED $\simeq$ 1030 - TIMESTEP = 455, TIME = 3.5×10^{-7}, $\Delta t = 2.9 \times 10^{-10}$

- NEW FILE: "Mod-mod-powerϕ1i" - IDENTICAL TO "real-powerϕ1i" EXCEPT "GENER" AS SHOWN ON NEXT PAGE. IN:

/home2/sisyphus/grice/cg11/cg1-1-95/vary-power

NOTE - POWER INPUT ABOVE = 10X TOO HIGH.

1-12-95
MR

CORRECTED POWER INPUT FOR TUFF CYLINDER INPUT, 10-31 TO 11-7-94 MR-HG

```
.
GENER----1----*----2----*----3----*----4----*----5----*--
: el ne sl ns nsq nad nads ltb  itp   itb    gx          ex
A    9 HOT  1    0   0   0  29 HEAT    b  0.000E+00 0.000
  0.000000E+00  1.260000E+03  2.880000E+03  3.360000E+03
  3.720000E+03  4.500000E+03  5.160000E+03  5.760000E+03
  7.920000E+03  1.044000E+04  1.056000E+04  1.212000E+04
  1.332000E+04  1.446000E+04  1.566000E+04  1.572000E+04
  1.674000E+04  1.938000E+04  2.046000E+04  2.154000E+04
  2.262000E+04  2.502000E+04  2.742000E+04  8.202000E+04
  9.390000E+04  1.114200E+05  1.773600E+05  6.064800E+05
  6.064810E+05
  8.800000E-03  1.045000E-02  1.030000E-02  1.132500E-02
  1.130000E-02  1.162500E-02  1.177500E-02  1.180000E-02
  1.177500E-02  1.170000E-02  1.320000E-02  1.312500E-02
  1.477500E-02  1.480000E-02  1.467500E-02  1.652500E-02
  1.655000E-02  1.625000E-02  1.630000E-02  1.632500E-02
  1.647500E-02  1.665000E-02  1.647500E-02  1.662500E-02
  1.630000E-02  1.622500E-02  1.592500E-02  1.625000E-02
  0.000000E-00
B    9 HOT  1    0   0   0  29 HEAT    b  0.000E+00 0.000
  0.000000E+00  1.260000E+03  2.880000E+03  3.360000E+03
  3.720000E+03  4.500000E+03  5.160000E+03  5.760000E+03
  7.920000E+03  1.044000E+04  1.056000E+04  1.212000E+04
  1.332000E+04  1.446000E+04  1.566000E+04  1.572000E+04
  1.674000E+04  1.938000E+04  2.046000E+04  2.154000E+04
  2.262000E+04  2.502000E+04  2.742000E+04  8.202000E+04
  9.390000E+04  1.114200E+05  1.773600E+05  6.064800E+05
  6.064810E+05
  2.640000E-02  3.135000E-02  3.090000E-02  3.397500E-02
  3.390000E-02  3.487500E-02  3.532500E-02  3.540000E-02
  3.532500E-02  3.510000E-02  3.960000E-02  3.937500E-02
  4.432500E-02  4.440000E-02  4.402500E-02  4.957500E-02
  4.965000E-02  4.875000E-02  4.890000E-02  4.897500E-02
  4.942500E-02  4.995000E-02  4.942500E-02  4.987500E-02
  4.890000E-02  4.867500E-02  4.777500E-02  4.875000E-02
  0.000000E-00
```

MR 1-12-95

- BEGIN RUNNING CORRECTED "real-powerϕ1i" $\simeq$ 1115 IN:

/home2/sisyphus/grice/cg11/cg1-1-95/vary-power

1-13-95 MR

OUTPUT "real-powerϕ1i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
3.15	101710	100000	28.3
31.5	118620	100000	55.1
315	345620	100000	132
3154	216860	100000	197
31536	140710	100000	305
94608	117030	100000	303
220750	108730	100000	298
315360	106550	100000	299

1-13-95 MR

NEW FILE: "real-powerϕ2i" - IDENTICAL TO "real-powerϕ1i" EXCEPT THERMAL CONDUCTIVITY OF BOUNDARIES = 0.4

NEW FILE: "60% Powerϕ1i" - IDENTICAL TO "real-powerϕ2i" - IDENTICAL TO "real-powerϕ1i" EXCEPT POWER REDUCED TO 60% OF ACTUAL (SEE BELOW AND NEXT PAGE) AND WATER SATURATION = 70%

```
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne sl ns nsq nad nads ltb  itp    itb    gx          ex          hg
A    9 HOT  1    0    0    0 29 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  1.260000E+03  2.880000E+03  3.360000E+03
  3.720000E+03  4.500000E+03  5.160000E+03  5.760000E+03
  7.920000E+03  1.044000E+04  1.056000E+04  1.212000E+04
  1.332000E+04  1.446000E+04  1.566000E+04  1.572000E+04
  1.674000E+04  1.938000E+04  2.046000E+04  2.154000E+04
  2.262000E+04  2.502000E+04  2.742000E+04  8.202000E+04
  9.390000E+04  1.114200E+05  1.773600E+05  6.064800E+05
  6.064810E+05
  5.280000E-03  6.270000E-03  6.180000E-03  6.795000E-03
  6.780000E-03  6.975000E-03  7.065000E-03  7.080000E-03
  7.065000E-03  7.020000E-03  7.920000E-03  7.875000E-03
  8.865000E-03  8.880000E-03  8.805000E-03  9.915000E-03
  9.930000E-03  9.750000E-03  9.780000E-03  9.795000E-03
  9.885000E-03  9.990000E-03  9.885000E-03  9.975000E-03
  9.780000E-03  9.735000E-03  9.555000E-03  9.750000E-03
  0.000000E-00
```

60% POWER

MR 1-13-95

IN: /home2/sisyphus/grice/cg1/cg1-1-95/vary-power

1-13-95 MR

"GENER" INPUT FOR "60% powerϕ1i" (cont)

```
B   12 HOT  1    0    0    0 29 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.00000E+00  1.260000E+03  2.880000E+03  3.360000E+03
  3.72000E+03  4.500000E+03  5.160000E+03  5.760000E+03
  7.92000E+03  1.044000E+04  1.056000E+04  1.212000E+04
  1.33200E+04  1.446000E+04  1.566000E+04  1.572000E+04
  1.67400E+04  1.938000E+04  2.046000E+04  2.154000E+04
  2.26200E+04  2.502000E+04  2.742000E+04  8.202000E+04
  9.39000E+04  1.114200E+05  1.773600E+05  6.064800E+05
  6.06481E+05
  1.58400E-02  1.881000E-02  1.854000E-02  3.038500E-02
  2.03400E-02  2.092500E-02  2.119500E-02  2.124000E-02
  2.11950E-02  2.106000E-02  2.376000E-02  2.362500E-02
  2.65950E-02  2.664000E-02  2.641500E-02  2.974500E-02
  2.97900E-02  2.925000E-02  2.934000E-02  2.938500E-02
  2.96550E-02  2.997000E-02  2.996550E-02  2.992500E-02
  2.93400E-02  2.920500E-02  2.866500E-02  2.925000E-02
  0.00000E-00
```

60% power

MR 1-13-95

OUTPUT: "60% Powerϕ1i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
31.5	104920	100000	41.9
158	124170	100000	73.7
315	142520	100000	87.6
946	190300	100000	108
2208	240800	100000	119
3154	301460	100000	130
9461	227340	100000	137
22075	246700	100000	183
31536	232300	100000	185
94608	153580	100000	184
157680	134000	100000	182
220,75	129510	100000	181

NEW FILE: "60% Powerϕ2i" - IDENTICAL TO "60% Powerϕ1i" EXCEPT WATER SATURATION = 80% & INITIAL TEMPERATURE = 22°C

BEGIN RUNNING ≈ 1305 IN:

/home/skippy/ngreen/cg1-1-95

MR 1-13-95

1-13-95 JL

OUTPUT: "60% Power φ2i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
31.5	103240	100000	38.7
158	115160	100000	70.2
315	128100	100000	84.1
1577	198530	100000	113
2365	213910	100000	116
3154	269530	100000	127
6307	291250	100000	133
9461	254690	100000	133

SEE Page 291 FOR OUTPUT

MR 1-13-95

NEW FILE: "60% Power φ3i" - IDENTICAL TO "60% Power φ2i" EXCEPT K_{sat} = 5×10^{-15} - BEGIN RUNNING ≈ 1500 IN: /home2/sisyphus/grice/cyl/cyl-1-95/vary-power

• NEW FILE: "55% Power φ1i" IDENTICAL TO "60% Power φ2i" EXCEPT "GRACE" REDUCED TO 55% OF RECORDED HEAT INPUT IN: /home2/sisyphus/grice/cyl/cyl-1-95/55%power

• NEW FILE: "55% Power φ2i" - IDENTICAL TO 55% Power φ1i" EXCEPT AFTER SATURATION = 50% INSTEAD OF 80%. IN: /home/skiffy/rgreen/cyl-1-95

SEE Page 284

1-14-95 MR

OUTPUT: "55% Power φ1i" - NOTE - SIMULATION STOPPED AFTER TIME = 1.886×10^{-2} yr, TIMESTEP = 1153, $\Delta t = 1.012 \times 10^{-3}$

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
31.5	102870	100000	37.2
158	112310	100000	66.0
315	122170	100000	78.8
946	149800	100000	97.4
2208	181250	100000	108
3154	221580	100000	118
9461	247660	100000	123
22,075	307980	100000	165
31,536	267220	100000	167
94,608	196560	100000	166
157,680	188720	100000	164
220,750	176730	100000	164
315,360	158850	100000	165

OUTPUT: "55% Power φ2i" - NOTE STOPPED ≈ 1.7×10^{-2} YRS

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
31.5	105600	100000	37.9
158	126420	100000	67.4
315	144280	100000	80.2
946	184770	100000	98.7
2208	220450	100000	109
3154	247160	100000	120
9461	177980	100000	126
22075	164030	100000	168
31536	144620	100000	170
94608	119080	100000	169
157680	113450	100000	167
220750	110600	100000	166
315360	108610	100000	167

1-14-95 NL

- BEGIN RE-RUNNING "55% power φ2i" WITH DIFFERENT REPORTING "TIMES" - NO OTHER CHANGES IN: /home/SLIPPY/rgreen/cg1-1-95 - WILL FTP OUTPUT TO SISYPHUS.
- BEGIN RE-RUNNING "55% power φ1i" WITH DIFFERENT times IN "TIMES" - no OTHER CHANGES IN: /home2/sisyphus/grice/cg1/cg1-1-95/55%power
- NEW FILE: "55% power φ3i" IDENTICAL TO "55% power φ1i" EXCEPT PERMEABILITY = 5×10^{-15} m². IN: /usr2/sheedy/rgreen/grice ...

OUTPUT: "55% power φ1i" - RE-RUN.

TIME (S)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
100	107910	100000	56.9
1000	152020	100000	98.4 ~~98.4~~ 1-14-95 NR
3000	194710	100000	111
5000	250560	100000	122
7500	254980	100000	124
10,000	244990	100000	123
12,000	265040	100000	135
14,000	284830	100000	149
16,000	320940	100000	161
18,000	335510	100000	164
20,000	319310	100000	164
22,000	308220	100000	165
26,000	288690	100000	167
30,000	270810	100000	167
50,000	236070	100000	168
100000	196260	100000	166
315360	158860	100000	165

1-14-95 NR

OUTPUT: "55% power φ2i" = TUFF EXPERIMENT BASECASE → CHANGED, SEE PAGE 289 NR 1-14-94

TIME (S)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
100	117410	100000	58.3
1000	187650	100000	97.8
2000	218400	100000	109
3000	225780	100000	113
4000	198930	100000	123
5000	199680	100000	125
6000	200620	100000	126
7000	197300	100000	126
8000	190940	100000	126
9000	182280	100000	126
10,000	173140	100000	126
15,000	176300	100000	153
20,000	172940	100000	167
50,000	131080	100000	171
100000	118180	100000	169
150,000	113940	100000	167
315,360	108620	100000	167

NEW FILE: "55% power φ4i" - IDENTICAL TO "55% power φ2i" EXCEPT VAN GENUCHTEN α = 2.24E-7.

IN: /home2/sisyphus/grice/cg1/cg1-1-95/55%power

NR 1-14-95

1-14-95 INPUT: "55% POWER φ2i"

```
tuff experiment, cyl,1/14/95,20 heat elements, Power input 55% as recorded duffn
: experiment, Water Saturation = 50% Therm Cond of Boundaries = 0.4
:
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr1  2  2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 4.000E-01 1.000E+04
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  4.0000E-01  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+00 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr2  2  2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 1.900E+00 8.400E+02
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr3  2  2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 4.000E-01 1.000E+04
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  4.000E-01  5.0000E-01
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por       permx     permy     permz     cwet      spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 4.000E-01 1.000E+04
:
:   comp        expan        cdry       tortx
  0.0000E+00  0.0000E+00  4.0000E-01  0.0000E+00
: irp   rp(1)      rp(2)      rp(3)      rp(4)      rp(5)      rp(6)      rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)      cp(2)      cp(3)      cp(4)      cp(5)      cp(6)      cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-05 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
                                    :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo      texp       (mop(i),i   =1,17)
:                                            1 2 3 4 5 6 7 8 9 10111213141516 17
  0  1  9999   0  550  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:    tstart       timax      deltn      deltmx     elst      gf         redlt      scale
 0.000E+00  1.000E-02 -1.000E+00  0.000E+00  B  1  9.807E+00 0.000E+00 0.000E+00
:      dlt(i)..
 1.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
:
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:  iti  ite    delaf       tinter
   16   16  3.1700E+00  2.0000E+00
:  tis(1)     tis(2)     tis(3) .....
 3.171E-06 3.171E-05 6.342E-05 9.513E-05 1.268E-04 1.585E-04 1.903E-04 2.220E-04
 2.537E-04 2.854E-04 3.171E-04 4.756E-04 6.342E-04 1.585E-03 3.171E-03 4.756E-03
ELEME----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne   nsq  nad mal ma2     volx
:
A       1     0     0  matr1    3.9270E+09
A       2     0     0  matr2    3.9270E-09
A      22     0     0  matr2    3.9270E-09
A      23     0     0  matr2    3.9270E-09
A      24     0     0  matr3    3.9270E+09
B       1     0     0  matr1    1.1780E+08
B       2     0     0  matr2    1.1780E-08
B      23     0     0  matr2    1.1780E-08
B      24     0     0  matr3    1.1780E+08
C       1     0     0  matr1    1.9630E+08
C       2     0     0  matr2    1.9630E-08
DD     23     0     0  matr4    2.3170E+05
DD     24     0     0  matr4    2.3170E+05
```


1-14-95 INPUT: "55% power φ2i" (cont)

```
CONNE----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el n1 e2   n2 nsq nd1 nd2 isot   d1        d2        area      betax
A     1  B    1  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 0.000E+00  0
A     2  B    2  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 0.000E+00  0
A     3  B    3  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 0.000E+00  0
CC   23  DD  23  0   0   0   1  2.500E-03 2.500E-03 4.477E-05 0.000E+00  0
CC   24  DD  24  0   0   0   1  2.500E-03 2.500E-03 4.477E-05 0.000E+00  0
A     1  A    2  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 1.000E+00  0
A     2  A    3  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 1.000E+00  0
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne sl ns nsq nad nads ltb  itp    itb    gx         ex         hg
A    9 HOT  1    0   0   0  29 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  1.260000E+03  2.880000E+03  3.360000E+03
  3.720000E+03  4.500000E+03  5.160000E+03  5.760000E+03
  7.920000E+03  1.044000E+04  1.056000E+04  1.212000E+04
  1.332000E+04  1.446000E+04  1.566000E+04  1.572000E+04
  1.674000E+04  1.938000E+04  2.046000E+04  2.154000E+04
  2.262000E+04  2.502000E+04  2.742000E+04  8.202000E+04
  9.390000E+04  1.114200E+05  1.773600E+05  6.064800E+05
  6.064810E+05
  4.840000E-03  5.750000E-03  5.660000E-03  6.230000E-03
  6.220000E-03  6.390000E-03  6.480000E-03  6.490000E-03
  6.480000E-03  6.440000E-03  7.260000E-03  7.220000E-03
  8.130000E-03  8.140000E-03  8.070000E-03  9.090000E-03
  9.100000E-03  8.940000E-03  8.960000E-03  8.980000E-03
  9.060000E-03  9.160000E-03  8.970000E-03  9.140000E-03
  8.960000E-03  8.920000E-03  8.760000E-03  8.940000E-03
  0.000000E-00
B   12 HOT  1    0   0   0  29 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.00000E+00  1.260000E+03  2.880000E+03  3.360000E+03
  3.72000E+03  4.500000E+03  5.160000E+03  5.760000E+03
  7.92000E+03  1.044000E+04  1.056000E+04  1.212000E+04
  1.33200E+04  1.446000E+04  1.566000E+04  1.572000E+04
  1.67400E+04  1.938000E+04  2.046000E+04  2.154000E+04
  2.26200E+04  2.502000E+04  2.742000E+04  8.202000E+04
  9.39000E+04  1.114200E+05  1.773600E+05  6.064800E+05
  6.06481E+05
  1.45000E-02  1.720000E-02  1.700000E-02  2.790000E-02
  1.86000E-02  1.920000E-02  1.940000E-02  1.950000E-02
  1.94000E-02  1.930000E-02  2.180000E-02  2.170000E-02
  2.44000E-02  2.440000E-02  2.420000E-02  2.730000E-02
  2.73000E-02  2.680000E-02  2.690000E-02  2.690000E-02
  2.72000E-02  2.750000E-02  2.750000E-02  2.740000E-02
  2.69000E-02  2.680000E-02  2.630000E-02  2.680000E-02
  0.00000E-00
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne   nsq nadd       porx
A       1    0    0   0.0
:            x1                  x2                  x3
       1.00000000E+05      0.50        2.20E+01
B       1    0    0   0.0
       1.00000000E+05      0.50        2.20E+01
```

OUTPUT: "55% power φ3i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
100	100090	100000	55.7
1000	102040	100000	96.5
3000	121140	100000	105
5000	138820	100000	109
7500	140650	100000	110
10,000	140110	100000	109
12,000	157570	100000	114

1-14-95 MC

OUTPUT: "55% powerϕ5i" (CONT)

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
14000	173410	100000	120
16000	185850	100000	128
18000	181130	100000	133
20,000	179700	100000	133
22,000	179700	100000	134
26,000	180610	100000	137
30,000	179750	100000	137
50,000	179910	100000	137
100,000	178890	100000	134
315360	178510	100000	131

MOST MC 1-14-95

NOTE - ALL RUNS DONE ON SKIPPY HAVE BEEN FTP'd TO:

/usr2/sneezy/rgreen/grice/cyl1-95/from-skippy

OUTPUT: "55% Powerϕ4i" = BASECASE

TIME (S)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
100	113000	100000	58.2
1000	166150	100000	99.8
2000	179810	100000	109
3000	183500	100000	113
4000	192640	100000	123
5000	191200	100000	124
6000	189320	100000	125
7000	185890	100000	125
8000	182950	100000	125

1-14-95 MC

OUTPUT "55% Powerϕ4i" (CONT)

TIME (S)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
9000	180400	100000	125
10,000	178260	100000	125
15,000	202720	100000	157
20,000	200310	100000	165
50000	174720	100000	168
100,000	164610	100000	166
150,000	162430	100000	164
315,360	161430	100000	164

NEW BASECASE

1-15-95 AR

- RE-RUN - "55% powerϕ4i" - DIFFERENT REPORTING TIMES.

- NEW FILE "55% powerϕ5i" - IDENTICAL TO "55% powerϕ4i" EXCEPT PERMEABILITY = 5×10^{-15} m^2. IN: /usr2/sneezy/rgreen/grice/cyl1-95/55%power

- OUTPUT: "55%Powerϕ5i"

TIME (S)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
100	100150	100000	56.7
1000	101770	100000	99.6
3000	107320	100000	111
5000	119870	100000	118
8000	121350	100000	119
10,000	120880	100000	118
12,000	135590	100000	125
14,000	150190	100000	134
15,000	150550	100000	134
18,000	163610	100000	144

1-15-95
SL

OUTPUT: "55% Power φ5i" (cont)

TIME (s)	~~MAX~~ 1-15 MAX GAS ~~PRESSURE~~ PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
20,000	162650	100000	143
50,000	164690	100000	145
100,000	162760	100000	144
150,000	161260	100000	142
200,000	160300	100000	141
500,000	161820	100000	143

NEW FILE: "55% power φ6i" IDENTICAL TO "55% POWER φ2i" EXCEPT VAN GENUCHTEN ALPHA = 2.24×10^{-5} IN:
~~from~~ SL 1-15-95
/usr2/sneezy/rgreen/grice/cg/1-95/55%power

OUTPUT - Re-run of "55% Power φ4i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
100	113000	100000	58.2
1000	116150	100000	99.8
3000	183390	100000	113
5000	191280	100000	124
8000	183000	100000	125
10,000	178300	100000	125
12,000	193850	100000	137
14,000	209160	100000	151
15,000	202,720	100000	151
18,000	209,500	100000	~~160~~ 166
20,000	200,310	100000	165
50,000	174,720	100000	168
100,000	164610	100000	166
150000	162430	100000	164
200000	161630	100000	163
500000	161440	100000	165
315,360	161430	100000	164

. VAR16?
. VAR17?

1-15-95
SL

OUTPUT: "55% power φ6i"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
100	101840	100000	56.7
1000	104900	100000	98.6
3000	107500	100000	112
5000	111090	100000	124
8000	110970	100000	125
10,000	110570	100000	125
12,000	116500	100000	137
14,000	125760	100000	151
15,000	125540	100000	151
18,000	137480	100000	166
20,000	135720	100000	165
50,000	136680	100000	168
100,000	134550	100000	165
150,000	133020	100000	163
200,000	132170	100000	162
500,000	133680	100000	164

NEW INPUT FILE: "55% power φ7i" - IDENTICAL TO "55% power φ4i" EXCEPT THERMAL CONDUCTIVITIES OF BOUNDARIES = 0.2

OUTPUT: "60% Power φ2i" (CONTINUED FROM pg 282)

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
12,614	285,310	100000	150
15,768	357,810	100000	168
18922	350,080	100000	177
22,075	315,910	100000	178
25,229	316,540	100000	181
31,536	285,630	100000	181
315,360	147,540	100000	178

1-15-95 MR

NEW FILE: "60% compareϕ1i" - IDENTICAL TO BASECASE ("55% powerϕ4i") EXCEPT POWER AT 60% OF MEASURED POWER INPUT

- BEGIN RUNNING "60% compareϕ1i" ~ 1340 IN: /home2/sisyphus/grice/eg//cyl-1-95/compare
- NEW FILE "55% compareϕ1i" - IDENTICAL TO BASECASE ("55% powerϕ4i")

OUTPUT: "55% powerϕ7i"

TIME (s)	MAX GAS PRESSURE (P_a)	MIN GAS PRESSURE (P_a)	MAX TEMPERATURE (°C)
100	113000	100000	58.2
1000	166420	100000	99.9
3000	185470	100000	114
5000	194310	100000	126
8000	186050	100000	127
10,000	181150	100000	127
12,000	196620	100000	139
14,000	211990	100000	153
15,000	205530	100000	154
18,000	212230	100000	169
20,000	202850	100000	168
50,000	175020	100000	171
100,000	164,060	100000	169
150,000	161370	100000	167
200,000	160810	100000	166
500,000	160 520	100000	168

- BEGIN RUNNING "55% compareϕ1i" ~ 1515 IN: /home2/sisyphus/grice/eg//cyl-1-95/compare

MR 1-15-95

1-15-95 MR

INPUT "55% COMPAREϕ1i" - IDENTICAL TO BASECASE, DIFFERENT REPORTING TIMES

MR 1/15/95

```
tuff experiment, cyl,1/15/95,20 heat elements, Power input 55% as recorded durin
: experiment, Water Saturation = 50% Therm Cond of Boundaries = 0.4
: van Genuchten alpha = 2.24E-7
ROCKS----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr1  2  2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 4.000E-01 1.000E+04
:
:   comp        expan        cdry      tortx
  0.0000E+00  0.0000E+00  4.0000E-01  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-07 1.0000E+00 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr2  2  2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 1.900E+00 8.400E+02
:
:   comp        expan        cdry      tortx
  0.0000E+00  0.0000E+00  1.7400E+00  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr3  2  2.580E+03 7.000E-02 5.000E-17 5.000E-17 5.000E-17 4.000E-01 1.000E+04
:
:   comp        expan        cdry      tortx
  0.0000E+00  0.0000E+00  4.000E-01  5.0000E-01
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
:
: mat  nad   drock      por      permx     permy     permz     cwet      spht
matr4  2  2.500E+03 1.000E-04 4.000E-90 0.000E+00 0.000E+00 4.000E-01 1.000E+04
:
:   comp        expan        cdry      tortx
  0.0000E+00  0.0000E+00  4.0000E-01  0.0000E+00
: irp   rp(1)       rp(2)       rp(3)       rp(4)       rp(5)       rp(6)       rp(7)
  7 2.0600E-01 0.0000E+00 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
: icp   cp(1)       cp(2)       cp(3)       cp(4)       cp(5)       cp(6)       cp(7)
 11 2.0600E-01 0.0000E+00 2.2400E-07 1.0000E+05 1.0000E+00 1.0000E-01 0.0000E+00
                                        :reqd blank line
:
PARAM----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:noit kdt cyc sec  cypr  diffo     texp      (mop(i),i   =1,17)
:                                          1 2 3 4 5 6 7 8 9 10111213141516 17
  0  1  9999   0  550  2.1300E-05 1.8000E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1
:   tstart       timax      deltn     deltmx    elst      gf        redlt      scale
 0.000E+00  3.171E-02 -1.000E+00  0.000E+00  B  1  9.807E+00 0.000E+00 0.000E+00
:     dlt(i)..
 1.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
:
:   rel        re2        u          wup       wnr       dfac
 1.000E-05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E-08
TIMES----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
:  iti  ite   delaf       tinter
```

MR 1-15-95

```
   24   24  3.1700E+00  2.0000E+00
:
:  tis(1)     tis(2)     tis(3) .....
 3.171E-06 3.171E-05 1.585E-04 3.171E-04 3.805E-04 4.439E-04 5.074E-04 5.708E-04
 6.342E-04 6.976E-04 7.610E-04 8.245E-04 8.879E-04 1.015E-03 1.142E-03 1.268E-03
 1.427E-03 1.585E-03 1.903E-03 2.537E-03 3.171E-03 6.342E-03 1.268E-02 2.537E-02
ELEME----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne   nsq  nad mat mat2    volx
:
A       1     0     0  matr1    3.9270E+09
A       2     0     0  matr2    3.9270E-09
A       3     0     0  matr2    3.9270E-09
A      23     0     0  matr2    3.9270E-09
A      24     0     0  matr3    3.9270E+09
B       1     0     0  matr1    1.1780E+08
DD     23     0     0  matr4    2.3170E+05
DD     24     0     0  matr4    2.3170E+05
```

MR 1-15-95

1-15-95 INPUT: "55% compare ϕ i"

AR

```
CONNE----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el n1 e2   n2 nsq nd1 nd2 isot   d1        d2          areax       betax
:
A     1  B     1  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 0.000E+00   0
A     2  B     2  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 0.000E+00   0
A    17  A    18  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 1.000E+00   0
A    18  A    19  0   0   0   1  2.500E-03 2.500E-03 7.854E-07 1.000E+00   0
DD   23  DD   24  0   0   0   1  2.500E-03 2.500E-03 4.634E-05 1.000E+00   0
GENER----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
: el ne sl ns nsq nad nads ltb  itp    itb    gx          ex          hg
A    9 HOT  1    0   0   0  29 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.000000E+00  1.260000E+03  2.880000E+03  3.360000E+03
  3.720000E+03  4.500000E+03  5.160000E+03  5.760000E+03
  7.920000E+03  1.044000E+04  1.056000E+04  1.212000E+04
  1.332000E+04  1.446000E+04  1.566000E+04  1.572000E+04
  1.674000E+04  1.938000E+04  2.046000E+04  2.154000E+04
  2.262000E+04  2.502000E+04  2.742000E+04  8.202000E+04
  9.390000E+04  1.114200E+05  1.773600E+05  6.064800E+05
  6.064810E+05
  4.840000E-03  5.750000E-03  5.660000E-03  6.230000E-03
  6.220000E-03  6.390000E-03  6.480000E-03  6.490000E-03
  6.480000E-03  6.440000E-03  7.260000E-03  7.220000E-03
  8.130000E-03  8.140000E-03  8.070000E-03  9.090000E-03
  9.100000E-03  8.940000E-03  8.960000E-03  8.980000E-03
  9.060000E-03  9.160000E-03  8.970000E-03  9.140000E-03
  8.960000E-03  8.920000E-03  8.760000E-03  8.940000E-03
  0.000000E-00
B   12 HOT  1    0   0   0  29 HEAT    b  0.000E+00 0.000E+00 0.000E+00
  0.00000E+00  1.260000E+03  2.880000E+03  3.360000E+03
  3.72000E+03  4.500000E+03  5.160000E+03  5.760000E+03
  7.92000E+03  1.044000E+04  1.056000E+04  1.212000E+04
  1.33200E+04  1.446000E+04  1.566000E+04  1.572000E+04
  1.67400E+04  1.938000E+04  2.046000E+04  2.154000E+04
  2.26200E+04  2.502000E+04  2.742000E+04  8.202000E+04
  9.39000E+04  1.114200E+05  1.773600E+05  6.064800E+05
  6.06481E+05
  1.45000E-02  1.720000E-02  1.700000E-02  2.790000E-02
  1.86000E-02  1.920000E-02  1.940000E-02  1.950000E-02
  1.94000E-02  1.930000E-02  2.180000E-02  2.170000E-02
  2.44000E-02  2.440000E-02  2.420000E-02  2.730000E-02
  2.73000E-02  2.680000E-02  2.690000E-02  2.690000E-02
  2.72000E-02  2.750000E-02  2.750000E-02  2.740000E-02
  2.69000E-02  2.680000E-02  2.630000E-02  2.680000E-02
|
  0.00000E-00
```

AR 1-15-95

```
INCON----1----*----2----*----3----*----4----*----5----*----6----*----7----*----8
:
: el ne   nsq nadd       porx
A     1    0    0   0.0
:
:          x1                  x2                  x3
      1.00000000E+05        0.50        2.20E+01
B     1    0    0   0.0
      1.00000000E+05        0.50        2.20E+01
C     1    0    0   0.0
      1.00000000E+05        0.50        2.20E+01
```

AR 1-15-95

- New File: "55% compare ϕ 2 i" - IDENTICAL TO "55% compare ϕ 1 i" EXCEPT SATURATION = 80%

AR 1-15-95

1-15-95 OUTPUT: "60% compare ϕ i"

AR

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
100	115520	100000	61.6
1000	181930	100000	107
5000	202720	100000	133
10,000	186320	100000	134
12,000	201890	100000	147
14,000	217,710	100000	162
16,000	239,540	100000	176
18,000	215,760	100000	179
20,000	205,480	100000	178
22,000	201,560	100000	179
24,000	199,320	100000	181
26,000	195,600	100000	182
28000	191,920	100000	182
32000	187,260	100000	182
36000	183,800	100000	182
40,000	181,130	100000	182
45,000	178,450	100000	182
50,000	176,320	100000	182
60,000	173,110	100000	182
85,000	169,110	100000	182
AR 1-15-95			
400,000	161930	100000	177

AR 1-15-95

-15-95 MR

OUTPUT: "55% compare φ ii" — BASE CASE — SAME AS BEFORE — DIFFERENT REPORTING TIMES

TIME (S)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
100	113000	100000	58.2
~~10000~~ 1000	166150	100000	99.8
5000	191040	100000	124
10,000	178370	100000	125
12,000	193860	100000	137
14,000	209170	100000	151
16,000	229600	100000	163
18,000	209510	100000	166
20,000	200320	100000	165
22,00	196730	100000	166
24,000	195360	100000	168
26,000	191860	100000	168
28,000	188300	100000	168
32,000	184360	100000	168
36,000	181330	100000	~~168~~ MR 1-15-95 168
40,000	178940	100000	168
45,000	176560	100000	168
50,000	174,640	100000	168
60,000	171,770	100000	168
80,000	168,190	100000	169
400,000	161,340	100000	164

NEW FILE: "55% compare φ3i" — IDENTICAL TO "55% compare φ1i" EXCEPT PERMEABILITY = 5×10^{-15} m². IN:

/home2/sisyphus/grice/cyl/cy1-1-95/compare

1-15-95 MR

NEW FILE: "55% compare φ4i" — IDENTICAL TO ~~"55% φ4"~~ MR 1-15-95 "55% compare φ1i" EXCEPT IN CONCRETE $\alpha = 2.24 \times 10^{-5}$ INSTEAD OF 2.24×10^{-7} IN:

/usr2/sneezy/rgreen/grice/cy11-95/compare

OUTPUT: "55% compare φ2i" — 80% SAT.

TIME (S)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMP (°C)
100	107570	100000	56.9
1000	152020	100000	98.4
5000	232390	100000	122
10,000	236340	100000	123
12,000	306400	100000	134
14,000	419020	100000	147
16,000	544300	100000	157
18,000	575870	100000	160
20,000	564400	100000	159
22,000	572,480	100000	160
24,000	592300	100000	162
26,000	597,650	100000	162
28,000	589,280	100000	161
32,000	589,470	100000	161
36,000	590,090	100000	161
40,000	590,740	100000	161
45,000	591,620	100000	162
50,000	592430	100000	162
60,000	593,940	100000	162
80,000	597,160	100000	162
400,000	547,910	100000	158
70,000	595540	100000	162
75000	596 530	100000	162
85000	591 230	100000	162
90000	578 380	100000	161
100,000	565 410	100000	159
110000	561 890	100000	159
120000	557 580	100000	159
150000	549910	100000	158
200000	533840	100000	157

NOTE, REDO FOR PERIOD 70,000 - 150,000 SECONDS →

-15-95 MR

NEW FILE: "55% compared5i" - IDENTICAL TO "55% compared1i" EXCEPT THERMAL CONDUCTIVITY OF BOUNDARIES = 0.2 INSTEAD OF 0.4 - IN:

/home2/sisyphus/grice/cg1/cg1-1-95/compare

OUTPUT: "55% compared3i" - 5×10^{-15}

TIME (S)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
100	100150	100000	56.7
1000	101770	100000	97.6
5000	119890	100000	118
10,000	121020	100000	119
12,000	135590	100000	125
14,000	150190	100000	134
16,000	162020	100000	142
18,000	163560	100000	144
20,000	162650	100000	143
22,000	163180	100000	144
24,000	164720	100000	145
26,000	165180	100000	146
28,000	164480	100000	145
32,000	164500	100000	145
36,000	164550	100000	145
40,000	164600	100000	145
45,000	164670	100000	145
50,000	164740	100000	145
60,000	164860	100000	145
80,000	165090	100000	146
400,000	161290	100000	142

1-15-95 MR

OUTPUT: "55% compared4i" - HIGH & LOW ATM ENTRY PRESSURE

OUTPUT -

TIME (S)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
100	117910	100000	58.3
1000	187680	100000	99.8
5000	199690	100000	125
10000	173150	100000	126
12000	169610	100000	138
14000	178410	100000	152
16000	186890	100000	164
18000	182760	100000	168
20000	172920	100000	167
22000	169250	100000	168
24000	157500	100000	170
26000	151640	100000	171
28000	146790	100000	170
32000	144190	100000	170
36000	142020	100000	170
40000	138840	100000	170
45000	134670	100000	171
50000	131050	100000	171
60000	126830	100000	171
80000	122730	100000	172
400000	107330	100000	168
2200	220380	100000	109
2400	221600	100000	110
2000	218380	100000	109
3000	225840	100000	113
4000	198930	100000	123
6000	200650	100000	126
7000	197300	100000	126
8000	190970	100000	126
9000	182280	100000	126
2600	221820	100000	110
2800	220690	100000	110
3200	255060	100000	122
3400	286930	100000	134
3600	254800	100000	133

ENTRY TEMP & PRESS MAX 1-16-95 MR

-15-95
MR

~~OUTPUT: "55% compare φ5i" - DR 1-15-95~~

OUTPUT: "55% compare φ5i" - THERM = 0.2

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
100	113000	100000	58.2
1000	166410	100000	99.9
5000	194310	100000	126
10000	181210	100000	127
12000	196700	100000	139
14000	212060	100000	153
16000	232790	100000	165
18000	212280	100000	169
20000	202910	100000	168
22000	199140	100000	169
24000	197440	100000	171
26000	193680	100000	171
28000	189930	100000	171
32000	185640	100000	171
36000	182300	100000	171
40000	179690	100000	171
45000	177070	100000	171
50000	174960	100000	171
60000 MR 1-15-95	171790	100000	171
80000	167840	100000	172
400000	160450	100000	167

MR
1-16-95

1-15-95
MR

NEW FILE: "55% compare φ6i" - IDENTICAL TO "55% compare φ1i" EXCEPT POROSITY = 30%
IN: /home2/sisyphus/grice/cg1/cyl-1-95/compare

OUTPUT: "55% compare φ6i" - n = 30%

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
100	133810	99999	58.6
1000	237870	99995	99.6
5000	273990	100000	124
10,000	235060	100000	125
12,000	258380	100000	136
14,000	281820	100000	150
16,000	310510	100000	163
18,000	276160	100000	166
20,000	257310	100000	165
22,000	249110	100000	166
24000	244710	100000	168
26000	236810	100000	168
28000	229120	100000	168
32000	220010	100000	168
36000	212770	100000	168
40,000	207040	100000	168
45000	201200	100000	168
50000	196460	100000	168
80000	179280	100000	169
400000	147760	100000	165

MR
1-16-95

1-16-95 MR

FRAN BLOCK - NEW RUN - POWER INPUT = 50% OF BASECASE (ctfmid5i) - OTHERWISE IDENTICAL TO "ctfmid5i" — "50% power-basecasei" IN: /home2/sisyphus/grice/thermal/fran/outputs

• NEW CYLINDER (TUFF) FILE: "205 day 55% compare ϕ/i" IS IDENTICAL TO "55% compare ϕ/i" EXCEPT RUN FOR 205 days

• NEW FRAN BLOCK FILE: "poweroff-basecasei" = IDENTICAL TO "ctfmid5i" EXCEPT POWER IS RAMPED DOWN BETWEEN 9 mos + 1 yr. IN: /home2/sisyphus/grice/thermal/fran/outputs

←OUTPUT: "50% power-basecasei" - FRAN

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
86400	100090	100000	29.6
432,000	100020	100000	37.8
1,000,000	100030	100000	45.4
2,000,000	100060	100000	54.5
3,000,000	100090	100000	61.6
4,000,000	100120	100000	67.3
5,000,000	100160	100000	72.3
6,000,000	100210	100000	76.7
7,000,000	100260	100000	80.5 ~~80.5~~ MR 1-16-95
8,000,000	100320	100000	83.8
9,000,000	100390	100000	86.8
10,000,000	100480	100000	89.4
20,000,000	101470	100000	103
30,000,000	102040	100000	108
40,000,000	102210	100000	111
50,000,000	102250	100000	113
100,000,000	102280	100000	120
500,000,000	119370	100000	150

1-16-95 MR

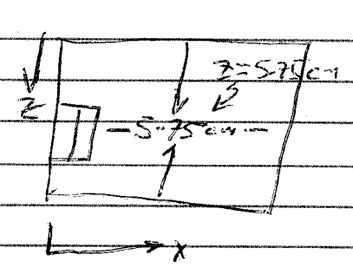
NEW FRAN RUN - ~~50% power-basecase~~ MR 1-16-95 "50% poweroffi" - IDENTICAL TO "50% power-basecasei" EXCEPT POWER TURNED DOWN BETWEEN ~~90 DAYS~~ MR 1-16-95 9 MONTHS + 1 YR UNTIL POWER OFF AT 1 YR. (=750 WATTS) IN: /usr2/sneezy/rgreen/grice/fran-1-95

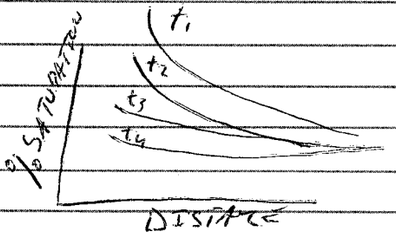
• NEW FRAN RUN - "200% poweroffi" - IDENTICAL TO "poweroff-basecasei" EXCEPT POWER RAMPED DOWN BETWEEN 9 MONTHS + 1 YR, - AND - POWER AT 200% OF basecase. IN: /home/skiffy/rgreen/fran-1-95

OUTPUT: "50% poweroffi"

TIME (s)	MAX GAS PRESSURE (Pa)	MIN GAS PRESSURE (Pa)	MAX TEMPERATURE (°C)
2,160,000	100060	100000	55.6
4,320,000	100130	100000	68.7
8,640,000	100350	100000	85.0
17,280,000	101410	100000	100
23,330,000	101650	100000	105
25,920,000	100900	100000	99.6
~~31,~~ 31,540,000 MR 1-16-95	100260	100000	65.8

MAKING PLOT OF SATURATION VS DISTANCE ALONG TUFF CYLINDER





NEW FILE: "25 DAY 55% compare ϕ/i" - IDENTICAL TO "205 day 55% compare ϕ/i" EXCEPT GOES ONLY OUT TO 25 DAYS. AFTER 25 DAYS (AS SHOWN BY 205 day ...) ALL MOISTURE UNIFORMLY DISTRIBUTED @ 50% SATURATION.

1-16-95 MR

OUTPUT: "25 day 55% compare4i" - TUFF CYLINDER

TIME (s)	MAX CAS PRESSURE (Pa)	MIN CAS PRESSURE (Pa)	MIN/MAX SAT (%)	MAX TEMP (°C)
604,860	161590	100000	.267/.5	166
691,270	100000	99907	.485/.5	22
777,680	100000	99979	.496/.5	22
864090	–	–	0.499/0.5	–
1,036,900	–	–	0.4998/0.5	–
1,209,700	–	–	0.49997/0.5	–
1,382,500	–	–	0.4999/0.5	–
1,555,400	–	–	0.5/0.5	–

MR 1-16-95 ~~1,38~~

JSR 1-16-95

•NEW RUN: "zearly1" - REPOSITORY
SCALE FROM PETER L. IN:
/usr2/sneezy/rgreen/grrice/cy/1-95/compare

MOVED TO: JSR 1-17-95
/usr2/sneezy/rgreen/grice/~~cy~~ repository-1-95

JSR 1-16-95 THIS WORK IS CONTINUED IN CNWRA NOTEBOOK #129

MR 1-16-95

I have reviewed this scientific notebook and find it in compliance with QAP-001. JSR 1-17-97