308 --- Q200006050001
Scientific Notebook #324, Sensitivity Analysis of TPA using the Morris Method and the FAST Method

21
150

Vichi Lu
SwRI
Work for Div 20

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Initial Entries Yichi Lu

Title: Sensitivity Analysis of TPA using the Morris Method and the FAST method

Name: Yichi Lu

Objectives & Approaches

Determine the most influential input parameters on the output of TPA using the method proposed by Max Morris (Morris method) and Fourier Amplitude Sensitivity Test (FAST).

Special Requirements

FORTRAN 77.
~~Matrix~~ Linear Algebra
Statistics
8/16/2000 Basic Mathematics

Hypothesis

The materials included in this notebook only apply to the executable file:

home/smohanty/A_yichi/tpa.e.

and the output files:

gwpkdos.res, gwpkdos_c.res.

the output is peak TEDE.

Computer Platform: SUN Solaris 2.6
Computer Language: FORTRAN 77
Directory: home/yichi/morris
home/yichi/FAST

3-18-99 Y. L.

Discussed w/ Sitakanta about the results.
~~decided to~~ Sitakanta raised questions.
Sy 8:15pm
wrote checkresl.f, plotscatt.m. to analyze results.

study scattered data. plots.

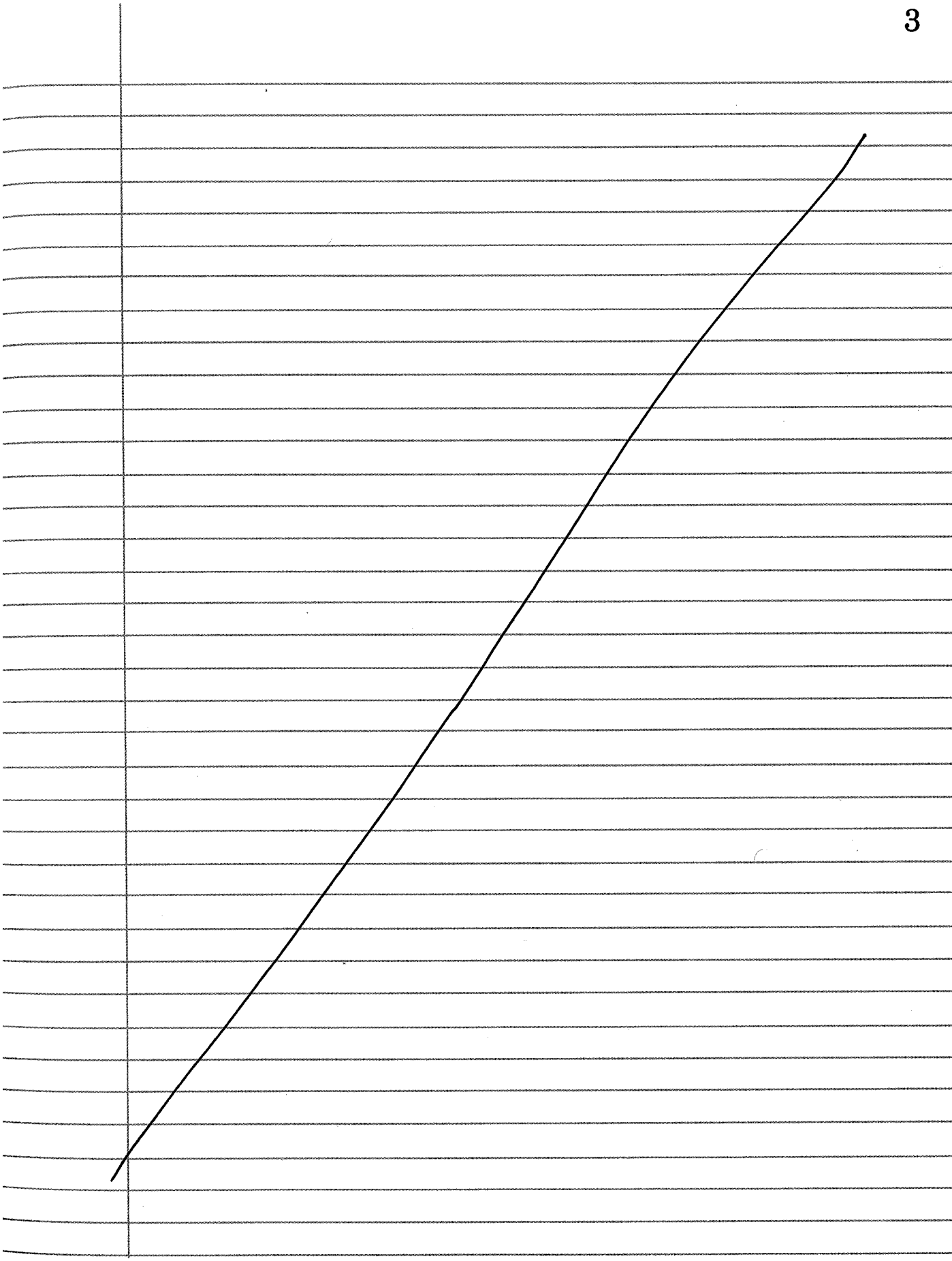
3-19-99 Y.L.

find bugs in ~~bo~~ /morris/testlhs/baselhs.f

log10(x) → log(x)
10 ** x → exp(x)

Talked to Marty about working on Sensitivity Analysis

Marty – 594-2034



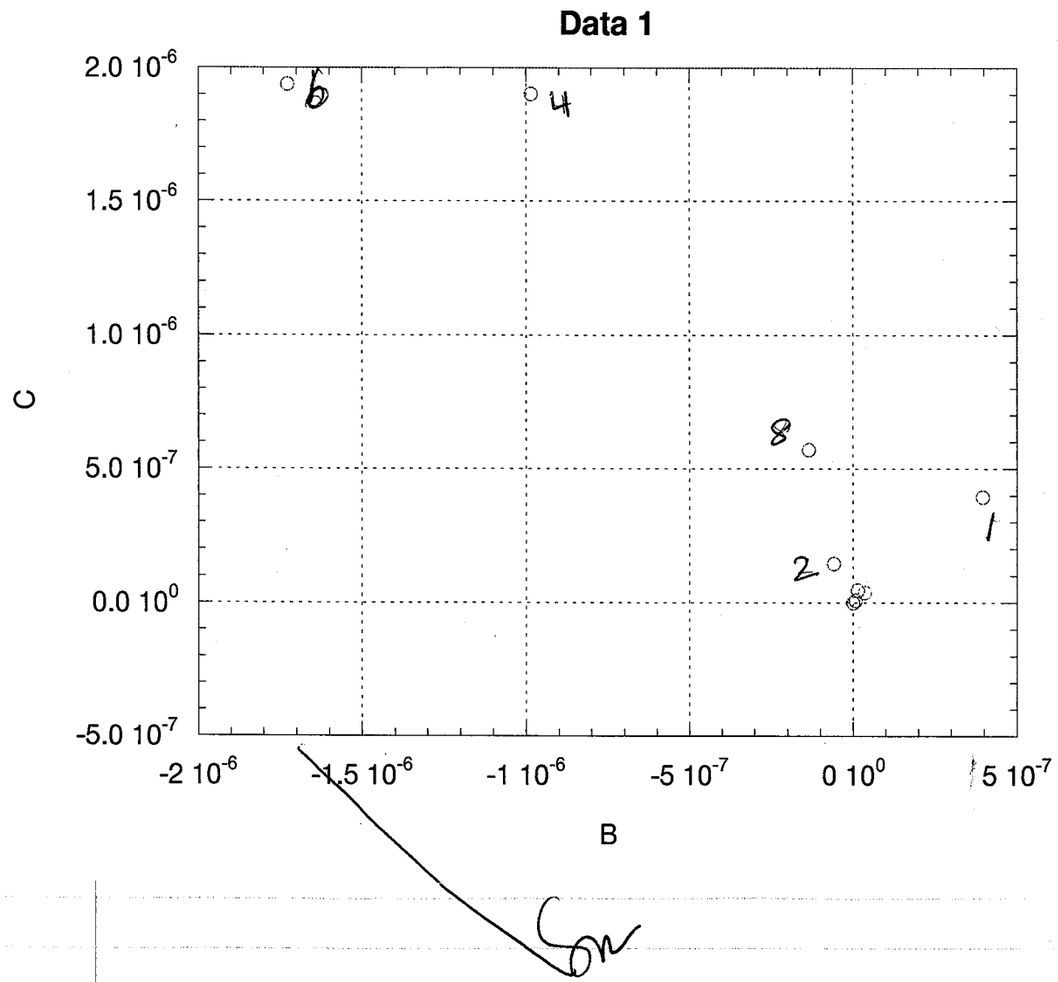
4-5-99 Y.L.

① obtained new results for the Morris method.
showed results to Sitakanta.
Sitakanta will run himself.
need to clarify the meaning of Mean & Dev.

② start working on Sobol method. based on Homma & Saltelli, 1996.

8/15/2000 Sy

-4 hours



4-6-99 Y.C.

start Sobol algorithm.

Toshimitsu Homma & Andrea Saltelli:

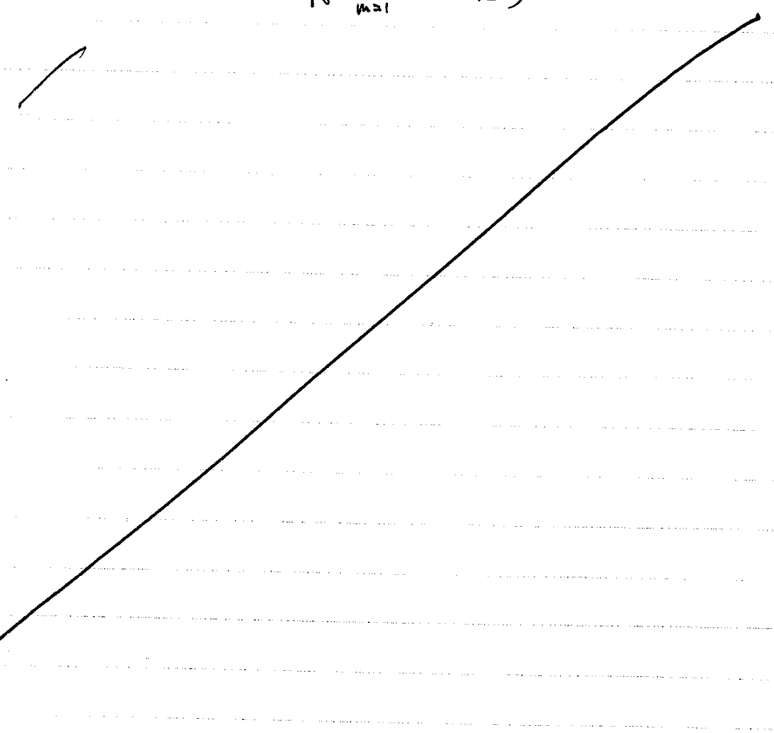
"Importance Measures ..." Reliability Engineering and System Safety 52, 1-17, 1996.

running tpa.e in /tparun.
246 ~~input~~ input variables, 245 realizations
8/15/2000 Sy

This should give

$$\hat{f}_0 \doteq \frac{1}{N}\sum_{m=1}^{N} f(\underset{\sim}{x})$$

$$\hat{D} + \hat{f}_0^2 \doteq \frac{1}{N}\sum_{m=1}^{N} f^2(\underset{\sim}{x})$$



-4-8-99

4- hours Started sobol.

only two random number ~~matrix~~ matrices are needed. SM 8/15/2000

one for $\underset{\sim}{u}m$, $\underset{\sim}{r}m$, lhs_1.out in /sobol/

another for $\underset{\sim}{v}m$, $\underset{\sim}{s}m$ lhs_2.out in /sobol/

244 variables

talked to Sitakanta. Told him we can do Sobol. But he ~~to~~ needs to finish a report on Morris & FAST first.

So start FAST.

running ~smohanty/A_yichi/tpa.e.
using lhs.out_1_500.

lhs.out-1-500, lhs.out-501-1814
generated using Table I. ~~SM~~
Schaibly & Schuler

wrote ~~[illegible]~~ fastlhs.f. ⇒ Table I

SM 8/15/2000

4-9-99 Y.L.

Two hours of QA meeting w/ Bruce Mabrito.

Finished /FAST/fastam.f. programming. 1st version

running ~~fast~~ tpa.e. lhs-out_~~8~~00_1000.

SM 8/15/2000

QA charge # 20-1402-159. two hours

Spoke to Sitakanta, he needs a write-up. for the report. urgent.

Work on the ~~[illegible]~~ sensitivity analysis report.

SM 8/15/2000

4-12-99 YL

① Writing report on Sensitivity analysis

② running FAST, using lhs.out_FAST_1001-1500

③ Sitakanta left multiple regression results.

4-13-99 YL

obtained FAST results for 14 inputs.

1	UNIFORM	ArealAverageMeanAnnualInfiltrationAtStart[mm/yr]
	0.100000E+01	0.100000E+02
2	UNIFORM	MeanAveragePrecipitationMultiplierAtGlacialMaximum
	0.150000E+01	0.250000E+01
3	UNIFORM	MeanAverageTemperatureIncreaseAtGlacialMaximum[degC]
	-0.100000E+02	-0.500000E+01
4	LOGUNIFORM	FractionOfCondensateRemoved[1/yr]
	0.100000E-07	0.100000E+01
5	UNIFORM	FractionOfCondensateTowardRepository[1/yr]
	0.000000E+00	0.100000E+01
6	LOGUNIFORM	FractionOfCondensateTowardRepositoryRemoved[1/yr]
	0.100000E-07	0.100000E+01
7	UNIFORM	TemperatureGradientInVicinityOfBoilingIsotherm[K/m]
	0.100000E+01	0.100000E+03
8	UNIFORM	ThermalConductivityofYMRock[W/(m-K)]
	0.180000E+01	0.220000E+01
9	NORMAL	CriticalRelativeHumidityAqueousCorrosion
	0.750000E+00	0.850000E+00
10	UNIFORM	ThicknessOfWaterFilm[m]
	0.100000E-02	0.300000E-02
11	UNIFORM	InnerOverpackErpIntercept
	0.104000E+04	0.124000E+04
12	UNIFORM	AA_2_1[C/m2/yr]
	0.200000E+05	0.630000E+05
13	UNIFORM	CoefForLocCorrOfOuterOverpack
	0.866000E-03	0.866000E-02
14	UNIFORM	ChlorideMultFactor
	0.100000E+01	0.300000E+02

i	amplitude
1	-0.50045E-08
2	0.11350E-08
3	0.22190E-09
4	0.22634E-09
5	-0.14933E-09
6	0.44622E-09
7	0.44302E-10
8	-0.81273E-10
9	-0.17438E-10
10	0.85544E-12
11	0.61297E-11
12	-0.20691E-10
13	-0.13458E-10
14	-0.42547E-12

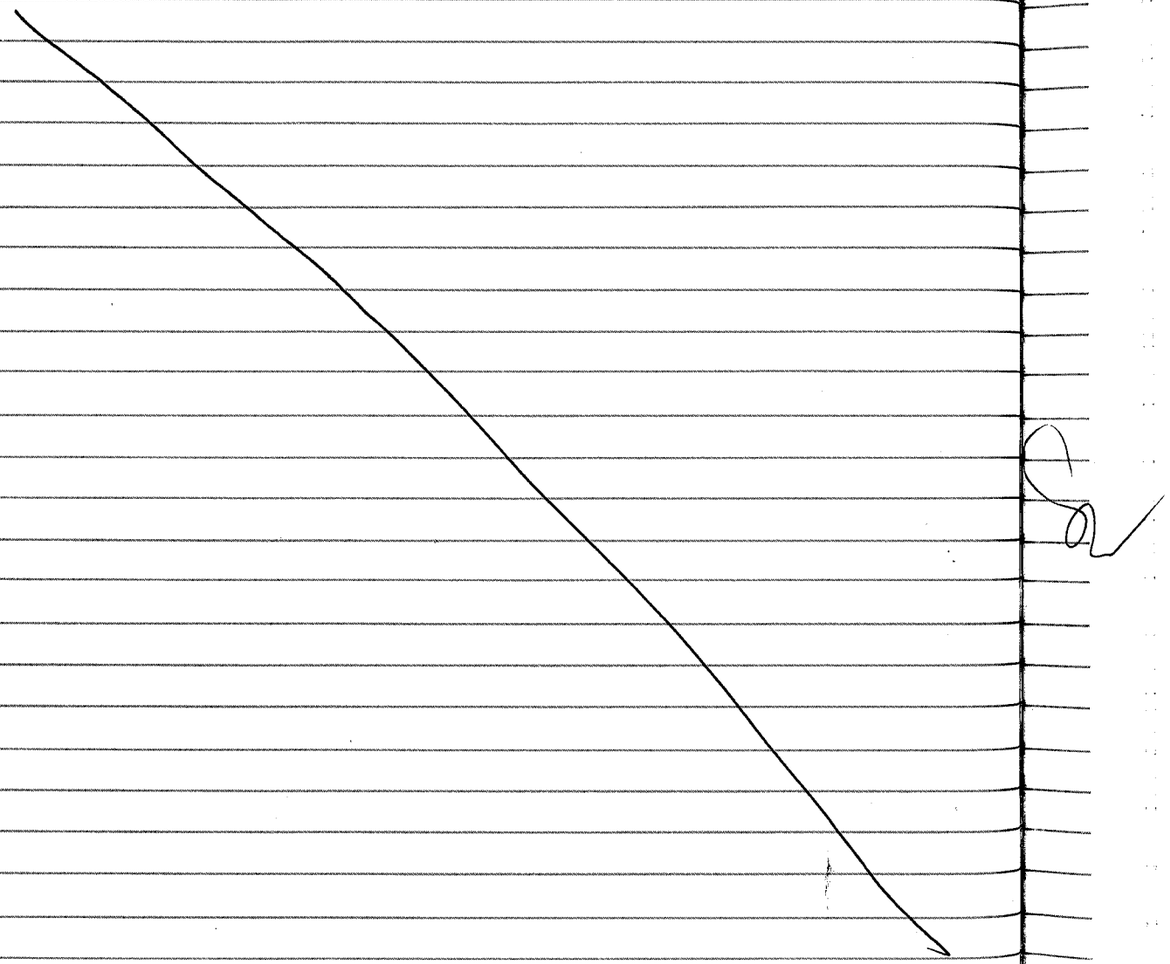
4-13-99 Y.L.

after talking w/ sitakanta. decide to use the Morris method to test all input variables. to select 19 most sensitive inputs for FAST method to run further.

Sy 8/15/2000

A 2470 x 246 matrix was generated for lhs.out.

It was



4-14-99 YL

Meeting w/ Budhi Sagar, Sitakanta. Hollis Thomas. discussed on Parameter Tree, GUI, Java

Parameter Tree Java Gui'. program takes 1 ½ hours to run.

Sy 8/15/2000

Pachinco

user should be able to decide how to partition.

Schedule to finish in Sept.
should finish in June, July each realization

$R_i (I_0 = X_1, F_{out} = X_2, WP_{def} = X_3, \ldots X_s. D_i = Y_i)$.

Decision Tree.

SRD: software requirement description
-send to NRC

1402-76

4-15-99 YL

First draft sent to Sitakanta

Still running tpa.e.

4-16-99 YL

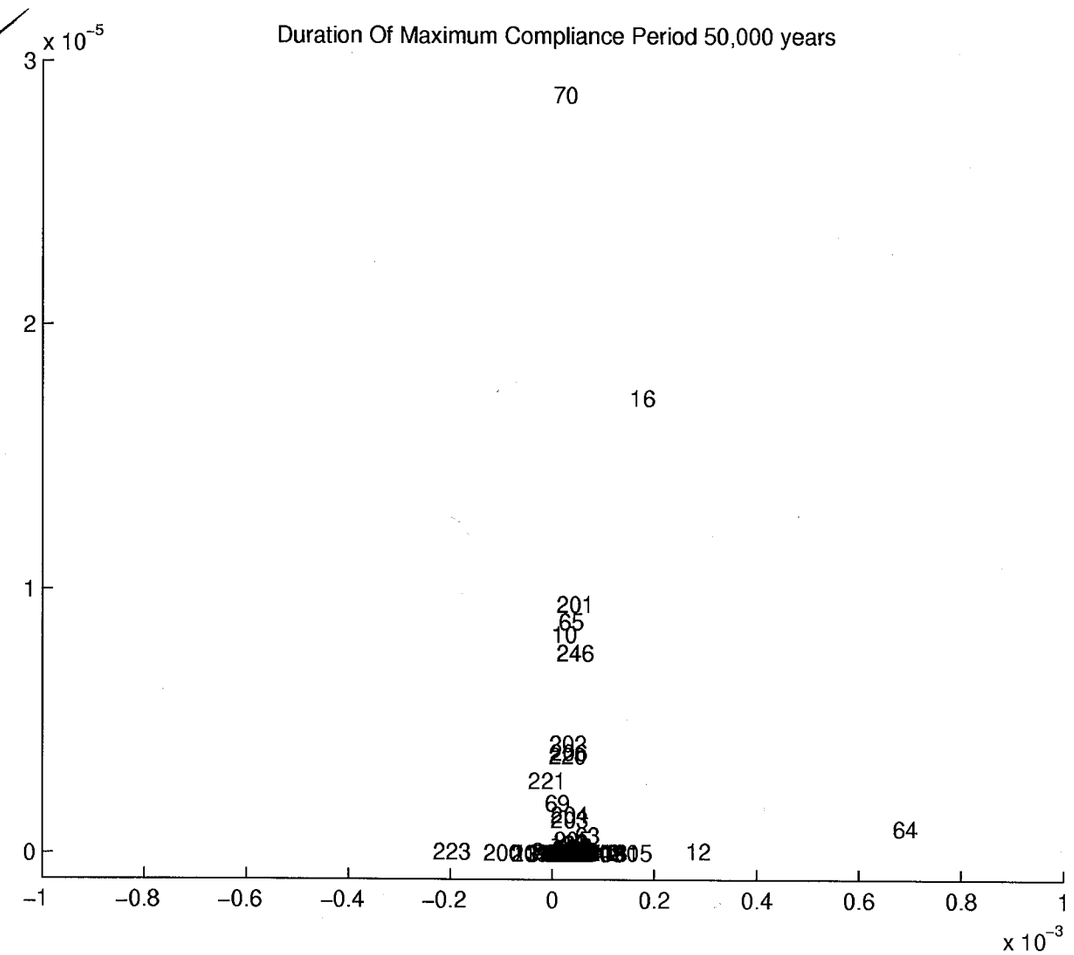
finished tpa.e. 50,000 years.

Sitakanta wants to see ~~to~~ 10,000 year results

70: Solubility Pu Sy 4/15/99

64: SubArea Wet Fraction

16: Rock Poisson Ratio For SGI~~M0~~SM0

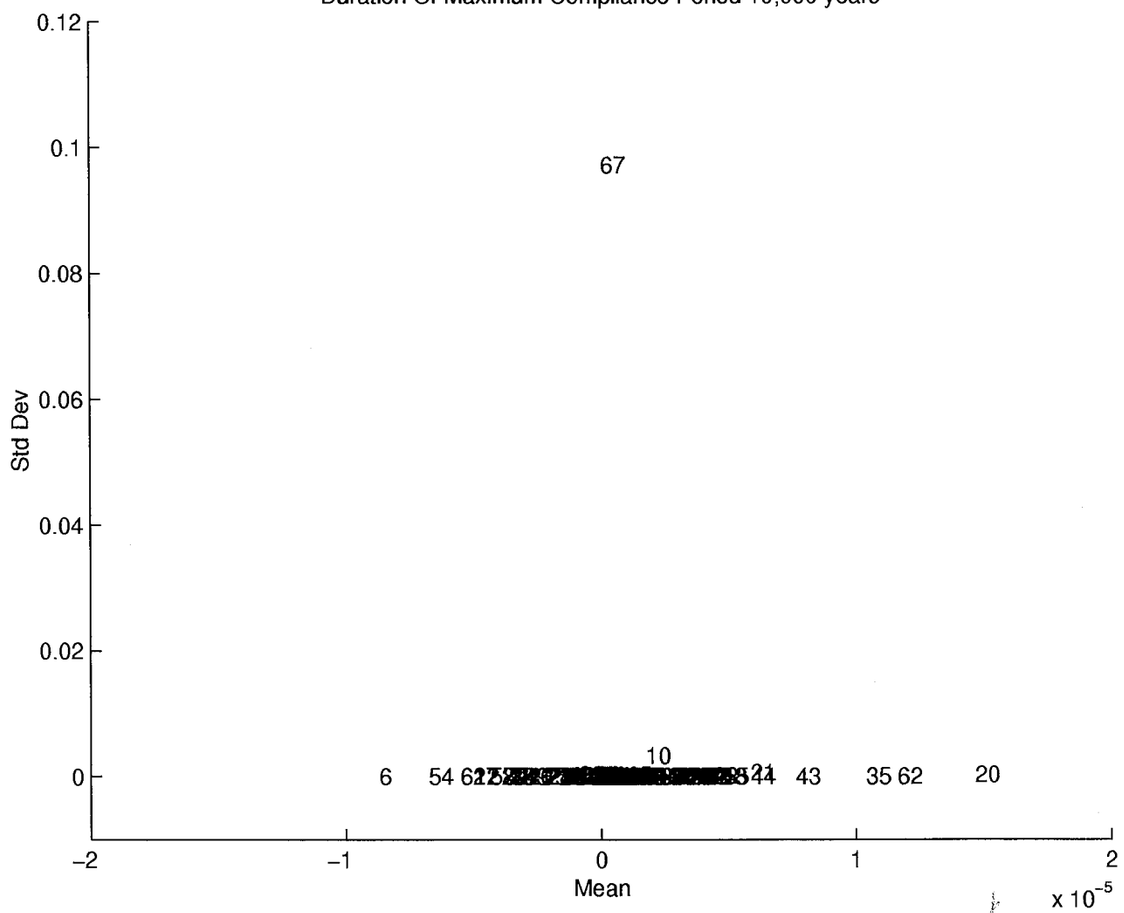


4-19-99 YL

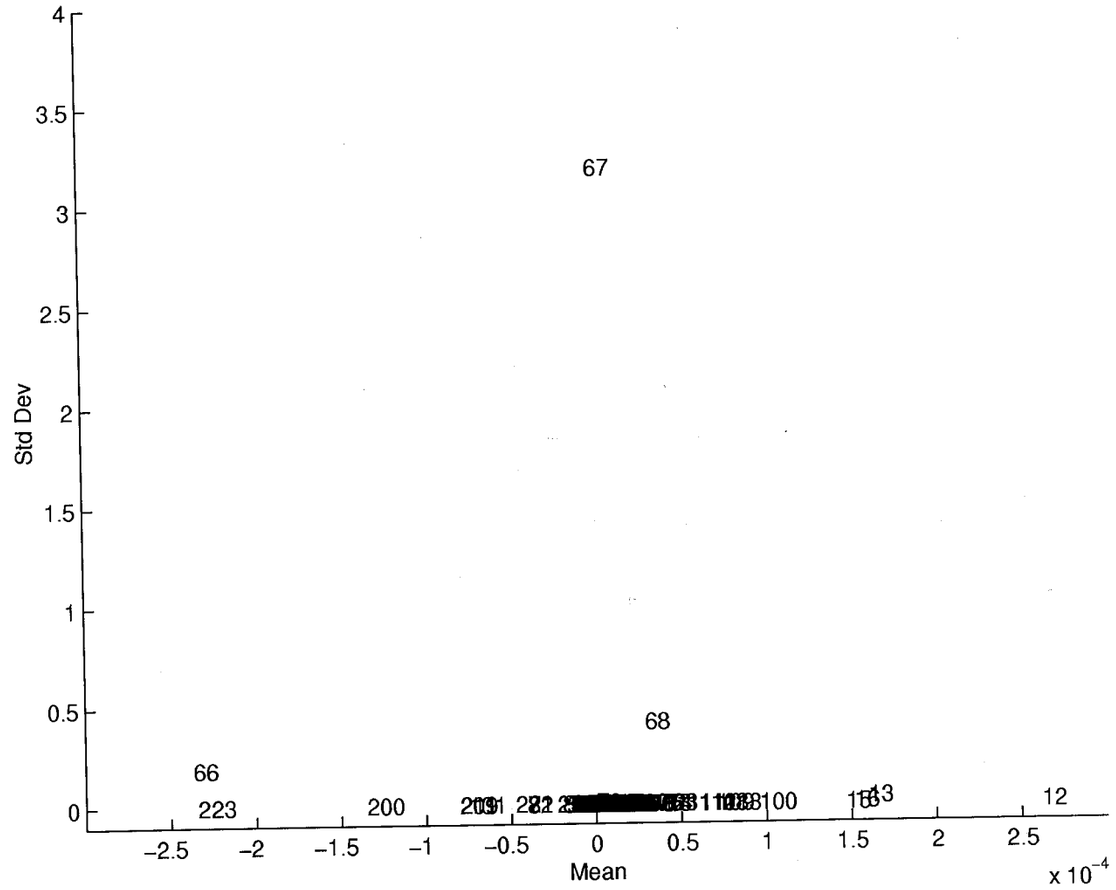
New plots for 10000 yr, 50000 yr.
Morris method. 2470 realizations

#67: ~~Sado~~ S6GFRATF

Sm
4/15/2000



The plot obtained on 4-16-99 was wrong.
Ymax too small



Sm

		50000 yr	10000 yr
(1)	1	67 ✓	(1) 67 ✓
(3)	2	64	(6) 6
(2)	3	68	(7) 20
(4)	4	66 ✓	(8) 21
	5	12 ✓	(4) 35
	6	223	(3) 62
	7	200	(7) 43
	8	13	(9) 44
(10)	9	15	(5) 10
(9)	10	16	(10) 54
	11	100	(17) 220
	12	113	(18) 66 ✓
	13	108	(18) 65
	14	109	(20) 70
	15	111	(11) 22
	16	112	(12) 61
	17	131	(13) 27
	18	209	(14) 12 ✓
	19	211	(15) 55
			(16) ~~68~~ 48

Sy/15/pm

4-20-99 YL

A serious flaw was found in efft lhs. f. when calculating yd (ydev).

4-19 results were therefore wrong.

Top 19 most influential variables.

	1000 yr
1	20
2	35
3	43
4	62
5	54
6	6
7	61
8	27
9	44
10	21
11	48
12	55
13	12
14	57
15	11
16	22
17	58
18	47
19	34

TPARUN

But /~~FAST~~/gwpkdor.res_2470_50000yr
/ ~10000yr

are still good. 6/6/2003

running tpa.e using ~~fa~~./FAST/lhs.out_10.806_10000
50000
yr.

50000 yr

1	64
2	12
3	15
4	16
5	66
6	223
7	13
8	200
9	211
10	115
11	100
12	131
13	209
14	52
15	63
16	1
17	113
18	209
19	72

4-21-99 YC

Marty pointed out the problem with log. variables.

take #4 input. for example.

$[0.1 \times 10^{-7} \quad 1]$.

$\Delta \approx 0.5714285$

p=8

Xlevel[1] = 0.1×10^{-7}
2 = 0.1389495×10^{-6}
3 = 0.1930698×10^{-5}
4 = 0.2682696×10^{-4}

these ~~four~~ four levels will be assigned to #4
then Δ will be add to them to get 8 levels.
8/15/2000

but $\Delta = 0.5714285$
the max level will only be $\Delta + 0.2682696$
≈ 0.5714554.

in other words, Xlevels are log transformed
but Δ is not

4-21-99

```
                1                246
 0.2285714E+01  0.2214286E+01 -0.6428571E+01  0.2682696E-04  0.1428571E+00
(1)0.1000000E-07  0.8585714E+02  0.1800000E+01  0.7500000E+00  0.3000000E-02
                5                246
 0.7428571E+01  0.1642857E+01 -0.9285714E+01  0.5714554E+00  0.1428571E+00
 0.1000000E-07  0.8585714E+02  0.1800000E+01  0.7500000E+00  0.3000000E-02
                7                246
 0.7428571E+01  0.1642857E+01 -0.9285714E+01  0.5714554E+00  0.7142857E+00
 0.5714286E+00  0.8585714E+02  0.1800000E+01  0.7500000E+00  0.3000000E-02
              248                246
 0.1000000E+01  0.1500000E+01 -0.7857143E+01  0.5714287E+00  0.1428571E+00
 0.5714286E+00  0.1514286E+02  0.1800000E+01  0.8214286E+00  0.1285714E-02
              252                246
 0.6142857E+01  0.2071429E+01 -0.5000000E+01  0.1389495E-06  0.1428571E+00
 0.5714286E+00  0.1514286E+02  0.1800000E+01  0.8214286E+00  0.1285714E-02
              254                246
 0.6142857E+01  0.2071429E+01 -0.5000000E+01  0.1389495E-06  0.7142857E+00
 0.1000000E-07  0.1514286E+02  0.1800000E+01  0.8214286E+00  0.1285714E-02
              495                246
 0.1000000E+01  0.2500000E+01 -0.8571429E+01  0.1930698E-05  0.1428571E+00
 0.5714305E+00  0.4342857E+02  0.1857143E+01  0.7928571E+00  0.1285714E-02
              499                246
 0.6142857E+01  0.1928571E+01 -0.5714286E+01  0.5714305E+00  0.1428571E+00
 0.5714305E+00  0.4342857E+02  0.1857143E+01  0.7928571E+00  0.1285714E-02
              501                246
 0.6142857E+01  0.1928571E+01 -0.5714286E+01  0.5714305E+00  0.7142857E+00
 0.1930698E-05  0.4342857E+02  0.1857143E+01  0.7928571E+00  0.1285714E-02
              742                246
 0.4857143E+01  0.2071429E+01 -0.7142857E+01  0.5714554E+00  0.2857143E+00
 0.5714305E+00  0.1514286E+02  0.2028571E+01  0.7642857E+00  0.1857143E-02
              746                246
 0.1000000E+02  0.1500000E+01 -0.1000000E+02  0.2682696E-04  0.2857143E+00
 0.5714305E+00  0.1514286E+02  0.2028571E+01  0.7642857E+00  0.1857143E-02
              748                246
 0.1000000E+02  0.1500000E+01 -0.1000000E+02  0.2682696E-04  0.8571429E+00
(2)0.1930698E-05  0.1514286E+02  0.2028571E+01  0.7642857E+00  0.1857143E-02
              989                246
 0.8714286E+01  0.2500000E+01 -0.8571429E+01  0.5714287E+00  0.1000000E+01
 0.5714305E+00  0.1514286E+02  0.2142857E+01  0.7928571E+00  0.2142857E-02
              993                246
 0.3571429E+01  0.1928571E+01 -0.5714286E+01  0.1389495E-06  0.1000000E+01
 0.5714305E+00  0.1514286E+02  0.2142857E+01  0.7928571E+00  0.2142857E-02
              995                246
 0.3571429E+01  0.1928571E+01 -0.5714286E+01  0.1389495E-06  0.4285714E+00
 0.1930698E-05  0.1514286E+02  0.2142857E+01  0.7928571E+00  0.2142857E-02
             1236                246
 0.2285714E+01  0.2500000E+01 -0.5000000E+01  0.5714286E+00  0.1428571E+00
 0.1930698E-05  0.1000000E+03  0.1857143E+01  0.7642857E+00  0.1857143E-02
             1240                246
 0.7428571E+01  0.1928571E+01 -0.7857143E+01  0.1000000E-07  0.1428571E+00
 0.1930698E-05  0.1000000E+03  0.1857143E+01  0.7642857E+00  0.1857143E-02
             1242                246
 0.7428571E+01  0.1928571E+01 -0.7857143E+01  0.1000000E-07  0.7142857E+00
 0.5714305E+00  0.1000000E+03  0.1857143E+01  0.7642857E+00  0.1857143E-02
             1483                246
 0.8714286E+01  0.2500000E+01 -0.7857143E+01  0.5714286E+00  0.5714286E+00
 0.1930698E-05  0.2928571E+02  0.1914286E+01  0.8500000E+00  0.1571429E-02
             1487                246
 0.3571429E+01  0.1928571E+01 -0.5000000E+01  0.1000000E-07  0.5714286E+00
 0.1930698E-05  0.2928571E+02  0.1914286E+01  0.8500000E+00  0.1571429E-02
```

$X_4(1) = 0.1\ E-07$

$X_4(2) = 0.1389495\ E-06$

$X_4(3) = 0.1930698\ E-05$

$X_4(4) = 0.2682696\ E-04$

$X_4(5) = 0.5714286 = \Delta + X_4(1)$

$X_4(6) = 0.5714287 = \Delta + X_4(2)$

$X_4(7) = 0.5714304 = \Delta + X_4(3)$

$X_4(8) = 0.5714554 = \Delta + X_4(4)$

$\Delta_4 = 0.5714285$

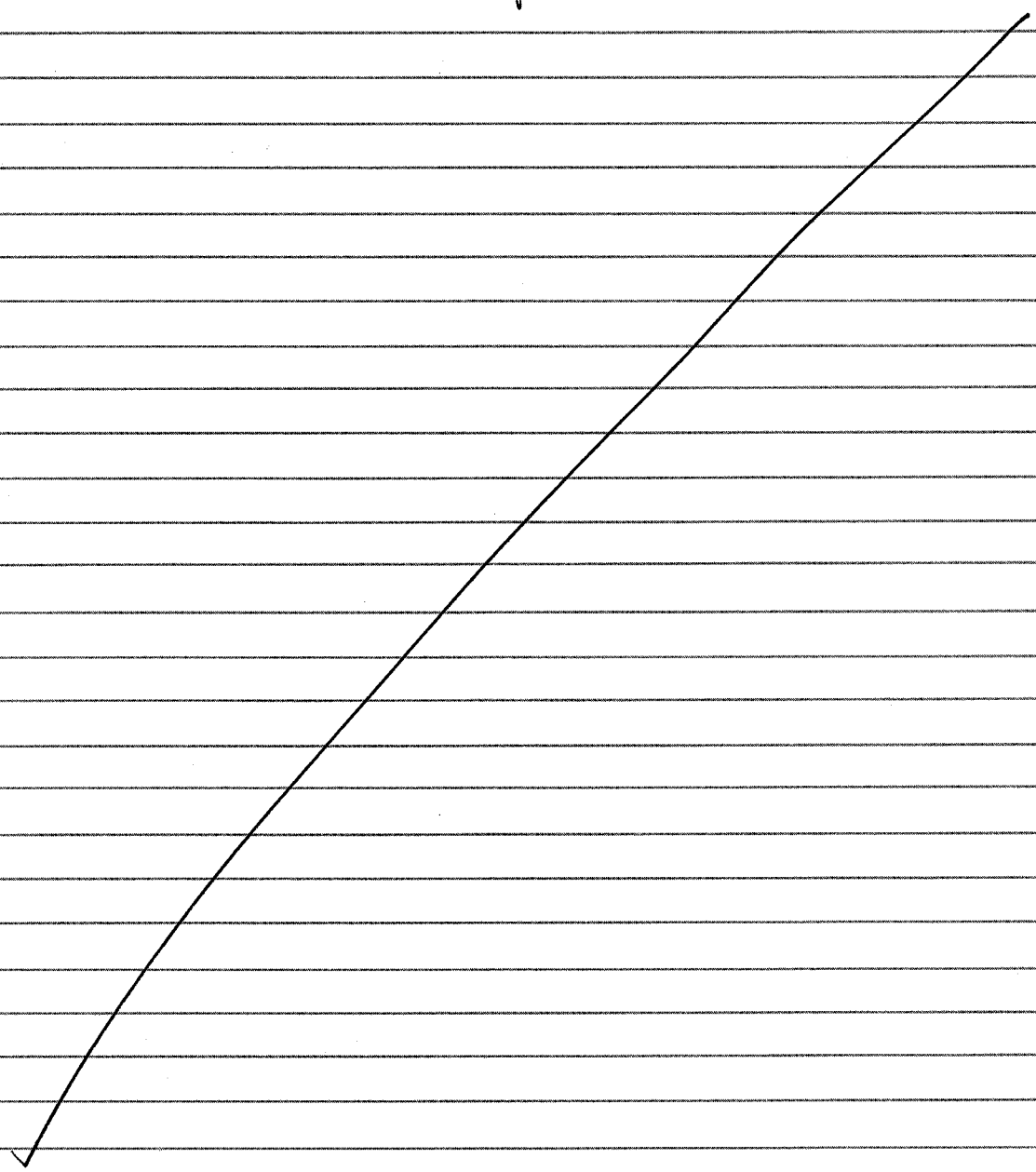
```
        1489         246
0.3571429E+01 0.1928571E+01 -0.5000000E+01 0.1000000E-07 0.0000000E+00
0.5714305E+00 0.2928571E+02  0.1914286E+01 0.8500000E+00 0.1571429E-02
        1730         246
0.4857143E+01 0.2357143E+01 -0.7857143E+01 0.5714305E+00 0.8571429E+00
0.5714305E+00 0.7171429E+02  0.1914286E+01 0.7928571E+00 0.1285714E-02
        1734         246
0.1000000E+02 0.1785714E+01 -0.5000000E+01 0.1930698E-05 0.8571429E+00
0.5714305E+00 0.7171429E+02  0.1914286E+01 0.7928571E+00 0.1285714E-02
        1736         246
0.1000000E+02 0.1785714E+01 -0.5000000E+01 0.1930698E-05 0.2857143E+00
0.1930698E-05 0.7171429E+02  0.1914286E+01 0.7928571E+00 0.1285714E-02
        1977         246
0.6142857E+01 0.1928571E+01 -0.7142857E+01 0.5714305E+00 0.4285714E+00
0.5714554E+00 0.4342857E+02  0.2142857E+01 0.7642857E+00 0.1571429E-02
        1981         246
0.1000000E+01 0.2500000E+01 -0.1000000E+02 0.1930698E-05 0.4285714E+00
0.5714554E+00 0.4342857E+02  0.2142857E+01 0.7642857E+00 0.1571429E-02
        1983         246
0.1000000E+01 0.2500000E+01 -0.1000000E+02 0.1930698E-05 0.1000000E+01
0.2682696E-04 0.4342857E+02  0.2142857E+01 0.7642857E+00 0.1571429E-02
        2224         246
0.8714286E+01 0.2214286E+01 -0.6428571E+01 0.5714287E+00 0.1428571E+00
0.5714554E+00 0.1000000E+01  0.2085714E+01 0.7928571E+00 0.2714286E-02
        2228         246
0.3571429E+01 0.1642857E+01 -0.9285714E+01 0.1389495E-06 0.1428571E+00
0.5714554E+00 0.1000000E+01  0.2085714E+01 0.7928571E+00 0.2714286E-02
        2230         246
0.3571429E+01 0.1642857E+01 -0.9285714E+01 0.1389495E-06 0.7142857E+00
0.2682696E-04 0.1000000E+01  0.2085714E+01 0.7928571E+00 0.2714286E-02
```

(3)

The file on the left /morris/test1hs/lhs.out

showed that loguniform was right

Continue on the report on FAST.



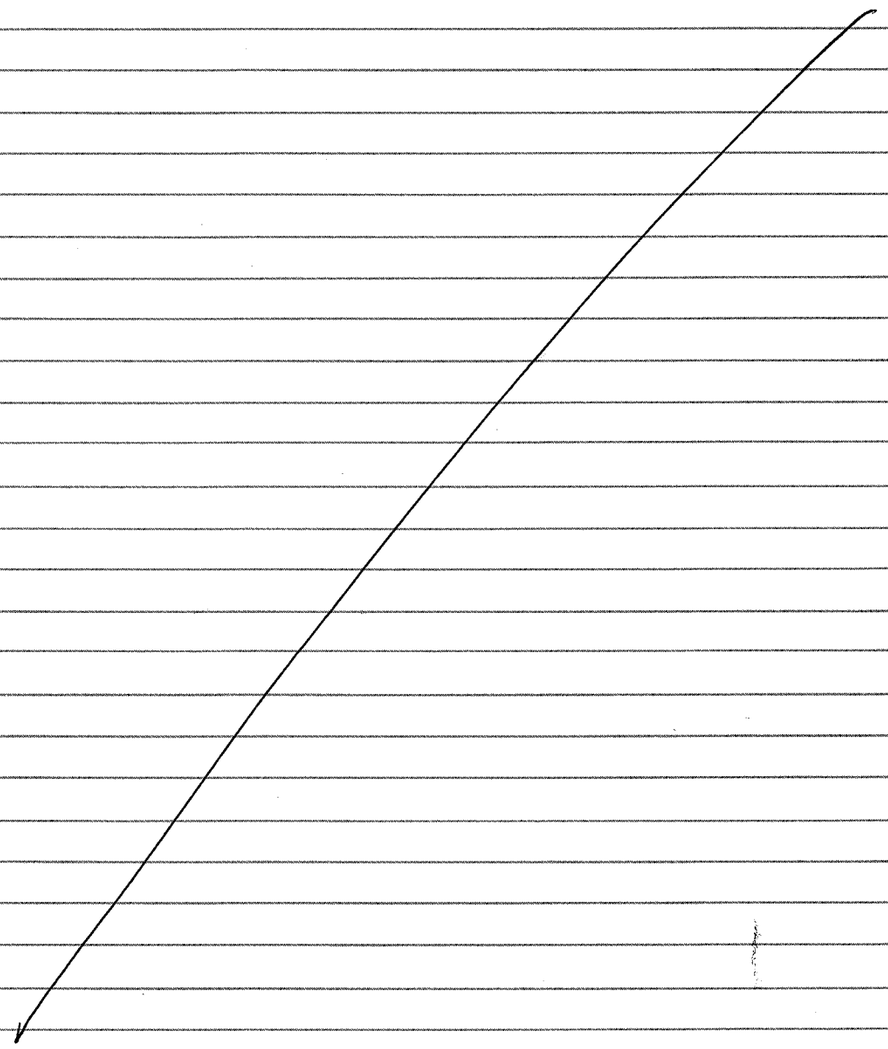
4-22-99 YL

Check checkres.f and efttlhs.f to see how mean and std dev are determined.

8/15/2000

~~After~~ modified G:\Mohanty\tpa32 sensitivity \section 3.1.3 and section 3.1.4.

to new section 3.1.3 section. 3.1.4



4-23-99 YL

Start Sobol. 2460 realizations.
/sobol/fo-data/lhs.out

finished revisions on

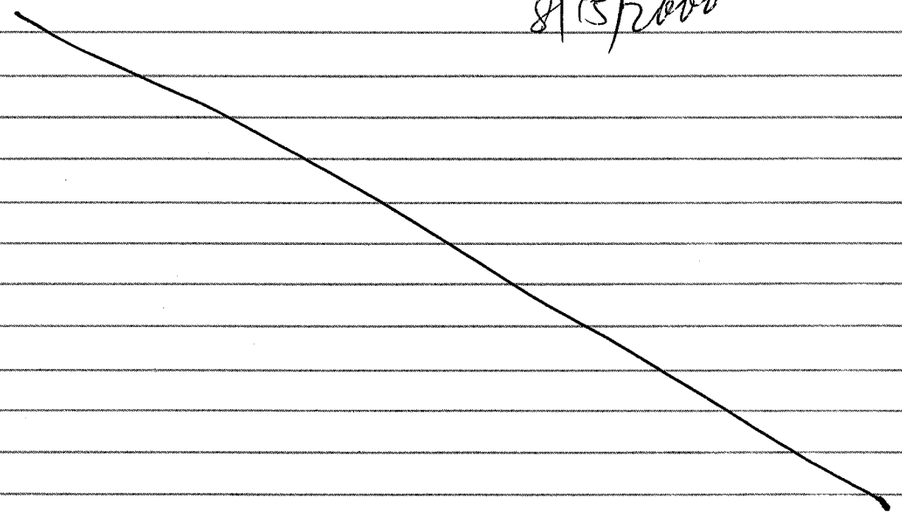
section 3.1.3 → new section 3.1.3
3.1.4 → new section 3.1.4
→ results.wpd

plot peak TEDE as a function of x_i while holding all other variables at their mid values.

new directory : /checktpa.

if holding all variables at their mid values and vary only ones x_i. this could miss some situations that occur ~~only when~~ in extreme conditions.

8/15/2000



4-26-99 YL

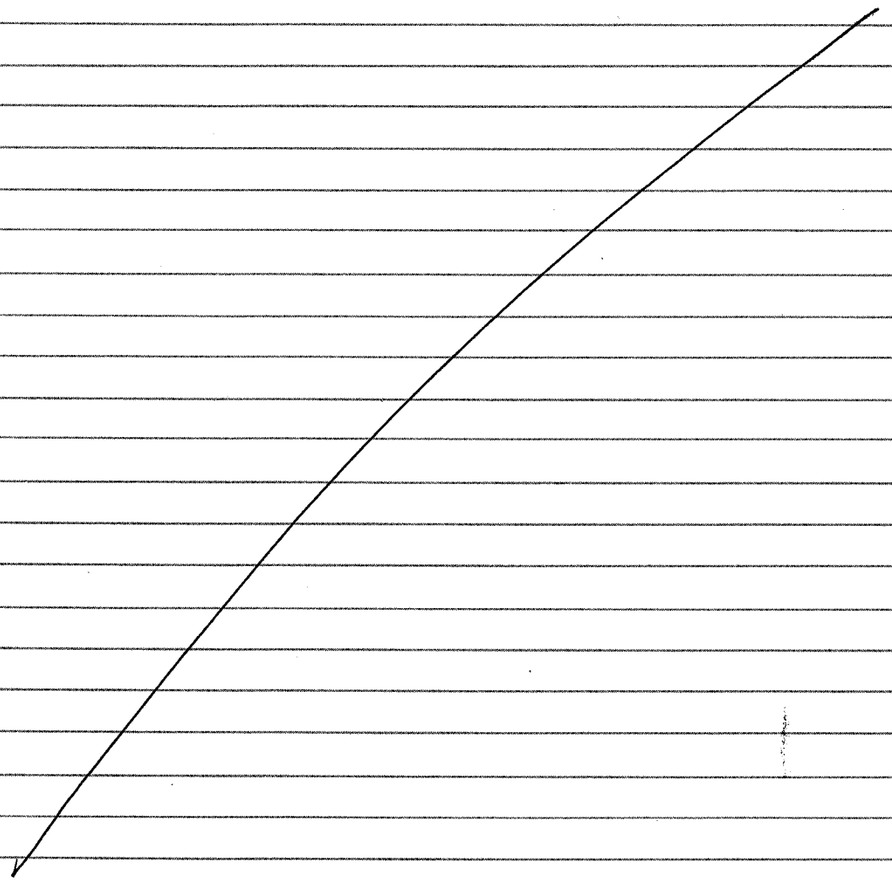
Analyze the Morris method.

Try to explain the results from the Morris method.

created analysis in /morris/testfhs/
plotgw:

finished another versions of 3.1.3, 3.1.4

→ new_2 3.1.3, new_2 3.1.4

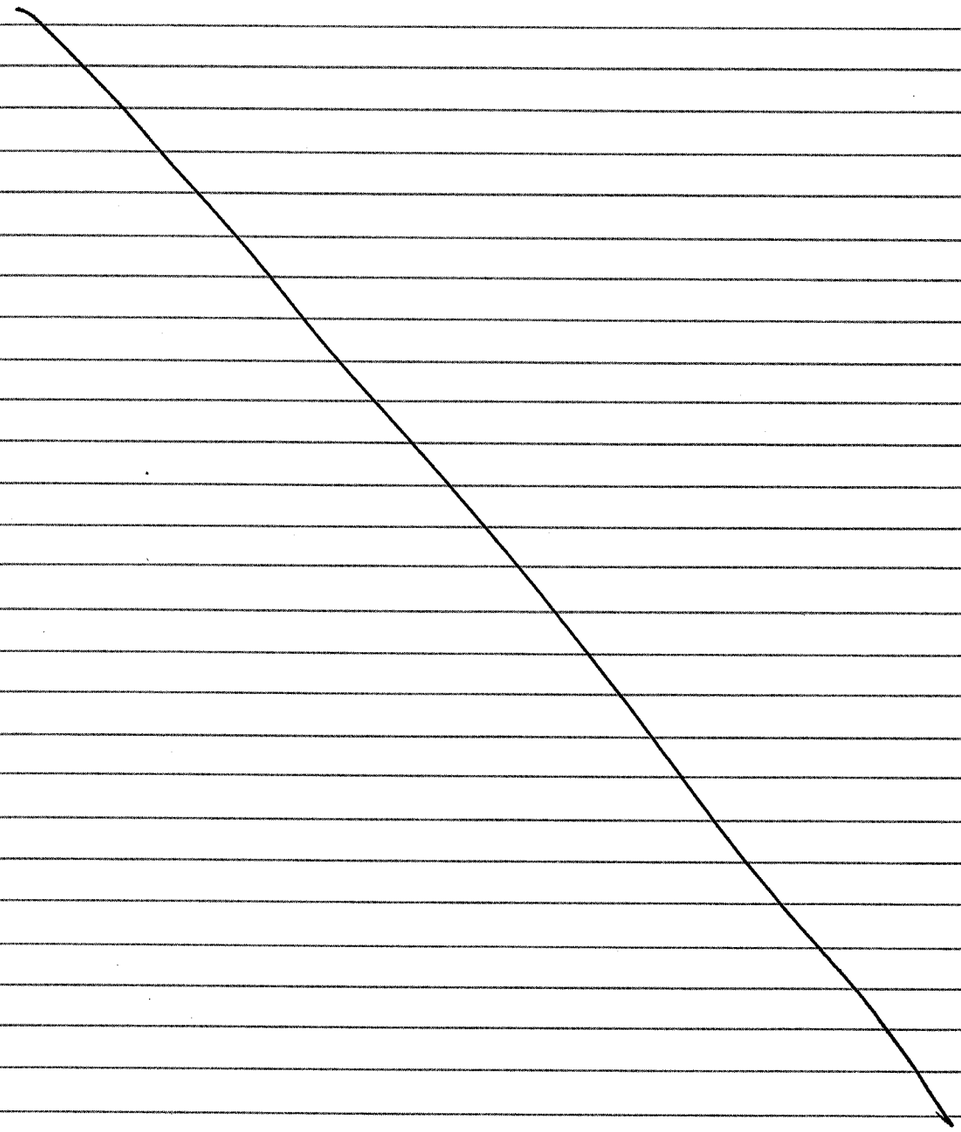


4-27-99 YL

Started rank /YLu/rank

Iman & Conover, 1979

Iman & Conover, 1982. Self-teaching



4-28-98 YL

finished rank1.f.

rank1.f passed test on ex1.dat.
but not ex2.dat.

start ~~Set~~ Stepwise regression
8/15/2000

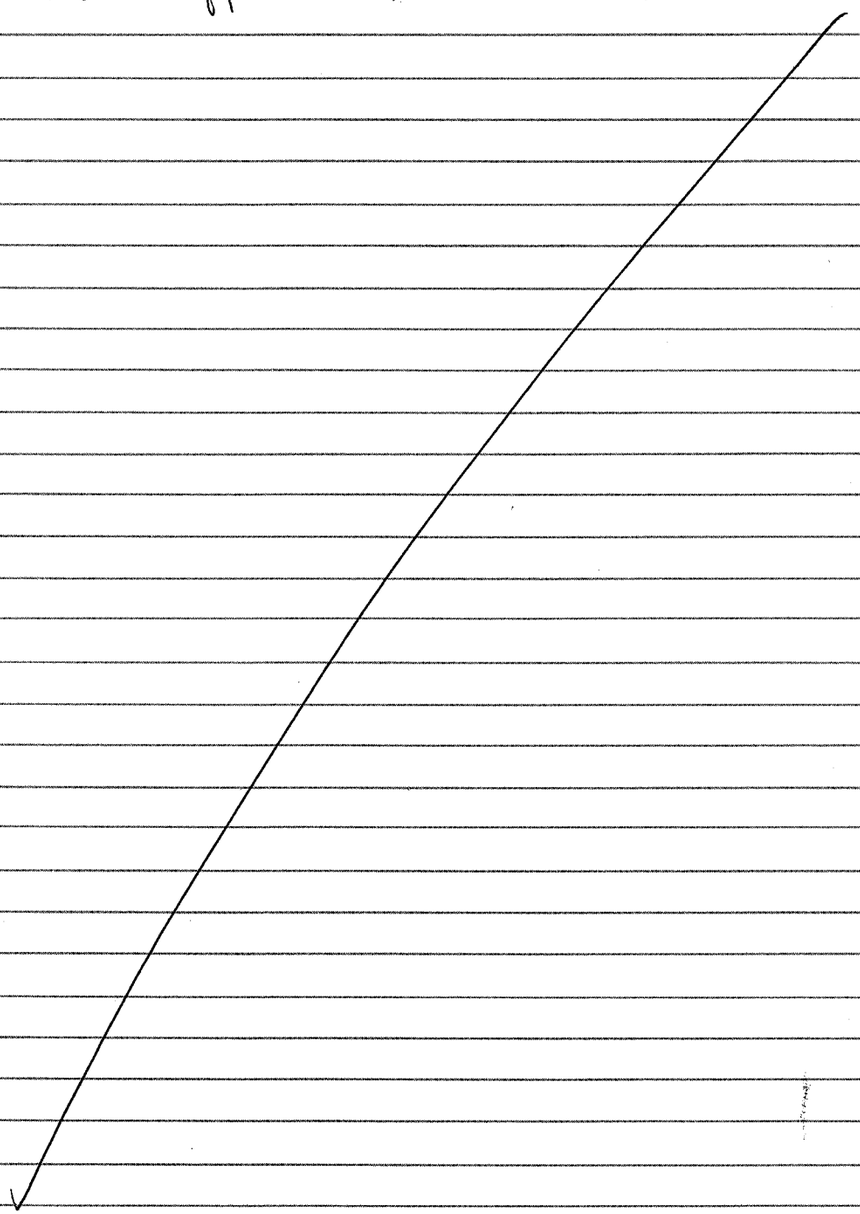
4-27-98 YL

finished modifications to efftlhs.f.
added ~~stand~~ subroutines stand, logrithm.
Sunday 8/15/2000
finished standardization & logrithm results

⇒ G:\mohanty\tpa3.2\

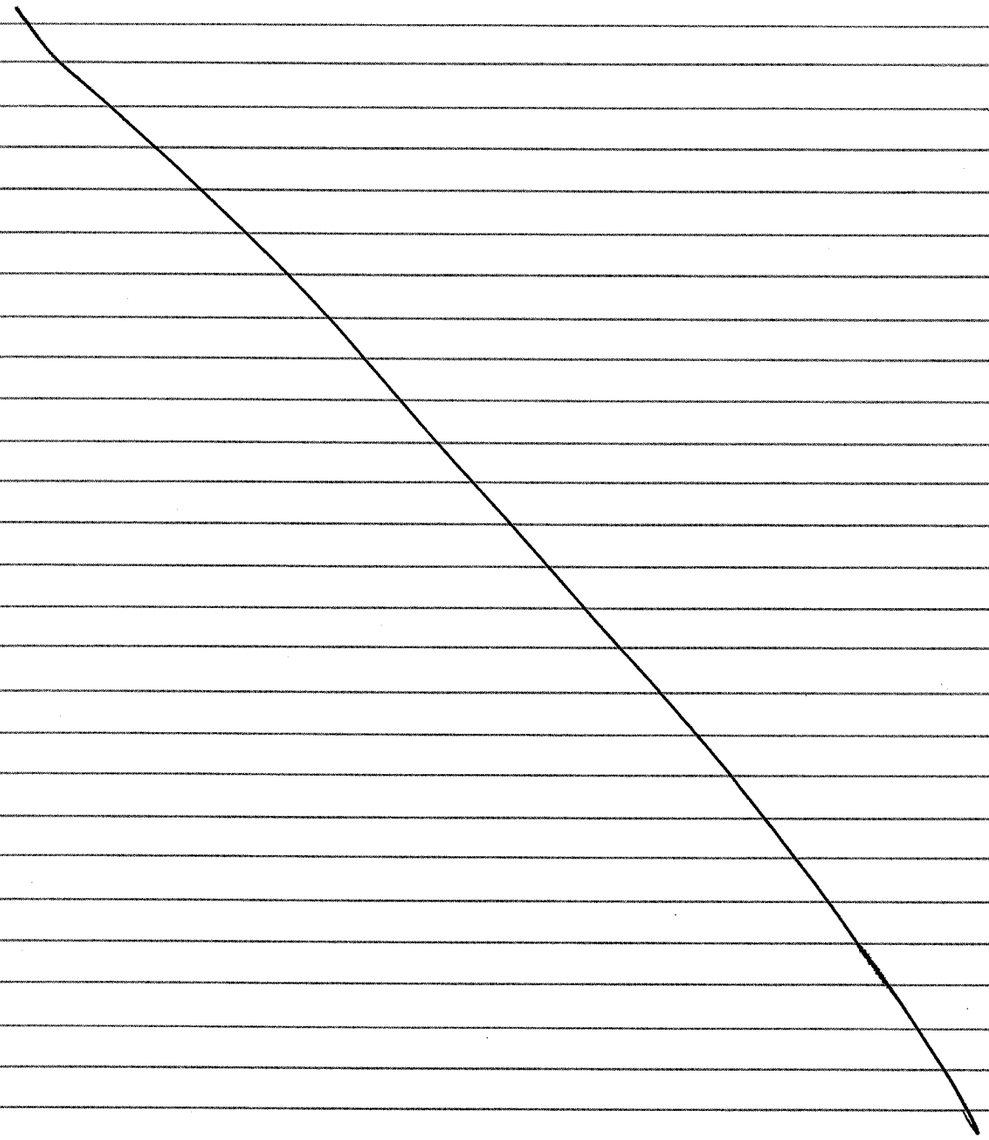
4-30-99 YL

revised 3.1.3, 3.1.4.
made tables for standization, logrithmic
made appendics for Morris.



5-3-99 YL

revised 3.1.3 and 3.1.4 sent to Sitakanta.
running tpa.e for Sobol.



5-4-SP YL

~~Edit~~ Edited 3.1.3. 3.1.4 of report.

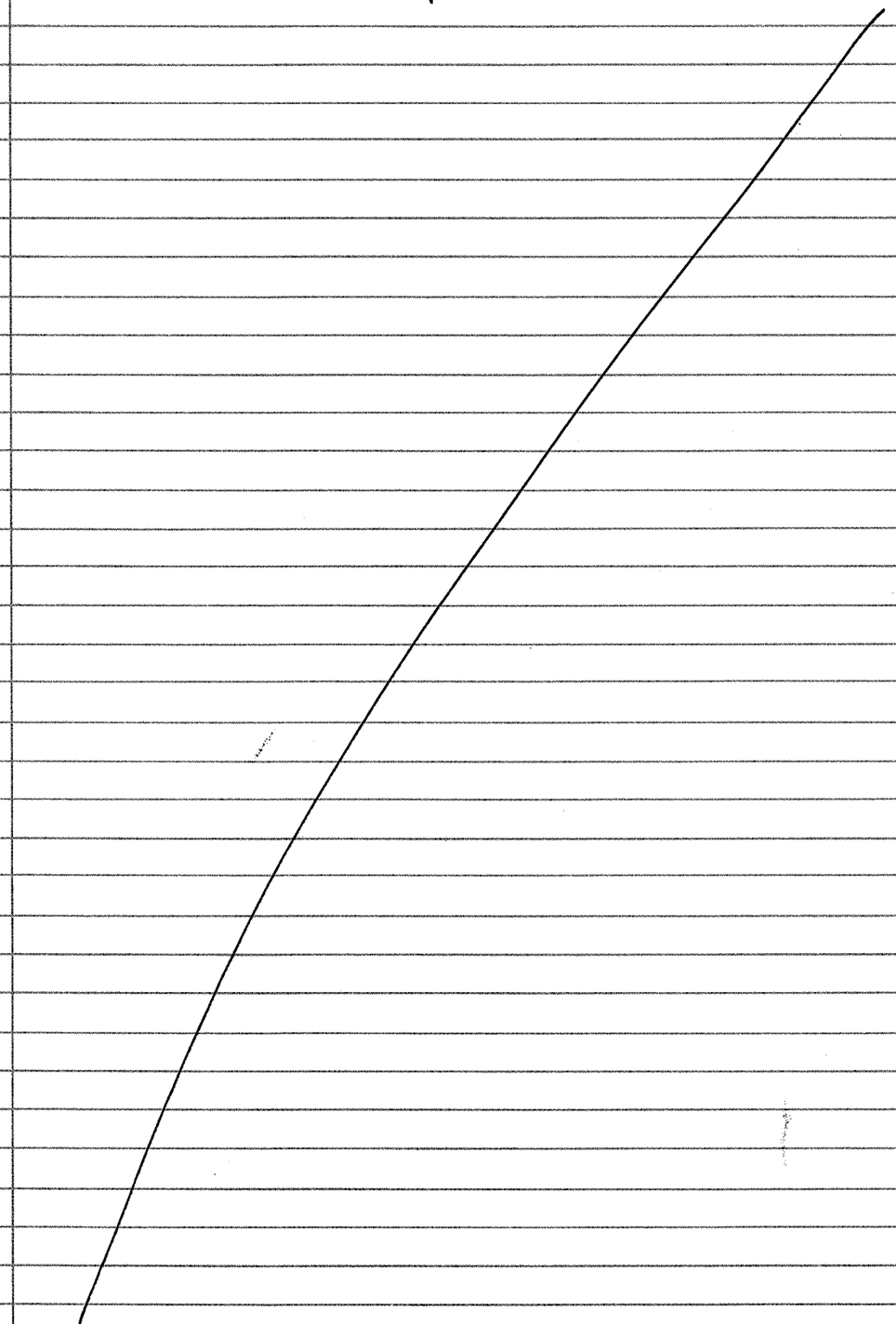
SM
8/15/2000

5-5-SP YL

Worked for Justin of Div. 18

5-6-99 YC

Work on report



5-7-99 YC

prepare for talk w/ NRC.

defending seismic factors

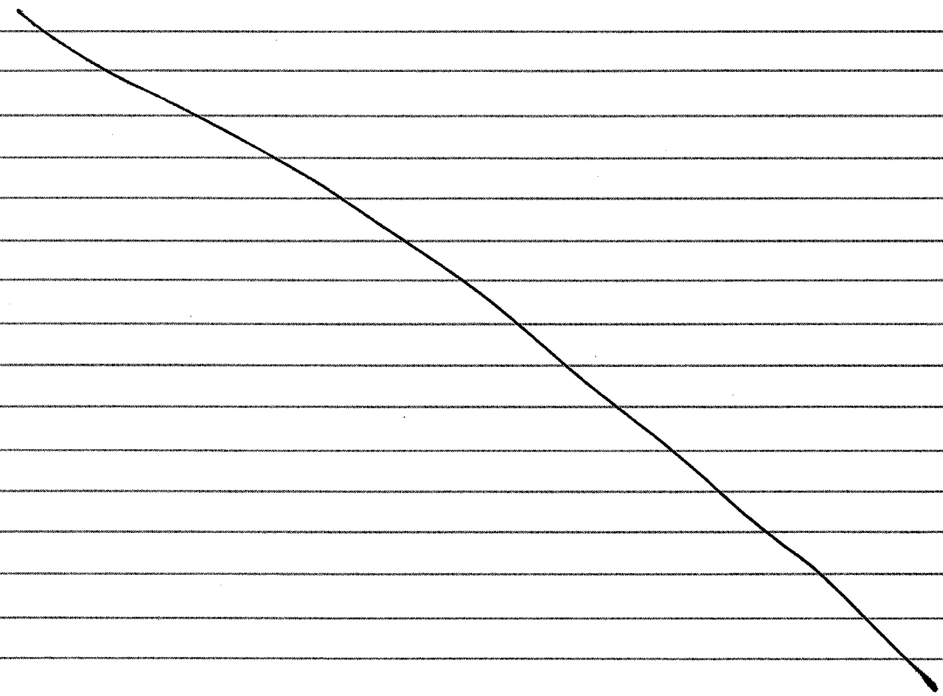
how: change Δ to a smaller value.

changed delta in baselhs.f to

$$delta = \frac{ip}{ip(ip-1)}$$

⇒ CheckMorris/lhs1.out

run tpa.e. at 1:06pm



5-10-99 YC

modified mrrslhs.f, ...

added "idelta"

~~xbase~~ Y.C. if (xbase .gt. 1-Δ)

xbase = xbase - Δ.

...

run tpa.e.

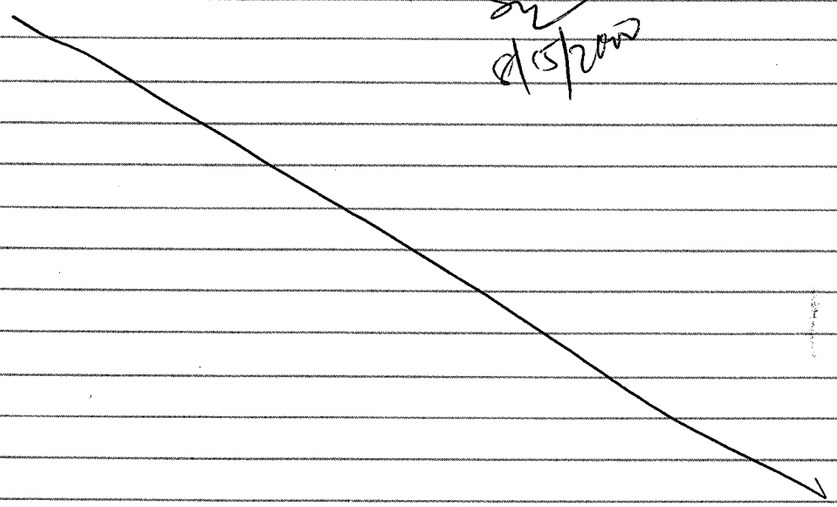
need to ask Marty to do scatter plot.

Several tests may be conducted on the Morris method

(1) change the size of Δ.

(2) change the ~~number~~ value of p

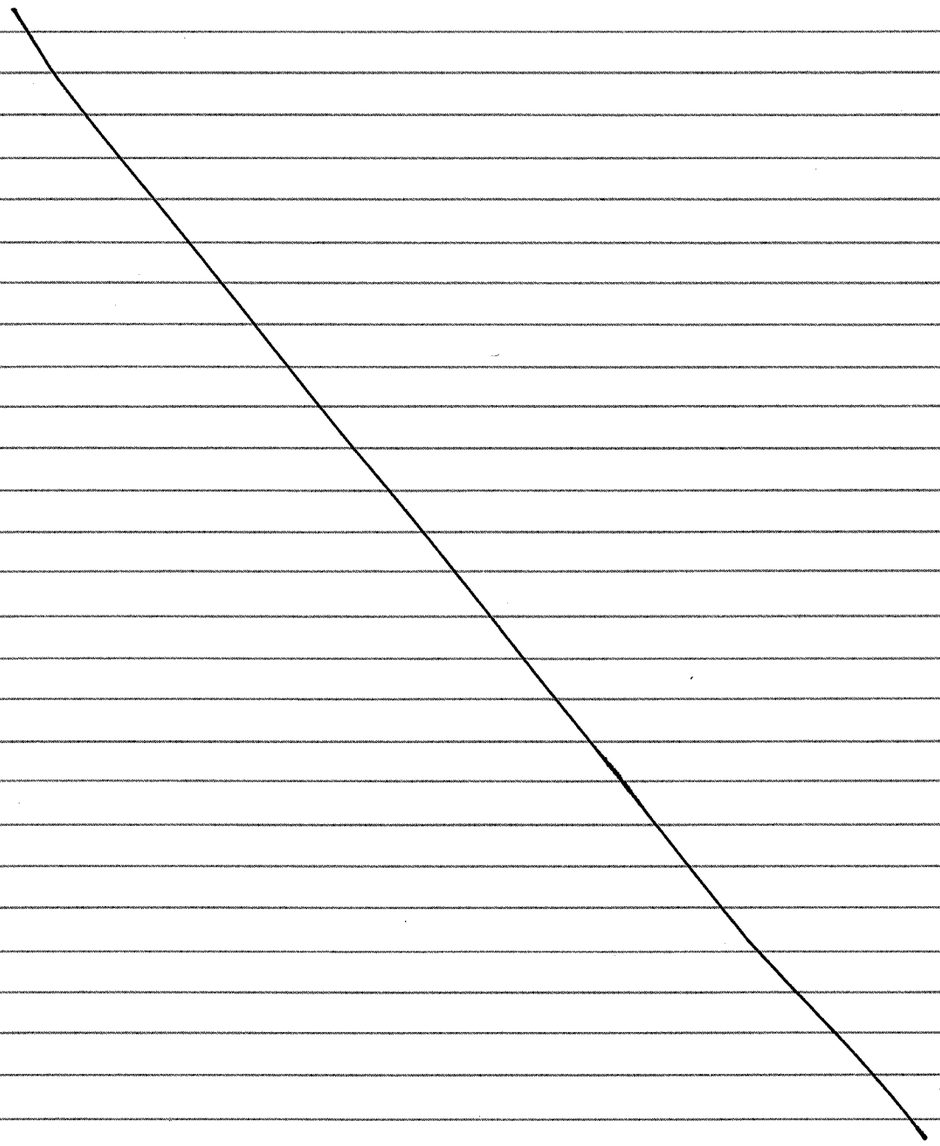
Sy
4/15/2000



5-11-99 YC

Discussed w/ Marty on what we should do next; prepare for NRC's questions on the report, Morris method, FAST.

Sitakanta: focus on SRD of Morris & FAST



5-12-99 YL

sick.

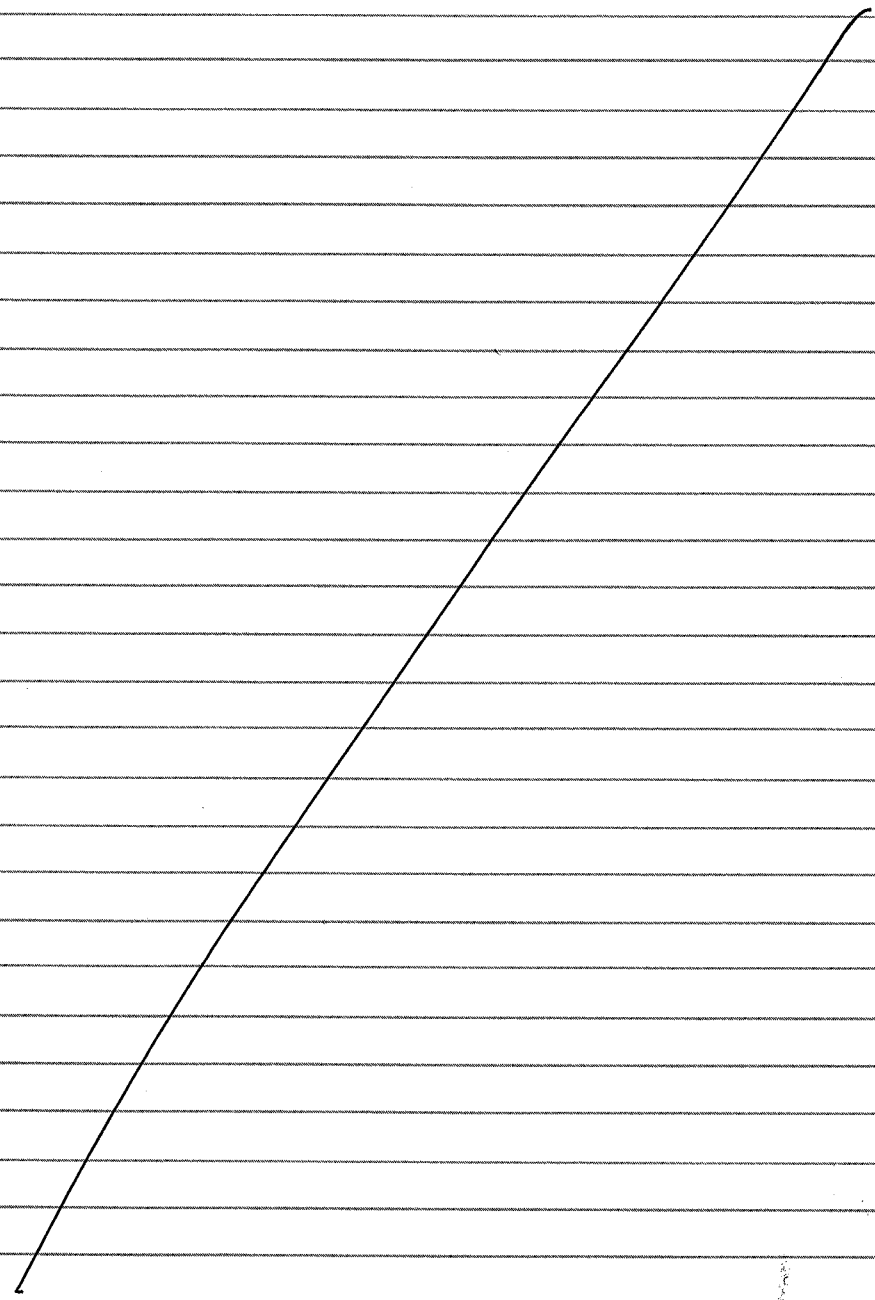
~~5-~~ 5-13-99 YL

sick for half day.

SRD.

5-14-19 YC

Finished SRD & SDP for Morris and FAST emailed them to Sitakanta.



morris/testlhs/checkMorris/delta_8
morris/testlhs/checkMorris/delta_8

May, 15, 1999

Delta = p / [8 * (p-1)]

8/15/2000

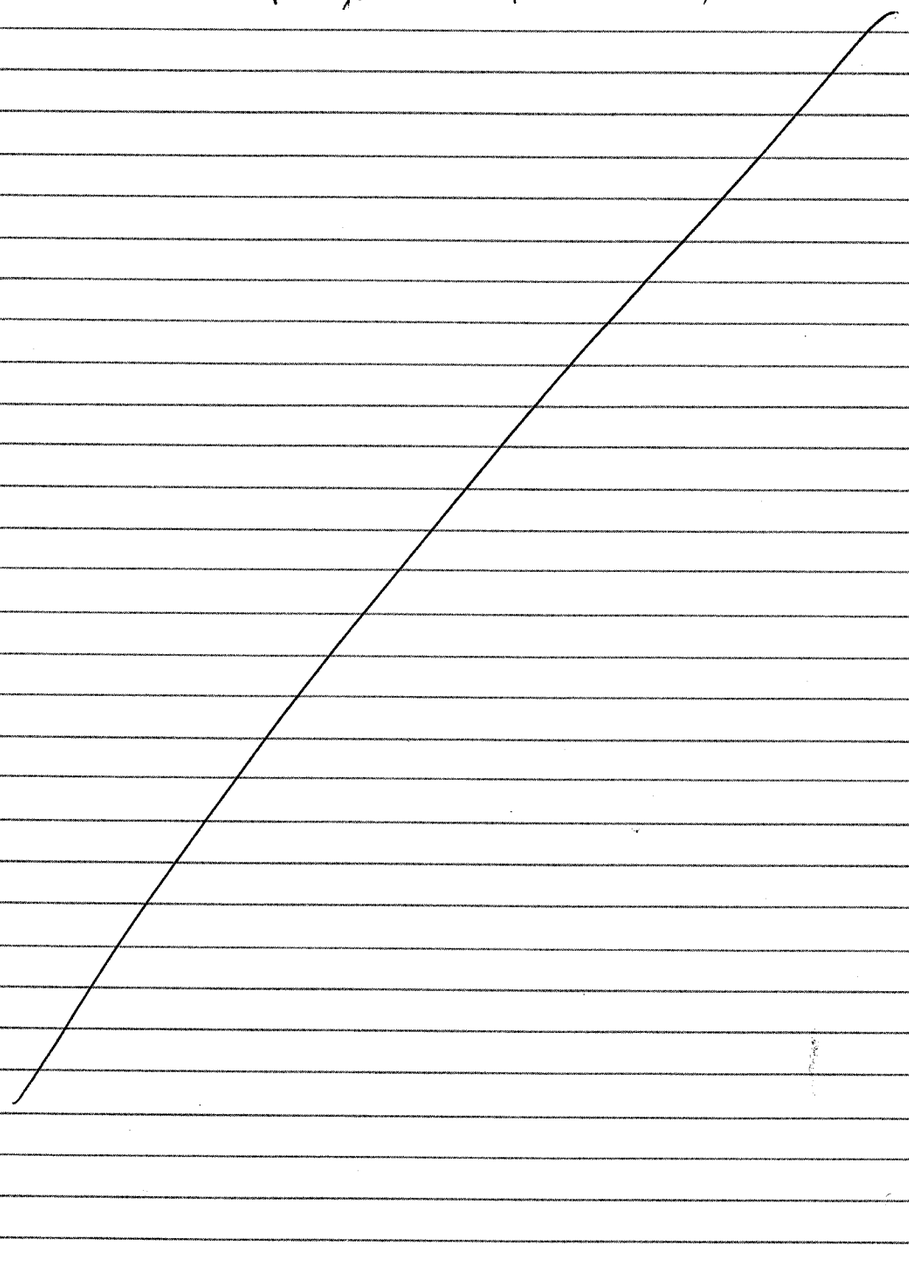
Rank	10kyr	50kyr
1	ARDSAVNp	ARDSAVNp
2	APrs_SAV	WPRRG@20
3	FO-Rn#Sd	SbArWt%
4	NWFZnW	MKDCHvNp
5	NELCDAmt	MAPM@GM
6	WPRRG@20	AAMAI@S
7	VEi/e-R#	ARDSAV_U
8	FPrs_STF	APrs_SAV
9	Fow*	AA_2_1
10	AqThick5	InitRSFP
11	PlumeTh5	SFWt%S37
12	MixZnT20	FPrs_TSw
13	FEROI-Tn	MKD_CHvU
14	ARDSAVTh	Fow*
15	ARDSAVPb	SFWt%C4
16	Fmult*	Fmult*
17	FPrs_TSw	ARDSAV_I
18	FOCTR-R	SFWt%C2
19	FOC-R	SFWt%C1
20	InitRSFP	SFWt%C7

5-16-99 YL

continue morris.

Submitted delta = $\frac{p}{2(p-1)}$

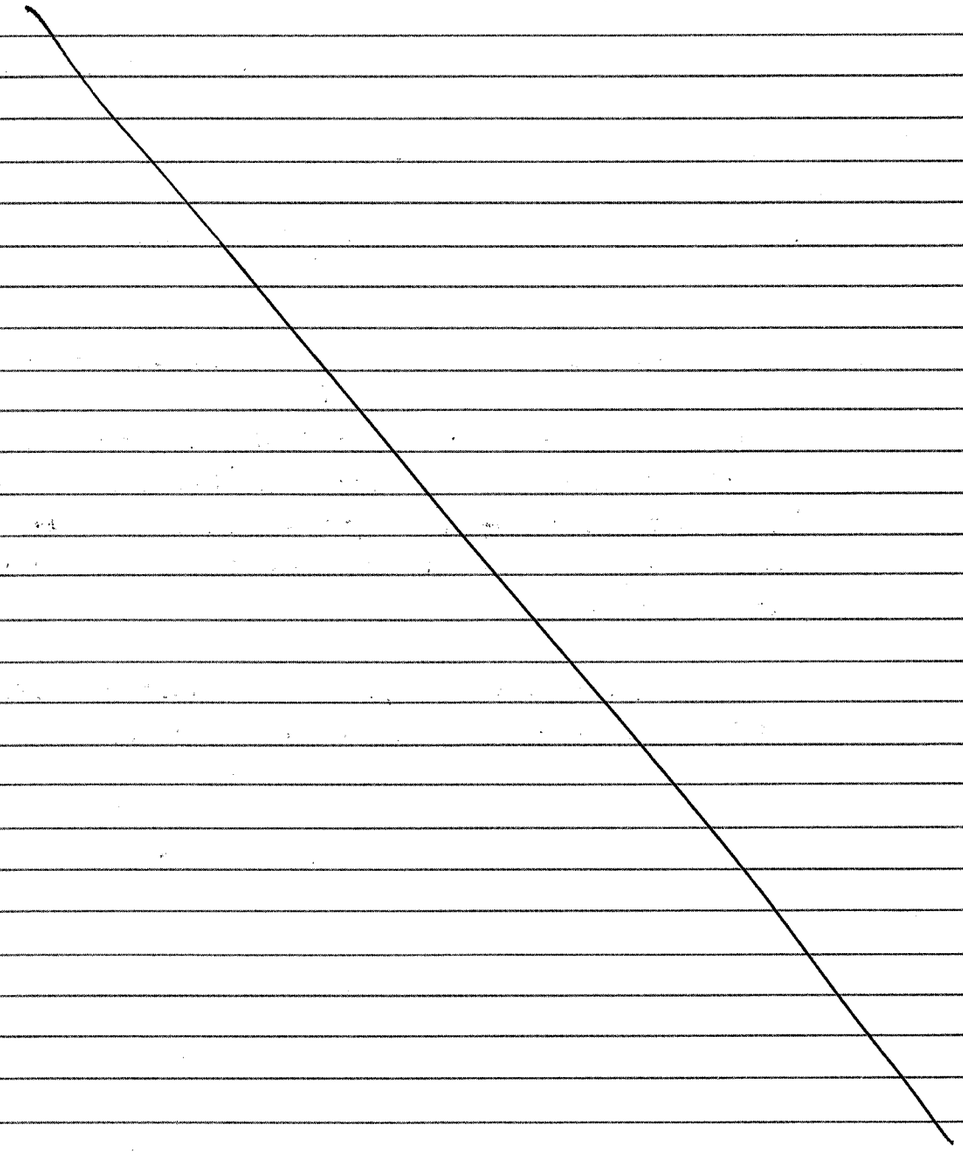
to compare to what previously did



5-19-99 YL

Got results for d=2, d=4, d=8, p=8

results put in ylu/morris/testlhs/CheckMorris/p=8.



5-20-99 YL

running p=d=11. in TPARUN.

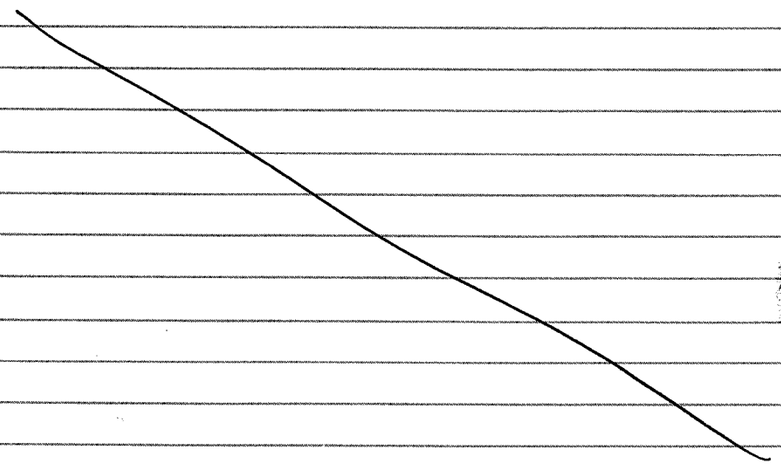
~~prep~~ preparing next week's meeting.
Y.L.

discovered that in the report, 10 kyr used indep. run. But should use *_c.res for 50 kyr run.

Created a subdirectory /CheckMorris

To check whether we correctly performed Morris method or not, we can look at the file lhs.out It must be of ~~for~~ the form described in the middle of the right column of page 164 of Morris' paper.

The subdirectory stores lhs.out files for p=8, d=2, 4, 8 and p=11, d=11.

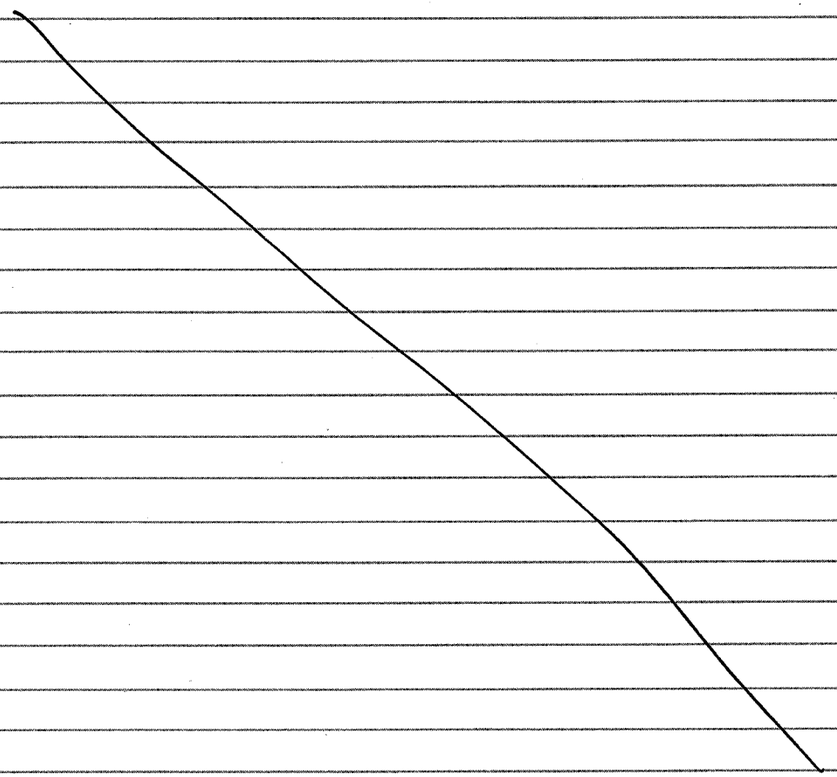


5-21-99 YL

plotted 10 kyr, 50kyr using p=8/delta_2, _4_8. they all are from ~~50 max~~ 50 kyr max TPI runs.
Y.L.

50 10 kyr and 50 kyr are consistent.

Sitakanta pointed out that some parameters were not discovered before.



5-22-98 YC

prepared a document for Sitakanta.

44

Sitakanta:

Last week I got new results for the Morris method like this:

For normalized xi, 0 <= xi <= 1, $\Delta x_i = \frac{p}{2(p-1)}$, p = 8.

Morris Method

Rank	10 kyr	50 kyr
1	CritRHAC (9)	ARDSAVNp
2	YMR-TC (8)	WPRRG@20
3	*Chlorid (14)	AA_2_1
4	SSMO-RE (15)	MAPM@GM
5	H2O-FThk (10)	AAMAI@S
6	Fow* (62)	APrs_SAV
7	Fmult* (63)	Fow*
8	FOCTR-R (6)	SbArWt%
9	FOC-R (4)	Fmult*
10	WPRRG@20 (223)	OO-CofLC

Comparing the results with other sensitivity analysis results, there are 9 hits in the 50 kyr column, and there are 5 hits in the 10 kyr column. However, the top 5 parameters of the 10 kyr column are new, and are not picked up by other methods. I listed parameter numbers beside the abbreviations.

When trying to explain this, I looked at the gwpkdos_c.res file, and for the first 16 realizations I got:

...

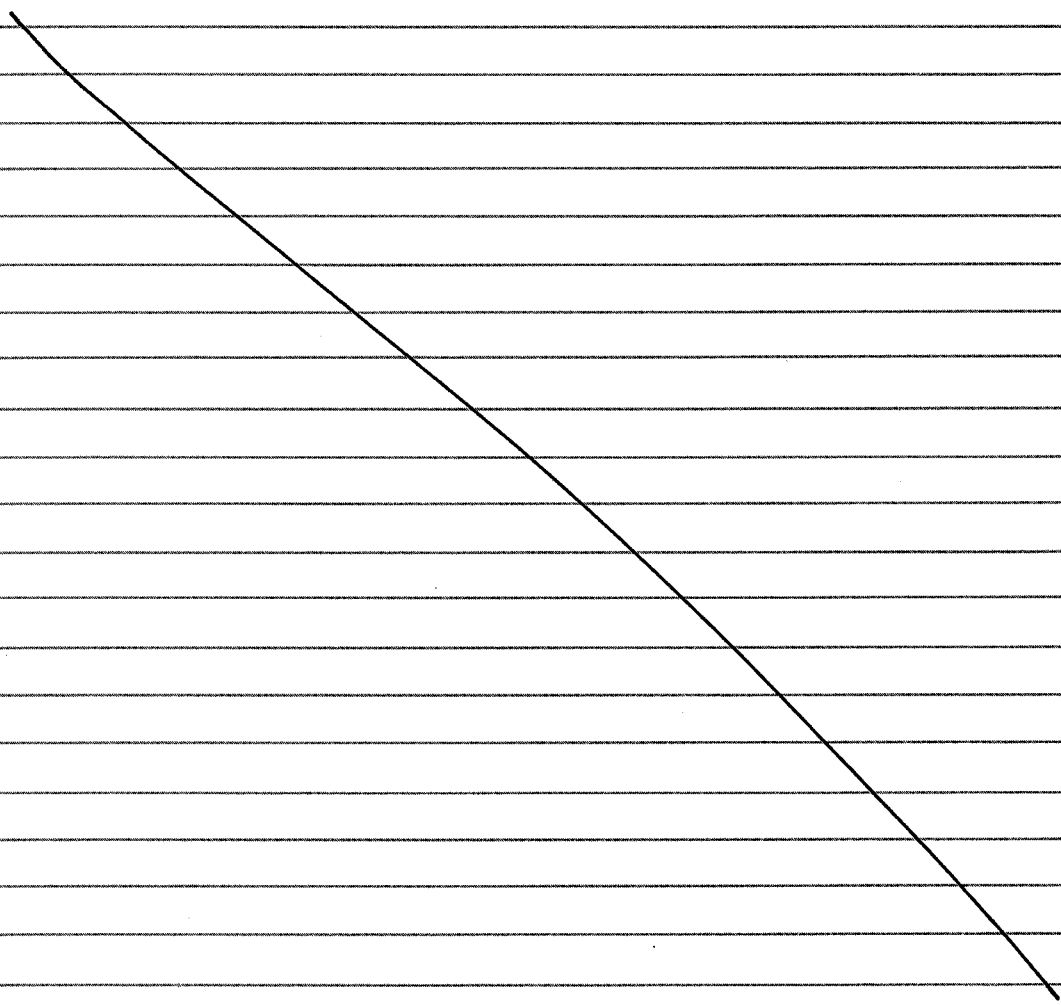
7	0.10000E+05	0.11596E-05	0.00000E+00	0.00000E+00
8	0.10000E+05	0.11495E-05	0.00000E+00	0.00000E+00
9	0.10000E+05	0.14838E-03	0.00000E+00	0.00000E+00
10	0.10000E+05	0.98127E-06	0.00000E+00	0.00000E+00
11	0.10000E+05	0.98127E-06	0.00000E+00	0.00000E+00

5-24-88 YL

Sitakanta wanted a time table for finishing Morris. send c:\YLH\plan.zip to Sitakanta & Marty.

Morris is to be finished in June 4.

need to do (1) porting to PC
(2) user manual
(3) project administrative paperwork.

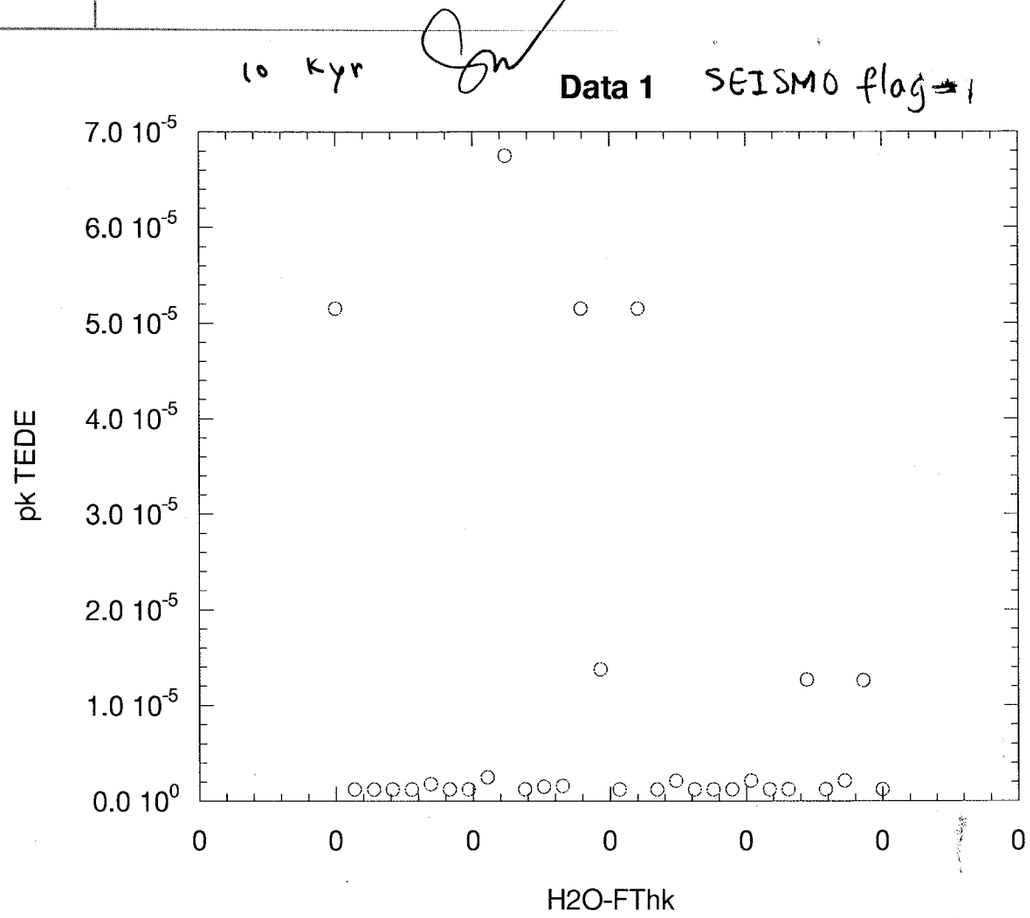


5-25-99 YL

got results saved data files in
morris/testlhs/CheckMorris/p=8/delta=2
/Codell.

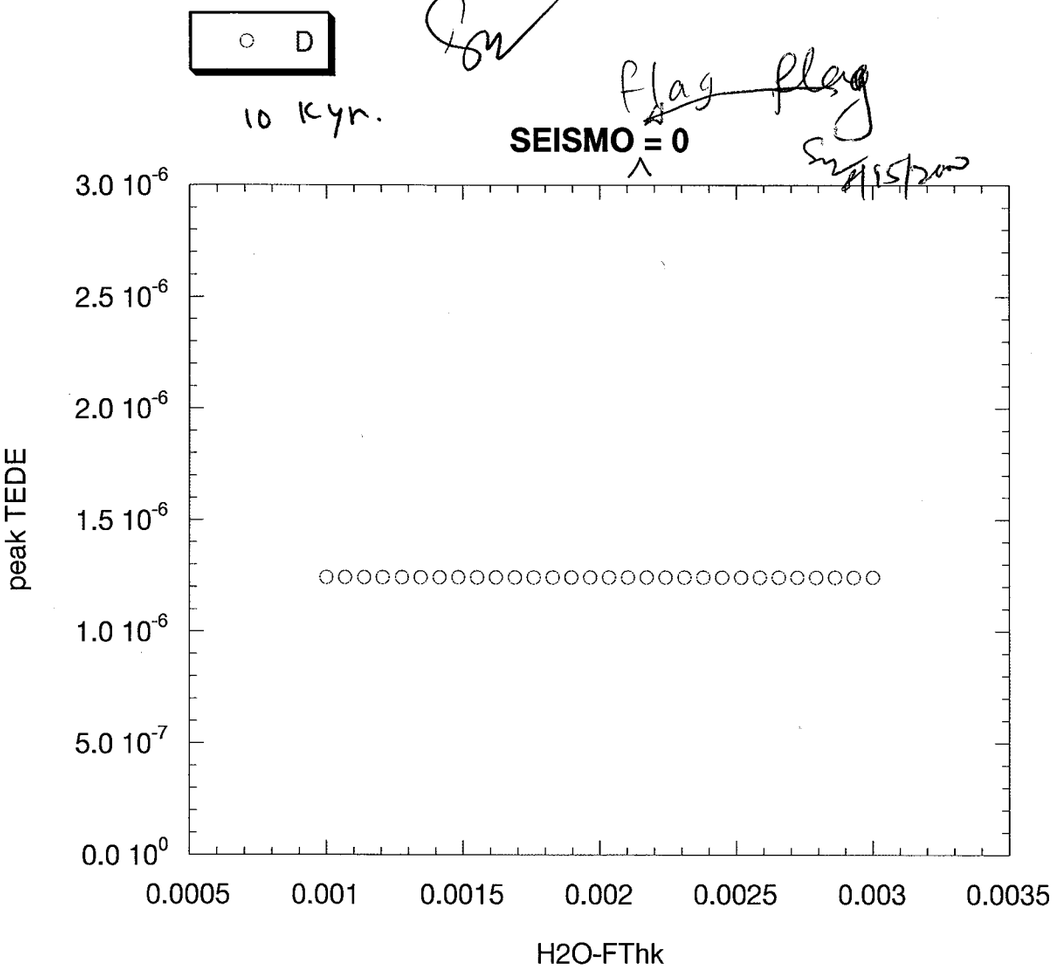
Codell thought this was wrong, see wpsfail.res. many points were due to seismo, not corrosion.

10 kyr



if SEISMO flag in tpa.inp = 0.

10 kyr.



Rob Rice thought that tpa code needs to be modified for the Morris method. because there is another file that generates random events for SEISMO, while lhs.out was read from a file.

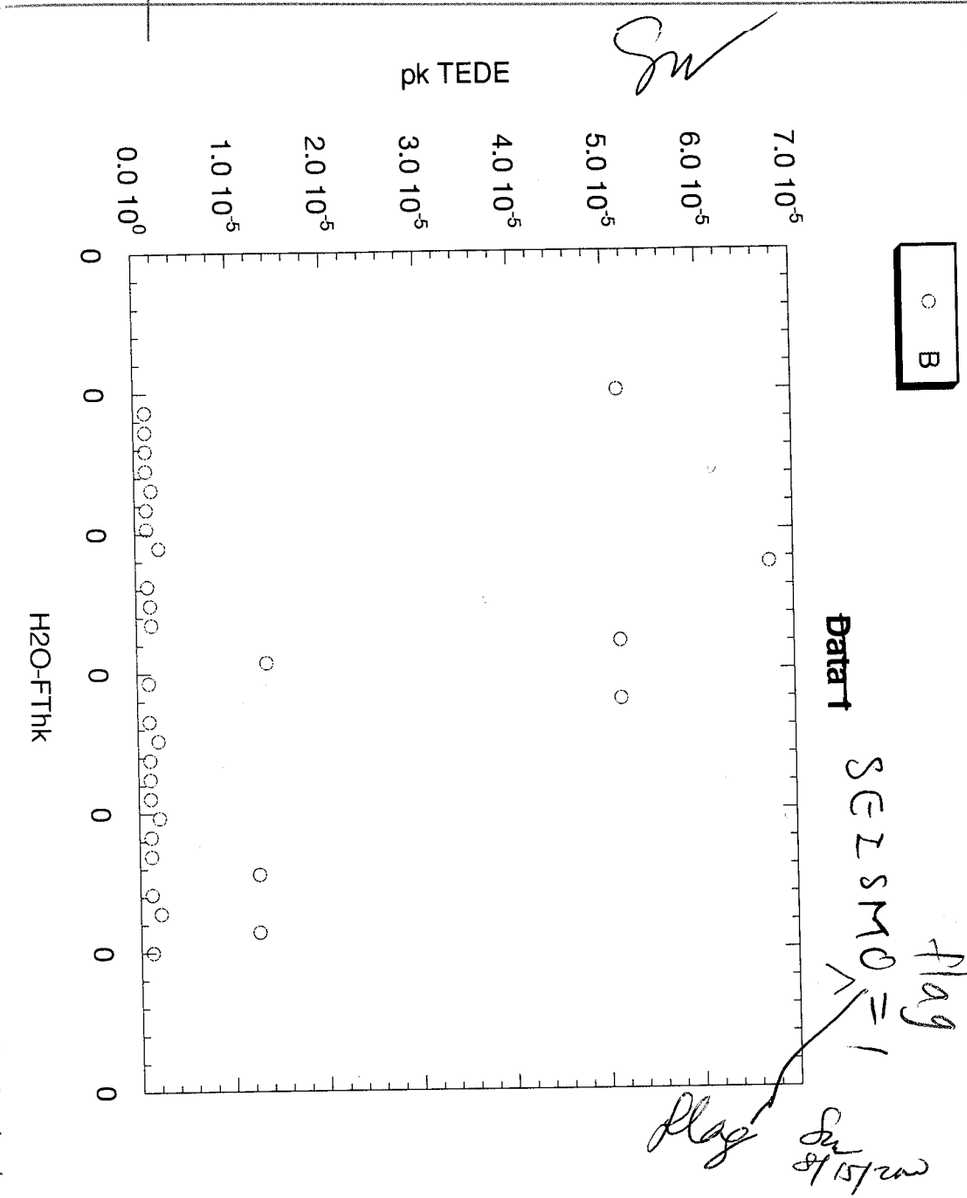
Sitakanta agreed to look at it.

random Seismo events ⇒ ~~pk dos~~ gwpkdos_c.res in ~~[illegible]~~ < 10 kyr.

⇒ H_2O-FThk important.

also see wpsfail.res.

Dick Codell threw a bomb at DOE / NRC Technical Exchange meeting. said Morris results were wrong.



5-26-99 YL

Talked to Rob Rice

He thought that the Seismic hazard curve should use a constant instead of of monte ~~cat~~ carlo sampling for seismic event.

ran several cases with Seismo flag = 0

Is this what we want?

If seismo flag = 0, and only vary H_2O-FThk, ~~output~~ pk TGDG = const.

8/15/2000

gave Sitakanta results based on limited Morris run. by turning the seismo flag off.

run Morris-2470 ~~or~~ in TPARUN.

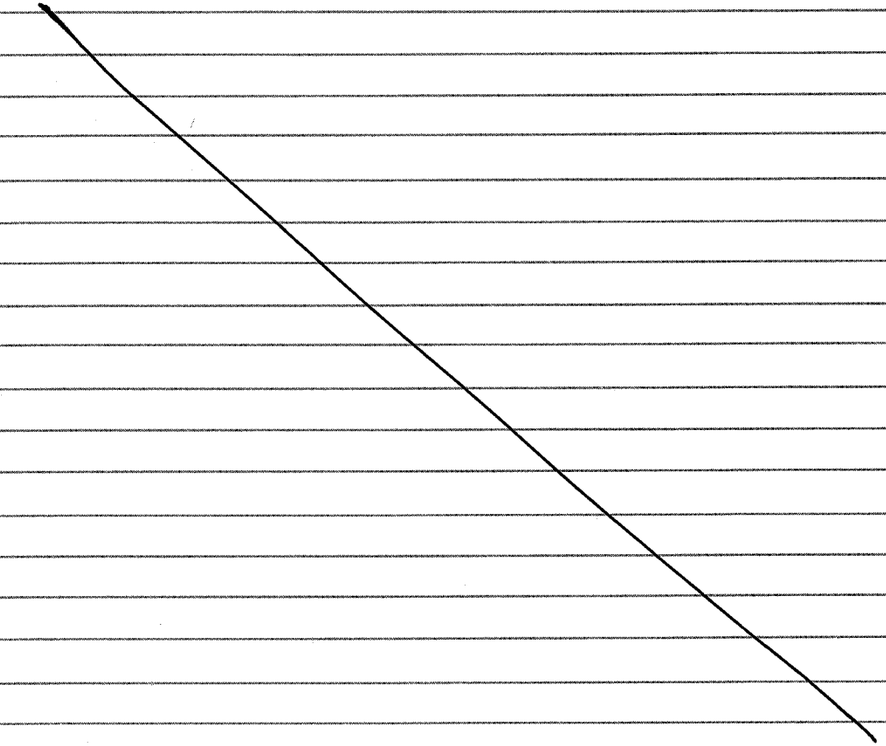
turn seismo flag off.

5-27-99 YL

Rob gave me following six parameters as corrosion-failure related parameters.

Sampled Corrosion Parameters

9 CriticalRelativeHumidityAqueousCorrosion
10 ThicknessOfWaterFilm[m]
11 InnerOverpackErpIntercept
12 AA_2_1[C/m2/yr]
13 CoefForLocCorrOfOuterOverpack
14 ChlorideMultFactor



Sitakanta wants to see a comparison between the limited Mirris run and CheckMorris/p=8/delta-2/gwpkdos-c.res results with corrosion related params removed. results on the right.

	Limited Morris 50 kyr
1	WPRRG@20
2	OO-CofLC
3	AA-2-1
4	AAMAI@S
5	YMR-TC
6	MAPM@GM
7	⊗ CritRHAC
8	WP Def %
9	Sb Ar Wer %
10	Fmul*
	obtained 5-26-99

A comparison
5-27-99

Ranking	Limited Morris Seismic flag = 0	Morris Seismic flag = 1 Corrosion params removed
1	FOC-R	YMP-TC
2	AAMAI@S	SSMO-RE
3	Fow*	Fow*
4	WPRRG@20	Fmul*
5	YMR-TC	FOC-R
6	TempGrBI	FOCTR-R
7	MAPM@GM	WPRRG@20
8	Fmul*	APrs_SAV
9	WPDef%	ARDSAVNp
10	SFWt%I4	AAMAI@S

↑ see 5-22-99

↑ morris/testths/checkmorris/delta-2/gwpkdos_c.res

There is a clear connection between seismic failure before 10 kyr in wpsfail.res and big jumps in gwpkdos_c.res

The two files on the right are from

/morris/testlhs/CheckMorris/p=8/delta-2/

In realization #4, there is a seismic failure at 8.6849×10^3 year, and there is a jump in pktede of realization #4.

Same occur at realization # 9, and #15.

But notice the seismic failure at # 11 has no effects on gwpkdos_c.res, because it occurs in 11033 and 12211 years.

One way to solve the problem is if there is a seismic failure before 10 kyr, then the variation in gwpkdos_c.res is not allow to double the previous. If it does, then force it back to the previous value.

5-28-99

5-24-99, Dick Codell of NRC declared that the results of the Morris method were wrong. When we ran the TPA code, there were random seismic events that contributed to gwpkdos.res, which might not have anything to do with the contributions from delta x's.

Without modifying the TPA code itself, Sitakanta suggested that we calculate the contributions to pktede from failed WP's of seismic events, so that we could somehow eliminate the influence from seismic events.

The following results are based on

/home/yichi/morris/testlhs/CheckMorris/p=8/delta_2/wpsfail_16.res

and

/home/yichi/morris/testlhs/CheckMorris/p=8/delta_2/gwpkdos_c_16.res.

The amount of dose depends on the number failed WP and the time the WP's fail.

For the realization #4, there was a seismic event at year 8684.9 that resulted in 2179 WP's failure. This resulted in a jump in pktede from 2.2232E-6 at realization #3 to 6.7233E-6 at realization #4. If each WP contributes to pktede an amount of 2.0E-9 at year 8684.9, then without the seismic event, the pktede at realization #4 would be 6.7233E-6 - 2.0E-9 x 2179 = 2.3653E-6.

For the realization #9, there were two seismic events, one at year 1885.6 that resulted in 2179 WP's failure, and the other at year 8684.9 that resulted in 1226 WP's failure. These resulted in a jump in pktede from1.1495E-6 at realization #8 to 1.4838E-4 at realization #9. If each WP contributes to pktede an amount of 2.0E-9 at year 8684.9, and 66.44E-9 at year 1885.6, then without the seismic event, the pktede at realization #9 would be 148.38E-06 - 1226 x 2.0E-9 - 66.44E-9 x 2179 = 145.928E-6 - 144.773 = 1.155E-6.

For the realization #15, there was a seismic event at year 4274.1 that resulted in 2179 WP's failure. This resulted in a jump in pktede from0.98127E-6at realization #14 to 7.5882E-6 at realization #15. If each WP contributes to pktede an amount of 3.032E-9 at year 4274.1, then without the seismic event, the pktede at realization #15 would be 7.5882E-6 - 3.032E-9 x 2179 = 0.9815E-6.

mean annual temp. chng. @ glac-max

gwpkdos-c-16.res

Mean value input file tpa.inp for TPA Version 3.2 Code.
Parent file is the modified base case data set Rev 3.2, Jan. 7, 1999
TPA 3.2, Job started: Mon May 24 15:07:27 1999
Groundwater Total Peak Dose and Peak Time with Doses for Compliance Period
for Each Nuclide at Peak Time - Values for Each Vector

mean avg. precipitation multipliers at glac. max.

AAMAI

vector	pktime	pktede	Cm245de	Am241de	Np237de	Pu239de	U234de	
unitless	yr	rem/yr	rem/yr	rem/yr	rem/yr	rem/yr	rem/yr	
1	1.0000E+04	9.3564E-07	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.
2	1.0000E+04	2.1406E-06	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.
3	1.0000E+04	2.2232E-06	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.
4	1.0000E+04	6.7233E-06	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.
5	1.0000E+04	1.1734E-06	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.
6	1.0000E+04	1.1374E-06	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.
7	1.0000E+04	1.1596E-06	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.
8	1.0000E+04	1.1495E-06	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.
9	1.0000E+04	1.4838E-04	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.
10	1.0000E+04	9.8127E-07	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.
11	1.0000E+04	9.8127E-07	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.
12	1.0000E+04	9.8127E-07	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.
13	1.0000E+04	9.8127E-07	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.
14	1.0000E+04	9.8127E-07	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.
15	1.0000E+04	7.5882E-05	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.
16	1.0000E+04	9.8127E-07	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.

Temp. gradient

frac. condensate removed

fraction of cond. toward repository

wps fail - 16 - res

Mean value input file tpa.inp for TPA Version 3.2 Code.
Parent file is the modified base case data set Rev 3.2, Jan. 7, 1999
TPA 3.2, Job started: Mon May 24 15:07:27 1999
Number of Failed WPs by Type of Disruptive Event
Including Time of Event - Values for Each Vector

vector	time	#corrode	#seismic	#fault	#igact
unitless	yr	unitless	unitless	unitless	unitless
1	1.3210E+04	2.7800E+02	0.0000E+00	0.0000E+00	0.0000E+00
1	1.3560E+04	6.5300E+02	0.0000E+00	0.0000E+00	0.0000E+00
1	1.3945E+04	2.0620E+03	0.0000E+00	0.0000E+00	0.0000E+00
1	1.4151E+04	3.4240E+03	0.0000E+00	0.0000E+00	0.0000E+00
1	4.3143E+04	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2	1.3210E+04	2.7800E+02	0.0000E+00	0.0000E+00	0.0000E+00
2	1.3560E+04	6.5300E+02	0.0000E+00	0.0000E+00	0.0000E+00
2	1.3945E+04	2.0620E+03	0.0000E+00	0.0000E+00	0.0000E+00
2	1.4151E+04	3.4240E+03	0.0000E+00	0.0000E+00	0.0000E+00
3	1.3210E+04	2.7800E+02	0.0000E+00	0.0000E+00	0.0000E+00
3	1.3560E+04	6.5300E+02	0.0000E+00	0.0000E+00	0.0000E+00
3	1.3945E+04	2.0620E+03	0.0000E+00	0.0000E+00	0.0000E+00
3	1.4151E+04	3.4240E+03	0.0000E+00	0.0000E+00	0.0000E+00
3	3.3825E+04	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4	8.6849E+03	0.0000E+00	2.1790E+03	0.0000E+00	0.0000E+00
4	1.3210E+04	1.8300E+02	0.0000E+00	0.0000E+00	0.0000E+00
4	1.3560E+04	4.3100E+02	0.0000E+00	0.0000E+00	0.0000E+00
4	1.3945E+04	1.3620E+03	0.0000E+00	0.0000E+00	0.0000E+00
4	1.4151E+04	2.2610E+03	0.0000E+00	0.0000E+00	0.0000E+00
4	4.4740E+04	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5	1.3210E+04	2.7800E+02	0.0000E+00	0.0000E+00	0.0000E+00
5	1.3560E+04	6.5300E+02	0.0000E+00	0.0000E+00	0.0000E+00
5	1.3945E+04	2.0620E+03	0.0000E+00	0.0000E+00	0.0000E+00
5	1.4151E+04	3.4240E+03	0.0000E+00	0.0000E+00	0.0000E+00
5	4.3143E+04	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5	4.4740E+04	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
6	1.3210E+04	2.7800E+02	0.0000E+00	0.0000E+00	0.0000E+00
6	1.3560E+04	6.5300E+02	0.0000E+00	0.0000E+00	0.0000E+00
6	1.3945E+04	2.0620E+03	0.0000E+00	0.0000E+00	0.0000E+00
6	1.4151E+04	3.4240E+03	0.0000E+00	0.0000E+00	0.0000E+00
6	2.0594E+04	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7	1.3210E+04	2.7800E+02	0.0000E+00	0.0000E+00	0.0000E+00
7	1.3560E+04	6.5300E+02	0.0000E+00	0.0000E+00	0.0000E+00
7	1.3945E+04	2.0620E+03	0.0000E+00	0.0000E+00	0.0000E+00
7	1.4151E+04	3.4240E+03	0.0000E+00	0.0000E+00	0.0000E+00
7	2.1116E+04	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
8	1.3210E+04	2.7800E+02	0.0000E+00	0.0000E+00	0.0000E+00
8	1.3560E+04	6.5300E+02	0.0000E+00	0.0000E+00	0.0000E+00
8	1.3945E+04	2.0620E+03	0.0000E+00	0.0000E+00	0.0000E+00
8	1.4151E+04	3.4240E+03	0.0000E+00	0.0000E+00	0.0000E+00
8	4.3143E+04	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
9	1.8856E+03	0.0000E+00	2.1790E+03	0.0000E+00	0.0000E+00
9	8.6849E+03	0.0000E+00	1.2260E+03	0.0000E+00	0.0000E+00
9	1.3046E+04	1.3000E+02	0.0000E+00	0.0000E+00	0.0000E+00
9	1.3381E+04	3.0600E+02	0.0000E+00	0.0000E+00	0.0000E+00
9	1.3560E+04	2.2100E+02	0.0000E+00	0.0000E+00	0.0000E+00
9	1.3748E+04	2.3540E+03	0.0000E+00	0.0000E+00	0.0000E+00
10	1.3210E+04	2.7800E+02	0.0000E+00	0.0000E+00	0.0000E+00
10	1.3381E+04	6.5300E+02	0.0000E+00	0.0000E+00	0.0000E+00
10	1.3748E+04	3.7220E+03	0.0000E+00	0.0000E+00	0.0000E+00
10	1.3945E+04	1.7640E+03	0.0000E+00	0.0000E+00	0.0000E+00
10	2.0594E+04	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

at 8684.9 year
2×10^{-9} /per wp

at 8684.9 years
2×10^{-9} /per wp

8/15/2000

at 1885.6 years
66.5×10^{-6} /per wp

at 1885.6 years
66.5×10^{-6} /per wp

10	4.6412E+04	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
11	1.1033E+04	0.0000E+00	2.1790E+03	0.0000E+00	0.0000E+00
11	1.2211E+04	0.0000E+00	1.2260E+03	0.0000E+00	0.0000E+00
11	1.3210E+04	1.3000E+02	0.0000E+00	0.0000E+00	0.0000E+00
11	1.3381E+04	3.0600E+02	0.0000E+00	0.0000E+00	0.0000E+00
11	1.3748E+04	1.7470E+03	0.0000E+00	0.0000E+00	0.0000E+00
11	1.3945E+04	8.2800E+02	0.0000E+00	0.0000E+00	0.0000E+00
12	1.3210E+04	2.7800E+02	0.0000E+00	0.0000E+00	0.0000E+00
12	1.3381E+04	6.5300E+02	0.0000E+00	0.0000E+00	0.0000E+00
12	1.3748E+04	3.7220E+03	0.0000E+00	0.0000E+00	0.0000E+00
12	1.3945E+04	1.7640E+03	0.0000E+00	0.0000E+00	0.0000E+00
12	4.3143E+04	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
13	2.4128E+04	2.7800E+02	0.0000E+00	0.0000E+00	0.0000E+00
13	2.4819E+04	6.1390E+03	0.0000E+00	0.0000E+00	0.0000E+00
13	4.8164E+04	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
14	2.4819E+04	2.7800E+02	0.0000E+00	0.0000E+00	0.0000E+00
14	2.5543E+04	6.1390E+03	0.0000E+00	0.0000E+00	0.0000E+00
14	3.8776E+04	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
15	4.2741E+03	0.0000E+00	2.1790E+03	0.0000E+00	0.0000E+00
15	2.4819E+04	1.8300E+02	0.0000E+00	0.0000E+00	0.0000E+00
15	2.5543E+04	4.0540E+03	0.0000E+00	0.0000E+00	0.0000E+00
15	3.8776E+04	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
16	2.4819E+04	2.7800E+02	0.0000E+00	0.0000E+00	0.0000E+00
16	2.5543E+04	6.1390E+03	0.0000E+00	0.0000E+00	0.0000E+00

at 4274.1 year
3.437×10^{-8}/wp

at 4274.1 year
3.437×10^{-8}/wp

Sm
8/16/2002

5-28-91 YL

Had a meeting w/ Sitakanta and Marty.
It was decided that ~~we~~ we should run the TPA code w/ flag on.

Sitakanta has doubts about how the Morris method is executed.
He has bigger doubts about what trigs the seismic events.

Create TPARUN2 to recreate
~~wssf~~ wps fail_16.res
⇒ vector_16

8/16/2000

TPARUN2.

Volcanism flag = ON
Seismic flag = off

TPARUN3	→	delta-2,	p=8
4	→	-4	p=8
5	→	-8	p=8
6	→	-11,	p=11

6-1-98 YL

TPARUN3 finished
4 "
5 not finished
6 finished

create TPARUN7. delta-2, p=8
TPARUN8. -4, p=8
faulting flag on. others off.

run

terminated before finishing

Actually, there were also WP failure before 10 kyr. due to igneous events.

but # WP failure < ~~5000~~ 100

8/16/2000

Within ~~1000~~ each 247 realizations, failed WP's are almost constant.

Volcanism flag on, seismic flag off.

$$\Delta x = \frac{p}{d(p-1)} \qquad 0 \le x \le 1$$

10 kyr TPI

Ranking	p = 8, d = 2	p = 8, d = 4	p = 8, d = 8	p = 11, d = 11
1	Fow*	ARDSAVNp		ARDSAVNp
2	ARDSAV_U	WPRRG@20		Fow*
3	WPRRG@20	Fow*		VEROI-Tn
4	ARDSAVNp	APrs_SAV		FOCTR-R
5	Fmult*	VEROI-Tn		Fmult*
6	FOCTR-R	FOCTR-R		APrs_SAV
7	SbArWt%	FOC-R		WPRRG@20
8	FOC-R	ARDSAV_Tc		ARDSAV_Tc
9	VD-Width	AAMAI@S		FOC-R
10	VEROI-Tn	SbArWt%		AAMAI@S
11	AAMAI@S	Fmult*		SbArWt%
12	FOCTR	WPDef%		VD-Width
13	SFWt%V0	VD-Width		ARDSAV_Se
14	InitRSFP	ARDSAV_I		VD-Angle
15	ARDSAV_Tc	InitRSFP		ARDSAV_I
16	WPDef%	YMR-TC		WPDef%
17	APrs_SAV	MAPM@GM		SFWt%I_3
18	ARDSAV_I	TempGrBI		SFWt%V0
19	MAPM@GM	SFWt%V0		InitRSFP
20	VD-Lengt	ARDSAV_Se		TempGrBI

50 kyr TPI

Ranking	p = 8, d = 2	p = 8, d = 4	p = 8, d = 8	p = 11, d = 11
1	ARDSAVNp	ARDSAVNp		ARDSAVNp
2	WPRRG@20	WPRRG@20		ARDSAV_U
3	AA_2_1	AAMAI@S		SbArWt%
4	MAPM@GM	SbArWt%		MKD_CHvNp
5	AAMAI@S	MATI@GM		InitRSFP
6	APrs_SAV	MAPM@GM		Fow*
7	Fow*	MKD_CHvNp		AA_2_1
8	Fmult*	AA_2_1		WPRRG@20
9	SbArWt%	APrs_SAV		MKD_CHvU
10	OO-CofLC	InitRSFP		ARDSAV_Tc
11	MKD_CHvU	SFWt%C3		SFWt%C3
12	ARDSAV_U	ARDSAV_U		SFWt%C2
13	YMR-TC	ARDSAV_Tc		Fmult*
14	InitRSFP	SFWt%C4		APrs_SAV
15	SFWt%C3	MKD_CHvU		SFWt%C1
16	ARDSAV_Tc	FOCTR-R		SFWt%C4
17	SFWt%C6	YMR-TC		SFWt%C6
18	SFWt%C5	Fow*		SFWt%C5
19	ARDSAV_Th	ARDSAV_I		MAPM@GM
20	SFWt%C4	SFWt%C7		YMR-TC

6-2-95 YL

Someone is modifying the TPA code.
Sitakanta wants to see the test plan
and test results
also wants to ~~see the reduced~~ Y.L 8/16/2000
try reducing the # of FAST method.

Rob Rice modified tpa.e. and
tpa.inp.nsetflag in ~smohanty/A-Yichi/

copied ~~tpa~~ TPARUN3 → TPARUN4
4 → 12
5 → 13
~~6 → 14~~ Y.L.

nset = 7.
# realizations 1729.

Volcanism flag = off.
seismic flag = on.

run.

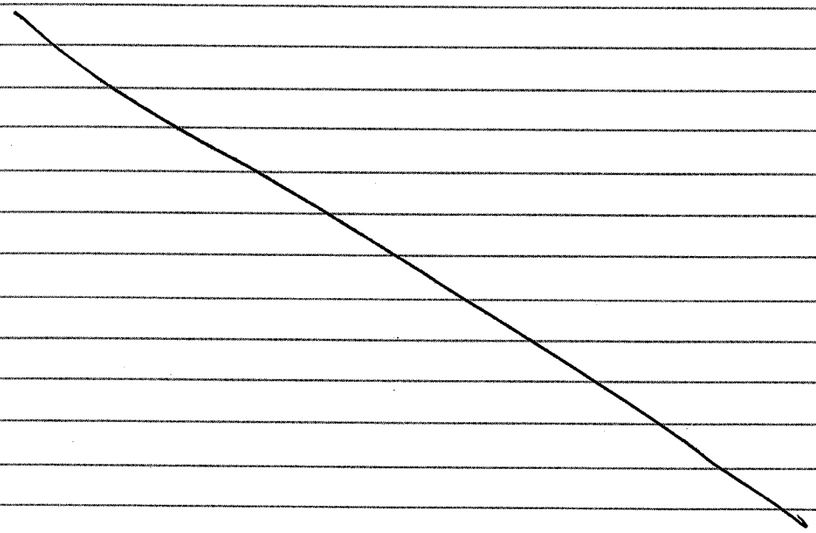
TPARUN 1, 2, ..., 8 used old tpa.e.

Starting from TPARUN 11, ... new tpa.e

wrote fastlhs3.f for 20 parameters.
generated lhs.out_Codell.
created TPARUN21 for lhs.out_Codell
run 2470 realizations

6-3-95 YL

Jury Duty



6-4-99 YL

TPARUN 11, 12, 13 finished.

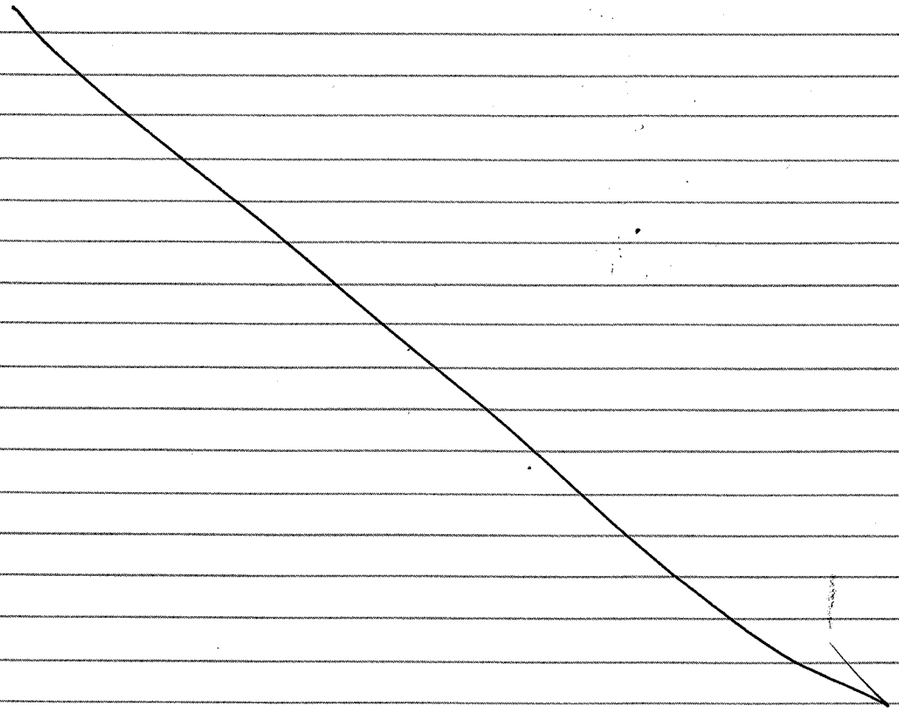
results tabulated → ylu/June-4-99

sent to sitakanta.

results quite consistent.

TPARUN21 still running

Vulcan crashed.



6-7-99 YL

corrected the report.

vulcan still bad.

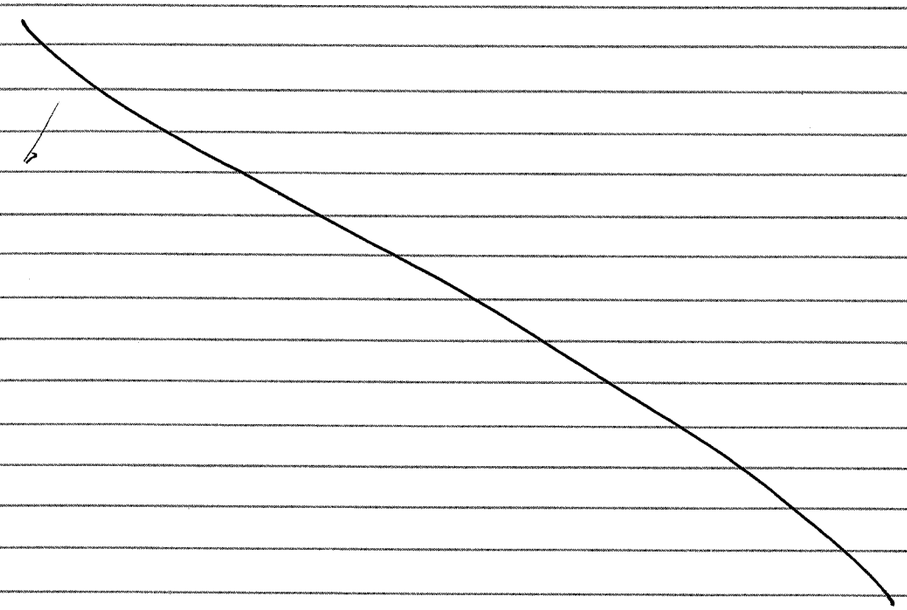
did test report on Morris & FAST.

Discussed with Marty about the Morris test work

8/16/2000

did Morris test & FAST test

vulcan is still down



6-8-99 YC

Vulcan is still down.

But I am supposed to run FAST.

work on the report.

6-9-99 YC

work on the report.

asked Morty to do figs. 3-6 & 7-7.
using TPARUN 3 / qwpkdos-c.res
qwpkdos.res.
8/16/2000
but Volcan is down, he could not do anything, me neither.

Bruce M emphasized the initial entries.

6-10-99 YL

work on report, serve as a reviewer for Sitakanta. Parameter Tree

Volcan is good now.

8y 8/16/2000

did ~~standd~~ standardization & log transform on TPARUN11 / gwpkdos.res gwPKdos-c.res.

⇒ ylu / June-10-99

G:/Mohanty/tp&3.2 sensitivity / morris_stand-log

create TPARUN22 to run the second half of lhs.out-Codell-50K

June-10-99

10 kyr TPI

Ranking	Normalization	Standradization	Logrithmic
1	FOCTR-R	FOCTR-R	AAMAI@S
2	FOC-R	FOC-R	WPRRG@20
3	FOCTR	FOCTR	FOCTR
4	AAMAI@S	WPRRG@20	APrs_SAV
5	WPRRG@20	AAMAI@S	MAPM@GM
6	ARDSAV_U	ARDSAV_U	FOCTR-R
7	Fow*	Fow*	Fow*
8	ARDSAV_I	WP-Def%	FOC-R
9	WP-Def%	ARDSAV_I	WP-Def%
10	APrs_SAV	SbArWt%	SbArWt%

50 kyr TPI

Ranking	Normalization	Standradization	Logrithmic
1	ARDSAVNp	ARDSAVNp	WPRRG@20
2	WPRRG@20	WPRRG@20	ARDSAVNp
3	APrs_SAV	APrs_SAV	APrs_SAV
4	MKD_CHvU	MKD_CHvU	SbArWt%
5	SbArWt%	SbArWt%	SFWt%C6
6	ARDSAV_U	InitRSFP	AA_2_1
7	InitRSFP	ARDSAV_U	SFWt%C3
8	SFWt%C3	SFWt%C3	InitRSFP
9	ARDSAVTc	ARDSAVTc	SFWt%C5
10	SFWt%C6	SFWt%C6	SFWt%C4

6-11-99 YC

FAST is still running in TPARUN 22

read report. c

did some modification on ~~chapt~~ 8/16/2000

G:\mohanty\tpa3.2 sensitivity\

chapter 3 fa.

analyzed the Morris table, and tables 4-6, 4-7.

6-12-99 YL

TPARUN22 finished

/FAST/gwpkdos_c.res
gwpkdos.res
⇒ paste /TPARUN22/gwpkdos_c.
gwpkdos.res

to TPARUN21, and saved into /FAST

total # of realizations: 4174

revised /FAST/fastamp.f
fashlhs_3.f

FAST applied only to Codell's list.

FAST/gwpkdos_res_~~Cobalt~~ Codell_50k

= TPARUN21/gwpkdos_res

+ TPARUN22/gwpkdos_res

8/16/2000

June-12-99
for 50kyr of Sens table 4-2

Application of FAST to Codell's list of 20 parameters.

(for 50 kyr of Sens table 4-2) 8/16/2000

Codell's list	Ranking	10 kyr TPI	Ranking	50 kyr TPI
AA_2_1	1	ARDSAV_I	1	SbArWt%
SSMO-RPR	2	SbArWt%	2	AA_2_1
SSMO-JS5	3	WPRRG@20	3	WPRRG@20
SSMOV206	4	APrs_SAV	4	ARDSAV_I
Fmult	5	InitRSFP	5	SFWt%C2
SbArWt%	6	Fmult	6	SFWt%C1
InitRSFP	7	ARDSAVNp	7	InitRSFP
SbGFRATF	8	SSMOV206	8	SFWt%C3
SFWt%C1	9	SFWt%C3	9	APrs_SAV
SFWt%C2	10	SFWt%C1	10	Fmult
SFWt%C3	11	SFWt%C7	11	SFWt%C6
SFWt%C6	12	SSMO-RPR	12	SFWt%C7
SFWt%C7	13	SFWt%C6	13	SSMOV206
MKD_CHvNp	14	ARDSAV_U	14	SSMO-RPR
ARDSAVNp	15	SSMO-JS5	15	ARDSAV_U
ARDSAV_I	16	SbGFRATF	16	ARDSAVTc
ARDSAVTc	17	AA_2_1	17	MKD_CHvNp
ARDSAV_U	18	MKD_CHvNp	18	SbGFRATF
APrs_SAV	19	ARDSAVTc	19	SSMO-JS5
WPRRG@20	20	SFWt%C3	20	ARDSAVNp

without multiplying σ_x

results of FAST without multiply σ_x

10 kyr

10	0.00000000044245182518	0.00000000044245182518	20
17	0.00000000108910436225	0.00000000108910436225	19
14	0.00000000109499620482	0.00000000109499620482	18
1	0.00000000153524859492	0.00000000153524859492	17
3	0.00000000171189418197	0.00000000171189418197	15
18	0.00000000233345187617	0.00000000233345187617	14
13	0.00000000432618785240	0.00000000432618785240	11
9	0.00000000660991616996	0.00000000660991616996	10
15	0.00000002123021047851	0.00000002123021047851	7
6	0.00000048387857987109	0.00000048387857987109	2
8	-0.00000000159493951379	0.00000000159493951379	16
12	-0.00000000238979569467	0.00000000238979569467	13
2	-0.00000000267452948677	0.00000000267452948677	12
11	-0.00000000798303201321	0.00000000798303201321	9
4	-0.00000001659491211115	0.00000001659491211115	8
5	-0.00000002449226066403	0.00000002449226066403	6
7	-0.00000024528173980798	0.00000024528173980798	5
19	-0.00000029468560569512	0.00000029468560569512	4
20	-0.00000030836841347082	0.00000030836841347082	3
16	-0.00000074578395015124	0.00000074578395015124	1

50 kyr

15	0.00000000110423725719	0.00000000110423725719	20
3	0.00000001134076388354	0.00000001134076388354	19
14	0.00000003723657826527	0.00000003723657826527	17
13	0.00000140036331686133	0.00000140036331686133	12
12	0.00000766905486671021	0.00000766905486671021	11
11	0.00001032179170579184	0.00001032179170579184	8
9	0.00001523535775049822	0.00001523535775049822	6
10	0.00001536561831017025	0.00001536561831017025	5
1	0.00003497975194477476	0.00003497975194477476	2
6	0.00004695490861195140	0.00004695490861195140	1
8	-0.00000003675537385561	0.00000003675537385561	18
17	-0.00000072719370791674	0.00000072719370791674	16
18	-0.00000073920693921536	0.00000073920693921536	15
2	-0.00000097435952284286	0.00000097435952284286	14
4	-0.00000137021038426610	0.00000137021038426610	13
5	-0.00000876457124832086	0.00000876457124832086	10
19	-0.00001002107637759764	0.00001002107637759764	9
7	-0.00001055464599630795	0.00001055464599630795	7
16	-0.00002326191133761313	0.00002326191133761313	4
20	-0.00002886515721911564	0.00002886515721911564	3

FAST results after multiplying σ_y

applied standard dev.

10 kyr

3	0.00000000000830954056	0.00000000000830954056	
10	0.00000000012772483071	0.00000000012772483071	
13	0.00000000124886279096	0.00000000124886279096	
9	0.00000000190811833001	0.00000000190811833001	
17	0.00000000290721846596	0.00000000290721846596	
14	0.00000000742661043773	0.00000000742661043773	8
18	0.00000001148951422891	0.00000001148951422891	7
15	0.00000008090754022305	0.00000008090754022305	5
6	0.00000013968370637940	0.00000013968370637940	4
1	0.00001905708813865203	0.00001905708813865203	2
8	-0.00000000000000038709	0.00000000000000038709	
2	-0.00000000004327391570	0.00000000004327391570	
7	-0.00000000009127921335	0.00000000009127921335	
12	-0.00000000068987454638	0.00000000068987454638	
11	-0.00000000230450281080	0.00000000230450281080	
19	-0.00000000425342072674	0.00000000425342072674	10
4	-0.00000000431148450275	0.00000000431148450275	9
5	-0.00000003976817808393	0.00000003976817808393	6
16	-0.00000111278882286570	0.00000111278882286570	3
20	-0.75665539503097534180	0.75665539503097534180	1

50 kyr

3	0.00000000005504810496	0.00000000005504810496	
15	0.00000000420820711611	0.00000000420820711611	
14	0.00000025255022251258	0.00000025255022251258	
13	0.00000040425007341582	0.00000040425007341582	
12	0.00000221386540033564	0.00000221386540033564	10
11	0.00000297964447781851	0.00000297964447781851	9
9	0.00000439806899521500	0.00000439806899521500	7
10	0.00000443567159891245	0.00000443567159891245	6
6	0.00001355471431452315	0.00001355471431452315	5
1	0.43420469760894775391	0.43420469760894775391	2
8	-0.00000000000000892054	0.00000000000000892054	
7	-0.00000000392780918901	0.00000000392780918901	
2	-0.00000001576514740975	0.00000001576514740975	
19	-0.00000014464178832441	0.00000014464178832441	
4	-0.00000035599109082796	0.00000035599109082796	
17	-0.00000194114636542508	0.00000194114636542508	
18	-0.00000363972753802955	0.00000363972753802955	8
5	-0.00001423106732545421	0.00001423106732545421	4
16	-0.00003470924275461584	0.00003470924275461584	3
20	-70.82754516601562500000	70.82754516601562500000	1

6-14-99 YC

~~wrote ~~fast~~ fast~~ [initials] 8/16/2000

wrote results section for Morris & FAST.

did abbreviation for Tables 4-6, 4-7.

started Codell_10K. for FAST

created TPARUN23 → ~~60~~ lhs.out_Codell_10K_1_1655

TPARUN24 → lhs.out_Codell_10K_1656-3310

for 18 parameters.

50Kyr max TPI.

but only use 10K results.

each lhs.out was extended to 1 - 1729

but should only use 1-1655.

6-14-99

Morris

The top ten most influential input parameters are listed in Tables 4-6 for the 10 kyr TPI and Table 4-7 for the 50 kyr TPI, where each parameter was normalized according to Eq. (3-14). For the 10 kyr TPI, the listed parameters are either related to condensate or radionuclides in alluvia, but for the 50 kyr TPI, no condensate related parameters made top ten list. The well pumping rate for farming receptor group located greater than 20 km from YM appeared in both 10 kyr and 50 kyr TPIs, as well as those related radionuclides in alluvia. Several SF wet fraction related appeared in Table 4-7 but not in Table 4-6.

The standardization transformation, Eq. (3-3), and logarithmic transformation were also used in the Morris method. For the top ten most influential parameter list, the standardization transformation replaced the alluvium matrix porosity (Aprs_SAV) with the subarea wet fraction for the 10 kyr TPI, but it did not change any thing for the 50 kyr TPI. It did change slightly the ranking of several parameters for both the 10 kyr TPI and 50 kyr TPI.

The logarithmic transformation of the normalized parameters replaced radionuclides I (ARDSAV_I) and U (ARDSAV_U) with the mean average precipitation multiplier at glacia maximum and the subarea wet fraction for the 10 kyr TPI, and radionuclides U (ARDSAV_U) , Tc (ARDSAVTc) and matrix Kd of U for Calico Hills (MKD_CHvU) with AA_2_1, SF wet fraction for corrosion failures in subareas 4 and 5 for the 50 kyr TPI. The logarithmic transformation also changed the ranking for both the 10 kyr TPI and 50 kyr TPI.

Similar to Differential Analysis, no WPs failed from corrosion in the 10 kyr TPI except those due to defective WP. Wps did fail within the yr TPI

Results for the FAST Method.

As mentioned in section 3.1.4., it would take more than 40,000 realizations for the FAST method to conduct a sensitivity analysis on 50 input parameters. At present, such a large number of realizations would take months of CPU time for TPA 3.2 to run. Instead, the FAST method was used to rank 20 parameters that were considered to be important to peak TEDE (these parameters were selected by Richard Codell of NRC). The 20 parameters are:

1. AA_2_1
2. RockPoissonRatioforSEISMO
3. SEISMOJointSpacing5
4. VerticalExtentOfRockFall2_6
5. FmultFactor
6. SubAreaWetFraction
7. InitialRadiusOfSFParticle
8. SubGrainFragmentRadiusAfterTransFrac
9. SFWettedFraction_Corrosion_1
10. SFWettedFraction_Corrosion_3
11. SFWettedFraction_Corrosion_5
12. SFWettedFraction_Corrosion_6

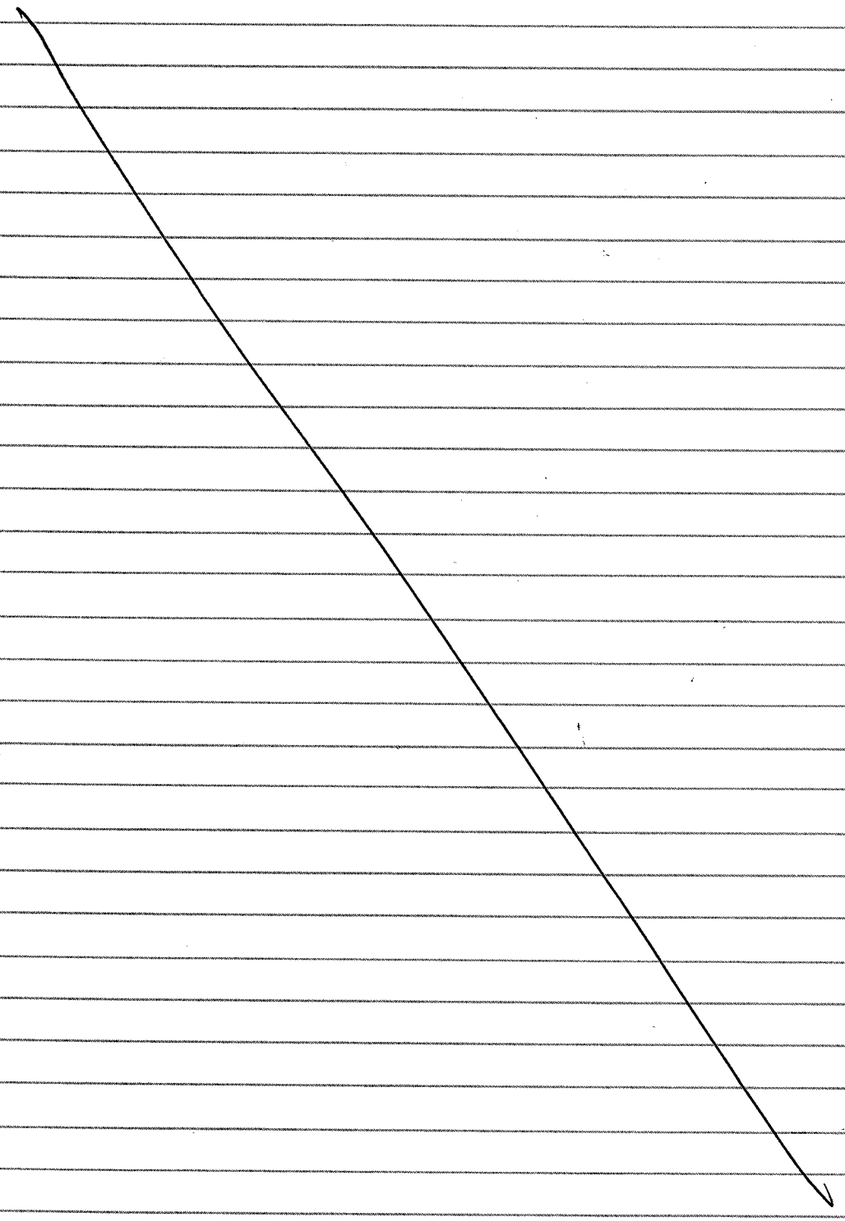
13. SFWettedFraction_Corrosion_7
14. MatrixKD_CHnvNp
15. AlluviumMatrixRD_SAV_Np
16. AlluviumMatrixRD_SAV_I
17. AlluviumMatrixRD_SAV_Tc
18. AlluviumMatrixRD_SAV_U
19. AlluviumMatrixPorosity_SAV
20. WellPumpingRateAtReceptorGroup20km

For these 20 parameters, only 4174 realizations are needed to avoid aliasing among any four Fourier amplitudes. To account for the range of an input parameter, each Fourier amplitude was multiplied by the standard deviation of the corresponding input parameter, as defined by Eq. (3-12). The ranking for the top ten parameters is listed in Tables 4-6 and 4-7 for the 10 kyr TPI and 50 kyr TPI.

It is not surprise that WellPumpingRateAtReceptorGroup20km and AA_2_1 are ranked number one and number two for both the 10 kyr TPI and 50 kyr TPI, they both have very large ranges of variation. We caution here that some parameters may be selected by other sensitivity analysis methods but not by the FAST method simply because they are not included in the 20 parameters that are investigated by the FAST method.

6-15-99 YL

8/16/2000 check mean & distribution values listed in the report.



6-16-99 YL

TPARUN23, TPARUN24 finished.

~~TPARUN23/gwpkdos_c.res + TPARUN~~ YL.

TPARUN23/gwpkdos_c.res(1:1655)

+ TPARUN24/gwpkdos_c.res(1:1655)

8/16/2000 ⇒ FAST/gwpkdos_c_res_Code11_10K.

FAST amplitudes

1	0.00000100697377547476	0.00000100697377547476	3	AMMAI@GM S
2	-0.00000004021734412163	0.00000004021734412163		
3	0.00000009204511997041	0.00000009204511997041	10	MATI@GM
4	0.00000000709478786831	0.00000000709478786831		
5	0.00000081503998217158	0.00000081503998217158	4	FOW
6	0.00000046494051275658	0.00000046494051275658	5	Fmult
7	0.00000028347596980893	0.00000028347596980893	7	S6ArW+%
8	0.00000000258682653076	0.00000000258682653076		
9	-0.00000000017100508509	0.00000000017100508509		
10	0.00000009571285630727	0.00000009571285630727	9	~~SFW+%~~ SFW+% I3
11	-0.00000000780089859376	0.00000000780089859376		
12	-0.00000041518620719216	0.00000041518620719216	6	MKDBFwSe
13	-0.00000006437808508508	0.00000006437808508508		
14	-0.00000019831833242279	0.00000019831833242279	8	ARDSAVNp
15	-0.00000190700438906788	0.00000190700438906788	2	ARDSAV_I
16	-0.00000003996332864631	0.00000003996332864631		
17	-0.00000000705201852469	0.00000000705201852469		
18	-1.36481308937072753906	1.36481308937072753906	1	WPRRG@20

received a copy ~~fastest~~ latest of chapter 4 from Sitakanta. It was sent to review

6-17-99 YL

in TPARUN21, 22, 23, 24

the trigonometric transform was

$$x_i = \frac{1}{2} + \frac{1}{\pi} \arcsin(w_i s)$$

create TPARUN 25, 26

try

$$x_i = \text{mid} + \text{halfwidth} \cdot \sin(w_i s)$$

for Codell_10K_suspects

run TPARUN 25, 26

The purpose of running TPARUN 25, 26 is to see the effects of different trigonometric transforms.

6-18-99 YL

had a discussion w/ Sitakanta prepare to write a paper.

need to run ~~[illegible]~~ Y.L. FAST using top 20 from morris. This afternoon.

thinking about using Morris to do

$$\frac{\Delta^2 Y}{\Delta X^2} = \frac{Y(x+2\Delta) - 2Y(x+\Delta) + Y(x)}{}$$

8/16/2000

create TPARUN31, 32 to run

~~[illegible]~~ Y.L.

/ylu/FAST/lhs.out_Morris-50k_p=8_d=2

If a sampling matrix

0	0	0	...	0
1	0	0	...	0
1	1	0	...	0
1	1	1	...	0
...				
1	1	1	...	1

is used to evaluate $\Delta Y/\Delta X$.

then

0	0	0	...	0
1	0	0	...	0
1	1	0	...	0
1	1	1	...	0
...	...			
1	1	1	...	1
2	1	1	...	1
2	2	1	...	1
2	2	2	...	1
...	...			
2	2	2	...	2

$\Rightarrow \left(\frac{\Delta Y}{\Delta X}\right)_1$

$\left(\frac{\Delta Y}{\Delta X}\right)_2$

Sm 8/16/2000

$$\left(\frac{\Delta Y}{\Delta X}\right)_1 = \frac{Y(x+\Delta x) - Y(x)}{\Delta x}$$

$$\left(\frac{\Delta Y}{\Delta X}\right)_2 = \frac{Y(x+2\Delta x) - Y(x+\Delta x)}{\Delta x}$$

$$\frac{\Delta^2 Y}{\Delta x^2} = \frac{1}{\Delta x}\left[\left(\frac{\Delta Y}{\Delta x}\right)_2 - \left(\frac{\Delta Y}{\Delta x}\right)_1\right]$$

6-21-99 YL

TPARUN31, 32 done

TPARUN25 did not finish.

Sm 8/16/2000 TOP

finished 1st version of 2nd order Morris

obtained lhs.out for 2nd order Morris in

Ylu/morris/test1hs/2ndmorris/lhs.out

4930 x 246. matrix.

create TPARUN51, 52 to test 2nd order Morris

TPARUN51 submitted and failed.

Something wrong w/ the computer.

" open LIBFOR77.so.2 " failed "

6-22-99 YL

finished 2nd version of 2nd order Morris. ⇒ ylw/morris/testlhs/2ndmorris

/mrrslhs2nd.f
/bdesgnmat.f
/baselhs.f

generated lhs.out of size 4930 x 246.

saved in TPARUN51, 52. to be run.

right now there are three tpa.e running.

wait until len tpa.e. otherwize

jobs may be crashed.

Sw 8/16/2000

6-23-99 YL

created TPARUN33, 34

to run FAST of Morris_10k_p=8_d=2

TPARUN25 finished.

Sw 8/16/2000 submitted TPARUN33, 51. at abont 4:45 pm

6-24-99 YL

tools a sick leave.

headache, muscle pain

6-25-99 YC

TPARUN ~~33~~ 51 Y.L ~~do~~ finished
33 "

SY 8/16/2000

submitted 34, 52

6-28-99 YC

~~TPA34~~ Y.L TPARUN 34, 52 done.

~~recem rec~~ Y.L. received Sitakanta's draft.

appended TPARUN33/gwpkdos-c.res with TPARUN34/gwpkdos-c.res.

⇒ FAST/gwpkdos_c.res_Morris_10k_p=8_d=2

appended TPARUN31/gwpkdos.res with 32/ "

⇒ FAST/gwpkdos.res_Morris_50k_p=8_d=2

indices of the input variables to apply FAST to

1	1
2	2
3	4
4	5
5	6
6	8
7	15
8	62
9	63
10	64
11	65
12	66
13	71
14	73
15	209
16	210
17	211
18	218
19	221
20	223

top 20 from Morris
10kyr. p=8, d=2
(50 max TPI)

top 20 from Morris
10 kyr p=8, d=2
(50 max TPI) SR 8/16/2000

i	FAST ampl	FAST abs(amp)	FAST amp * dev	FAST abs(amp * dev)
1	0.0000070114282380018	0.0000070114282380018 11	0.0000182162241679007	0.0000182162241679007
2	0.0000046254032781690	0.0000046254032781690 14	0.0000013352388899155	0.0000013352388899155
3	0.0000001252020354059	0.0000001252020354059 20	0.0000255277485915217	0.0000255277485915217
4	0.0000031878943218544	0.0000031878943218544 16	0.0000009202658059182	0.0000009202658059182
5	-0.0000011043491809914	0.0000011043491809914 19	-0.0000225168450003297 8	0.0000225168450003297 8
6	-0.0000060874378959852	0.0000060874378959852 13	-0.0000007029169503881	0.0000007029169503881
7	0.0000015720478074854	0.0000015720478074854 351	.013434540862363064 66	351.013434540862363064 66 18
8	0.0000142225542276719	0.0000142225542276719 7	0.0000357911865146862	0.0000357911865146862
9	0.0000089441164163873	0.0000089441164163873 9	0.0000145225961473931	0.0000145225961473931
10	0.0000354937719748705	0.0000354937719748705 2	0.0000102461692182227	0.0000102461692182227
11	0.0000386172132493812	0.0000386172132493812 1	0.0000001103635040396	0.0000001103635040396
12	-0.0000175118714196287	0.0000175118714196287 5	-0.0000000065168729082	0.0000000065168729082
13	0.0000069776081090822	0.0000069776081090822 12	0.0000020142619238867	0.0000020142619238867
14	0.0000086139084487513	0.0000086139084487513 10	0.0000024866211362002	0.0000024866211362002
15	-0.0000162816729698534	0.0000162816729698534 6	-0.0000242939851727159	0.0000242939851727159
16	-0.0000180183008069434	0.0000180183008069434 4	-0.0000480974460332029	0.0000480974460332029
17	-0.0000040630726516611	0.0000040630726516611 15	-0.0000020005869458743 0	0.0000020005869458743 0
18	0.0000018238102938994	0.0000018238102938994 17	0.0000010967437499964 8	0.0000010967437499964 8
19	-0.0000093602182005270	0.0000093602182005270 8	-0.0000001351031274536	0.0000001351031274536
20	-0.0000197613690033904	0.0000197613690033904 3	-4.8489231936325722927 0	4.8489231936325722927 0

numbers from 1 to 20 SR 8/18/2000

indices of the input variables to apply FAST to

1	5
2	12
3	13
4	62
5	63
6	64
7	66
8	108
9	110
10	111
11	112
12	113
13	114
14	131
15	208
16	210
17	211
18	213
19	221
20	223

top 20 from Morris
50 kyr. p=8, d=2

top 20 from Morris
50 kyr p=8, d=2
SR 8/16/2000

i	FAST ampl	FAST abs(amp)	FAST amp * dev	FAST abs(amp * dev)
1	0.0000866066329763270 9	0.0000866066329763270 9 14	0.0000250011809825177 9	0.0000250011809825177 9
2	0.0003050777013413608 1	0.0003050777013413608 1 3	3.7869387425010359038 4	3.7869387425010359038 4
3	0.0002587311028037220 2	0.0002587311028037220 2 5	0.0000005821278479380 2	0.0000005821278479380 2
4	-0.0000748615057091228 7	0.0000748615057091228 7 16	-0.0001883896570696388 9	0.0001883896570696388 9
5	0.0001182453561341390 0	0.0001182453561341390 0 8	0.0001919954385091061 2	0.0001919954385091061 2
6	0.0005191070376895368 1	0.0005191070376895368 1 2	0.0001498532912845400 3	0.0001498532912845400 3
7	-0.0001076396656571887 4	0.0001076396656571887 4 10	-0.0000000400570563913 2	0.0000000400570563913 2
8	0.0001643764990149065 9	0.0001643764990149065 9 6	0.0000474514071256834 3	0.0000474514071256834 3
9	0.0001138425868703052 4	0.0001138425868703052 4 9	0.0000328635234975649 0	0.0000328635234975649 0
10	0.0001039508060785010 5	0.0001039508060785010 5 11	0.0000300080123973598 2	0.0000300080123973598 2
11	-0.0000188220674317563 0	0.0000188220674317563 0 18	-0.0000054334627516938 4	0.0000054334627516938 4
12	0.0000422319135395810 0	0.0000422319135395810 0 17	0.0000121913031064227 1	0.0000121913031064227 1
13	0.0001481627405155450 1	0.0001481627405155450 1 7	0.0000427708982925992 9	0.0000427708982925992 9
14	-0.0000920826714718714 4	0.0000920826714718714 4 12	-0.0030608249928750774 8	0.0030608249928750774 8
15	-0.0006630404968746006 5	0.0006630404968746006 5 1	-0.0025268225869299332 2	0.0025268225869299332 2
16	-0.0000874783072504214 9	0.0000874783072504214 9 13	-0.0002335116505787111 8	0.0002335116505787111 8
17	-0.0000838460546219721 4	0.0000838460546219721 4 15	-0.0004128435219370382 7	0.0004128435219370382 7
18	-0.0000145229678309988 2	0.0000145229678309988 2 19	-0.0002265915579892398 3	0.0002265915579892398 3
19	0.0000065543022174097 1	0.0000065543022174097 1 20	0.0000009460321424967	0.0000009460321424967
20	-0.0002744844532571733 0	0.0002744844532571733 0 -673.513070608576526 86	673.513070608576526 86	

Top ten parameters identified by the FAST method (without standardization), based on top 20 parameters selected by the Morris method (p = 8, d = 2).

For both 10 kyr and 50 kyr, max TPI = 50 kyr.

Ranking	10 kyr	50 kyr
1	WP-Def%	ARDSAVNp
2	SbArWt%	SbArWt%
3	WPRRG@20	AA_2_1
4	ARDSAVTc	WPRRG@20
5	InitRSFP	OO-CofLC
6	ARDSAV_I	SFWt%C1
7	Fow*	SFWt%C7
8	APrs_SAV	Fmult*
9	Fmult*	SFWt%C3
10	SFWt%I3	InitRSFP

work on the Morris paper.

6-29-99 YC

Table 4-6. 10 Most-Sensitive Standardized Variables from Statistical Analysis for 10,000 Year TPI

Rank	Normalized Variables	Log-Normalized Variables	Differential Analysis	Morris Method	FAST Method
1	WP-Def%	Fow*	ARDSAVTc	FOCTR-R	WPRRG@20
2	Fow*	WP-Def%	FOCTR-R	FOC-R	ARDSAV_I
3	SbArWt%	SbArWt%	Fow*	FOCTR	AAMAI@S
4	Fmult*	FMult*	ARDSAV_I	WPRRG@20	Fow*
5	ARDSAVTc	AAMAI@S	SFWt%I3	AAMIA@S	Fmult*
6	WPRRG@20	ARDSAV_I	WP-Def%	ARDSAV_U	MKDBFwSe
7	AAMAI@S	ARDSAV_Tc	ARDSAVSe	Fow*	SbArWt%
8	SFWt%S46	WPRRG@20	SbArWt%	WP-Def%	ARDSAVNp
9	SFWt%I1	ARDSAVNp	Fmult*	ARDSAV_I	SFWt%I3
10	FPrm_BFw	MAPM@GM	FOC-R	SbArWt%	MATI@GM

Abbreviation	*Description*	*Abbreviation*	*Description*	*Abbreviation*	*Description*
AA_2_1	AA_2_1[C/m2/yr]	SbArWt%	SubAreaWetFraction	SSMOV303	VerticalExtentOfRockFall3_3[m]
AAMAI@S	ArealAverageMeanAnnualInfiltrationAtStart[mm/yr]	SFWt%I5	SFWettedFraction_Initial_5	SSMOV304	VerticalExtentOfRockFall3_4[m]
ARDSAV_I	AlluviumMatrixRD_SAV_I	SFWt%S12	SFWettedFraction_SEISMO1_2	SSMOV402	VerticalExtentOfRockFall4_2[m]
ARDSAVSe	AlluviumMatrixRD_SAV_Se	SFWt%S37	SFWettedFraction_SEISMO3_7	SSMOV403	VerticalExtentOfRockFall4_3[m]
ARDSAVTc	AlluviumMatrixRD_SAV_Tc	Solbl-Np	SolubilityNp[kg/m3]	SSMOV407	VerticalExtentOfRockFall4_7[m]
AshMnPLD	AshMeanParticleLogDiameter[d_in_cm]			SSMOV409	VerticalExtentOfRockFall4_9[m]
FOCTR	FractionOfCondensateTowardRepository[1/yr]	SSMO-RE	RockModulusOfElasticityforSEISMO[Pa]	SSMOV503	VerticalExtentOfRockFall5_3[m]
FOCTR-R	FractionOfCondensateTowardRepositoryRemoved[1/yr]	SSMO-RPR	RockPoissonRatioforSEISMO[]	SSMOV504	VerticalExtentOfRockFall5_4[m]
FoW*	FowFactor	SSMO-JS4	SEISMOJointSpacing4[m]	SSMOV507	VerticalExtentOfRockFall5_7[m]
Fprs_TSw	FracturePorosity_TSw_	SSMO-JS5	SEISMOJointSpacing5[m]	SSMOV510	VerticalExtentOfRockFall5_10[m]
InitRSFP	InitialRadiusOfSFParticle[m]	SSMOV206	VerticalExtentOfRockFall2_6[m]	WPRRG@10	WellPumpingRateAtReceptorGroup10km[gal/day]
OO-CofLC	CoefForLocCorrOfOuterOverpack			WPRRG@20	WellPumpingRateAtReceptorGroup20km[gal/day]

6-29-99 YC

Table 4-7. 10 Most-Sensitive Standardized Variables from Statistical Analysis for 50,000 Year TPI

Rank	Normalized Variables	Log-Normalized Variables	Differential Analysis	Morris Method	FAST Method
1	SbArWt%	Fow*	ARDSAVNp	ARDSAVNp	WPRRG@20
2	AAMAI@S	WP-Def%	Fow*	WPRRG@20	AA_2_1
3	WPRRG@20	SbArWt%	OO-CofLC	APrs_SAV	ARDSAV_I
4	ARDSAVNp	Fmult*	AA_2_1	MKD_CHvU	Fmult*
5	SSMO-RPR	AAMAI@S	SbArWt%	SbArWt%	SbArWt%
6	InitRSFP	ARDSAV_I	ARDSAVTc	InitRSFP	SFWt%C2
7	SSMOV206	ARDSAV_Tc	Fmult*	ARDSAV_U	SFWt%C1
8	SbGFRATF	WPRRG@20	WPRRG@20	SFWt%C3	ARDSAV_U
9	SFWt%C2	ARDSAVNp	APrs-SAV	ARDSAVTc	SFWt%C3
10	ARDSAV_U	MAPM@GM	ARDSAV_I	SFWt%C6	SFWt%C6

Abbreviation	*Description*
AA_2_1	AA_2_1[C/m2/yr]
AAMAI@S	ArealAverageMeanAnnualInfiltrationAtStart[mm/yr]
ARDSAV_I	AlluviumMatrixRD_SAV_I
ARDSAVSe	AlluviumMatrixRD_SAV_Se
ARDSAVTc	AlluviumMatrixRD_SAV_Tc
AshMnPLD	AshMeanParticleLogDiameter[d_in_cm]
FOCTR	FractionOfCondensateTowardRepository[1/yr]
FOCTR-R	FractionOfCondensateTowardRepositoryRemoved[1/yr]
FoW*	FowFactor
Fprs_TSw	FracturePorosity_TSw_
InitRSFP	InitialRadiusOfSFParticle[m]
OO-CofLC	CoefForLocCorrOfOuterOverpack

Abbreviation	*Description*
SbArWt%	SubAreaWetFraction
SFWt%I5	SFWettedFraction_Initial_5
SFWt%S12	SFWettedFraction_SEISMO1_2
SFWt%S37	SFWettedFraction_SEISMO3_7
Solbl-Np	SolubilityNp[kg/m3]
SSMO-RE	RockModulusOfElasticityforSEISMO[Pa]
SSMO-RPR	RockPoissonRatioforSEISMO[]
SSMO-JS4	SEISMOJointSpacing4[m]
SSMO-JS5	SEISMOJointSpacing5[m]
SSMOV206	VerticalExtentOfRockFall2_6[m]
SSMOV303	VerticalExtentOfRockFall3_3[m]
SSMOV304	VerticalExtentOfRockFall3_4[m]

Abbreviation	*Description*
SSMOV402	VerticalExtentOfRockFall4_2[m]
SSMOV403	VerticalExtentOfRockFall4_3[m]
SSMOV407	VerticalExtentOfRockFall4_7[m]
SSMOV409	VerticalExtentOfRockFall4_9[m]
SSMOV503	VerticalExtentOfRockFall5_3[m]
SSMOV504	VerticalExtentOfRockFall5_4[m]
SSMOV507	VerticalExtentOfRockFall5_7[m]
SSMOV510	VerticalExtentOfRockFall5_10[m]
WPRRG@10	WellPumpingRateAtReceptorGroup10km[gal/day]
WPRRG@20	WellPumpingRateAtReceptorGroup20km[gal/day]

6-30, 7-1, 7-2, ~~[illegible]~~ YL

Do FAST paper.

8/16/2000

7-3-99 — ~~[illegible]~~ YL

FAST Paper. 8 hours 8/16/2000

7-4-99, 7-5-99, 7-6-99

FAST Paper

7-7-88 ~ 7-30-88 YL

Vacation

8-2-88 YL

Talked to Marty. He made changes to Morris code. for log-typeed variables.

Talked to Sitaram ta.

① QA. finish within this week.

② report. send before Aug. 12.

③ TOP-18. requirements.

TOP-018.

① SRD

② SDP

③ Acceptance Testing

Morris & FAST must output TPA styled output files

Spoke to Max Morris 515-294-2775
email: mmorris@iastate.edu

① large mean but small std. dev.
⇒ ~~large~~ linear dependency
on 8/16/2000

② large std. dev ⇒ either nonlinear or interaction

③ for log typed variables, consider ~~to~~ using

$$\frac{y(x_2) - y(x_1)}{\log(x_2) - \log(x_1)}.$$

but need to convert into $\frac{\Delta y}{\Delta x}$.

using chain rule ?

④ could be developed into

$$\frac{\Delta^2 y}{\Delta x^2} = \frac{y(x+2\Delta) - 2y(x+\Delta) + y(x)}{\Delta x^2}$$

Marty modified mrrslhs.f.

$$\frac{\Delta y}{\Delta x} \approx \frac{y(x_2) - y(x_1)}{\log(x_2) - \log(x_1)}$$

talked to him, and pointed out that

$$\frac{y(x_2) - y(x_1)}{\log(x_2) - \log(x_1)} \neq \frac{y(x_2) - y(x_1)}{x_2 - x_1}$$

inconsistent with the definition of $\Delta y / \Delta x$.

8-3-99 YL

Prepare for QA

got "FORTRAN Coding Guidelines" and
"C Language Coding Guidelines"

work on Morris, QA, ~~conf~~ TOP-018
Y.L.
Sm 8/16/2000

called sick afteen.

8-4-99 YL

modified Morris method code and FAST code
to conform to FORTRAN Coding Guidelines!

talked to Marty ~~a~~ again, made my point
known.

Sm 8/16/2000

worked on /FAST/fastlhs4.f.

to add ~~disttype~~ the subroutine pdfvalue.
Y.L.

did not work well.

The idea was after

$x_i = f(\sin w_i s)$,

$y_i = p_i(x_i)$, where p_i: distribution density
function of x_i

8-5-99 YL

FAST User's Manual.

continue to ~~write~~ modify ~~the~~ the Morris and FAST programs.

Y.L.

Sy 8/16/2000

Marty's results were not consistent either.

8-6-99 YL

discussed w/ Sitakanta about bringing the Morris work to ~~a~~ closure.

Y.L.

will talk to Marty this afternoon.

QA work.

Sy 8/16/2000

Log typed variables need special attention.

~~one question is~~

assuming y is a ~~log-typed variable.~~ loguniform variable.

so $x = \log y$ is a uniform typed.

say $\Delta = \frac{p/2}{p-1}$

~~one question is~~ Y.L.

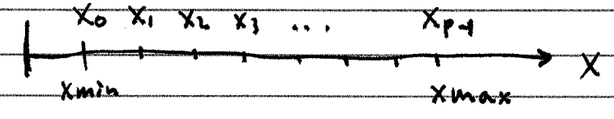
~~$\frac{p-1}{p}(\log x_{max} - \log x_{min})$~~ $\frac{p-1}{p}(\log y_{max} - \log y_{min})$

~~$\frac{p/2}{p-1}(y_{max} - y_{min})$~~ ?

Y.L.

~~The left side is the~~

in our program,



so one question is:

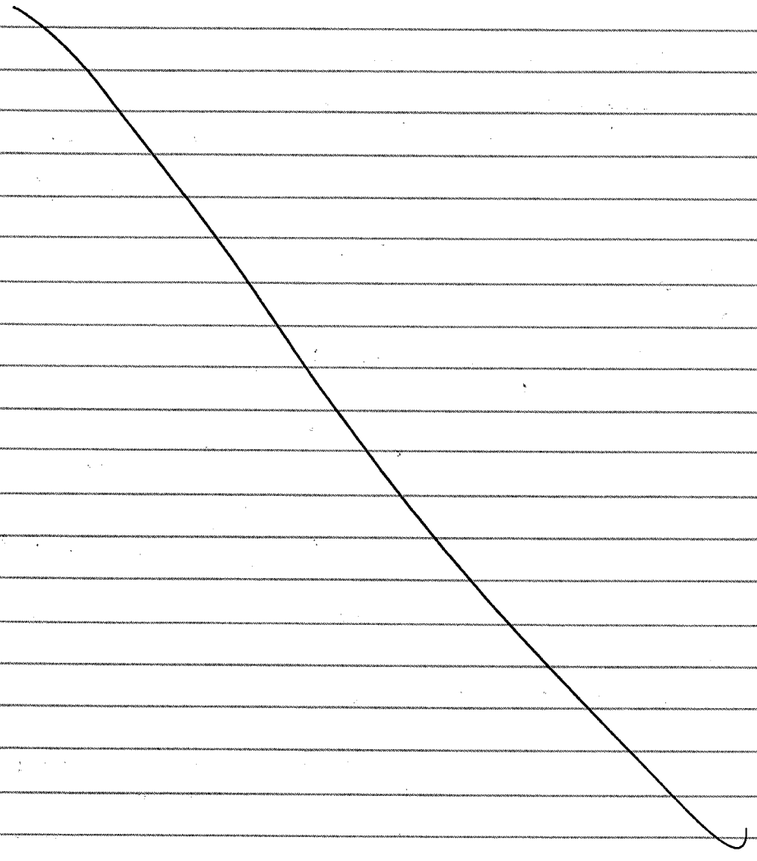
$$\exp(x_{p-1}) - \exp(x_{p-2}) \overset{?}{>} \frac{p/2}{p-1}(y_{max} - y_{min}) = y_\Delta$$

or

$$y_{max} - y_{p-2} \overset{?}{>} \frac{p/2}{p-1}(y_{max} - y_{min})$$

$$\| \quad y_{p-1}$$

$y_{p-2} =$



$x = \log(y)$

y: FOC-R

8-9-99 YC

Had a conversation w/ sitakanta on 8-7-99.

need to find out why changing # random seed # will change the ranking for the Morris method.

reinstored baselhs.f. it is good.

both 5-28-99 and 8-06-99 versions are good.

used subroutine qualid in mrrslhs.f to check. SR 8/16/2000

some numerical #'s for ~~tom~~ logunif.

consider FOC-R, loguniform $[10^{-8}, 1]$ $[a, b]$

$\log(a) = \log(10^{-8}) = -18.4207$, $\log(1) = 0. = \log(b)$

equally divide $[\log(a), \log(b)]$ into seven intervals:

x_0:	-18.4207	$y_0 = \exp(x_0) = 10^{-8}$
x_1:	-15.7892	$y_1 = \exp(x_1) = 1.3894 \times 10^{-7}$
x_2:	-13.1576	$y_2 = \exp(x_2) = 1.9308 \times 10^{-6}$
x_3:	-10.5261	$y_3 = \exp(x_3) = 2.6827 \times 10^{-5}$
x_4:	-7.8946	$y_4 = \exp(x_4) = 3.7275 \times 10^{-4}$
x_5	-5.2631	$y_5 = \exp(x_5) = 5.2 \times 10^{-3}$
x_6:	-2.6315	$y_6 = \exp(x_6) = 7.2 \times 10^{-2}$
x_7:	0.0	$y_7 = \exp(x_7) = 1$

8/16/2000

directories TPARUN 3, 4, 5, 6 were used for testing. see ~~the~~ page 57 of this notebook

Now use these directories to run lhs.out of /home/Jmench/sevenSets/

246Params_11/
246Params_12/

bbaca c:\YLu\ Aug-9-99

Some thoughts about applying the Morris method to log-typed variables.

Yichi Lu
Aug. 10, 1999

Recall that for a uniform distribution,

$$f(x) = \frac{1}{b-a} \tag{1a}$$

$$F(x) = \int_a^x f(x)dx = \begin{cases} 0, & x \le a \\ \dfrac{x-a}{b-a}, & a < x < b \\ 1, & x \ge b \end{cases} \tag{1b}$$

while for a loguniform distribution,

$$f(x) = \frac{1}{x[\log(b) - \log(a)]} \tag{2a}$$

$$F(x) = \int_a^x f(x)dy = \int_a^x \frac{dx}{x[\log(b) - \log(a)]}$$

$$= \int_a^x \frac{d[\log(x)]}{\log(b) - \log(a)} = \frac{\log(x) - \log(a)}{\log(b) - \log(a)} = \begin{cases} 0, & x \le a \\ \dfrac{\log(x) - \log(a)}{\log(b) - \log(a)}, & a < x < b \\ 1, & x \ge b \end{cases} \tag{2b}$$

Now consider a loguniform parameter x, $a \le x \le b$, where $a = 10^{-8}$, $b = 1.0$. Since x has a loguniform distribution, $y = \log(x)$ has a uniform distribution. When using the Morris method, we need to select p equally spaced values in the region [a, b]. A question arises as to whether we should select the values in the region [a, b], or in the region [log(a), log(b)]. Here I am going to make a case that we must do it in [log(a), log(b)].

Consider again the region [a, b], where $a = 10^{-8}$, $b = 1.0$. Suppose we want to select $p = 8$ values. If we select 8 equally spaced values in $[10^{-8}, 1.0]$, then we have: $x_0 = 10^{-8}$, $x_1 = 0.1429$, $x_2 = 0.2857$, $x_3 = 0.4286$, $x_4 = 0.5714$, $x_5 = 0.7142$, $x_6 = 0.8571$, and $x_7 = 1.0$. We call this the 1st set.

If we select 8 equally spaced values in the region for y: $[\log(a), \log(b)] = [\log(10^{-8}), \log(1.0)] = [-18.4206, 0]$, then we have $y_0 = -18.4206$, $y_1 = -15.7892$, $y_2 = -13.1576$, $y_3 = -10.5261$, $y_4 = -7.8946$, $y_5 = -5.2631$, $y_6 = -2.6315$, and $y_7 = 0.0$. Since $x=e^y$, we have $x_0 = 10^{-8}$, x_1

8-10-99

YL

101

$= 1.3894\times10^{-7}$, $x_2 = 1.9308\times10^{-6}$, $x_3 = 2.6827\times10^{-5}$, $x_4 = 3.7275\times10^{-4}$, $x_5 = 5.20\times10^{-3}$, $x_6 = 7.20\times10^{-2}$, and $x_7 = 1.0$. We call this the 2nd set.

Now I want to prove that the second set of data is the right data set based on CDF: the cumulative density function in Eq. (2b). Using the 2nd data set, we have: $F(x_0) = 0.0$, $F(x_1) = 1/8$, $F(x_2) = 1/4$, ..., $F(x_7) = 1.0$, which is correct. If, instead, we use the 1st data set, then we have $F(x_0) = 0.0$, $F(x_1) = 0.8944$, $F(x_2) = 0.9320$, ..., $F(x_7) = 1.0$, which is obviously wrong since the loguniform typed input parameter x has nearly 90% of probability of falling into the region between the first data point and the second data point.

Next problem is how we determine the size of Δ for a log-typed variable. I used a constant Δ, while Marty used a variable Δ. Using the previous example for a loguniform parameter x, $a \le x \le b$, where $a = 10^{-8}$, $b = 1.0$, and $p = 8$, $d = 2$, my $\Delta = 0.5714$, while Marty would use a Δ depending on the value of x. So if $x = 10^{-8}$, $\Delta = 3.7275\times10^{-4}$ (I hope I 'm right, Marty); if $x = 1.9308\times10^{-6}$, $\Delta = x_6 - x_2 = 7.20\times10^{-2} - 1.9308\times10^{-6} \approx 7.20\times10^{-2}$. The problem occurs when $p = 8$, $d = 8$. In this case, $\Delta = 1/(p - 1)$. In Marty's approach, Δ could have two different values depending upon whether you use forward Δ or backward Δ. Furthermore, if $x = 10^{-8}$, then Marty's $\Delta = 1.3894\times10^{-7}$, whereas if $x = 1$, $\Delta = 7.20\times10^{-2}$. My intuition tells me that this is not a good choice because the size of Δ changes so much even though I do not have a solid reason against it.

8-10-95

YC

Created a new directory in /home/yli

~~ConfigControl_A~~ Y.L. 8/18/2000

ConfigControl_Aug-10-99

it has three subdirectories:

(1) A_Yichi
(2) FAST
(3) MORRIS.

The content of the directory was copied on to two CD's, one for QA, and another for myself

This directory (ConfigControl_Aug-10-99) contains the directories and files that are put under the configuration control for QA by Yichi Lu, 210-522-5258.

(1) The directory A_yichi contains the files of TPA 3.2MM. Sensitivity analysis was performed on the TPA 3.2MM in this directory (tpa.e).

To conduct the sensitivity analysis, the field:

iconstant
LatinHypercubeSampling(yes=1,no=0)

must be set to 2:

iconstant
LatinHypercubeSampling(yes=1,no=0)
2

This will force tpa.e to use the 'lhs.out' file generated by FAST and MORRIS instead of using its own 'lhs.out'.

The field: NsetLatinHypercubeSampling and the field NumberOfRealizations

must satisfy the relation:

NumberOfRealizations = (NumberOfInputParameters + 1) * NumberOfRealizations.

(2) The directory FAST contains the files for conducting sensitivity analysis using the FAST method.

The program fastlhs3.f generates the 'lhs.out' file for conducting sensitivity analysis on the TPA 3.2MM, while the program fastamp.f analyzes the results. The input files to fastlhs3.f are lhs.inp and Morris_50k_p=8_d=2, the output file is fast2.out. The input files to fastamp.f are lhs.inp, Morris_50k_p=8_d=2, and gwpkdos.res_Morris_50k_p=8_d=2, the output file is fast1.out. These are listed in the files IO_fastlhs3 and IO_fastamp, respectively.

(3) The directory MORRIS contains the files for conducting sensitivity analysis using the Morris method.

The program mrrslhs.f generates the 'lhs.out' file for conducting sensitivity analysis on the TPA 3.2MM, while the program checkres.f analyzes the results. The input files to mrrslhs.f are va1_run11_lhs.out and va1_run11_llhs.inp, the output files are morris1.out, morris2.out, test1.out test2.out, lhs.out, test3.out, test4.out. The input files to checkres.f are TPARUN11_lhs.out, gwpkdos.res, and va1_run11_lhs.inp, the output files are check.out, efft.out, and check1.out. These are listed in the files IO_mrrslhs_filenames and IO_checkres_filenames, respectively.

When running mrrslhs, a user will be asked to enter the values of p and d. One can enter, for instance, 8 for p and 2 for d. P and d should be integers.

When running checkres, a user will be asked to choose between standardized, normalized, or logmithric parameters. Simply type 'y' or 'n'.

8-11-99 YC

Sm 8/16/2000

The content of /home/~~ylet~~ ylu/
Config Control - Aug-10-99

was saved on 2 CD's. one was given to

Bruce M.

another I kept.

Date: 8/10/99
Sender: Bruce Mabrito
To: Gordon Wittmeyer, Sitakanta Mohanty
cc: Maria Padilla, Bruce Mabrito
Priority: Normal
Subject: TSPA Sensitivity Analysis Report

This is to remind you all (and us) that we need to have the following from you to support the QA Records folder for this important deliverable:

A copy of the scientific and engineering software referenced in the document but that is not under TOP-018 control (there should be some form of input and output data so that the results could be replicated at some future time).

Input and output data used in TPA 3.2, etc. (you said you had this and could provide it).

Additionally, you will need to provide the non-eraseable comments from Dr. Lu and the same from Keith McConnell.

In the cases of providing us electronic versions of code and input/output data, the use of CDs is now PREFERRED. We are in the process of switching over to CDs and if you stay away from diskettes and go with the CDs, everyone is happier. Bruce

Sm 8/16/2000

TPARUN4 ~~was~~ unexpectedly quited.

restarted TPARUN4.

TPARUN3 almost done.

In /home/jmeuch/SevenSets/246Params_11
246Params_12

Marty did!

(1) TPA.inp change the random seed #.
LHS flag = 1

(2) ran tpa.e → lhs.out.

(3) ran mrrslhs.f → lhs.out

(4) tpa.inp LHS flag = 2

(5) ran tpa.e → gwpkdos.res

p = 8. d = 2

Params_11_lhs.inp random seed: 188910452
_12 188910254

(1) used /home/ylu/TPARUN/tpa.e
with the random seed # 188910452
to generate lhs.out, lhs.inp, saved in
/morris/w_Marty/randomseed452/~~[crossed out]~~

(2) mrrslhs → p=8_d=8 ~~254~~ Y.L.

~~+randomseed~~ Y.L.

did same for 254.

Sm 8/16/2000

copied 452/p=8_d=8/lhs.out → TPARUN3
254/ " / " → TPARUN4
run

8-12-95 YL

Talked to Marty.

He did:

p=8, d=2 { 18891045 2
18891025 4

p=11, d=11 { 18891045 2
18891025 4

SM 8/16/2000

TPARUN3 ~~crash~~ crashed after running 574 realizations. But the results in TPARUN3 are still useful. They ~~down~~ demonstrated that the ranking problem is caused by the TPA code 3.2MM itself, not the Morris code.

To see this, let's take a look at check1.out it showed param # 15 and ~~###~~ # 211 are important with only two sets of data. But # 15 and # 211 were not previously known to be that important. If we look at the file gwpkdos.res, we see two big jumps ~~(##)~~ between ~~#####~~ realizations # 262 and #263, # 458 and 459.

SM 8/16/2000

SO now the question is why the TPA code will produce such big diferences?

Since the input data for realizations # 262 and 263, # 458 and # 459 differ only one element.

8-13-95 YL

TPARUN4 crashed also.

copied TPARUN3 → TPARUN5
4 → 6

"copied" means copy lhs.out and tpa.inp.

submitted TPARUN5.

work on FAST.

8-16-99 YL

Finished inverse CDF for

(1) uniform
(2) loguniform
(3) normal
(4) log uniform
(5) Beta
(6) Exponential
(7) Finite Exponential
(8) Triangular
(9) Log Triangular

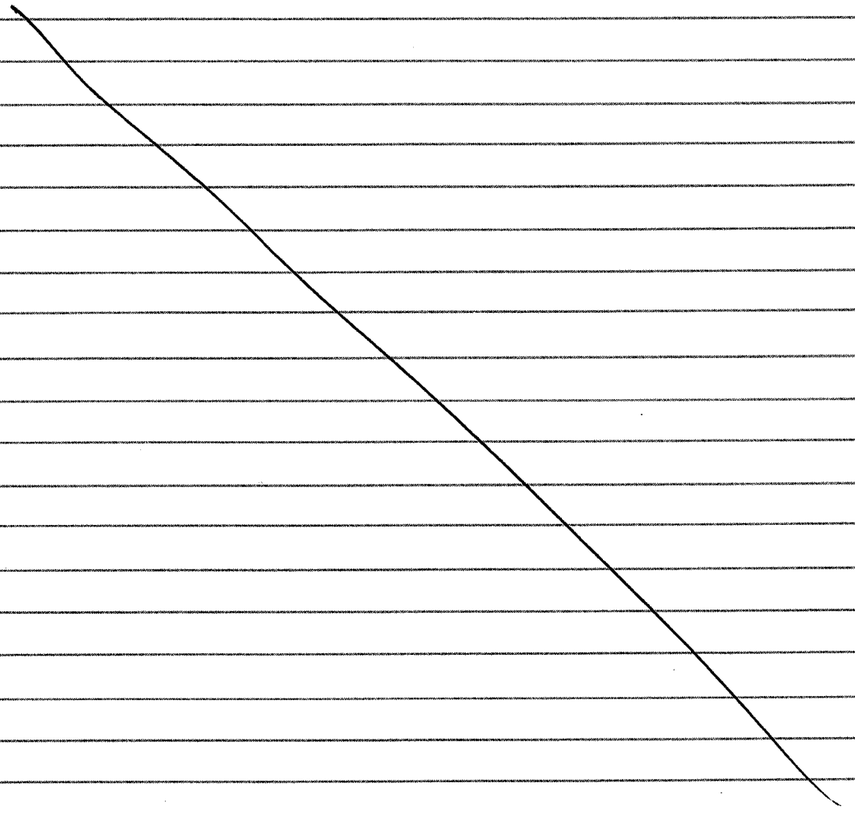
Programs in /FAST/invCDFs

8-17-99 YL

continue to work on FAST paper

briefly talked to Sitakanta about the paper and the work I did

revised fastlhs4.f



8-18-99 YL

Talked to Marty about his 4 params ~~expem~~ experiments.

one param has zero mean & dev.
other two params are extremely ~~@~~ close.

Continue to work on FAST paper

8-19-99 YL

Create TPARUN61, 62

~~Stip~~ split lhs.out.fast lhs4_morris_10K_p=8_d=2_ into two

Sy 8/16/2000

1-1976 ; 1977-4174

↓ TPARUN61 ↓ TPARUN62

jobs submitted

Vulcan is down.

Scheduled maintanance? no one told me.

don't know when it will be ~~b~~ back.

called ~~Sitakt~~ Sitakanta about CCDF's for FAST. Sitakanta suggested to me that I should run TPA first

8-20-95 YL

resubmitted jobs in TPARUN61, 62

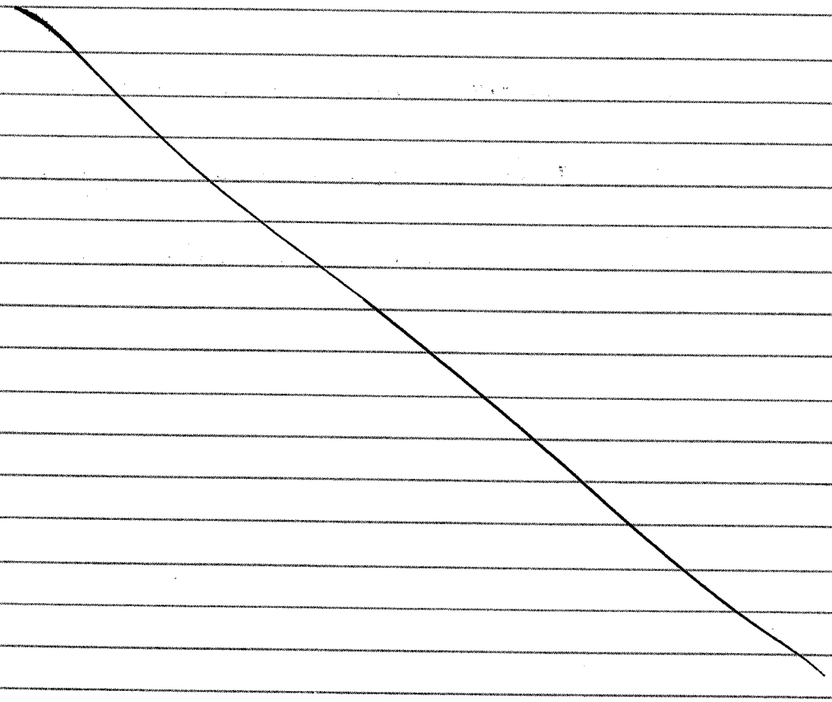
job #: TPARUN61 → 19487
62 → 19690

running lhs.out_fastlhs4_Morris_10k

create TPARUN63, 64 for 50k

Notice: TPARUN61, 62, 63, 64
used lhs.out produced by fastlhs4.f

they are different from those produced
by fastlhs3.f.



8-23-95 YL

Talked to Sitakanta and Marty about doing CCDF. It is done by using regular tpa.e. and lhs.out. (set flag = 1)

8/16/2000

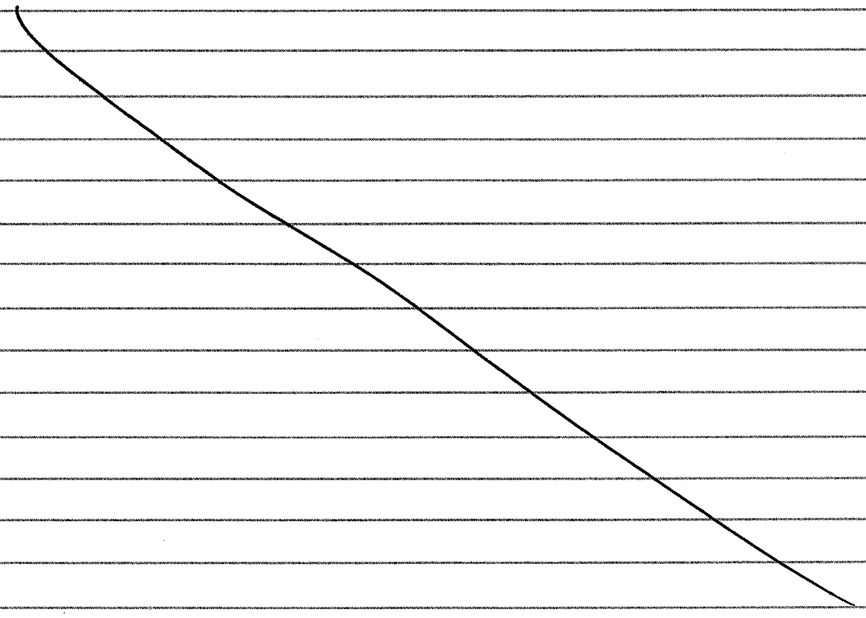
(1) run a regular tpa.e. with 250 realizations for 246 input parameters.

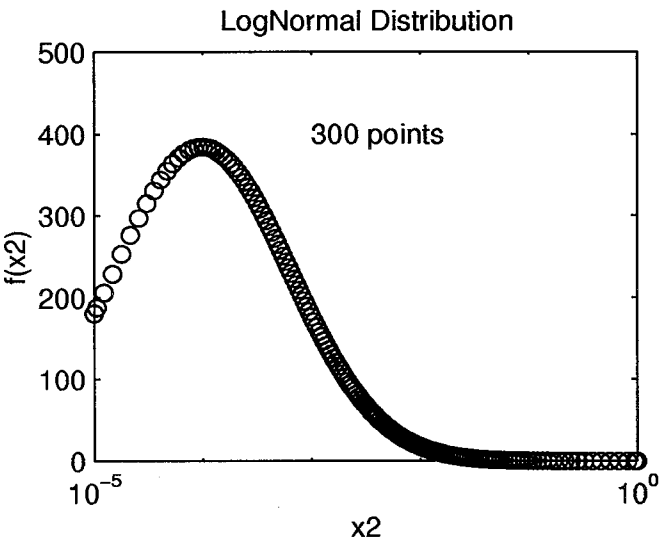
(2) to freeze one parameter, let the parameter vary between mean - ε ≤ x_i ≤ mean + ε

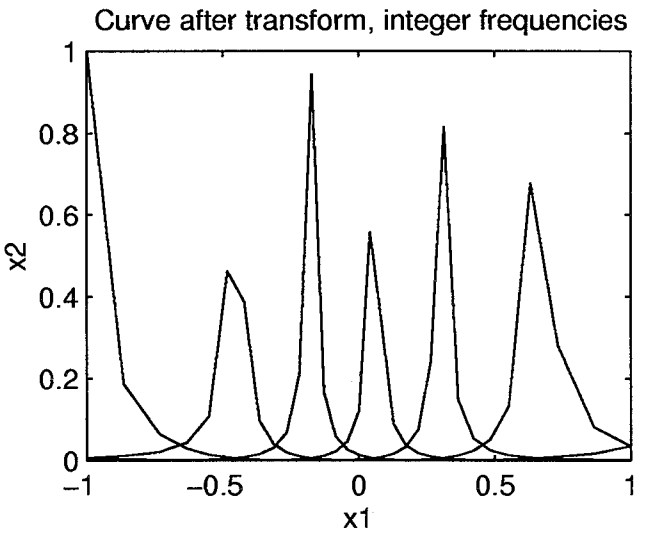
run the tpa.e again.

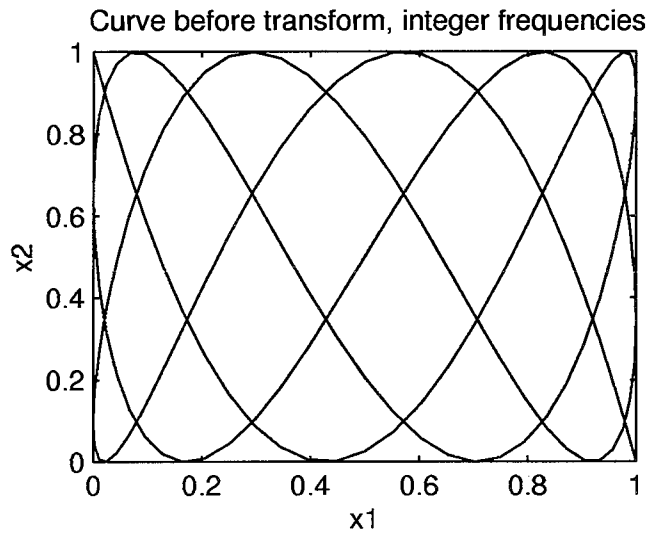
.....

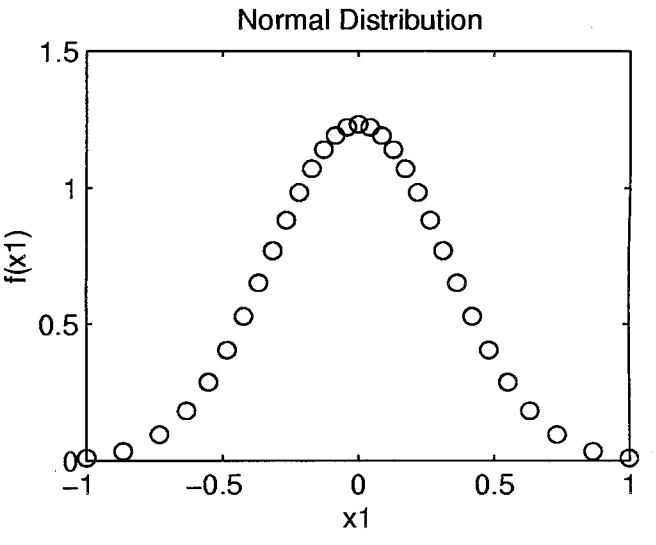
plot PKTEDE vs. $\{1, {}^{249}/_{250}, \cdots, {}^{1}/_{250}\}$

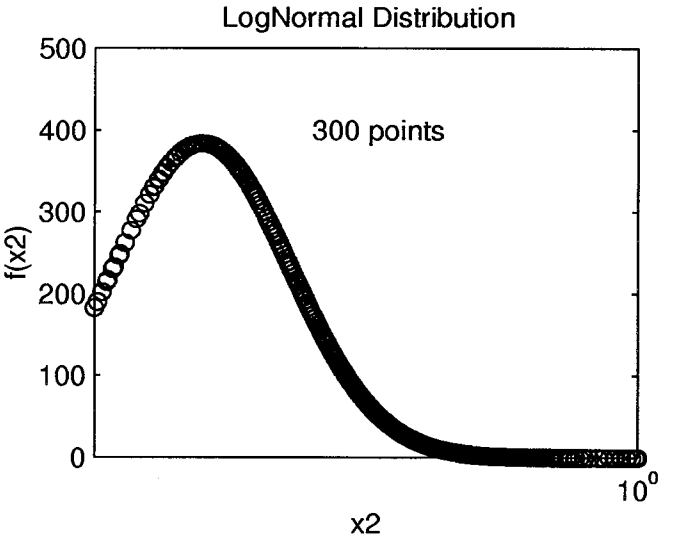


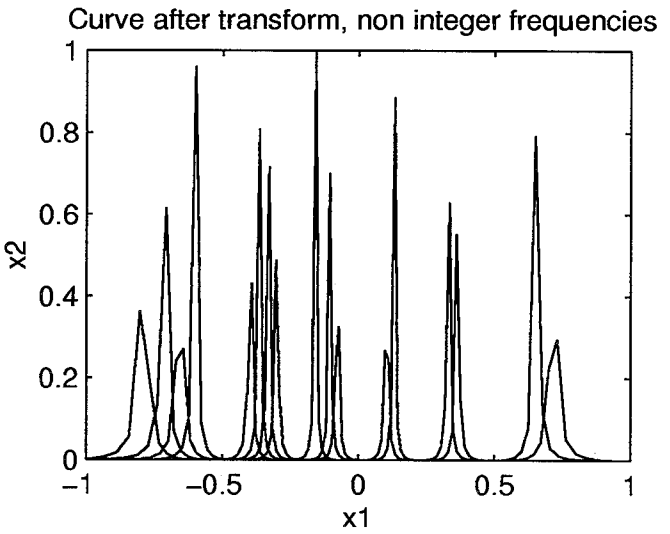

LogNormal Distribution
300 points
f(x2)
x2
500
400
300
200
100
0
10^{-5}
10^{0}

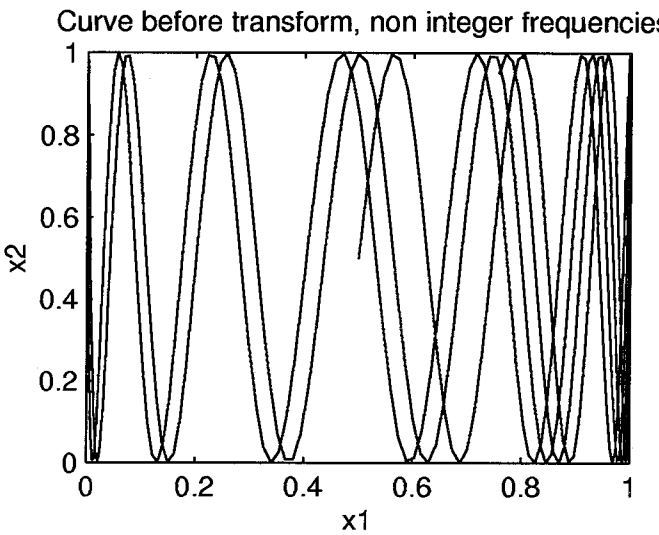

Curve after transform, integer frequencies
x2
x1
1
0.8
0.6
0.4
0.2
0
−1
−0.5
0
0.5
1

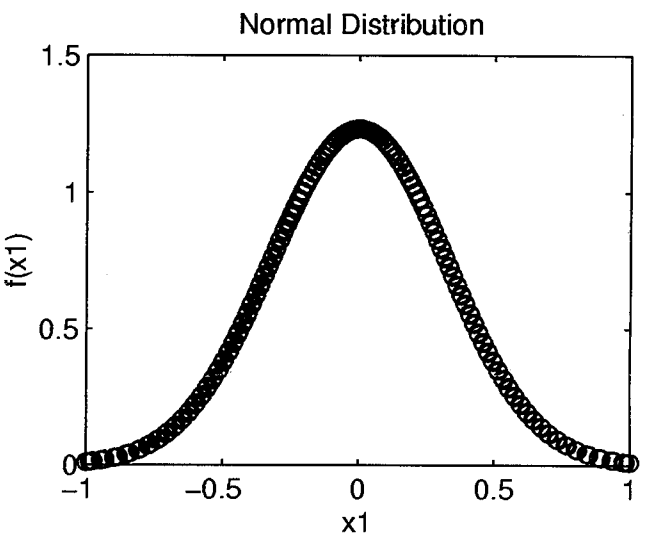

Curve before transform, integer frequencies
x2
x1
1
0.8
0.6
0.4
0.2
0
0
0.2
0.4
0.6
0.8
1


Normal Distribution
f(x1)
x1
1.5
1
0.5
0
−1
−0.5
0
0.5
1







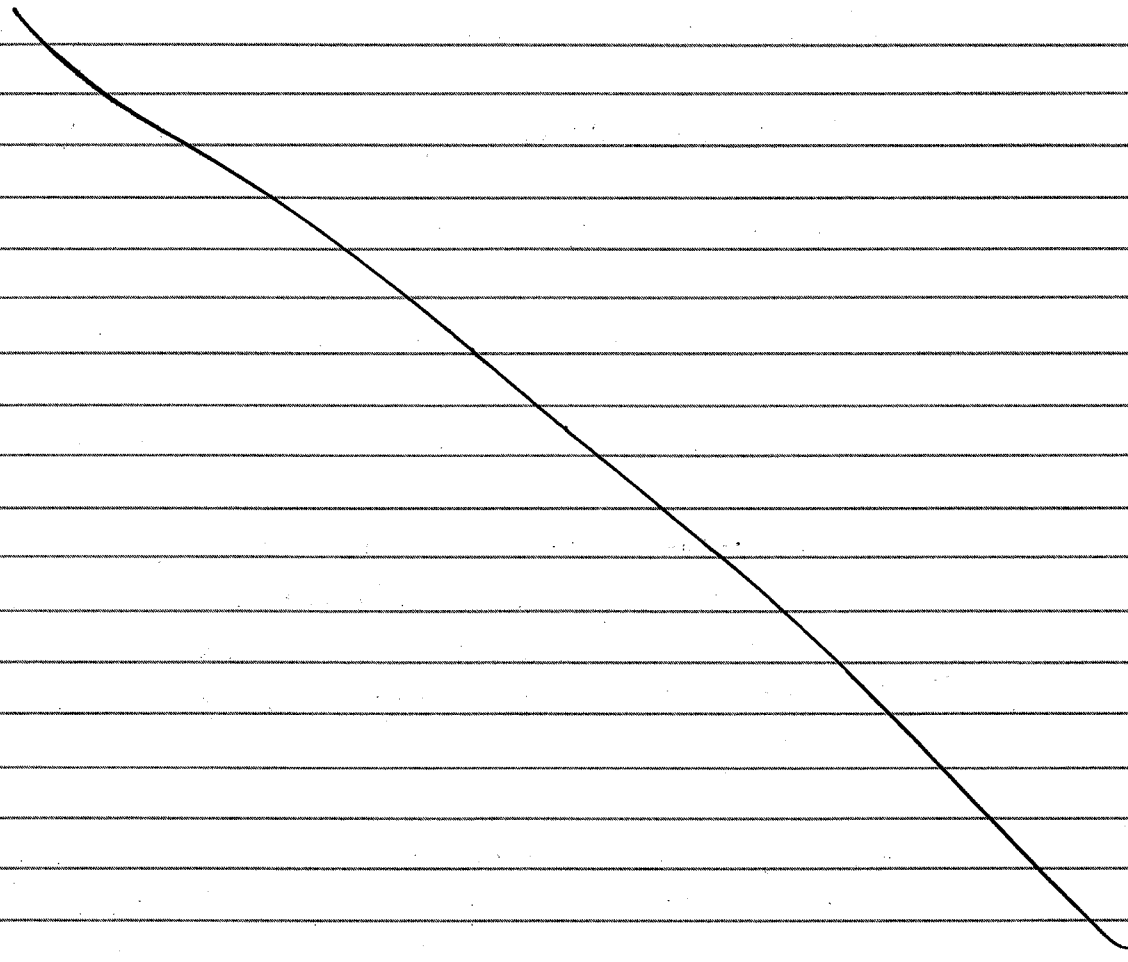


investigated $y = (x_1, x_2)$ further

files in FAST/test/twofreq.f. ...

several jobs finished

Discussed w/ Osvaldo P about errors in Fig. 3-5, p3-16, TPA 3.2 manual, Sept. 1988



8-25-99 8/16/2000 YL

Sitakanta wanted me to plot the data points in lhs.out used for FAST, to see how well these points cover the range of their variation.

Results are in /FAST/lhs-dist-plot.
checked param. # 62, 66
DONE.

Sitakanta wants me to do ranking using fewer realizations of the FAST results.

Motivation is that FAST requires a large number of realizations. It would be valuable if we can use less realizations.

The work is done.
in /FAST/fewer_realizations
showed results to Sitakanta.
used 200, 500, 1000, 2000, 4174 realizations.
required 4174.

conclusion is: the top 2 never changed.
for 1000, 2000, 4174, top 5 params not changed
but their rank position did.

done.

8-25-99 By 8/16/2000 YL

~~ST~~ Sitakanta wanted me to plot the data points in lhs.out used for ~~TOP~~ FAST, to see how well these points cover the range of their variation.

Results are in /FAST/lhs-dist-plot.
checked param. # 62, 66
DONE.

Sitakanta wants me to do ranking using fewer realizations of the FAST results.

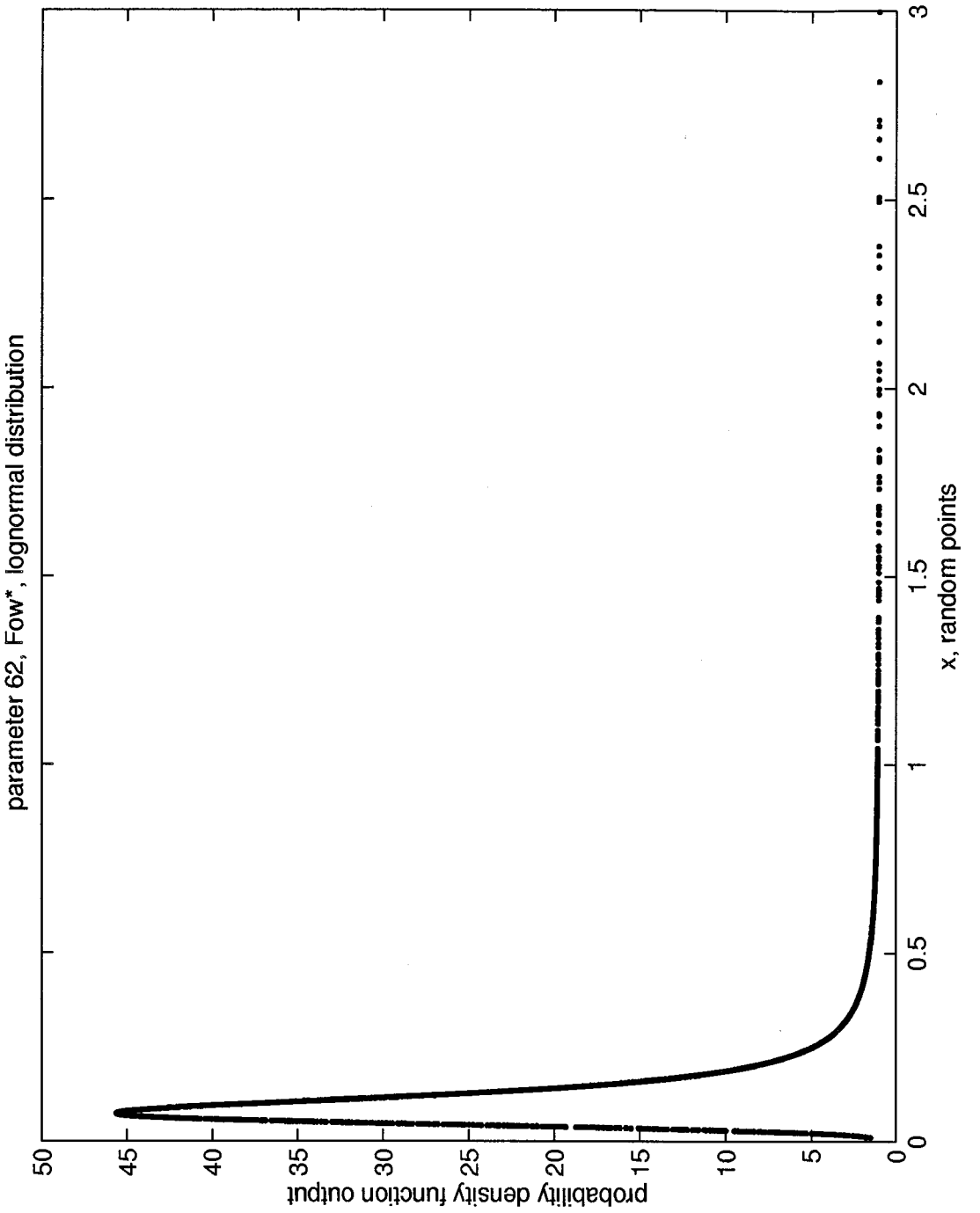
Motivation is that FAST requires a large number of realizations. It would be valuable if we can use less realizations.

The ~~mcka~~ work is done.

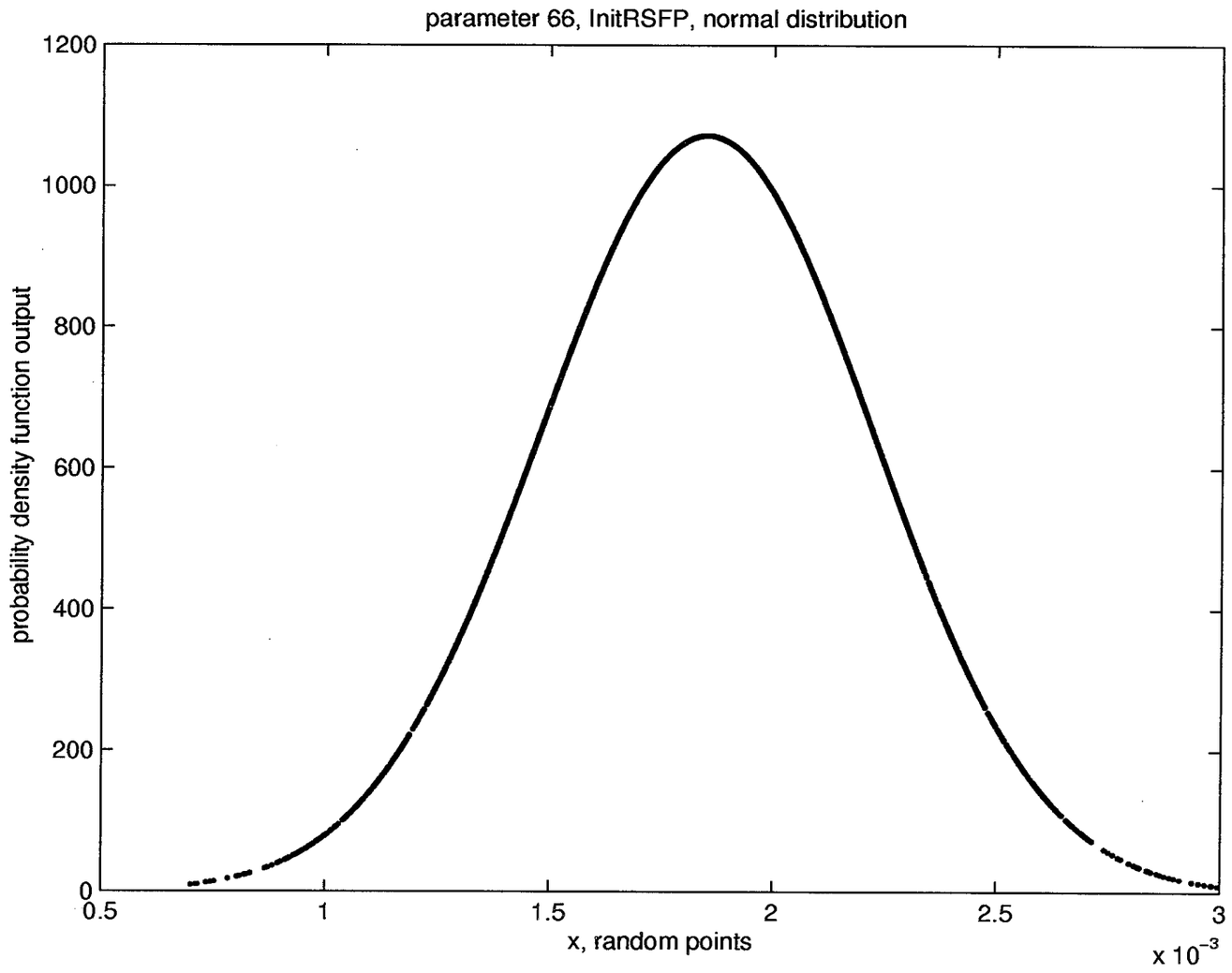
4174	4000	3800	3600	3300	3000	2500	2000	1500	1000	500	200
15	15	15	15	15	15	15	15	15	15	15	15
6	6	6	6	6	6	6	6	6	6	6	6
2	20	20	20	3	3	3	20	3	3	2	3
20	2	3	3	20	2	20	3	20	2	4	7
3	3	2	2	2	20	13	2	13	20	3	10
8	13	13	13	13	13	2	13	2	5	1	18
13	8	8	8	17	17	17	5	5	1	5	4
5	5	17	17	8	8	14	8	17	4	17	11
9	17	5	5	5	5	5	17	8	13	20	13
7	16	7	7	14	14	8	14	14	18	10	5

done.

know



8/16/2000


parameter 66, InitRSFP, normal distribution
probability density function output
x, random points
x 10^-3
0
200
400
600
800
1000
1200
0.5
1
1.5
2
2.5
3

Sitakanta wants to ~~see~~ know the smallest number of realizations needed so that the top 10 params will always be on the top. allow their rank to be differ.

On 8/16/2000

Sitakanta wants me to apply the FAST method ~~the~~ to example problem in the Morris paper. To further understand the nature of the FAST method, and to see why we can or cannot reduce the # of realizations

8/16/2000

8-27-99 TL

Finished using FAST to investigate the example problem in Morris' paper with 20 ~~pap~~ parameters, and ~~to~~ 1-10 being important, must have realizations ≥ 1500

SM 8/16/2000

Job started: Fri Aug 27 11:11:39 1999

NREALIZATIONS = 100

i	amp before sort	i	amp after sort
1	83.3794648713	18	2.1278915645
2	71.3378907494	17	4.7703227437
3	60.8983086102	14	9.0493907264
4	86.8760097537	7	9.0514765622
5	64.4587015136	8	9.0612098947
6	83.3757892596	9	14.6704549525
7	9.0514765622	19	17.8710964374
8	9.0612098947	20	19.7221342099
9	14.6704549525	16	20.9058990079
10	60.8961332092	10	60.8961332092
11	71.3301530537	3	60.8983086102
12	64.4594053364	5	64.4587015136
13	86.8796096958	12	64.4594053364
14	9.0493907264	11	71.3301530537
15	83.3841895363	2	71.3378907494
16	20.9058990079	6	83.3757892596
17	4.7703227437	1	83.3794648713
18	2.1278915645	15	83.3841895363
19	17.8710964374	4	86.8760097537
20	19.7221342099	13	86.8796096958

Job started: Fri Aug 27 11:11:10 1999

NREALIZATIONS = 200

i	amp before sort	i	amp after sort
1	71.0783488801	19	3.4413083575
2	64.8716261729	14	3.7918412516
3	41.4917114277	20	4.4124155878
4	70.7312537870	16	7.1374162556
5	29.6840577541	11	9.1939796305
6	19.0524040134	7	10.7209752860
7	10.7209752860	8	10.7239217894
8	10.7239217894	9	14.5952909039
9	14.5952909039	13	15.7552592261
10	41.4872440260	15	19.0521996815
11	9.1939796305	6	19.0524040134
12	29.6857237882	17	22.4185067625
13	15.7552592261	5	29.6840577541
14	3.7918412516	12	29.6857237882
15	19.0521996815	18	30.2005082810
16	7.1374162556	10	41.4872440260
17	22.4185067625	3	41.4917114277
18	30.2005082810	2	64.8716261729
19	3.4413083575	4	70.7312537870
20	4.4124155878	1	71.0783488801

Job started: Fri Aug 27 11:10:33 1999

NREALIZATIONS = 400

i	amp before sort	i	amp after sort
1	83.2319877996	14	1.3806713762
2	47.6882225822	18	1.6995991951
3	46.6888241634	19	1.8298081806
4	102.2283880065	7	2.0718059166
5	49.3625127208	16	3.0312056156
6	13.2968707375	20	3.2386175988
7	2.0718059166	13	4.4565910414
8	6.4547508839	17	4.5241066730
9	12.3942560969	8	6.4547508839
10	46.6906234724	9	12.3942560969
11	14.5386504431	6	13.2968707375
12	49.3632304477	15	13.2974231318
13	4.4565910414	11	14.5386504431
14	1.3806713762	3	46.6888241634
15	13.2974231318	10	46.6906234724
16	3.0312056156	2	47.6882225822
17	4.5241066730	5	49.3625127208
18	1.6995991951	12	49.3632304477
19	1.8298081806	1	83.2319877996
20	3.2386175988	4	102.2283880065

Job started: Fri Aug 27 11:09:45 1999

NREALIZATIONS = 600

i	amp before sort	i	amp after sort
1	67.8337918176	13	0.0436115853
2	76.4024481461	20	0.3716930531
3	65.4406750603	14	0.5637256208
4	75.4767424753	15	1.3831748682
5	29.3593811873	18	2.6045715391
6	13.4198380188	11	3.1286913342
7	8.5139727520	16	4.3181604680
8	16.4397549591	7	8.5139727520
9	9.8378291562	9	9.8378291562
10	65.4385875075	17	11.9838962565
11	3.1286913342	6	13.4198380188
12	15.3108014062	12	15.3108014062
13	0.0436115853	8	16.4397549591
14	0.5637256208	19	18.1887410871
15	1.3831748682	5	29.3593811873
16	4.3181604680	10	65.4385875075
17	11.9838962565	3	65.4406750603
18	2.6045715391	1	67.8337918176
19	18.1887410871	4	75.4767424753
20	0.3716930531	2	76.4024481461

Job started: Fri Aug 27 11:09:00 1999

NREALIZATIONS = 800

i	amp before sort	i	amp after sort
1	78.9074907324	19	0.8911961408
2	68.2807799941	20	0.9489172503
3	36.6249133009	17	1.7513809556
4	83.7537300309	16	2.7488742219
5	29.6505627920	7	3.5278989543
6	4.1400303172	15	4.1380606814
7	3.5278989543	6	4.1400303172
8	5.9615278674	14	4.6766237136
9	9.9792211624	12	5.0398622667
10	10.9190810282	13	5.1058641573
11	5.3221963957	11	5.3221963957
12	5.0398622667	8	5.9615278674
13	5.1058641573	9	9.9792211624
14	4.6766237136	18	10.0539580020
15	4.1380606814	10	10.9190810282
16	2.7488742219	5	29.6505627920
17	1.7513809556	3	36.6249133009
18	10.0539580020	2	68.2807799941
19	0.8911961408	1	78.9074907324
20	0.9489172503	4	83.7537300309

Job started: Fri Aug 27 11:08:20 1999

NREALIZATIONS = 1000

i	amp before sort	i	amp after sort
1	78.3743987449	12	0.0378813441
2	79.8934236090	11	2.1499865500
3	35.9430309145	7	3.1202609641
4	68.7375871156	16	3.1984565533
5	48.8533802402	19	4.2107135522
6	15.0321323208	14	5.1359560543
7	3.1202609641	17	8.8655574246
8	9.9312106266	15	9.3011959908
9	11.9658227698	8	9.9312106266
10	16.9578112510	13	10.0702503435
11	2.1499865500	9	11.9658227698
12	0.0378813441	20	12.7420221758
13	10.0702503435	6	15.0321323208
14	5.1359560543	18	15.9266537163
15	9.3011959908	10	16.9578112510
16	3.1984565533	3	35.9430309145
17	8.8655574246	5	48.8533802402
18	15.9266537163	4	68.7375871156
19	4.2107135522	1	78.3743987449
20	12.7420221758	2	79.8934236090

Job started: Fri Aug 27 11:06:54 1999

NREALIZATIONS = 1500

i	amp before sort	i	amp after sort
1	80.2884357904	11	2.2282852981
2	75.6412798287	19	2.4984459218
3	30.6567330099	14	2.7541019596
4	75.1327737720	15	2.8409203171
5	37.3116509030	12	3.3259384229
6	12.2591997903	16	4.5803430174
7	16.7213661798	17	4.7401161429
8	26.9500482293	20	4.9853420150
9	12.1322036969	18	6.3907317074
10	19.6434754951	13	8.0328642305
11	2.2282852981	9	12.1322036969
12	3.3259384229	6	12.2591997903
13	8.0328642305	7	16.7213661798
14	2.7541019596	10	19.6434754951
15	2.8409203171	8	26.9500482293
16	4.5803430174	3	30.6567330099
17	4.7401161429	5	37.3116509030
18	6.3907317074	4	75.1327737720
19	2.4984459218	2	75.6412798287
20	4.9853420150	1	80.2884357904

Job started: Fri Aug 27 11:02:20 1999

NREALIZATIONS = 2500

i	amp before sort	i	amp after sort
1	77.5479052978	16	0.2096418104
2	76.4751864018	14	0.5056685180
3	33.0556309052	12	0.6084541129
4	76.9536608332	11	1.2572546455
5	35.6965519277	19	2.0152804338
6	15.3150466421	17	2.1376661735
7	8.9517592364	13	2.5763021445
8	8.3353126636	15	2.8974795935
9	9.1385176386	18	3.5829807505
10	9.0815535947	20	3.6302306792
11	1.2572546455	8	8.3353126636
12	0.6084541129	7	8.9517592364
13	2.5763021445	10	9.0815535947
14	0.5056685180	9	9.1385176386
15	2.8974795935	6	15.3150466421
16	0.2096418104	3	33.0556309052
17	2.1376661735	5	35.6965519277
18	3.5829807505	2	76.4751864018
19	2.0152804338	4	76.9536608332
20	3.6302306792	1	77.5479052978

Job started: Fri Aug 27 11:05:03 1999

NREALIZATIONS = 2000

i	amp before sort	i	amp after sort
1	75.9243594330	13	0.5972948717
2	78.0002284354	20	1.4758724128
3	36.3463522540	7	1.8659867741
4	74.9878568294	14	2.4362367930
5	52.4374541684	11	2.6693740240
6	16.1060137158	18	4.3882316085
7	1.8659867741	19	4.9724593115
8	15.6279243400	12	5.0586623916
9	11.8616007903	16	5.2970960735
10	16.1318345446	17	6.0282021394
11	2.6693740240	15	7.5249351951
12	5.0586623916	9	11.8616007903
13	0.5972948717	8	15.6279243400
14	2.4362367930	6	16.1060137158
15	7.5249351951	10	16.1318345446
16	5.2970960735	3	36.3463522540
17	6.0282021394	5	52.4374541684
18	4.3882316085	4	74.9878568294
19	4.9724593115	1	75.9243594330
20	1.4758724128	2	78.0002284354

Job started: Fri Aug 27 11:01:19 1999

NREALIZATIONS = 3000

i	amp before sort	i	amp after sort
1	80.0025630464	19	0.5248331729
2	69.7657895527	15	0.7591195469
3	38.4244620704	17	1.4172134076
4	74.1963361701	14	2.2550555672
5	26.6413637357	13	2.4492866037
6	6.0984192897	18	4.1571545377
7	6.4960867269	12	4.3416309311
8	14.0818380815	20	4.5023670637
9	16.7217642314	11	4.9033744766
10	17.5704874340	16	5.2051503669
11	4.9033744766	6	6.0984192897
12	4.3416309311	7	6.4960867269
13	2.4492866037	8	14.0818380815
14	2.2550555672	9	16.7217642314
15	0.7591195469	10	17.5704874340
16	5.2051503669	5	26.6413637357
17	1.4172134076	3	38.4244620704
18	4.1571545377	2	69.7657895527
19	0.5248331729	4	74.1963361701
20	4.5023670637	1	80.0025630464

Job started: Fri Aug 27 10:57:41 1999

NREALIZATIONS = 3500

i	amp before sort	i	amp after sort
1	77.8221498442	19	0.2100086430
2	73.9410040428	20	1.0704465816
3	31.9006494360	13	1.1279401517
4	71.2451083758	16	1.2213695078
5	38.7360045582	17	1.4054407271
6	18.3456582633	15	1.7914437957
7	5.6074879069	14	2.2489254318
8	12.7846566992	11	2.3592552809
9	13.2419000926	18	3.9872463853
10	11.3349456320	7	5.6074879069
11	2.3592552809	12	8.1152795736
12	8.1152795736	10	11.3349456320
13	1.1279401517	8	12.7846566992
14	2.2489254318	9	13.2419000926
15	1.7914437957	6	18.3456582633
16	1.2213695078	3	31.9006494360
17	1.4054407271	5	38.7360045582
18	3.9872463853	4	71.2451083758
19	0.2100086430	2	73.9410040428
20	1.0704465816	1	77.8221498442

Job started: Fri Aug 27 10:56:02 1999

NREALIZATIONS = 4000

i	amp before sort	i	amp after sort
1	76.1354675522	17	0.0164150806
2	78.0518863070	20	0.0667755956
3	38.7054444432	15	0.1269950342
4	72.9398566623	11	0.1684370110
5	41.3634511659	16	1.6705007548
6	15.0619837175	12	2.5087447532
7	5.5523108950	14	3.0219408922
8	14.5186982334	19	3.5232546722
9	9.4173934951	13	3.8336559248
10	16.2008155238	18	4.4088754901
11	0.1684370110	7	5.5523108950
12	2.5087447532	9	9.4173934951
13	3.8336559248	8	14.5186982334
14	3.0219408922	6	15.0619837175
15	0.1269950342	10	16.2008155238
16	1.6705007548	3	38.7054444432
17	0.0164150806	5	41.3634511659
18	4.4088754901	4	72.9398566623
19	3.5232546722	1	76.1354675522
20	0.0667755956	2	78.0518863070

Job started: Fri Aug 27 10:54:15 1999

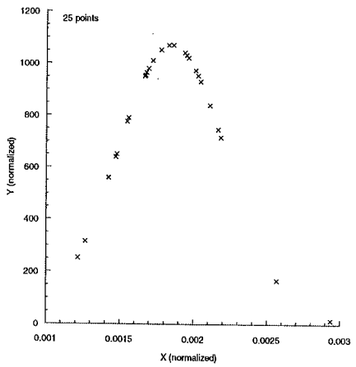
NREALIZATIONS = 4174

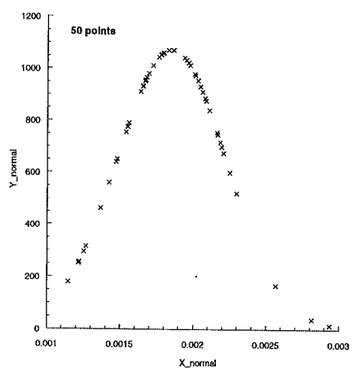
i	amp before sort	i	amp after sort
1	74.2002540328	19	1.2191651007
2	74.7763979010	13	2.0475315003
3	33.0958444320	16	2.4103182283
4	72.9018064130	17	2.5904447307
5	39.3126183535	20	2.6071718320
6	17.7776271761	18	3.0675058459
7	5.9660619810	12	3.1609260863
8	14.8299760193	11	3.3279396948
9	14.4121539398	15	3.3887796037
10	12.9773729543	14	3.6154727671
11	3.3279396948	7	5.9660619810
12	3.1609260863	10	12.9773729543
13	2.0475315003	9	14.4121539398
14	3.6154727671	8	14.8299760193
15	3.3887796037	6	17.7776271761
16	2.4103182283	3	33.0958444320
17	2.5904447307	5	39.3126183535
18	3.0675058459	4	72.9018064130
19	1.2191651007	1	74.2002540328
20	2.6071718320	2	74.7763979010

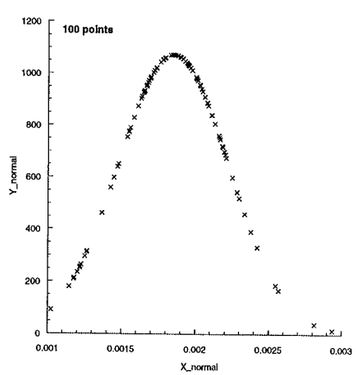
A graph Sitakanta gave to me.

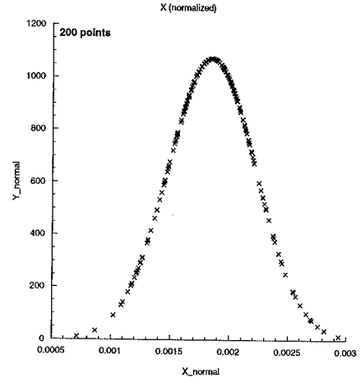
8/28/99

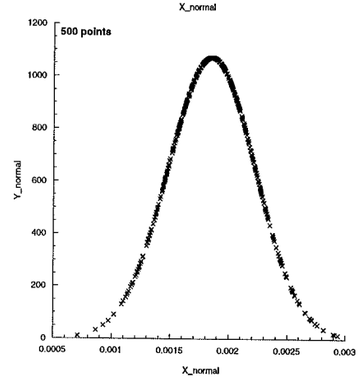
8/27/1999

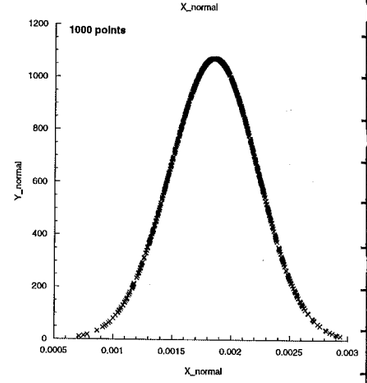


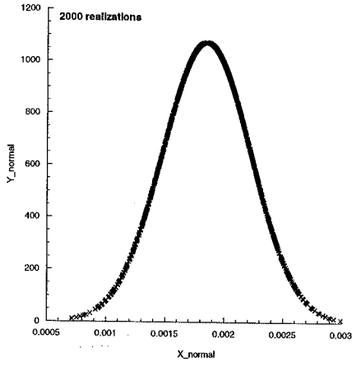


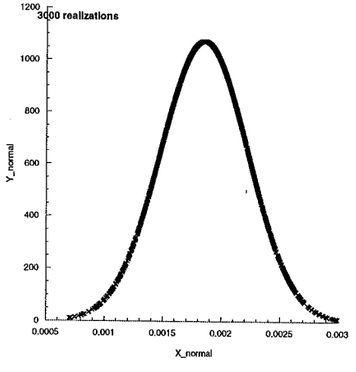


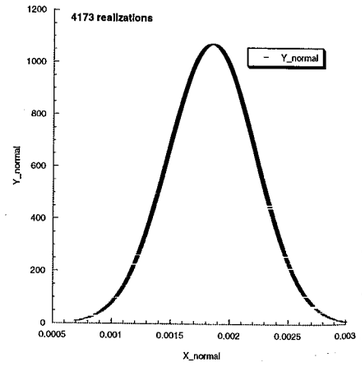












8-28-99 YL

Generally for a deterministic model, FAST stablized when # realization → ∞.

if use the # specified by FAST paper, then ranking could change since the #'s are only for the order of 4. M=4.

But the top ten params are stablized.

Submitted 3frozen /10K, 50K.

8-30-99 YL

modified fastamp.f

used the modified ~~fastamp~~ fastamp.f

to ~~produce~~ process TPARUN 61, 62, 63, 64

produced results on the right page. →

SW 8/26/2000

Obtain the FOURIER amplitudes of the FAST method
Job started: Mon Aug 30 14:58:15 1999

used gwpkdos_c.res_fastlhs4_Morris_10k_p=8_d=2

i	abbreviation	abs(amp) w/o sort	i	abbreviation	abs(amp) w/ sort
1	AAMAI@S	0.1072117E-05	18	ARDSAVSe	0.1630221E-07
2	MAPM@GM	0.2926149E-06	7	SSMO-RE	0.2820930E-07
3	FOC-R	0.2279419E-06	4	FOCTR	0.1494983E-06
4	FOCTR	0.1494983E-06	17	ARDSAV_U	0.1830177E-06
5	FOCTR-R	0.2327206E-06	13	SFWt%I1	0.1973707E-06
6	YMR-TC	0.2759942E-06	3	FOC-R	0.2279419E-06
7	SSMO-RE	0.2820930E-07	5	FOCTR-R	0.2327206E-06
8	Fow*	0.1875282E-05	6	YMR-TC	0.2759942E-06
9	Fmult*	0.8622833E-06	2	MAPM@GM	0.2926149E-06
10	SbArWt%	0.1979490E-05	14	SFWt%I3	0.3523412E-06
11	WP-Def%	0.1999327E-05	19	APrs_SAV	0.4662144E-06
12	InitRSFP	0.5155967E-06	12	InitRSFP	0.5155967E-06
13	SFWt%I1	0.1973707E-06	9	Fmult*	0.8622833E-06
14	SFWt%I3	0.3523412E-06	15	ARDSAV_I	0.9281699E-06
15	ARDSAV_I	0.9281699E-06	20	WPRRG@20	0.9566982E-06
16	ARDSAVTc	0.1269452E-05	1	AAMAI@S	0.1072117E-05
17	ARDSAV_U	0.1830177E-06	16	ARDSAVTc	0.1269452E-05
18	ARDSAVSe	0.1630221E-07	8	Fow*	0.1875282E-05
19	APrs_SAV	0.4662144E-06	10	SbArWt%	0.1979490E-05
20	WPRRG@20	0.9566982E-06	11	WP-Def%	0.1999327E-05

Obtain the FOURIER amplitudes of the FAST method
Job started: Mon Aug 30 14:59:23 1999

used gwpkdos.res_fastlhs4_Morris_50k_p=8_d=2

i	abbreviation	abs(amp) w/o sort	i	abbreviation	abs(amp) w/ sort
1	FOCTR	0.3484905E-05	1	FOCTR	0.3484905E-05
2	AA_2_1	0.4205052E-03	12	SFWt%C6	0.2120284E-04
3	OO-CofLC	0.2772587E-03	4	Fow*	0.3459209E-04
4	Fow*	0.3459209E-04	18	ARDSAVTh	0.4177478E-04
5	Fmult*	0.8159437E-04	14	MKD_CHvU	0.4799055E-04
6	SbArWt%	0.9155784E-03	17	ARDSAV_U	0.5072969E-04
7	InitRSFP	0.2976059E-03	13	SFWt%C7	0.6829250E-04
8	SFWt%C1	0.1805644E-03	16	ARDSAVTc	0.7014652E-04
9	SFWt%C3	0.2722041E-03	5	Fmult*	0.8159437E-04
10	SFWt%C4	0.2319961E-03	11	SFWt%C5	0.1172786E-03
11	SFWt%C5	0.1172786E-03	8	SFWt%C1	0.1805644E-03
12	SFWt%C6	0.2120284E-04	10	SFWt%C4	0.2319961E-03
13	SFWt%C7	0.6829250E-04	9	SFWt%C3	0.2722041E-03
14	MKD_CHvU	0.4799055E-04	3	OO-CofLC	0.2772587E-03
15	ARDSAVNp	0.1585205E-02	19	APrs_SAV	0.2813700E-03
16	ARDSAVTc	0.7014652E-04	7	InitRSFP	0.2976059E-03
17	ARDSAV_U	0.5072969E-04	20	WPRRG@20	0.4161764E-03
18	ARDSAVTh	0.4177478E-04	2	AA_2_1	0.4205052E-03
19	APrs_SAV	0.2813700E-03	6	SbArWt%	0.9155784E-03
20	WPRRG@20	0.4161764E-03	15	ARDSAVNp	0.1585205E-02

8-31-99 YL

A copy of FAST paper was given to Sitakanta. Instead of doing CCDF by fixing 1, 2, 3, ···, we do CCDF like: 1, 2, 5, 10, 15, 20.

Sitakanta emphasized the importance of finishing the FAST and MOM3 papers in time.

Sm 8/16/2000 This ~~the~~ is the job with the highest ~~pro~~ priority, and the only work I'm doing now.

submitted 5 frozen.

9-1-99 YL

5 frozen finished.

submitted 10 frozen.

Sitankanta emphasized again the urgency and importance of finishing the FAST paper so we can get on the next work.

fix the problems in the paper.

10 frozen finished

submitted 15 frozen, 20 frozen

9-3-99 YL

Had a conversation w/ Sitakanta.

He made many comments on the FAST manuscripts.

basically, explain FAST better.

collect Saltelli's (1994) papers.

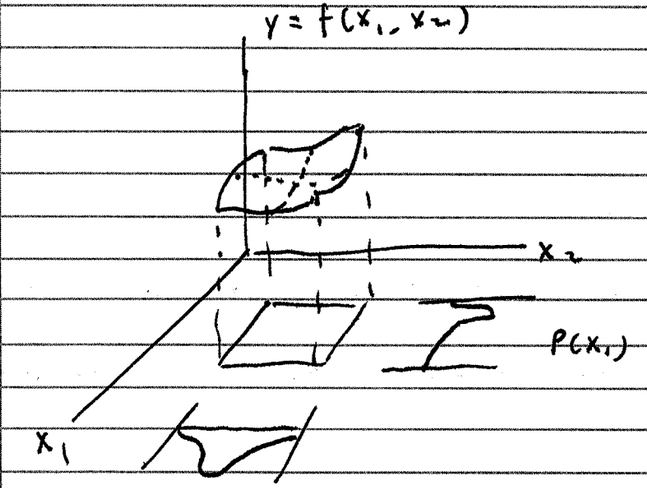
work on the paper Sn 8/16/2000

9-4-99 YL

Had a conversation w/ Sitakanta today.

He read the two (1994) Saltelli's paper that I Sn 8/16/2000
gave to him yesterday, and liked them a lot.
and suggested to me to follow the same style.
the way they presented FAST.

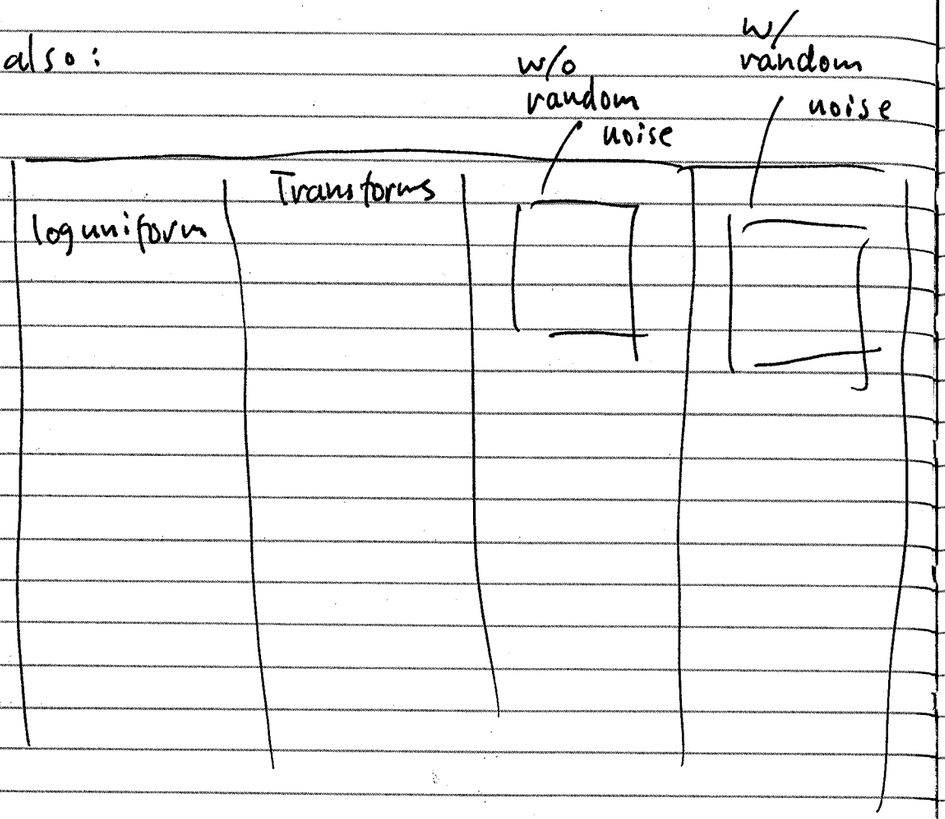
He wanted to do 3-D plots



one shows what is supposed to be done,

another shows what is done by FAST.

also:



Sitakanta also wanted me to work on a 20-params models with diff. distributions.

9-6-95 YL

worked on FAST/morris-20/ and FAST/distrib

with non uniform distributions, there is no way you can produce consistent ranking.

with uniform distribution, you can. but are they right by ignoring distribution?

The key is "order of M", M = ψ

if FAST applies to more than M params, errors bound to occur.

9-7-98 YL

After discussing with Sitakanta, devised a model in FAST/ylu-10/

$$y = 100(x_1 + x_1^3) + 80(x_2 + x_2^3) + 60(x_3 + x_3^3) + 40 x_4 + 20 x_5 + 50 (x_1 x_2 x_3)^{**} 2 + 0.1 (x_6 + x_6^3) + 0.08 (x_7 + x_7^3) + 0.06 (x_8 + x_8^3) + 0.04 (x_9 + x_9^3) + 0.02 (x_{10} + x_{10}^3)$$

8/6/2000

I can produce a stable ranking by increase 5 points. to certain level, and the top five parameters are right.

However, I cannot make the bottom five right even though they are stable.

I can make ranking both stable and right by removing $x_4 - x_8$.

This should have something to do with "order of M, M=4.".

An all uniform-params produces a much better ranking than non uniform params.

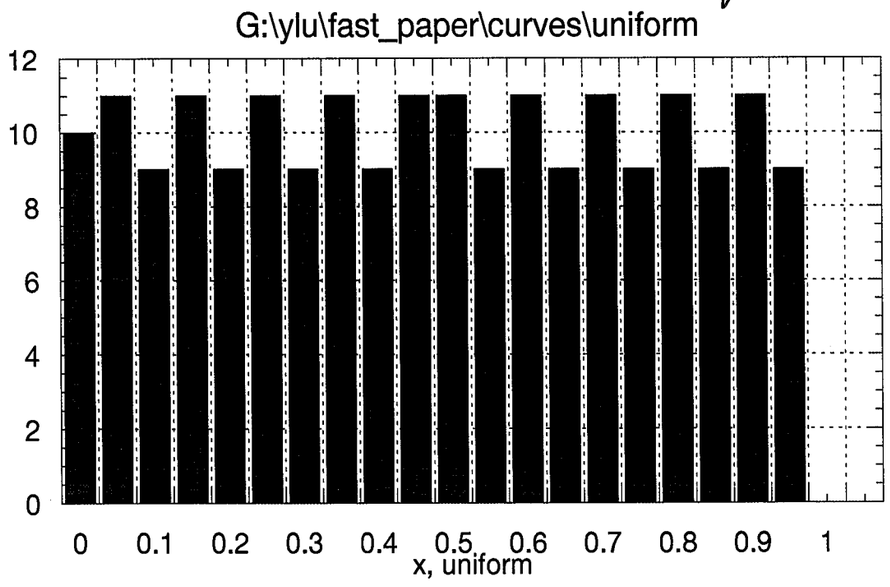
9-8-98 YL

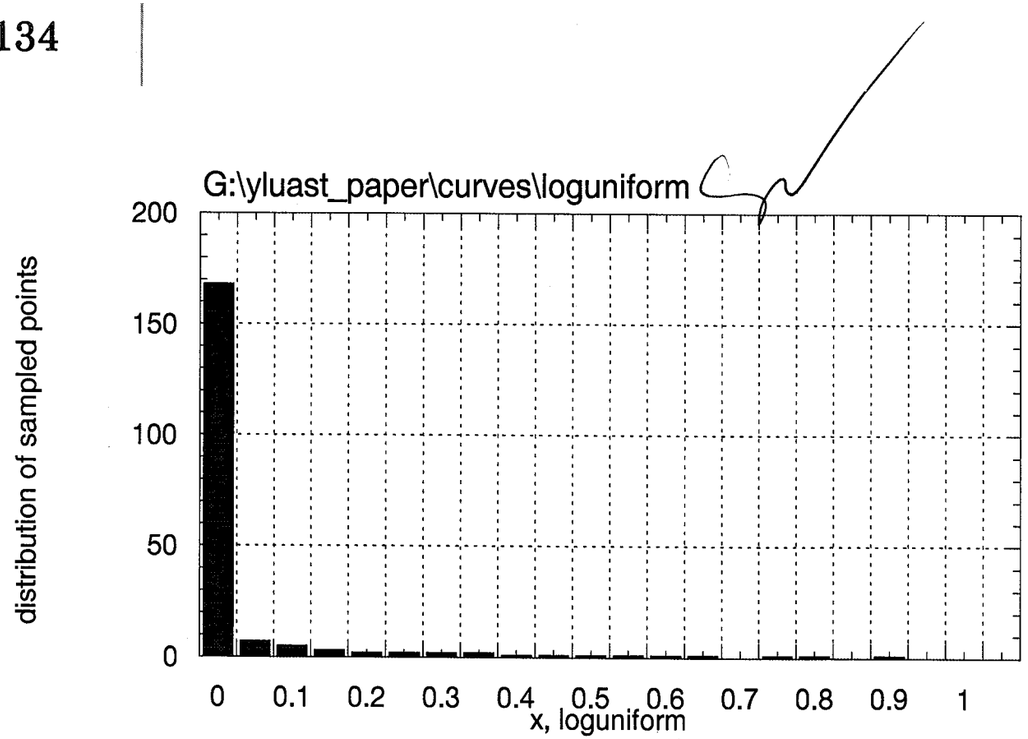
/FAST/curves/curve1.f, curve2.f

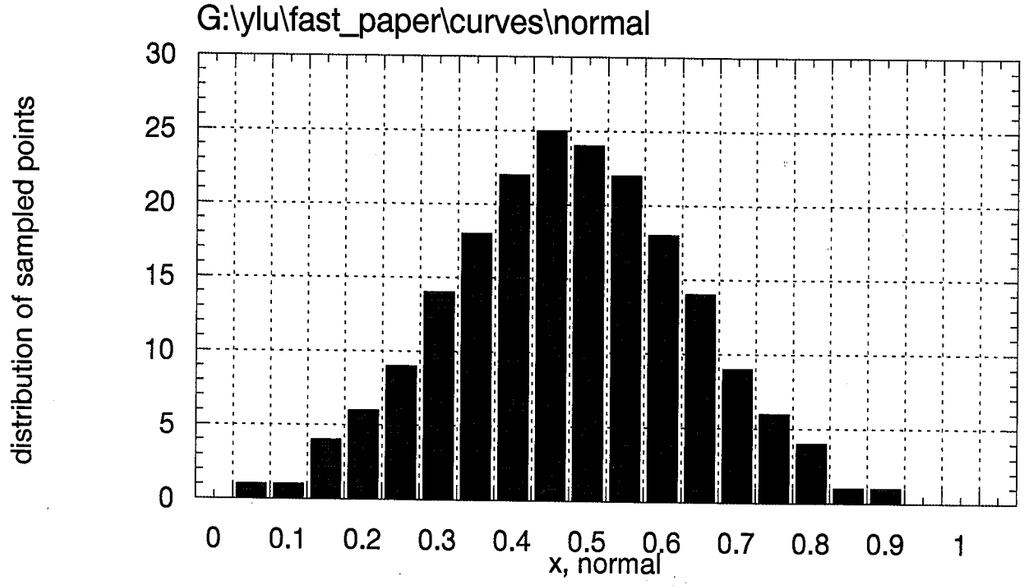
curve1.f reproduced Saltelli's fig. 2.

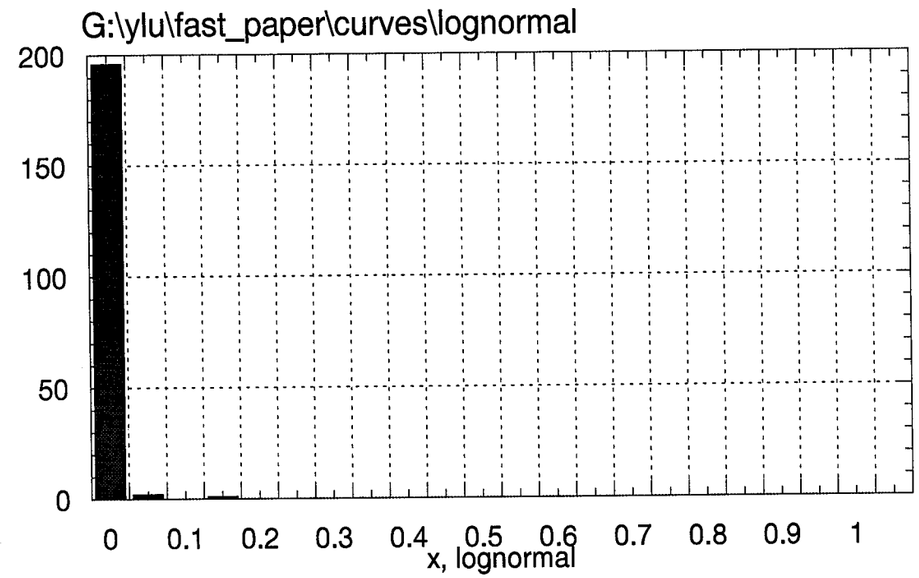
curve2.f showed that our code is better than saltelli's.

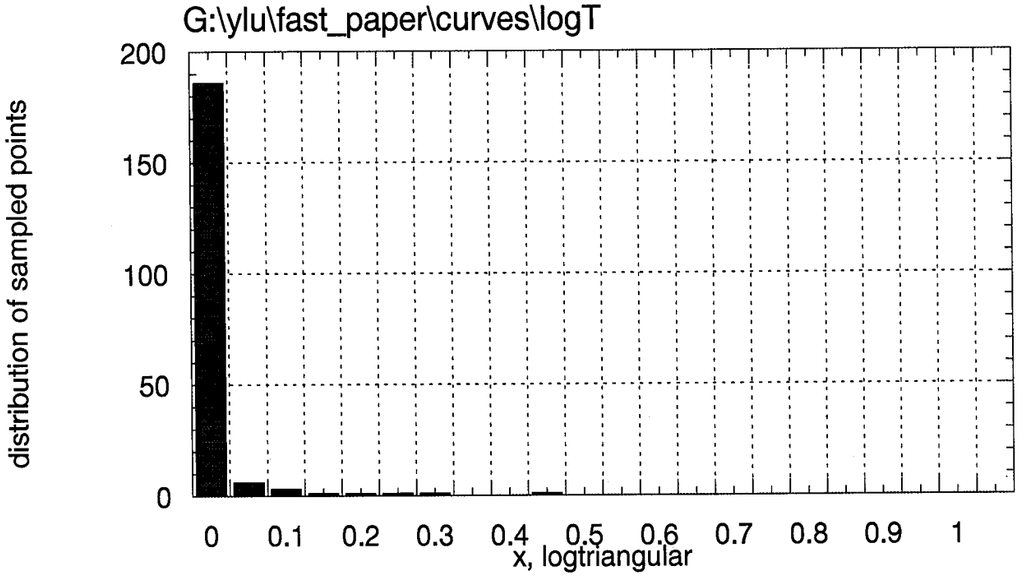
left figs. to Sitakanta.

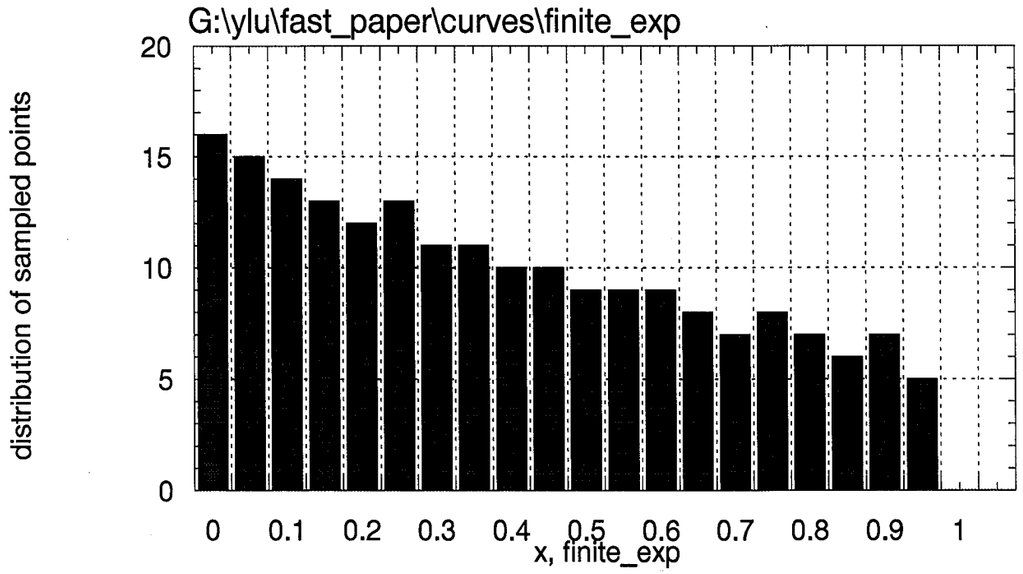


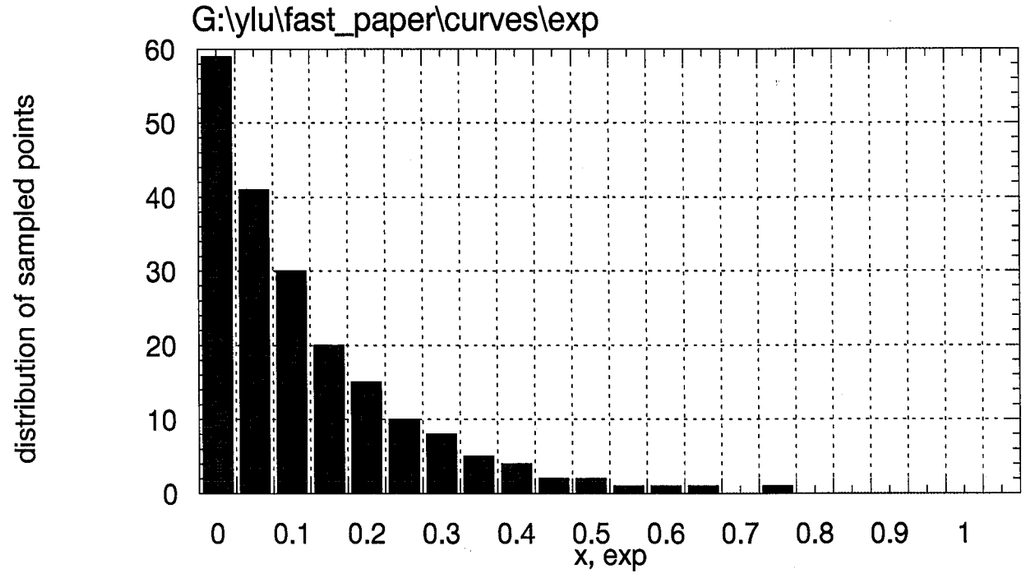

G:\yluast_paper\curves\loguniform
distribution of sampled points
200
150
100
50
0
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
x, loguniform

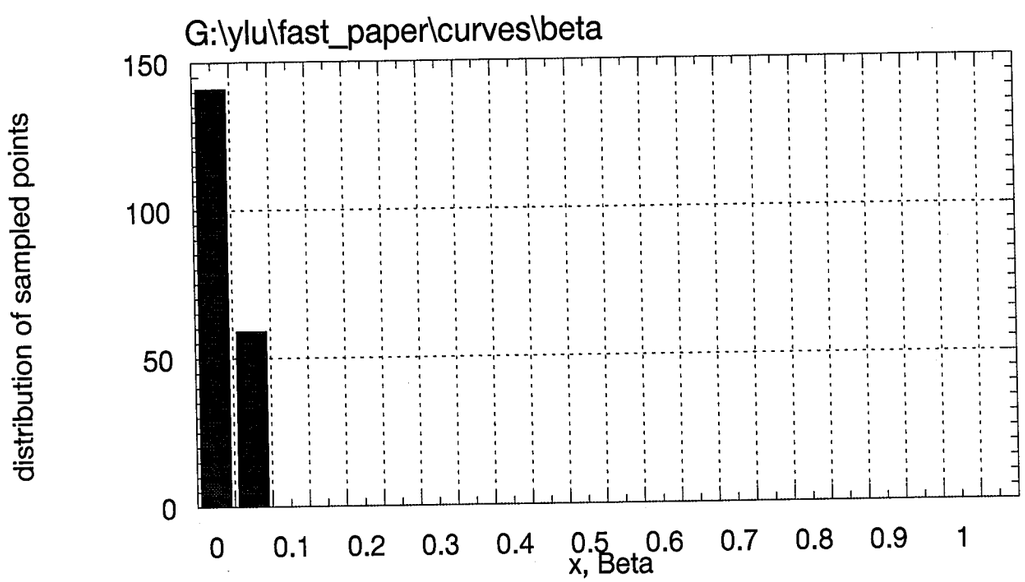

G:\ylu\fast_paper\curves\normal
distribution of sampled points
30
25
20
15
10
5
0
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
x, normal


G:\ylu\fast_paper\curves\lognormal
distribution of sampled points
200
150
100
50
0
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
x, lognormal


G:\ylu\fast_paper\curves\logT
distribution of sampled points
200
150
100
50
0
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
x, logtriangular


G:\ylu\fast_paper\curves\finite_exp
distribution of sampled points
20
15
10
5
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
x, finite_exp


G:\ylu\fast_paper\curves\exp
distribution of sampled points
60
50
40
30
20
10
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
x, exp

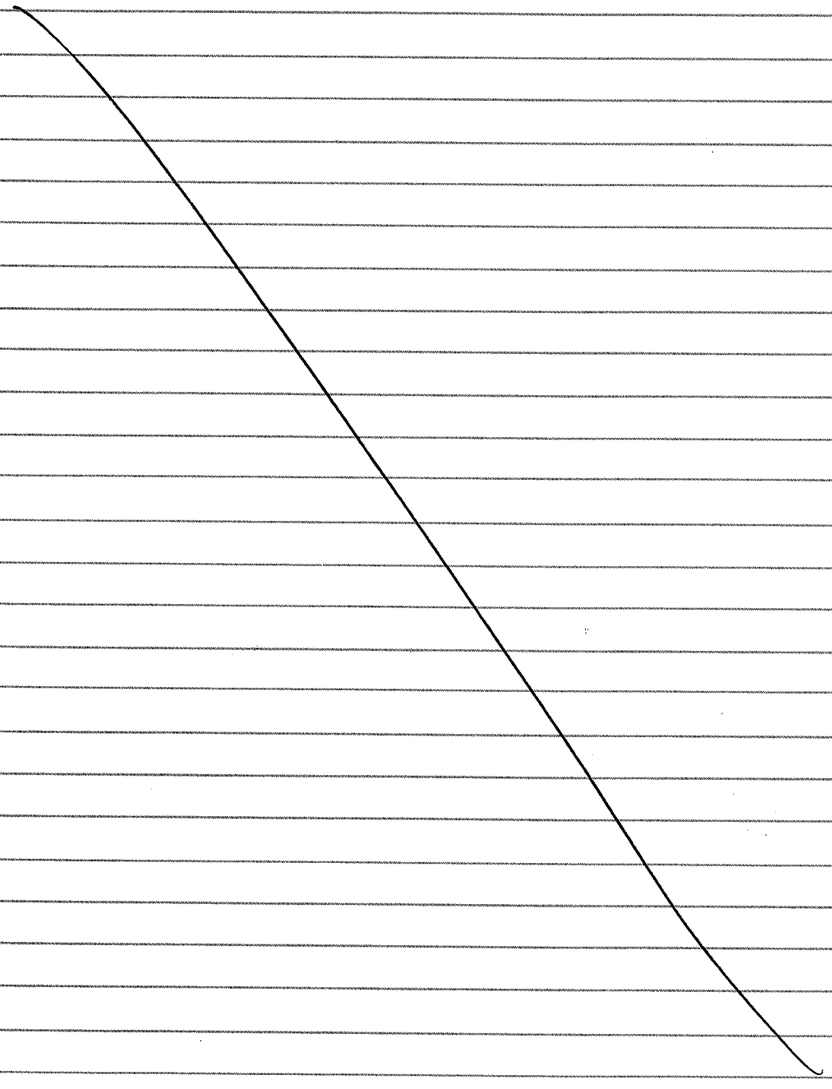

G:\ylu\fast_paper\curves\beta
distribution of sampled points
150
100
50
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
x, Beta

9-10-89 YL

worked on the FAST paper

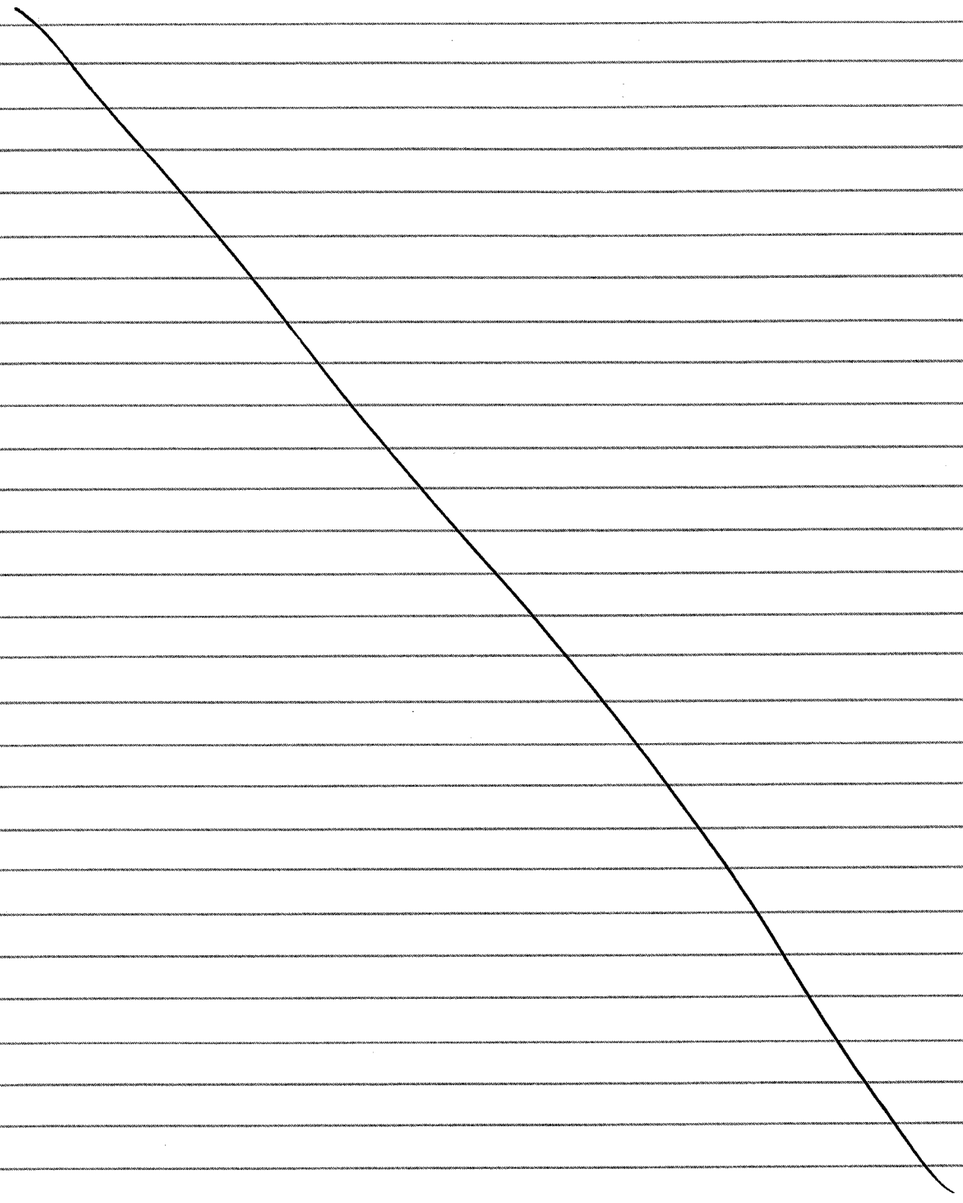
Frank Tapia called. Graph ready

worked on /FAST/yln-10



9-11-89 YL

worked on FAST paper



Sw 8/16/2000

~~9-12-99~~ 9-13-99 YL

worked on /FAST/ylu-10/
made Table 1, 2, 3, 4

left a copy of FAST paper on Sitakanta's chair.

9-14-99 YL

Sitakanta wants me to spend 50% time on NFENV, other 50% on FAST paper

Went through NFENV section of TPA 3.2 mannual several times.

8-15-05 YL

implemented Sitakanta's comments to the FAST paper. Pointed out ~~o~~ nfenv.f

Sitakanta wants me to try ~~en~~ nfenv.f out. Using data →

He wants me to take a serious look at the FAST paper. make sure it ~~reaches~~ the p is publishable, cannot rely on Div.20's reviewers'. They don't like it also need to look at Mons paper

Close the door, spend the whole day

8/16/2005

Table_ 1. Comparison of enhanced design alternative II (New Reference Design for Site Recommendation) to VA

Design Characteristics	VA	EDA II	Potential Impact on TPA
Mass Loading and Footprint Design			
Total emplacement drift length		54,000 m	
Total access drift length		33,400 m	
Total WPs		10,039	
Areal mass loading	85 MTHM/acre	60 MTHM/acre	Line loading
Emplacement in upper block		~1060 acres	
Drift spacing	28 m	81 m (center-to-center)	
Drift diameter	5.5 m	5.5 m	
Invert	Concrete lining	steel with sand or gravel ballast	Steel sets ground support (shifted away from concrete liner to steel set)
Number of WPs	10,500	10,039	
Length of Emplacement Drift	107 km	54 km	
Waste package Design			
WP materials	10 cm carbon steel over 2 cm Alloy-22	2 cm alloy-22 over 5 cm SS 316L	(SS stronger than carbon steel, potential for oxide wedging, surface contact doses will be higher)
Maximum WP	21 PWR assemblies	21 PWR assemblies	21 PWR/44 BWR SNF assembly WPs Average initial WP heat output is within 20% of average (11.2 kW max) (18 kW max for VA)
Peak WP Power (blending)	95% above average PWR WP power	20% above average PWR WP power	
Drip shield	None	2 cm Ti-7	
Backfill	None	Yes (may become an option)	
Thermal Management			
Pre-closure period	50 yrs	50 yr (potentially)	
Pre-closure ventilation rate	0.1 m3/s	2-10 m3/s air flow in emplacement drifts over 50 yr period	

9-17-99 YL

worked on the FAST paper, NFENV.f.

asked Ron about NFENV.f, input, output.

talked to Sitakanta about the paper

He wanted me to make sure the paper is acceptable for publishing.

9-20-99 YL

Split time between NFENV.f, and FAST paper.

morning → paper

afternoon → NFENV.f

some
fixed ~~x~~ graphs of the paper. still more to do.

created a directory: ~~Ylu/nfenv~~ Y.L 8/16/2000

Ylu/nfenv/TPARUN1

changed tpa.inp (1) Areal Mass Loading → 60 MTHM/acre

(2) WP Spacing Along Emplacement Drift → 81 m

(3) Emplacement Drift Diameter → 5.5 m

ran NFENV.f. had problem with aml.

program stopped if aml ≠ 83.

even if aml = 83, still had problem with "drift space".

Y.L. 8/16/2000

Robert Rice home #: 915-581-0853

Had a telephone conversation w/ Rob. need to look at (1) new repository; (2) invert; (3) WP design change

He suggested me to read VA report.

9-21-99 Y.L.

Talked to Sitakanta. He used quite serious words about the FAST paper and NFGNV.f

worked on ~~F~~ Y.L. NFGNV.f, now basically ~~use~~ Y.L understand it structure. The important subroutine is cond3DxYzt which calculate the temp for given X, Y, Z, t and AML. But since AML is an averaged ~~ov~~ Y.L. value, only thing that needs to be changed is AML.

Also worked on FAST paper.

9-22-99 Y.L.

It just occurred to me that adding random phase shift into the functional transformations may not be a good idea. Because it causes problem during amplitude Fourier Y.L. calculation

Created TPARUN65, 66, 67, 68

To run noiseless version of FAST.

TPARUN 65, 66 → 10kyr.
67, 68 → 50 kyr.

Submitted TPARUN 65, 66.

Work on the FAST paper.

I don't believe the boundary conditions were specified in NFENV.f.

Sitakanta wants me to calculate
AML = 60 ~ 83
may be five diff. AML's

Y.L.

9-24-99 YL

To run NFENV.f

Modified reader.f.

40000 < amtu < 80000

aml ≡ 60

before modification

40000 < amtu < 80000

In NFENV.f there is a section:

driftspace = amtu * 4047 / (AML * wpspace)

if keep driftspace = 81 as in EDA II

then:

AML (MTU)	wpspace (M)
60	8.1273
65	7.502131
70	6.9662645
75	6.501465
80	6.0954815
83	5.875162 9

results in G:\YLH\NFENV\wp_09-24-99

...

Sitakanta said that above was wrong

keep driftspace = 81.

but change AML, wpspace and amtu

formulae:

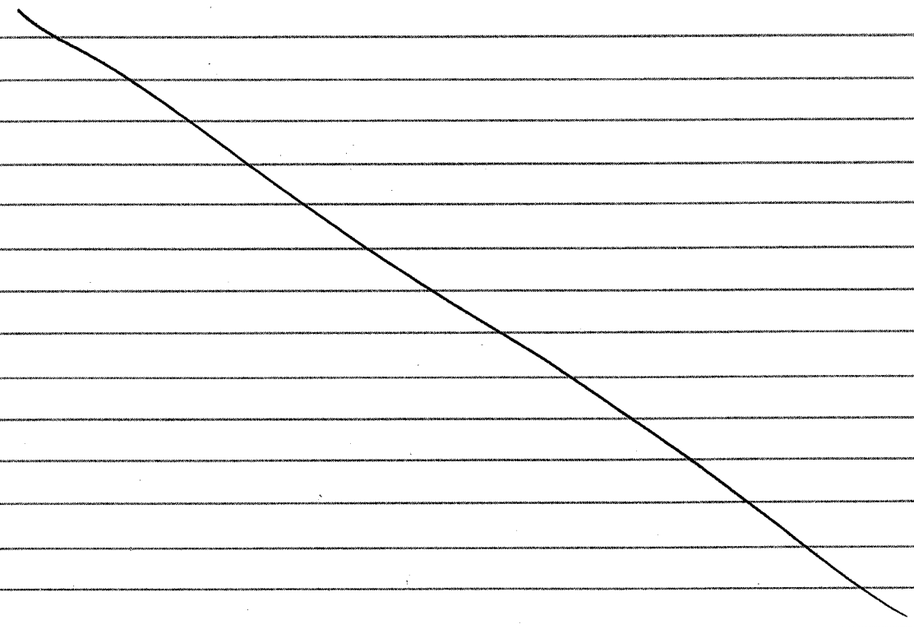
$$\frac{81}{4047} = \frac{(amtu / wpspace)}{AML}$$

AML	amtu/wpspace	wpspace	amtu
83	1.66	20	33.2
80	1.6	18	28.8
75	1.5	16	24
70	1.4	14	YL: 19.6
65	1.3	12	15.6
60	1.2	10	12

results in G:\YLH\NFENV\WP_09-24-99

RH_09-24-99

two graphs given to Sitakanta



9-27-88 YL

Sitakanta still thinks that some thing is wrong with my graphs.

did two more graphs. fix wppayload ≡ 9-76 MTU

but sitakanta still does not like it.

He wants me to fix wpspace at 1 meter. and change wp payload, see how temp. changes. keep AML = 60, driftspace = 81 m

Talked to Rob Rice over the phone. He suggested that I stick with nine ~~rectangle~~ rectangles, print out the area of each rectangle. This can be done in NFENV.f

It appears that /ylu/nfenv/doeVA-dev/nfenv.f is good now. By "good" I mean the numbers of wp's are consistent. The number can be calculated either by

$$\frac{\text{repository area} * \text{aml}}{\text{wp payload}}$$

or by

$$\frac{\text{repository area}}{\text{driftspace} * \text{wpspace}}$$

where driftspace * wpspace = unit cell area

If these two numbers are the same, then it must mean that the repository area has been used properly

○: AML = 83, wpspace = 19m, driftspace = 25 m

○: AML = 83, wpspace = 19m, driftspace = 25m

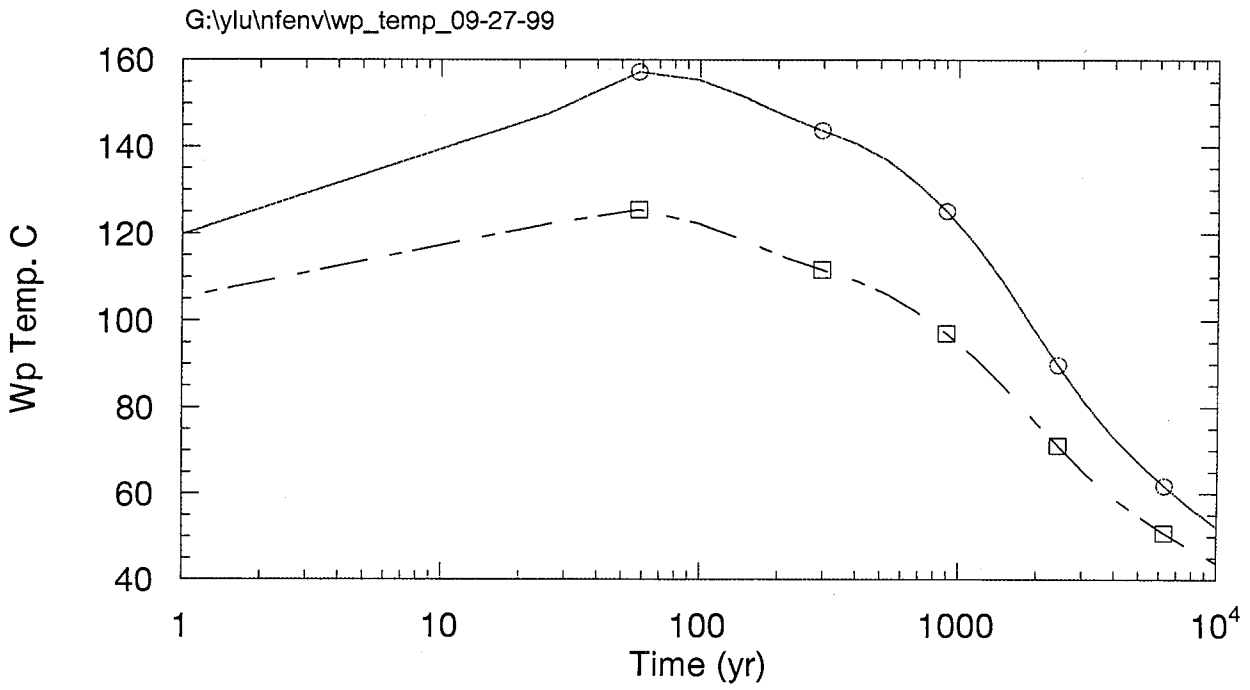
□: AML = 60, wpspace = 8.127m, driftspace = 8.1 m

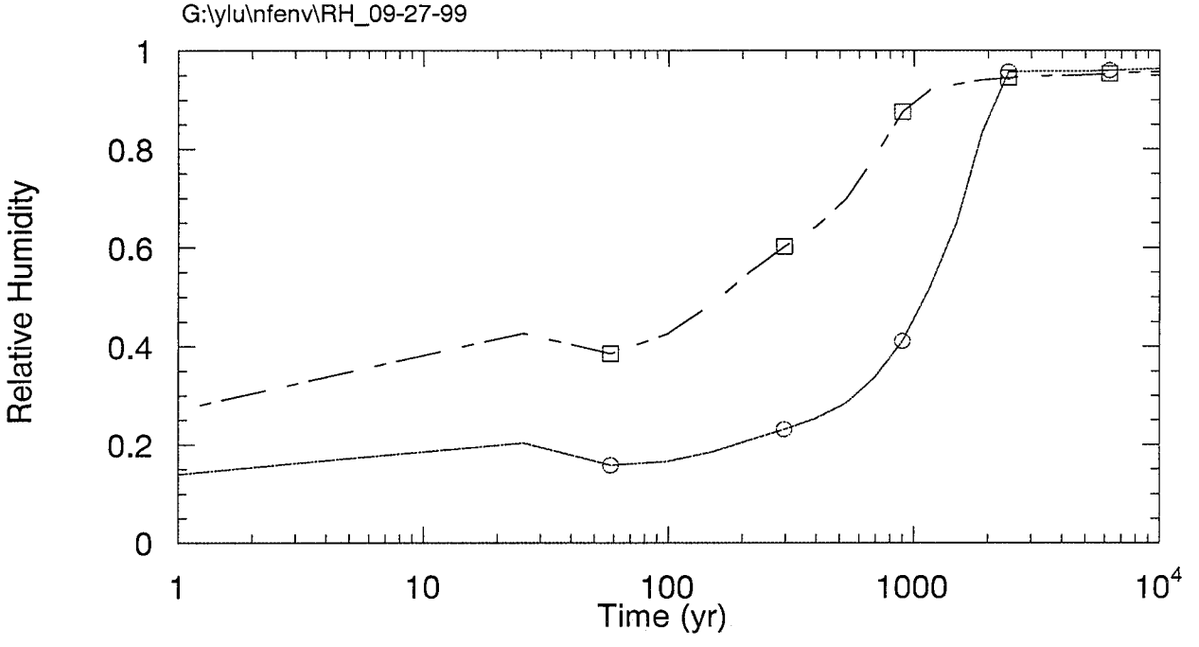
□: AML = 60, wpspace = 8.127m, driftspace = 8.1m

8/16/2000

wp payload = 9.76 MTU

wp payload = 9.76 MTU




G:\ylu\nfenv\RH_09-27-99
Relative Humidity
1
0.8
0.6
0.4
0.2
0
1
10
100
1000
10^4
Time (yr)

9-28-99 YL.

Explained to Sitakanta that I had a way of verifying the consistency of WP's.

fix AML = 60, 83 and wp payload = 9.76

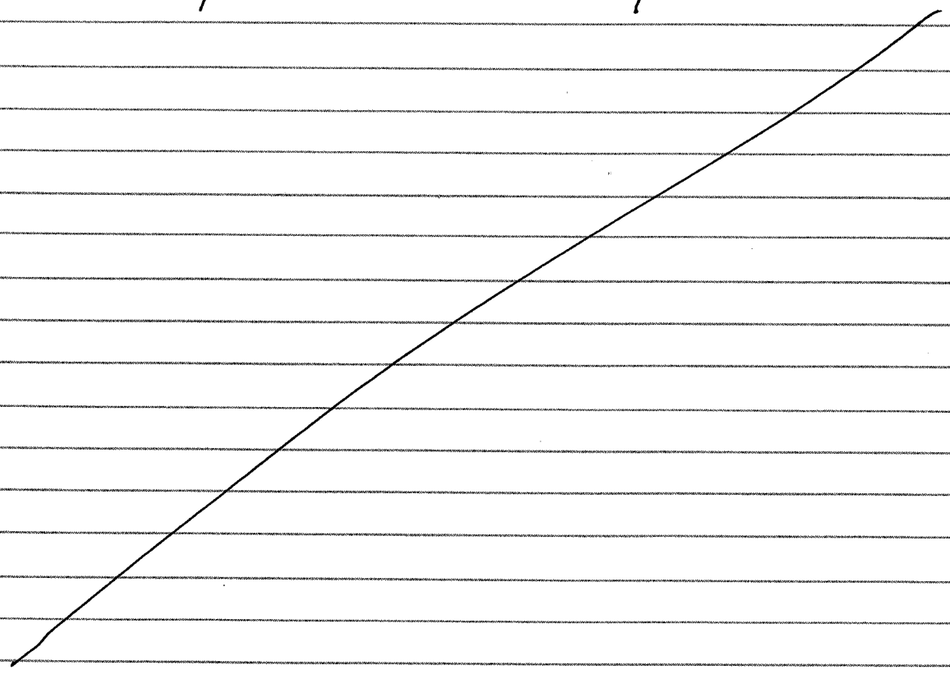
vary wpspace and consequently drift space

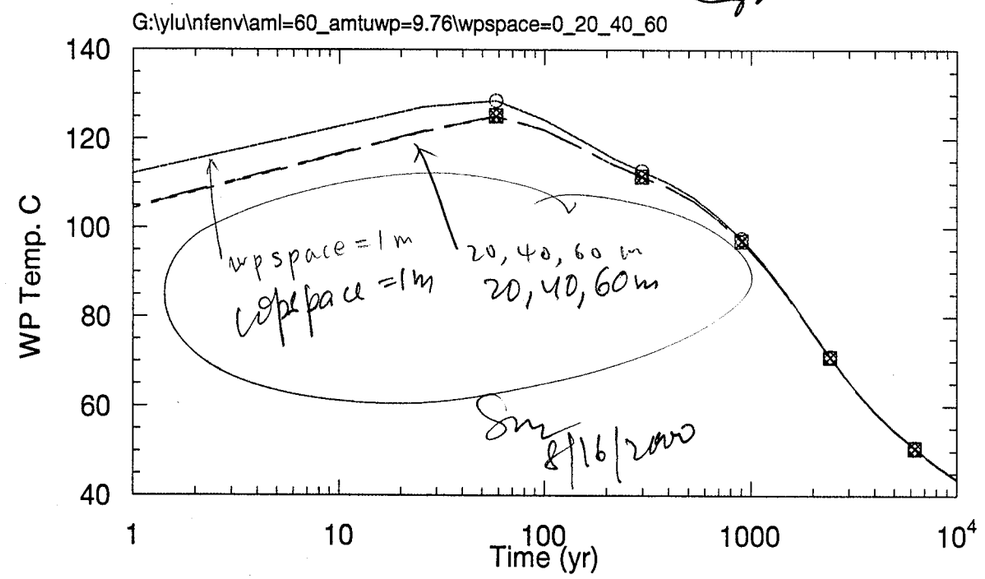
This only affect the early temperatures, but not long term temp. fields.

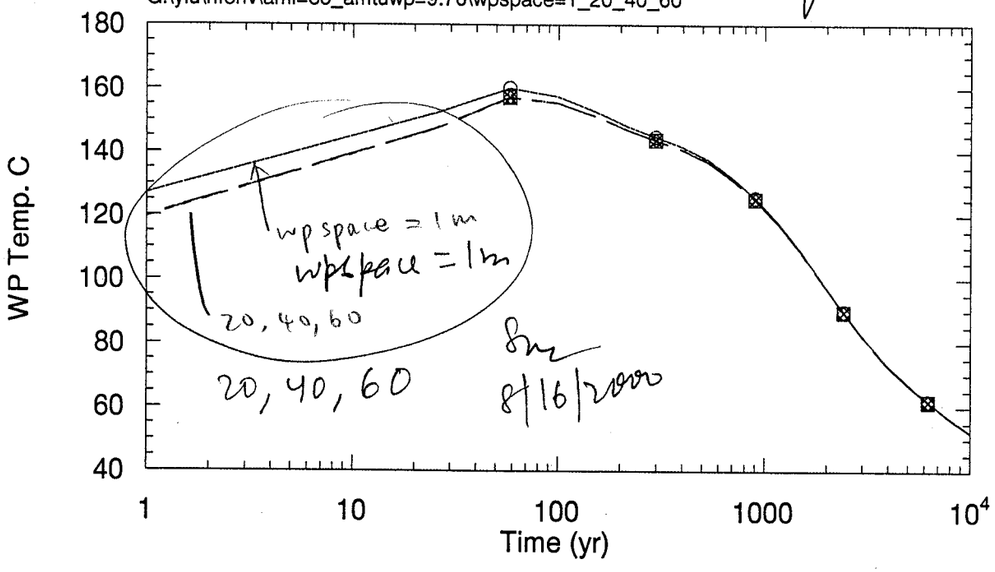
Showed results to Sitakanta. He still has doubt about it.

He wants me to do a comparison of temp. field between new design and the old design.

Also take a look at heat loss at the boundary of the repository.



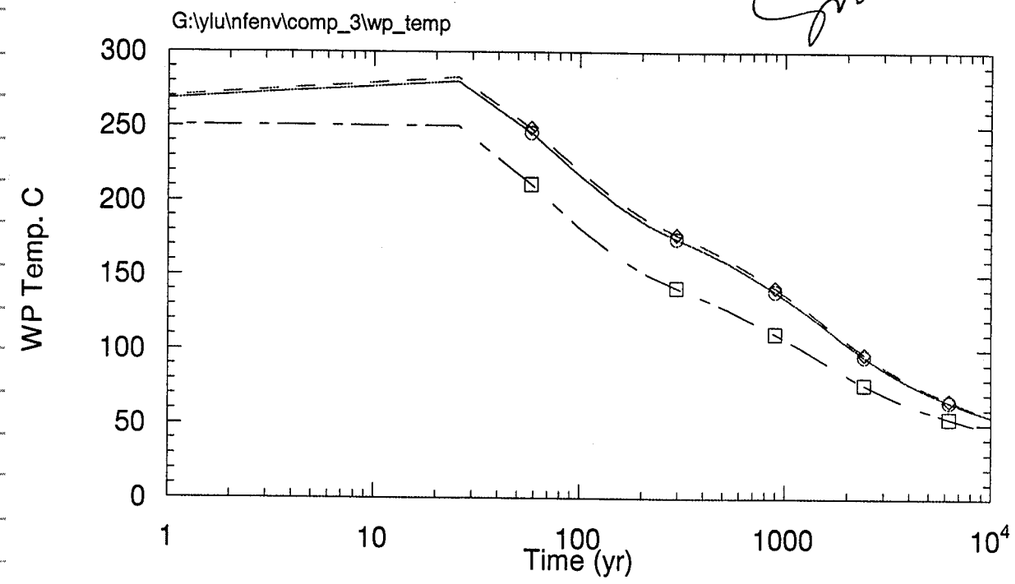




9-29-99 Y. L.

recieved a copy of Morris paper from Marty

Talked to Rob about dividing the seven subareas into 14, 28 areas. His file:
/rrice/davetest/testsa.f.



obtained this graph with Time Of Backfill = 0 yr.

compared to the graph on page 156, the backfill serves as insulator that sharply raises the WP temp. in the early time.

Work on the FAST paper.

Memo Sept. 29, 1999 Yichi Lu

The graph was generated using the following parameter values.

TimeOfBackfill = 0 yr.
nheat (# of rectangles) = 9
WPPayload = 9.76 MTU
The total area of the seven subareas = 770.337 acre.

(1) Solid line with circles:

AML = 83
wpspace = 25 m
driftspace = 19 m
Number of WP's = 6551
drift diameter = 5.5 m
Total emplacement drift length = wpspace * # of WP's = 163,775 m

(2) Dashed-dot line with squares:

AML = 60
wpspace = 8.127 m
driftspace = 81 m
Number of WP's = 4736
drift diameter = 5.5 m
Total emplacement drift length = 38,489 m

(3) Dashed line with diamonds:

AML = 85
wpspace = 16.5961 m
driftspace = 28 m
Number of WP's = 6709
drift diameter = 5.5 m
Total emplacement drift length = 111,343 m

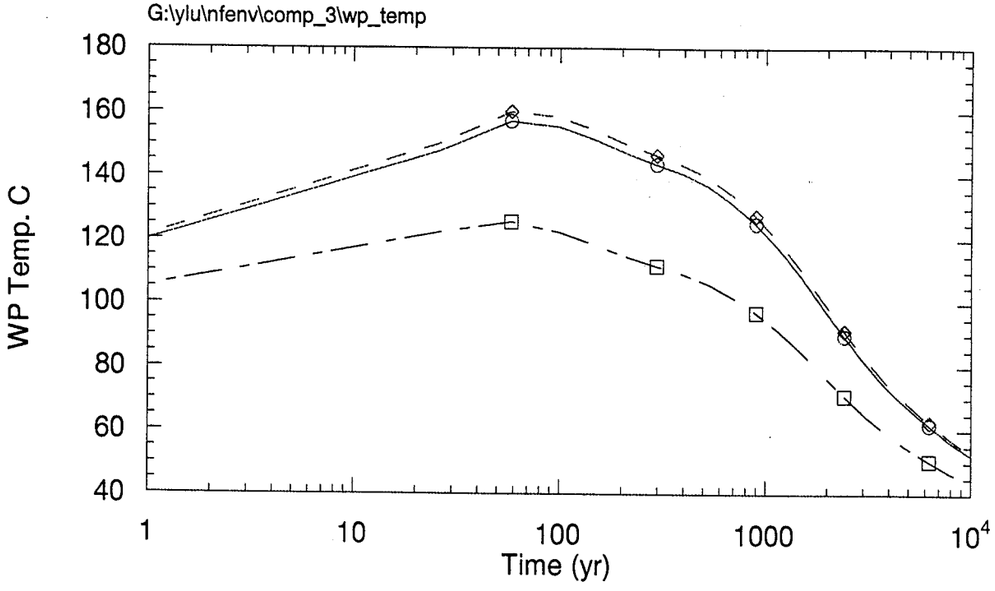
Some conditions listed in Table 1 cannot be satisfied. For instance, the number of waste packages is determined by the total repository area and the AML value; if we specify the total emplacement (or access) drift length and the number of WP's, then wpspace is fixed.

YL 8/16/2000

This graph should be compared to the one on page 154. Time Of Backfill was set at 100,001 yr.

drift space = 19 m, AML = 83, wp payload = 9.76, wp space = 25

—○—				
—·□—	81	60	9.76	8.127
- - ◇ -	28	85	9.76	16.39



10-01-99 YL.

Plotted wp temp. Graphs for Sitakanta.
gave sitakanta a copy of my resume.
He discussed with me about possible IR work.

continued working on FAST paper

10-02-99 YL.

continue to work on the FAST papers

vulcan is down today

searched on internet to look for possible project topic for SwRI IR. with Sitakanta

10-04-99 YL.

Worked on the FAST paper.

Last Friday Sitakanta suggested to me to replace the uniform area thermal source with line sources. It just seems quite difficult to do with quadraliteral shapes. Better use ~~rec~~ rectangles YL. ~~rectangle~~ YL. with horizontal & vertical boundaries.

Say the length of the total area is
$58 \times 81 + 5.5 = 4703.5$ m long

Total drift length = 54000 m
⇒ width of the rectangle = ~~54000/4703.5 =~~ YL. 8/16/2000
$\frac{54000}{81} = 667$ m

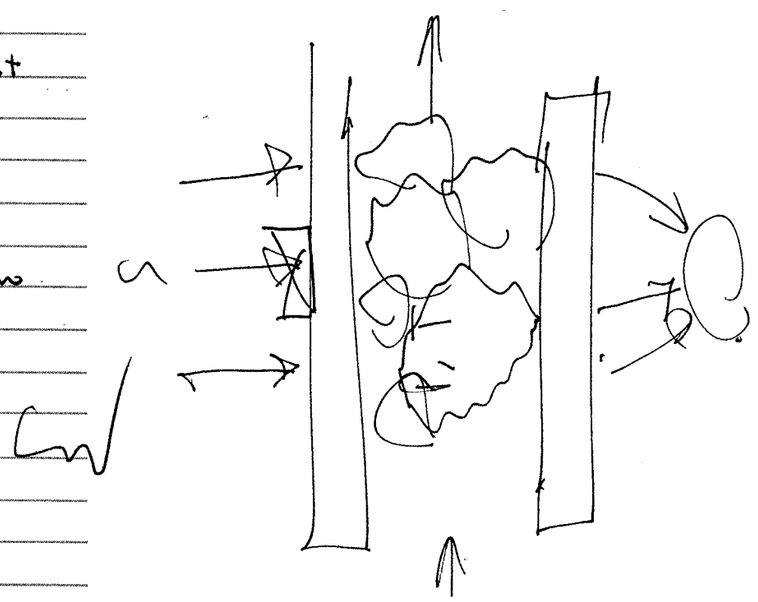
Used Matlab to do some plots in /nfenv/doeva-dev/matlab.

160

10-05-99 Y. L.

There is a strong possibility that extended functional transformation proposed by Soltani is no good. The results in /FAST/ccdf/no-noise is much better than w-noise. especially for 10 K.
going to throw a bomb on Soltani.

Sitalkanta talked about possible IR work on UT multiple phase flow problem.



Continue on Copy 372

My consultancy with Div. 20, SwRI ends on

Jan 10, 2000

Yichi Lu

This notebook appears to contain enough information for a technically competent scientist to replicate the work described.

Gordon Withers
6/12/2000

I verified all strike outs and pencil entries. I rewrote pencil entries so that the entry becomes permanent.

8/16/2000