SCIENTIFIC NOTEBOOK #371

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20.01402.461

JUNE 3, 1999 TO DECEMBER 19, 2000

SOUTHWEST RESEARCH INSTITUTE
CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES
SAN ANTONIO, TEXAS

Scientific notebook #371 documents work performed to study the interaction of low-volatile content basaltic magma with an horizontal tunnel, project # 20.01402.461. Work was conducted for the period June 3, 1999 through December 19, 2000.

Initial entry by Dr. Anne-Marie Lejeune

14.01.02

INITIAL ENTRY

Title of the experiments:

Fluid dynamics of the interaction of basaltic magma with an horizontal tunnel.

Individual performing the experiments:

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Description of the analogue experimental system

Description of the Apparatus

We have developed an analogue experimental system to model the flow of magma up a dyke and into a horizontal tunnel. This model (Fig. 1 and 2) consists of a vertical Hele-Shaw cell made up of two parallel plates, one of aluminum the other in glass, which represents the dyke. These plates are 200 mm wide and 500 mm high and 10 mm apart. The base of the cell is connected to a large aluminum reservoir, containing liquid. The internal dimensions of the reservoir are 153 mm in diameter and 485 mm high. Near the top of the Hele-Shaw cell is located a hydraulically operated gate, which can open in a fraction of a second, and which seals the cell from a glass cylinder, of 38 mm radius and 450 mm length, whose axis is horizontal and normal to the plates of the cell.

14.01.02

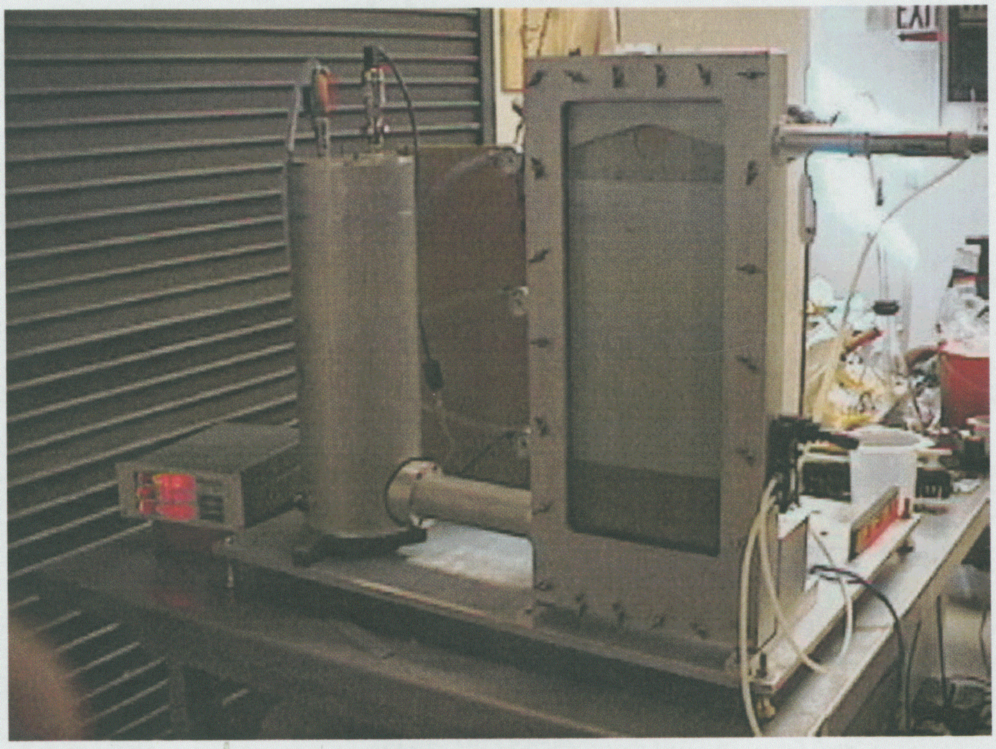
Fig. 1

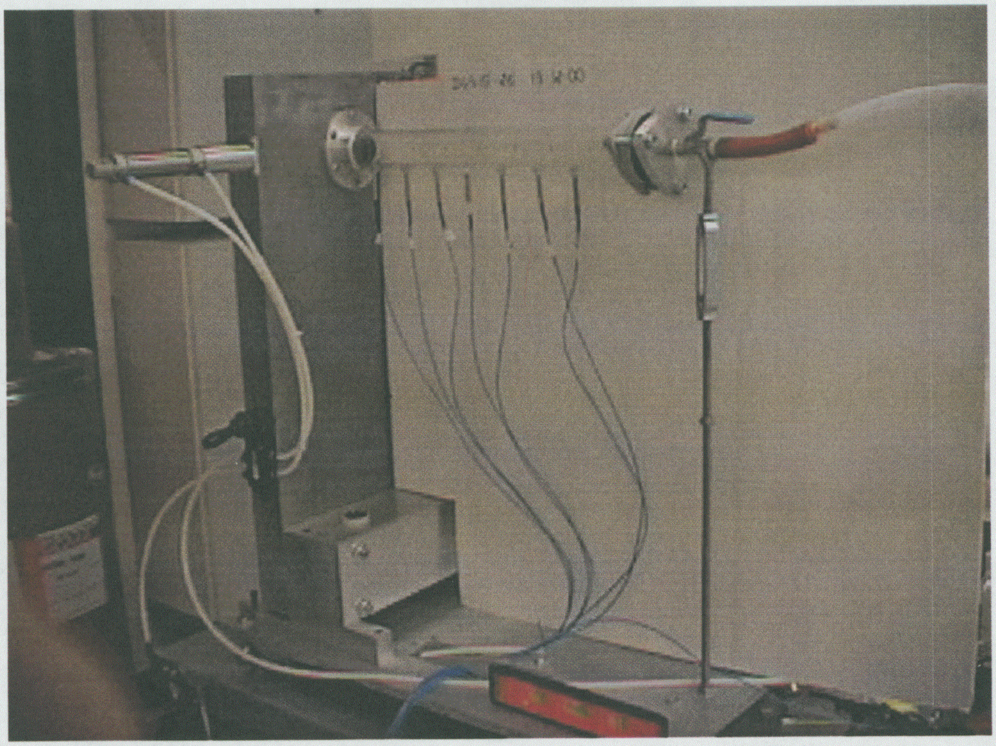
Fig. 2

<u>Hele-Shaw cell</u>

14.01.02

The whole system is sealed from the air, and the pressure at (i) the top of the reservoir, above the layer of liquid, (ii) the top of the Hele-Shaw cell, and (iii) the end of the cylinder can be controlled independently by three vacuum regulators (SMC handle operated vacuum regulators series T203) connected to a diaphragm vacuum pump (KNF Neuberger model N180.3 FT.18). The three pressures can be set independently, so as to control the pressure difference between the reservoir and the top of the dyke, and also between the top of the dyke and the tunnel. Pressures are measured with BOC Edwards active strain gauge (ASG NW16 - 1000 mbar). These gauges are regularly calibrated in the Calibration Laboratory of the Southwest Research Institute in San Antonio, and have an accuracy better than ± 1 mbar. The experimental system has been sealed from the atmosphere so that it may be operated at very low pressures. A series of miniature pressure sensors (113A21 sensors from PCB Piezotronics) is also emplaced at even distances along the bottom of the glass tube to record the changes of dynamic pressure during the flow propagation.

Experimental Materials

We are using three working fluids. The first one is pure Golden Syrup (PGS), a partially inverted refiners syrup comprising 31-38wt% sucrose, 42-50wt% invert sugar and the remainder dominantly water, manufactured by Tate & Lyle Co (UK). It has a Newtonian rheology with a strongly temperature-dependent viscosity. In order to cover a wider range of Reynolds numbers, we also used less viscous liquids: Golden Syrup diluted with 5 and 15wt.% de-ionized water and respectively called DGS5 and DGS15.

Viscosities of the samples used in our experiments were measured at Bristol University (UK) over a range of shear rates and temperatures between 0 and 40°C with a Haake RV20 Rotovisco rotating cylinder viscometer, using the sensor systems M5/MVI and M5/SVII. During these measurements, temperatures were set and controlled by a temperature vessel connected to a thermal liquid circulator. Densities are calculated by weighing different known volumes of each of the fluids at room temperature.

14.01.02

Experimental Methods

Two series of experiments are carried out with the apparatus. The syrup is initially stored in the Hele-Shaw cell and the reservoir. A series of calibration experiments (named 'dyke experiments', Fig. 3) are conducted first to examine the initial ascent of syrup up the Hele-Shaw cell as a function of the pressure drop between the reservoir and the top of the ascending layer of syrup. This enables us to test the model of flow resistance in the reservoir-dyke part of the system independently of the tunnel.

Figure 3: Dyke experiment

The second main series of experiments involves measuring the flow in the tunnel following the opening of the gate between the tunnel and the Hele-Shaw cell. In these experiments, the cell is initially filled with syrup while the gate is closed. Then the pressure in the tunnel is lowered to a prescribed value below that in the cell, and the gate is opened. The rate of advance of the syrup is then measured, and the morphology of the flow front is observed in the tunnel by analysing high-speed video (Fig. 4) recordings of the experiments.

14.01.02

V

Fig.4

14.01.02

I have reviewed the laboratory notebook for Anne-Marie LeJuene, for the period from 6/3/99 to 12/19/00 and find it in compliance with QAP-001. There is sufficient information regarding procedure used for conducting the research and acquiring and analyzing the data so that another qualified scientist could repeat the activity or activities recorded in this scientific notebook

H. Lawrence McKague 10/5/01

H. Lawrence McKague
GLGP Element Manager

Flow rate experiments
with pure golden syrup
(expt no 1 to 108)

06/03/99 – 09/06/00

Anne-Marie Lejeune

03.06.1999

FLOW RATE MEASUREMENTS (golden syrup) 3 June 1999

At atmospheric pressure

GS height in reservoir = $H - 346.5$ (137.5 mm) = 138.5 mm

GS visible in dyke = 71 to 73 mm (GS not levelled in dyke)

GS FLOW RATE 1 (video)

P_{tunnel} = 70 mbar

$P_{reservoir}$ = 10 mbar

$T = 19.5°C$

GS in dyke = GS slowly rised ⇒ is there a leak a the gate ?
= 111 to 113 mm

Dyke valve closed - Gate opened at $t_0 = 0$

↳ $P_{reservoir}$ = 10.5 mbar
P_{tunnel} dropped then back to 72 mbar at 6'50

Note: from experiment GS FLOW RATE 1 to experiment GS FLOW RATE 73, replace

{ P_{tunnel} by V_{tunnel} (vacuum) 16.06.1999

level (mm)	time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
150	13.23	10.5	74
200	33.28	10.5	74
250	1' 03.24	10.5	74
300	1' 47.80	10.5	74
350	2' 53.33	10.5	74
400	4' 48.88	10.5	74

Gate closed at 7' 03.46 when GS reached the bottom of H-tunnel entrance ( ) ⟹
P_{tunnel} = 77 mbar
$P_{reservoir}$ = 10 mbar
T = 19.4 °C

Pumped down in the dyke to check possible leakage
⟹ small air bubbles forming at the middle bottom screw just below the gate

03.06.1999

GS FLOW RATE 2 (video)

P_{tunnel} = 90 mbar
$P_{reservoir}$ = 9 mbar
T = 19.5°C
GS in dyke = 13 to 15 mm

Dyke valve closed - Gate opened at $t_0 = 0$

↳ $P_{reservoir}$ = 15 mbar
P_{tunnel} = 92 mbar at 9"70 after initial drop-off

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
150	18.51	13	93
200	30.29	12.5	94
250	46.32	12.5	95
300	1' 09.01	12	95
350	1' 38.38	12	96
400	2' 20.07	12	96

Gate closed at 2' 57.54 when GS reached the bottom of the tunnel entrance ⟹ P_{tunnel} = 96 mbar
$P_{reservoir}$ = 10.5 mbar and eventually 9 mbar

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GS FLOW RATE 3 (cont'd)

$P_{tunnel} = 40$ mbar
$P_{reservoir} = 9$ mbar
$T = 19.5°C$
GS in dyke = 14 - 17 mm

Dyke valve closed - Gate opened at $t_0 = 0$

↳ $P_{reservoir} = 12$ mbar
$P_{tunnel} = 39$ mbar after 7"51

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
100	27.79	12	40
150	1'03.99	12	41
200	2'19.18	11	41
250	6'47.99	11	42

GS slowed down and almost reached a full stop ($P_{res} = 11$, $P_{tun} = 42$)
Gate closed at 24'39.14 (GS in dyke = 259/261 mm)

↳ $P_{reservoir} = 10$ mbar
$P_{tunnel} = 43$ mbar
GS in dyke = 14 - 16 mm (still some on wall

03.06.1999

GS FLOW RATE 4 (video)

P_{tunnel} = 60.5 mbar
$P_{reservoir}$ = 9.5 mbar
T = 19.5°C
GS in dyke = 14 - 17 mm

Dyke valve closed - Gate opened at $t_0 = 0$

↳ $P_{reservoir}$ = 13 mbar
P_{tunnel} = 60 mbar after 7"39

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
150	27.84	12.5	63
200	52.02	12	63
250	1' 29.45	12	64
300	2' 32.61	11.5	64
350	4' 29.77	11.5	64
400	10' 36.16	11.5	64
412/414	25' 16.51	11.5	64
			64

Gate closed at 25' 34.51

↳ $P_{reservoir}$ = 10 mbar
P_{tunnel} = 64 mbar

03.06.1999

P_{tunnel} = 9.5 mbar
$P_{reservoir}$ = 80 mbar
T = 19.6°C
GS in dyke = 12/14 mm (GS still on walls)

Dyke valve closed - Gate opened at $t_0 = 0$

↳ $P_{reservoir}$
P_{tunnel}

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
50	4.25	?	?
100	10.42	?	80
150	20.04	13.5	80
200	34.11	12.5	80
250	54.52	11.5	80
300	1'25.67	11.5	80
350	2'08.28	11.5	80.5
400	3'19.25	11.5	80.5

Gate closed at 4'37.23 when GS reached the bottom of the tunnel entrance ⇒ P_{tunnel} = 81 mbar
$P_{reservoir}$ = 10 mbar

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At atmospheric pressure, $GS_{dyke} = 71 - 73$ mm

Removed wedges : GS is horizontally levelled, but not the plate limit
↳ no need for wedges
Heights measured in the middle of the plate

GS FLOW RATE 6 (video)

$P_{tunnel} = 50$ mbar
$P_{reservoir} = 10$ mbar
$T = 18.5°C$
GS in dyke = 10 mm (9 - 12 mm)

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
50	8.42	14.5	49
100	25.01	14	50
150	54.36	14	51
200	1'44.65	13.5	51
250	3'24.85	12	51
300	7'58.16	12	51
319	17'16.95	12	51.5

Gate closed at 17' 56.99

03.06.1999

GS FLOW RATE 7 (video)

P_{tunnel} = 70 mbar
$P_{reservoir}$ = 11.5 mbar
T = 18.6°C
GS in dyke = 8 mm (7-9 mm)

Dyke valve closed - Gate opened at $t_0 = 0$

⇒ $P_{reservoir}$ =
P_{tunnel} =

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
50	5.91	16	70
100	15.26	16	71
150	30.29	15	72
200	52.18	14	72
250	1'25.00	14	72
300	2'17.06	14	72.5
350	3'40.07	14	72.5
400	6'16.33	14	73

Gate closed at 10'21.60 when GS reached the bottom of the tunnel entrance ⇒ P_{tunnel} = 73 mbar
$P_{reservoir}$ = 12 mbar

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GS FLOW RATE 8 (video) ≡ GS FLOW RATE 2

P_{tunnel} = 90 mbar
$P_{reservoir}$ = 12 mbar
T = 18.7°C
GS in dyke = 5 mm (4-6 mm) (10^3 from)

Dyke valve closed - Gate opened at t_0 = 0
↳ $P_{reservoir}$ =
P_{tunnel} =

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
50	5.61 (5.01)	? 17	? 89
100	11.19	16	90
150	20.90	15	90
200	35.08	14.5	91
250	54.74	14	91
300	1'22.45	14	91
350	2'01.11	14	91
400	2'53.86	13	92

Gate closed at 3'51.66 when GS reached the bottom of the tunnel entrance.

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GS FLOW RATE 9 (video)

P_{tunnel} = 100 mbar
$P_{reservoir}$ = 12 mbar
T = 18.8°C
GS in dyke = 5 mm (4-6 mm)

Dyke valve closed - Gate opened at $t_0 = 0$

⇒ $P_{reservoir}$ =
P_{tunnel} =

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
50	4.96	?	?
100	10.39	17	98
150	19.17	17	100
200	30.75	16	100
250	47.44	15	100
300	1'09.69	15	100
350	1'39.60	14	100
400	2'19.96	14	100

Gate closed at 3'01.32 when GS reached the bottom of the tunnel entrance ⇒ P_{tunnel} = 101 mbar
$P_{reservoir}$ = 14 mbar

03.06.1999

GS FLOW RATE 10 (video) ≡ GS FLOW RATE 5

P_{tunnel} = 80 mbar
$P_{reservoir}$ = 12 mbar
T = 18.9 °C
GS in dyke = 4 mm (3-5 mm) GS still on walls

Dyke valve closed - Gate opened at $t_0 = 0$

↳ $P_{reservoir}$ =
P_{tunnel} =

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
50	5.74	?	80
100	12.20	16	81
150	22.54	16	82
200	37.43	15	83
250	59.32	14.5	83
300	1'30.80	14	83.5
350	2'15.59	14	84
400	3'24.24	14	84

Gate closed at 4'46.97 when GS reached the bottom of the tunnel entrance ⇒ P_{tunnel} = 84 mbar
$P_{reservoir}$ = 13 mbar

03.06.1999

GS FLOW RATE 11 (video) ≡ GS FLOW RATE 4

P_{tunnel} = 60 mbar
$P_{reservoir}$ = 12 mbar
T = 18.9°C
GS in dyke = 5 mm (4-6 mm)

Dyke valve closed - Gate opened at $t_0 = 0$

⇒ $P_{reservoir}$ =
P_{tunnel} =

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
50	6.67	16	60
100	17.20	16	61
150	35.18	15	62
200	1'00.88	13.75	62.5
250	1'43.72	13.75	63
300	2'59.07	13.75	63
350	5' 30.63	13.75	63
395	26' 33.88	13.75	63

Gate closed at 26'51.64 - T = 19.0°C

At atmospheric pressure
GS in dyke = 73 mm (71 to 74 mm)
$GS_{reservoir}$ = H - 351

Added GS in reservoir.

03.06.1999

SECOND SET OF FLOW RATE MEASUREMENTS

7 June 1999

~~At~~ atmospheric pressure

GS height in reservoir = H - 264 mm = 221 mm
GS visible in dyke = 158.5 mm (157.5 - 159.5 mm)
T = 18.1°C

GS FLOW RATE 12 (video)

P_{tunnel} = 50 mbar
$P_{reservoir}$ = 11.5 mbar
T = 18.1°C
GS in dyke = 97 mm (96 - 98 mm)

Dyke valve closed - Gate opened at $t_0 = 0$

⟹ $P_{reservoir}$ = 12.25
P_{tunnel} down to 24 mbar, back at 49 mbar after 10.66

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
150	20.10	12.25	49
200	50.61	12.25	50
250	1'43.91	12.25	50
300	3'13.75	12.25	50
350	6'14.71	12.25	50
400	23'55.10	12.25	50
			50.5

Gate closed at 25'23.63 - $P_{reservoir}$ = 12 mbar
P_{tunnel} = 50.5 mbar

0~~7~~.06.1999

$P_{tunnel} = 70$ mbar
$P_{reservoir} = 12$ mbar
$T = 18.4°C$
GS in dyke = 94.5 mm (93.5 to 95.5 mm)

Dyke valve closed - Gate opened at $t_0 = 0$

$\Rightarrow$ $P_{reservoir} = 13.75$ mbar
$P_{tunnel} = 68$ mbar
} after 5" 64

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
150	15.22	13.75	69
200	33.68	13.75	69.5
250	59.91	13.5	70
300	1' 37.77	13.5	70
350	2' 33.84	13.25	70
400	3' 58.73	13.25	70

Gate closed at 5' 43.54 when GS reached the tunnel entrance $\Rightarrow$
$P_{tunnel} = 70$ mbar
$P_{reservoir} = 13.25$ mbar

07.06.1999

GS FLOW RATE 14 (video)

P_{tunnel} = 90 mbar
$P_{reservoir}$ = 11.75 mbar
T = 18.5°C
GS in dyke = 93.5 mm (92.5 to 94.5 mm) still on walls

Dyke valve closed - Gate opened at $t_0 = 0$

⇒ $P_{reservoir}$ = 14.5 mbar
P_{tunnel} = 88 mbar
} after 5"50

level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
150	9.90	14.5	89
200	20.81	14.5	89.5
250	35.85	14	89.5
300	56.85	14	90
350	1'25.70	14 sudden drop to 12.5	90
400	2'05.29	12.5	90

Gate closed at 2'47.78 when GS reached the tunnel entrance

⇒ P_{tunnel} = 90 mbar
$P_{reservoir}$ = 12.5 mbar

07.06.1999

GS FLOW RATE 15 (video)

P_{tunnel} = 100 mbar
$P_{reservoir}$ = 11.75 mbar
T = 18.5°C
GS in dyke = 93 mm (92-94 mm) GS still on walls

Dyke valve closed - Gate opened at $t_0 = 0$ *

⇒ $P_{reservoir}$ =
P_{tunnel} =

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
150	8.53	14.5	98
200	19.43	14.5	99
250	33.58	14.5	99
300	53.28	14	99
350	1'18.24	14	99.5
400	1'51.42	13	99.5

Gate closed at 2'23.80 when GS reached the tunnel entrance ⇒ P_{tunnel} = 100 mbar
$P_{reservoir}$ = 12.5 mbar

* Gate stucked with GS ⇒ can't open properly

07.06.1999

Set up experiment for P_{tunnel} = 80 mbar

P_{tunnel} = 80.25 mbar
$P_{reservoir}$ = 11.5 mbar
T = 18.6 °C
GS in dyke = 93 mm (92-94 mm)

But the gate is stucked (GS infiltrated within it) and won't open ⇒ had to abort ⇒ clean the setup
GS in dyke at atmospheric pressure = 158.5 mm

CLEANING the APPARATUS

8 June 1999

08.06.1999

At atmospheric pressure

GS height in reservoir = H - 258 mm = 227 mm
GS visible in dyke = 162.5 mm
T = 18.2°C

GS FLOW RATE 16 (video)

Air leaking inside the tunnel via the connection ⇒ put loads of silicone grease on O' rings, glass tube and had to push the glass tube against the door (should leave ~1mm in between to avoid glass breakage ⇒ to be sorted out)
(change O' rings ?)

P_{tunnel} = 80 mbar
$P_{reservoir}$ = 10.75 mbar
T = 18.3°C
GS in dyke = 101.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$

↳ $P_{reservoir}$ = 13.5 mbar
P_{tunnel} down to 56 mbar, back to 79 mbar after 6" 31

10.06.1999

Level (mm)	Time	Preservoir (mbar)	Ptunnel (mbar)
150	10.01	13.5	80
200	23.80	13.25	80
250	43.46	13.25	80.5
300	1'12.54	13.25	80.5
350	1'53.99	12	80.5
400	2'50.89	12	81
Line 410	3'08.85	12	81
Gate closed	3'48.09	⇒ 11.5	81

when GS reached the tunnel entrance (435)

10.06.1999

GS FLOW RATE 17 (video)

P_{tunnel} = 60 mbar
$P_{reservoir}$ = 10.5 mbar
T = 18.3°C
GS in dyke = 99 mm

Dyke valve closed - Gate opened at $t_0 = 0$

↳ $P_{reservoir}$ = 12.75 mbar
P_{tunnel} down to 44 mbar, back at 60 mbar after 4"4

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
150	14.18	12.75	61
200	33.82	12.75	61.5
250	1'03.57	12.75	61.5
300	1'47.16	12.75	62
350	2'55.65	12.5	62
400	4'52.64	12.5	62
Line 410	5'36.42	12.5	62
435	7'39.70	12.5	62

Gate closed when GS reached the tunnel entrance

↳ P_{tunnel} = 63 mbar
$P_{reservoir}$ = 11 mbar

10.06.1999

GS FLOW RATE 18 (video)

P_{tunnel} = 40 mbar
$P_{reservoir}$ = 11 mbar
T = 18.4°C
GS in dyke = 985mm (still some on walls)

Dyke valve closed - Gate opened at $t_0 = 0$

↳ $P_{reservoir}$ = 11.5 mbar
P_{tunnel} = 38 mbar after 8"51

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
150	33.65	11.5	39
200	1'34.07	11.5	39
250	4'02.68	11.5	39
280	20'23.53	11.25	39

Gate closed at 20'23.53 ⇒ P_{tunnel} = 39.5 mbar
$P_{reservoir}$ = 11.25 mbar

10.06.1999

GS FLOW RATE 19 (video) ≡ GS FLOW RATE 15

P_{tunnel} = 100 mbar
$P_{reservoir}$ = 11.25 mbar
T = 18.5°C
GS in dyke = 99 mm

Dyke valve closed - Gate opened at $t_0 = 0$

⇒ $P_{reservoir}$ = 14 mbar
P_{tunnel} = 100 mbar after 6"45

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
200	19.81	14	102
250	35.72	14	102
300	57.42	14	102
350	1'24.73	12.5	103
400	2'02.72	12.5	103
435	2'37.99	12.5	103

Gate closed at 2'37.99 when GS reached the tunnel entrance

⇒ P_{tunnel} = 104 mbar
$P_{réservoir}$ = 11.25 mbar

10.06.1999

GS FLOW RATE 20 (video) ≡ GS FLOW RATE 13

P_{tunnel} = 70.5 mbar
$P_{reservoir}$ = 11.25 mbar
T = 18.5°C
GS in dyke = 98 mm

Dyke valve closed - Gate opened at $t_0 = 0$

↳ $P_{reservoir}$ = 13 mbar
P_{tunnel} = 70 mbar after 4"41

level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
150	12.73	13	72
200	29.83	13	72.5
250	55.11	13	73
300	1'33.12	13	73
350	2'29.16	13	73.5
400	3'58.84	13	73.75
410	4'32.84	13	73.75
435	6'05.20	13	73.75

Gate closed at 6'05.20 when GS reached the tunnel entrance.

↳ P_{tunnel} = 74.75 mbar
$P_{reservoir}$ = 11 mbar

10.06.1999

GS FLOW RATE 21 (video)

P_{tunnel} = 50.5 mbar
$P_{reservoir}$ = 22.75 mbar
T = 18.6°C
GS in dyke = 18 mm (still some GS on walls)

Dyke valve closed - Gate opened at $t_0 = 0$

↳ $P_{reservoir}$ = 27.5 mbar at maximum
P_{tunnel} down to 38 mbar, back at 50 mbar at 1'00

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
50	7.73	27.5	48
100	27.06	26.5	49.5
150	1'00.40	26	50
200	2'06.17	26	50.5
250	5'04.54	24.5	50.5
274.5	21'00.79	24.5	50.5

Gate closed at 21'00.79 ⇒ P_{tunnel} = 51 mbar
$P_{reservoir}$ = 24 mbar

10.06.1999

GS FLOW RATE 22 (video)

P_{tunnel} = 70.5 mbar
$P_{reservoir}$ = 23.5 mbar
T = 18.6°C
GS in dyke = 17.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$

⇒ $P_{reservoir}$ =
P_{tunnel} =

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
50	4.54	29.5	70
100	14.26	27.5	71.75
150	30.05	27.25	72
200	54.64	26.5	72.5
250	1'33.31	26	73
300	2'36.45	26	73
350	4'30.29	26	73
400	8'51.84	24.5	73
410	11'34.70	24.5	73
422.5	15'44.70	24.5	73
427.5	21'43.23	24.5	73
429	26'24.84	24.5	74

Gate closed at 26'29.26 ⇒ P_{tunnel} = 74 mbar
$P_{reservoir}$ = 24.5 mbar

N.B. End of videotape noticed at 14' 46.37

10.06.1999

GS FLOW RATE 23 (video)

P_{tunnel} = 90 mbar
$P_{reservoir}$ = 23.25 mbar
T = 18.7°C
GS in dyke = 15 mm (still some on wall)

Dyke valve closed - Gate opened at $t_0 = 0$

$\Rightarrow$ $P_{reservoir}$ =
P_{tunnel} =

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
50	3.88	31	90
100	10.84	30	91
150	20.43	28	91
200	34.59	27	92
250	55.53	27	92
300	1'25.09	26.5	92
350	2'05.49	26	92.25
400	3'09.27	26	92.25
410	3'30.03	26	92.5
435	4'22.77	26	93.5

Gate closed at 4'22.77 when GS reached tunnel entrance

$\Rightarrow$ P_{tunnel} = 93 mbar
$P_{reservoir}$ = 23.25 mbar

10.06.1999

GS FLOW RATE 24 (video)

P_{tunnel} = 100 mbar
$P_{reservoir}$ = 23.25 mbar
T = 18.7°C
GS in dyke = 15.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$

⇒ $P_{reservoir}$ =
P_{tunnel} =

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
50	3.91	32	96
100	10.48	31	99
150	19.65	28.5	100
200	32.97	28	100
250	51.10	26.5	100.5
300	1'15.84	26.5	100.5
350	1'50.25	26.25	100.5
400	2'39.21	26	100.5
410	2'55.79	26	100.5
435	3'31.82	26	100.5

Gate closed at 3'31.82 ⇒ P_{tunnel} = 101 mbar
$P_{reservoir}$ = 23.25 mbar

10.06.1999

GS FLOW RATE 25 (video)

$P_{tunnel} = 80$ mbar
$P_{reservoir} = 23.25$ mbar
$T = 18.8°C$
GS in dyke = 15 mm

Dyke valve closed - Gate opened at $t_0 = 0$

⇒ $P_{reservoir} =$
$P_{tunnel} =$

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
50	4.33	31	78
100	12.71	29	80
150	25.45	28	81
200	44.16	26.5	81
250	1'11.96	26.5	81.5
300	1'52.52	26	81.75
350	2'56.30	26	82
400	4'45.37	26	82
410	5'29.50	26	82
435	7'27.45	26	82

Gate closed at 7'27.45 ⇒ $P_{tunnel} = 82$ mbar
$P_{reservoir} = 23.25$ mbar

10.06.1999

11 June 1999

GS FLOW RATE 26 (video)

P_{tunnel} = 60 mbar
$P_{reservoir}$ = 23 mbar
T = 18.2°C
GS in dyke = 28 mm

Dyke valve closed - Gate opened at $t_0 = 0$

↳ $P_{reservoir}$ =
P_{tunnel} =

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
50	4.86	26	58
100	19.30	26	59
150	43.75	24.5	60
200	1'29.79	24.5	60
250	2'53.25	24.5	60.5
300	5'52.10	24.5	60.5
322	8'46.83	22.5	60.5
343.5	25'41.52	22.5	61
343.5	30'11.88	22.5	61

Gate closed at 30' 11.88 ⇒ P_{tunnel} = 61 mbar
$P_{reservoir}$ = 22 mbar

11.06.1999

GS FLOW RATE 27 (video) $\equiv$ GS FLOW RATE 23

P_{tunnel} = 90 mbar
$P_{reservoir}$ = 22 mbar
T = 18.3°C
GS in dyke = 27 mm (still some on walls)

Dyke valve closed - Gate opened at $t_0 = 0$

$\Rightarrow$ $P_{reservoir}$ =
P_{tunnel} =

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
50	3.03	28	88
100	9.49	28	90
150	19.90	26.5	91
200	34.94	25	91
250	57.07	25	91.5
300	1'28.19	24.75	91.5
350	2'16.16	24.75	91.5
400	3'26.45	22.5	91.5
410	3'48.71	22.5	91.5
435	4'45.51	22.5	91.5

Door closed when GS reached the tunnel entrance

$\Rightarrow$ P_{tunnel} = 92 mbar
$P_{réservoir}$ = 91.75 mbar

11.06.1999

GS FLOW RATE 28 (video)

P_{tunnel} = 50 mbar
$P_{reservoir}$ = atmospheric pressure
T = 18.5°C
GS in dyke = 162.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$

⇒ $P_{reservoir}$ =
P_{tunnel} = 50 mbar after 6"32

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
200	20.61	0	50
250	1'00.99	0	51
300	2'06.74	0	51
350	4'05.76	0	51.5
374.5	5'51.95	0	51.5
400	9'09.44	0	51.75
410	13'04.60	0	51.75
420	19'42.11	0	51.75
422.5	25'47.47	0	51.75

Gate closed at 25'47.47 ⇒ P_{tunnel} = 52.25 mbar

11.06.1999

(GS FLOW RATE 29) (video)

P_{tunnel} = 70 mbar
$P_{reservoir}$ = atmospheric
T = 18.5°C
GS in dyke = 162.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$

⇒ $P_{reservoir}$ =
P_{tunnel} = 68 mbar after 4''18

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
200	11.84	0	69
250	33.22	0	69.5
300	1'04.49	0	70
350	1'48.81	0	70
374.5	2'20.16	0	70
400	2'58.08	0	70
410	3'24.01	0	70
[illegible]	4'23.19	0	70

[illegible] at 4'23.19 ⇒ P_{tunnel} = 70.5 mbar

11.06.1999

GS FLOW RATE 29 (video)

P_{tunnel} = 70 mbar
$P_{reservoir}$ = atmospheric
T = 18.5°C
GS in dyke = 162.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$

⇒ $P_{reservoir}$ =
P_{tunnel} = 68 mbar after 4''18

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
200	11.84	0	69
250	33.22	0	69.5
300	1'04.49	0	70
350	1'48.81	0	70
374.5	2'20.16	0	70
400	2'58.08	0	70
410	3'24.01	0	70
435	4'23.19	0	70

Gate closed at 4'23.19 ⇒ P_{tunnel} = 70.5 mbar

11.06.1999

GS FLOW RATE 30 (video)

P_{tunnel} = 90 mbar
$P_{reservoir}$ = atmospheric
T = 18.6°C
GS in dyke = 162.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$

↳ $P_{reservoir}$ =
P_{tunnel} =

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
200	8.65	0	90
250	22.23	0	91
300	41.29	0	91
350	1'07.21	0	91.25
374.5	1'23.27	0	91.5
400	1'42.64	0	91.5
410	1'54.02	0	91.5
435	2'19.09	0	91.5

Gate closed at 2'19.09 ⟹ P_{tunnel} = 92 mbar

11.06.1999

GS FLOW RATE 31 (video)

P_{tunnel} = 100 mbar
$P_{reservoir}$ = atmospheric
T = 18.6°C
GS in dyke = 162.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
200	7.43	0	99
250	19.78	0	100
300	35.46	0	100
350	56.82	0	100
374.5	1'10.03	0	100
400	1'25.67	0	100
410	1'34.74	0	100
435	1'55.42	0	100

Gate closed at 1'55.09 ⟹ P_{tunnel} = 101 mbar

11.06.1999

GS FLOW RATE 39 (vidéo)

P_{tunnel} = 80 mbar
$P_{reservoir}$ = atmospheric
T = 18.7°C
GS in dyke = 163 mm

Dyke valve closed - Gate opened at $t_0 = 0$
⇒ P_{tunnel} = 79 mbar after 4"09

level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
200	10.03	0	80
250	25.84	0	80
300	49.81	0	80.5
350	1'21.41	0	80.5
374.5	1'41.59	0	80.5
400	2'07.65	0	80.5
410	2'22.16	0	80.5
435	2'59.13	0	80.5

Gate closed at 2'59.13 ⇒ P_{tunnel} = 81 mbar

11.06.1999

GS FLOW RATE 33 (video)

P_{tunnel} = 60 mbar
$P_{reservoir}$ = atmospheric
T = 18.7°C
GS in dyke = 162.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$
↳ P_{tunnel} = 58 mbar after 4"26

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
200	15.03	0	58.5
250	43.58	0	59
300	1'24.91	0	59.5
350	2'30.67	0	59.75
374.5	3'20.18	0	60
400	4'29.48	0	60
410	5'16.72	0	60
435	7'34.16	0	60

Gate closed at 7'34.16 ⇒ P_{tunnel} = 60.25 mbar

11.06.1999

11.06.1999

THIRD SET OF FLOW RATE MEASUREMENTS

14 June 1999

At atmospheric pressure

GS height in reservoir = H − 162 mm = 323 mm
GS visible in dyke = 259 mm

GS FLOW RATE 34 (video)

P_{tunnel} = 50 mbar
$P_{reservoir}$ = atmospheric
T = 17.9 °C
GS in dyke = 259 mm

Dyke valve closed - Gate opened at $t_0 = 0$

level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
275	14.70	0	49
300	41.23	0	49.5
325	1'12.65	0	49.5
350	1'50.75	0	50
375	2'39.29	0	50
400	3'40.84	0	50
410	4'20.70	0	50
435	6'00.76	0	50

Gate closed at 6'00.76 ⇒ P_{tunnel} = 51.5 mbar

14.06.1999

P_{tunnel} = 70 mbar
$P_{reservoir}$ = atmospheric
T = 18.0°C
GS in dyke = 260.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	P_{tunnel} (mbar)
275	7.31	70
300	20.12	70
325	35.51	70
350	53.96	70.5
375	1'15.51	70.5
400	1'42.51	70.5
410	1'57.20	71
435	2'32.06	71

Gate closed at 2'32.06 ⇒ P_{tunnel} = 72 mbar

GS FLOW RATE 36 (video)

P_{tunnel} = 90 mbar T = 18.1°C
$P_{reservoir}$ = atmospheric GS in dyke = 260.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	P_{tunnel} (mbar)
275	5.23	90
300	14.46	90
325	25.19	90
350	37.65	90
375	51.40	90.25
400	1'08.58	90.25
410	1'17.89	90.25
435	1'38.99	90.25

Gate closed at 1'38.99 ⇒ P_{tunnel} = 91.5 mbar

14.06.1999

GS FLOW RATE 37 (video)

P_{tunnel} = 100 mbar

$P_{reservoir}$ = atmospheric

T = 18.2°C

GS in dyke = 261 mm

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	P_{tunnel} (mbar)
275	4.54	100
300	12.36	100
325	21.36	100
350	31.26	100
375	43.23	100
400	57.13	100
410	1'04.92	100.5
435	1'22.66	100.5

Gate closed at 1'22.66 ⟹ P_{tunnel} = 102 mbar

GS FLOW RATE 38 (video)

P_{tunnel} = 80 mbar

$P_{reservoir}$ = atmospheric

T = 18.2°C

GS in dyke = 261.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	P_{tunnel} (mbar)
275	5.56	80
300	16.21	80
325	27.75	80
350	42.28	80.25
375	58.71	80.5
400	1'18.71	80.5
410	1'29.87	80.5
435	1'55.56	80.5

Gate closed at 1'55.56 ⟹ P_{tunnel} = 8 .5 mbar

14.06.1999

P_{tunnel} = 60 mbar T = 18.3 °C

$P_{reservoir}$ = atmospheric GS in dyke = 260 mm

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	P_{tunnel} (mbar)
275	8.49	59.5
300	23.89	59.5
325	42.42	60
350	1'04.84	60
375	1'31.21	60
400	2'06.23	60
410	2'27.25	60
435	3'16.33	60

Gate closed at 3'16.33 ⇒ P_{tunnel} = 61.5 mbar

GS FLOW RATE 40 (video)

P_{tunnel} = 40 mbar T = 18.3 °C

$P_{reservoir}$ atmospheric GS in dyke = 261 mm

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	P_{tunnel} (mbar)
275	15.51	37.5
300	48.39	38
325	1'29.62	38
350	2'26.93	38
375	3'53.62	38
400	6'31.27	38.25
410	9'12.52	38.25
430	24'45.30	38.25

Gate closed at 25'02.40 ⇒ P_{tunnel} = 39.5 mbar

14.06.1999

GS FLOW RATE 41 (video)

P_{tunnel} = 50 mbar
$P_{reservoir}$ = 21.5 mbar
T = 18.6°C
GS in dyke = 133.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$ ⇒ $P_{reservoir}$ =
P_{tunnel} =

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
150	8.41	22	49
175	22.93	22	49.5
200	39.90	22	50
225	1'02.36	22	50
250	1'31.92	22	50
275	2'08.42	22	50.25
300	3'00.62	22	50.5
325	4'09.99	22	50.5
350	6'12.40	22	50.5
375	10'32.25	22	50.5
383	14'25.97	22	50.5
388	22'38.17	22	50.5
389	29'23.67	22	50.5
389	35'04.05	22	50.5

Gate closed at 35'04.05 ⇒ P_{tunnel} = 51 mbar
$P_{réservoir}$ = 21 mbar

14.06.1999

GS FLOW RATE 42 (video)

$P_{tunnel} = 70.25$ mbar
$P_{reservoir} = 20.75$ mbar
$T = 18.7°C$
GS in dyke = 132.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$ ⟹ $P_{reservoir} =$
$P_{tunnel} =$

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
150	5.63	25.5	70
175	13.45	23.5	70
200	23.37 (?)	23.5	70.5
225	33.70	23.5	71
250	46.97	23.5	71
275	1'02.30	23.5	71
300	1'21.41	23.25	71
325	1'44.46	23.25	71.5
350	2'14.24	23.25	71.5
375	2'49.63	22	71.5
400	3'35.54	22	71.75
410	4'03.70	22	71.75
435	5'13.72	22	71.75

Gate closed at 5'13.72 ⟹ $P_{tunnel} = 72.5$ mbar
$P_{reservoir} = 21$ mbar

14.06.1999

GS FLOW RATE 43 (video)

P_{tunnel} = 90 mbar
$P_{reservoir}$ = 21 mbar
T = 18.8°C
GS in dyke = 132.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$ ⇒
$P_{reservoir}$ =
P_{tunnel} =

level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
150	3.85		
175	8.86		
200	14.77	24.5	90
225	21.55		91
250	29.33	24	91
275	38.87	24	91
300	50.12	24	91
325	1'02.74	24	91.5
350	1'18.26	23.75	91.5
375	1'35.37	23.75	91.5
400	1'56.60	22.5	91.5
410	2'08.79	22.5	91.5
435	2'37.27	22.5	91.5

Gate closed at 2'37.27 ⇒
P_{tunnel} = 92 mbar
$P_{reservoir}$ = 21.75 mbar

14.06.1999

GS FLOW RATE [illegible] ([illegible])

$P_{tunnel} = 100$ mbar
$P_{reservoir} = 20.75$ mbar
$T = 18.8°C$
GS in dyke = 132.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$ ⇒ $P_{reservoir} =$
$P_{tunnel} =$

level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
150	3.50	27	-
175	-	-	-
200	13.12	25	100
225	-	-	-
250	26.38	24.5	100
275	34.59	24	100
300	43.79	24	100
325	54.82	24	100
350	1'07.51	24	100
375	1'22.72	24	100
400	1'38.43	24 → 22.5	100
410	1'48.70 1'50.70 (?)	22.5	100
435	2'11.62	22	100

gate closed at 2'11.62 ⇒ $P_{tunnel} =$ 10[illegible]mbar
$P_{reservoir} = 21.75$ mbar

14.06.1999

GS FLOW RATE 45 (video)

P_{tunnel} = 80 mbar
$P_{reservoir}$ = 21 mbar
T = 18.9°C
GS in dyke = 132.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$ ⟹ $P_{reservoir}$ =
P_{tunnel} =

level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
150	4.45	24	79
175	10.62	24	80
200	17.65	24	80
225	27.27	24	80
250	37.55	24	80
275	49.77	24	80
300	1'04.14	24	80.5
325	1'20.20	24	80.5
350	1'41.17	22.5	80.5
375	2'05.55	22.5	80.5
400	2'35.15	22.5	80.5
410	2'54.50	22.5	80.5
435	3'37.03	22.5	80.5

Gate closed at 3'37.03 ⟹ P_{tunnel} = 81 mbar
$P_{reservoir}$ = 21 mbar

14.06.1999

GS FLOW RATE 46 (video)

$P_{tunnel} = 60$ mbar
$P_{reservoir} = 21$ mbar
$T = 18.9\,°C$
GS in dyke = 132.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$ ⇒ $P_{reservoir} =$
$P_{tunnel} =$

level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
150	5.39	23	58
175	14.07	23	58.5
200	25.44	23	59
225	38.98	23	59
250	54.74	23	59.5
275	1'15.53	23	59.5
300	1'41.19	23	59.5
325	2'13.97	23	59.5
350	2'58.75	23	60
375	4'01.46	23	60
400	5'37.17	23	60
410	7'04.04	23	60
430	10'12.58	23	60
435	12'45.79	23	60

Gate closed at 12'45.79 ⇒ $P_{tunnel} = 60$ mbar
$P_{reservoir} = 21$ mbar

14.06.1999

GS FLOW RATE 47 (video)

P_{tunnel} = 40 mbar
$P_{reservoir}$ = 21 mbar
T = 18.9°C
GS in dyke = 132 mm (GS still on walls)

Dyke valve closed - Gate opened at $t_0 = 0$

⟹ $P_{reservoir}$ =
P_{tunnel} =

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
150	10.93	22	39
175	28.28	22	39.5
200	51.89	22	40
225	1'24.64	22	40
250	2'09.86	22	40
275	3'27.06	22	40
300	5'58.88	22	40
314.5	11' 16.45	22	40.5
317	16'54.79	22	40.5
317.5	24'09.66	22	40.5

Gate closed at 24'09.66 ⟹ P_{tunnel} = 41 mbar
$P_{reservoir}$ = 21 mbar

14.06.1999

GS FLOW RATE 48 (video)

P_{tunnel} = 50 mbar
$P_{reservoir}$ = 30 mbar
T = 18.3°C
GS in dyke = 81 mm

At atmospheric pressure,
GS in dyke = 259 mm

Dyke valve closed - Gate opened at $t_0 = 0$

↳ $P_{reservoir}$ =
P_{tunnel} =

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
100	7.25	32	50
125	16.89	31.75	51
150	31.14	31.75	51
175	47.98	31.75	51.5
200	1'10.56	31.75	51.5
225	1'41.64	31.5	52
250	2'23.57	31.5	52
275	3'27.60	31.5	52
300	5'08.43	31.5	52
325	8'15.35	31.5	52.5
339.5	13'13.43	31.5	52.5
345	20'52.13	31.5	52.5
346	28'01.79	31.5	52.5
346	32'00.33	31.5	52.5

Gate closed at 32'00.33 ⟹ P_{tunnel} = 53 mbar
$P_{reservoir}$ = 29.5 mbar

15.06.1999

GS FLOW RATE 49 (video)

P_{tunnel} = 70 mbar T = 18.5°C
$P_{reservoir}$ = 29.25 mbar GS in dyke = 77 mm

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
100	5.74	34	70
125	11.98	34	70.5
150	19.89	33.5	71
175	29.68	33.5	71.5
200	41.03	33.5	72
225	56.33	33	72
250	1'13.21	31.5	72
275	1'33.11	31.5	72.5
300	2'00.38	31.5	72.5
325	2'31.89	31.5	72.5
350	3'14.87	31.5	72.5
375	4'08.38	31.5	72.5
400	5'21.92	31.5	72.5
410	6'10.57	31.5	72.5
435	8'34.41	31.5	72.5

Gate closed at 8'34.41 ⟹ P_{tunnel} = 73.5 mbar
$P_{reservoir}$ = 29.25 mbar

15.06.1999

P_{tunnel} = 90 mbar T = 18.6°C
$P_{reservoir}$ = 29.25 mbar GS in dyke = 76 mm

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
100	4.23	35.5	90
125	8.54	35.5	90
150	13.28	35	90.5
175	19.62	34	91
200	26.46	34	91.5
225	34.75	34	91.5
250	44.89	33.5	92
275	56.35	32	92
300	1'09.96	32	92
325	1'26.15	32	92
350	1'44.17	32	92
375	2'05.90	32	92
400	2'32.71	32	92.5
410	2'48.68	32	92.5
435	3'27.27	32	92.5

Gate closed at 3'27.27 ⇒ P_{tunnel} = 93 mbar
$P_{reservoir}$ = 29.25 mbar

15.06.1999

GS FLOW RATE 51 (video)

P_{tunnel} = 100 mbar   T = 18.6°C

$P_{reservoir}$ = 29.25 mbar   GS in dyke = 74 mm

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
100	4.27	36	100
125	7.80	36	100
150	12.47	36	100
175	17.63	34.5	100.5
200	23.95	34.5	100.5
225	31.89	34.5	101
250	40.57	32.75	101
275	50.42	32.75	101.5
300	1'01.88	32.75	102
325	1'14.79	32.75	102
350	1'30.38	32.75	102
375	1'47.86	32.75	102
400	2'09.48	32.5	102
410	2'22.32	32.5	102
435	2'49.52	32.5	102

Gate closed at 2'49.52 ⇒ P_{tunnel} = 103 mbar

$P_{reservoir}$ = 29.25 mbar

15.06.1999

P_{tunnel} = 80 mbar T = 18.8°C

$P_{reservoir}$ = 29.25 mbar GS in dyke = 75 mm

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
100	5.33	35	78
125	10.72	35	79
150	missed	35	79
175	25.46	35	79.5
200	35.45	34.5	79.5
225	47.13	32.5	80
250	1'00.27	32.5	80
275	1'16.76	32.5	80
300	1'36.36	32.5	80
325	1'59.21	32.5	80
350	2'28.87	32.5	80
375	3'04.84	32.5	80
400	3'49.65	30.75	80
410	4'15.95	30.75	80.5
435	5'24.11	30.75	80.5

Gate closed at 5'24.11 ⟹ P_{tunnel} = 80.75 mbar

$P_{reservoir}$ = 29.25 mbar

15.06.1999

GS FLOW RATE 53 (video)

P_{tunnel} = 60 mbar T = 18.8°C
$P_{reservoir}$ = 29.25 mbar GS in dyke = 74 mm

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
100	7.26	34	60
125	14.52	34	60
150	missed	34	60
175	36.02	34	60
200	50.65	33.5	60.5
225	1'09.96	31.5	60.5
250	1'33.58	31.5	61
275	2'03.75	31.5	61
300	2'43.44	31.5	61
325	3'37.28	31.5	61
350	5'04.20	31.5	61
375	7'42.70	31.5	61
392	12'54.07	31.5	61
400	18'34.62	31.5	61
399.5	25'00.00	31.5	61
399.5	26'35.45	31	61

Gate closed at 26'35.45 ⟹ P_{tunnel} = 61.5 mbar
$P_{reservoir}$ = 29.25 mbar

15.06.1999

P_{tunnel} = 40 mbar   T = 19.0°C
$P_{reservoir}$ = 29.5 mbar   GS in dyke = 73 mm

Dyke valve closed - Gate opened at $t_0 = 0$

level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
100	11.99	32.25	39
125	26.92	32.25	39.5
150	47.27	32.25	39.5
175	1'15.78	32.25	40
200	1'59.69	32.25	40
225	3'14.58	32.25	40
250	6'17.83	32	40.5
257	10'04.81	32	40.5
259	14'20.81	32	40.5
260	19'50.07	32	40.5
260	23'58.14	32	40.5

Gate closed at 23'58.14 ⟹ P_{tunnel} = 41 mbar
$P_{reservoir}$ = 30.25 mbar

15.06.1999

GS FLOW RATE 55 (video)

P_{tunnel} = 70 mbar T= 19.2°C

$P_{reservoir}$ = 40.75 mbar GS in dyke = 8 mm

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
25	2.69	-	-
50	6.14	-	-
75	10.99	-	70
100	16.71	48	70
125	24.52	45.5	71
150	33.69	45.5	71
175	46.09	45.5	71.5
200	1'00.62	45	72
225	1'17.81	45	72
250	1'40.12	44.5	72
275	2'10.14	44.25	72
300	2'47.89	44	72
325	3'37.29	44	72
350	4'51.98	44	72.5
375	6'45.23	44	72.5
388	8'34.92	44	72.5
400	10'48.19	44	72.5
406.5	13'38.34	44	72.5
410	19'29.53	44	72.5
414	26'00.56	44	72.5
414	31'42.38	44	72.5

Gate closed at 31'42.38 ⟹ P_{tunnel} = 72.5 mbar

$P_{reservoir}$ = 40.5 mbar

15.06.1999

GS FLOW RATE 56 ([illegible])

4

$P_{tunnel} = 90.5$ mbar $T = 19.3°C$

$P_{reservoir} = 40.75$ mbar   GS in dyke = 6 mm (still some GS on walls)

Dyke valve closed - Gate opened at $t_0 = 0$

level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
25	2.36	-	-
50	4.82	-	88
75	8.03	-	89
100	11.25	48	90
125	missed	48	90.5
150	21.31	48	91
175	28.07	44	91
200	35.91	44	91.5
225	45.69	44	91.5
250	56.59	44	92
275	1'09.75	44	92
300	missed	44	92
325	1'44.29	44	92
350	2'08.01	44	92
375	2'36.84	44	92
400	3'12.59	44	92
410	3'34.67	44	92
435	4'29.09	44	92

Gate closed at 4'29.09 $\Rightarrow$ $P_{tunnel} = 92.5$ mbar, $P_{reservoir} = 39.5$ mbar

15.06.1999

GS FLOW RATE 57 (video)

P_{tunnel} = 100 mbar T = 19.4°C

$P_{reservoir}$ = 40.5 mbar GS in dyke = 6 mm (GS still on walls)

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
25	1.98	-	-
50	3.94	52	96
75	-	-	-
100	9.57	-	-
125	13.10	-	-
150	17.07	48	99
175	-	-	-
200	28.64	44.5	100
225	37.02	44.5	100
250	45.11	44.5	100
275	55.26	44.5	100
300	1'07.23	44.5	100.5
325	1'21.28	44.5	100.5
350	1'37.64	44.5	100.5
375	1'57.44	44.5	100.5
400	2'21.23	44	100.5
410	2'36.28	44	100.5
435	3'10.79	44	100.5

Gate closed at 3'10.79 ⟹ P_{tunnel} = 101 mbar

$P_{reservoir}$ = 40 mbar

15.06.1999

P_{tunnel} = 80 mbar T = 19.4°C

$P_{reservoir}$ = 40.5 mbar GS in dyke = 6 mm

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
25	2.38	-	76
50	-	-	-
75	8.28	48.5	79
100	-	-	-
125	17.28	-	-
150	23.85	45	80
175	-	-	-
200	41.43	45	81
225	53.55	45	81
250	1'08.16	44.75	81
275	1'25.40	44.75	81
300	1'46.50	44.5	81.5
325	2'12.71	44.25	81.5
350	2'46.84	44.25	81.5
375	3'31.37	44	81.5
400	4'38.21	44	81.5
410	5'22.72	44	81.5
425.5	6'22.68	44	81.5
435	7'37.94	44	81.5

Gate closed at 7'37.94 ⟹ P_{tunnel} = 82 mbar

$P_{reservoir}$ = 40.25 mbar

15.06.1999

GS FLOW RATE 59 (video)

P_{tunnel} = 60 mbar   T = 19.5°C

$P_{reservoir}$ = 40.5 mbar   GS in dyke = 6 mm

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
25	2.80	49.5	-
50	6.12	-	60
75	11.04	-	61
100	-	46.5	62
125	25.42	46	62
150	36.03	46	62.5
175	49.25	45.5	63
200	1'07.13	45.5	63
225	1'29.15	45.25	63
250	1'58.87	41.5	63
275	2'43.25	41.5	63
300	3'47.32	41.5	63
325	5'45.58	41.5	63.5
339	8'42.02	41.5	63.5
350	14'46.27	41.5	63.5
350	21'34.94	41.5	63.5

Gate closed at 21'34.94 ⇒ P_{tunnel} = 63.5 mbar

$P_{reservoir}$ = 39.75 mbar

15.06.1999

GS FLOW RATE 80 (video)

P_{tunnel} = 40 mbar
$P_{reservoir}$ = 40.75 mbar

T = 19.6°C
GS in dyke = 6 mm

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
25	4.61	46	38
50	11.63	46	39
75	23.49	46	40
100	39.79	43.5	40
125	1'04.35	43.5	40.5
150	1'45.29	43.5	40.5
166.5	2'33.18	43.5	40.5
175	3'07.71	43.5	40.5
185.5	4'36.73	43.5	41
191.5	6'33.60	43.5	41
194	9'17.02	43.5	41
195	16'24.92	43.5	41
195	21'52.03	43.5	41

Gate closed at 21'52.03 ⇒ P_{tunnel} = 41 mbar
$P_{reservoir}$ = 40.5 mbar

15.06.1999

GS FLOW RATE 61 (video)

P_{tunnel} = 50 mbar   T = 19.6°C

$P_{reservoir}$ = 41 mbar   GS in dyke = 6 mm

Dyke valve closed – Gate opened at $t_0 = 0$

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
25	3.48	48	48
50	8.81	48	49
75	16.58	45	50
100	26.52	44.75	50
125	40.28	44.75	50.5
150	59.24	44.75	51
175	1'25.24	44.5	51
200	2'04.70	44.25	51.5
225	3'05.27	44	51.5
242.5	4'24.78	44	51.5
250	5'09.75	44	51.5
262	8'11.32	44	51.5
266.5	12'29.10	44	51.5
267	18'53.74	44	51.5
267.5	21'04.58	44	51.5
267.5	24'36.08	44	51.5

Gate closed at 24'36.08 ⟹ P_{tunnel} = 52 mbar

$P_{reservoir}$ = 40.25 mbar

T = 19.7°C

15.06.1999

At atmospheric pressure, GS in dyke = 259 mm

| P_{tunnel} = 50 mbar   T = 19.3°C
| $P_{reservoir}$ = 10.5 mbar   GS in dyke = 201 mm

Dyke valve closed - Gate opened at $t_0 = 0$ ⇒ P_{tunnel} = 48 mbar after 7"50

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
225	15.74	10.5	49
250	34.39	10.5	49
275	57.89	10.5	49.5
300	1'27.19	10.5	49.5
325	2'03.69	10.5	50
350	2'51.42	10.5	50
375	3'59.88	10.5	50
400	5'39.02	10.5	50.25
410	6'52.40	10.5	50.25
421	8'09.84	10.5	50.25
433.5	10'42.62	10.5	50.25
435	11'40.16	10.5	50.25

Gate closed at 11'40.16 ⇒ | P_{tunnel} = 51 mbar
| $P_{reservoir}$ = 10.5 mbar

16.06.1999

GS FLOW RATE 63 (video)

P_{tunnel} = 70.5 mbar T = 19.4 °C
$P_{reservoir}$ = 10.5 mbar GS in dyke = 200 mm

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
225	8.40	11.25	70
250	17.59	11.25	70
275	28.71	11.25	70.5
300	41.48	11.25	70.5
325	55.33	11.25	71
350	1'14.58	11.25	71
375	1'35.40	11.25	71
400	2'03.22	11.25	71
410	2'18.88	11.25	71
435	2'57.19	11.25	71

Gate closed at 2'57.19 ⟹ P_{tunnel} = 72.5 mbar
$P_{reservoir}$ = 11 mbar

16.06.1999

P_{tunnel} = 90 mbar T= 19.5°C

$P_{reservoir}$ = 11 mbar GS in dyke = 1995 mm

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
225	6.65	12	89
250	13.46	12	90
275	21.11	12	90
300	30.01	12	90
325	40.01	12	90.5
350	51.81	12	90.5
375	1'05.32	12	91
400	1'21.76	12	91
410	1'31.02	12	91
435	1'51.40	12	91

Gate closed at 1'51.40 ⟹ P_{tunnel} = 92 mbar

$P_{reservoir}$ = 11 mbar

16.06.1999

GS FLOW RATE 65 (video)

P_{tunnel} = 100 mbar T = 19.6°C

$P_{reservoir}$ = 10.75 mbar GS in dyke = 199.5 mm

Dyke valve closed – Gate opened at $t_0 = 0$

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
225	6.39	13.5	98
250	12.13	12.75	99
275	20.12	12.75	99
300	27.22	12.75	99
325	36.19	12.75	99.5
350	47.10	12.75	99.5
375	59.58	12.5	99.5
400	1'13.20	12.5	100
410	1'20.62	12.5	100
435	1'37.21	12.5	100

Gate closed at 1'37.21 ⇒ P_{tunnel} = 101 mbar

$P_{reservoir}$ = 11 mbar

16.06.1999

GS FLOW RATE 66 ([illegible])

$P_{tunnel} = 80$ mbar T = 19.7°C

$P_{reservoir} = 11$ mbar GS in dyke = 199.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
225	7.54	12	79
250	14.99	12	79.5
275	24.15	12	80
300	34.28	12	80
325	46.34	12	80
350	1'00.40	12	80
375	1'16.20	12	80.5
400	1'37.02	12	80.5
410	1'49.00	12	80.5
435	2'15.94	12	80.5

Gate closed at 2'15.94 ⇒ $P_{tunnel} = 81.5$ mbar, $P_{reservoir} = 11$ mbar

16.06.1999

GS FLOW RATE 67 (video)

P_{tunnel} = 60 mbar T = 19.7°C
$P_{reservoir}$ = 11 mbar GS in dyke = 199.5 mm

Dyke valve closed - Gate opened at $t_0 = 0$
↳ P_{tunnel} = 58 mbar after 3"42

Level (mm)	Time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
225	9.80	11.25	59
250	20.59	11.25	59.5
275	34.63	11.25	60
300	50.72	11.25	60
325	1'09.39	11.25	60
350	1'34.11	11.25	60.5
375	2'03.64	11.25	60.5
400	2'42.79	11.25	60.5
410	3'10.54	11.25	60.5
435	4'17.98	11.25	60.5

Gate closed at 4'17.98 ⟹ P_{tunnel} = 61.5 mbar
$P_{reservoir}$ = 11 mbar

16.06.1999

$P_{tunnel} = 40$ mbar T = 19.8°C

$P_{reservoir} = 11$ mbar GS in dyke = 199 mm

Dyke valve closed - Gate opened at $t_0 = 0$

↳ $P_{tunnel} = 37.5$ mbar after 6″16

Level (mm)	time	$P_{reservoir}$ (mbar)	P_{tunnel} (mbar)
225	21.36	11	38
250	46.88	11	38
275	1′19.47	11	38
300	2′05.73	11	38
325	3′17.27	11	38.5
343.5	4′58.17	11	38.5
350	5′38.82	11	38.5
357.5	7′18.76	11	39
365	10′26.72	11	39
370	20′57.94	11	39
370.5	30′07.00	11	39

Gate closed at 30′07.00 ⟹ $P_{tunnel} = 39$ mbar

$P_{reservoir} = 11$ mbar

T = 19.9°C

16.06.1999

Marks	Middle Real heights (mm)	Side
25	25	-
50	50	50
75	75	-
100	100	100
125	125	-
150	149.5	150
175	174.5	-
200	199.5	200.5
225	224.5	-
250	249.5	249.5
275	274	-
300	299	300
325	323.5	-
350	349	349.5
375	373.5	-
400	398.5	399
410 (line)	410	410
435 (door)	435	435

16. 06. 1999

GS FLOW RATE 69 (video)

P_{tunnel} = 100 mbar T = 20.0°C

$P_{reservoir}$ = 11 mbar GS in dyke = 198.5 mm

Door opened at $t_0 = 0$ (dyke valve and tunnel valve closed)

P_{tunnel} (mbar)	Time
48	1.21
40	5.63
34	9.13
28	14.53
24	19.62
22	23.57
20	29.40
19	36.71
17	58.78
17	1'55.89
17	2'04.28

↳ gate closed

Maximum GS level reached = 225 mm

16. 06. 1999

GS FLOW RATE 70 (video)

P_{tunnel} = 100 mbar   T = 20.0°C
$P_{reservoir}$ = 30.5 mbar   GS in dyke = 79 mm

Dyke valve and tunnel valve closed - Gate opened at $t_0 = 0$

P tunnel (mbar)	Time	$P_{reservoir}$ (mbar)
40	1.57	
32	5.44	32
26	9.71	
22	14.50	
20	18.09	30
18	28.18	
17	42.61	
16.5	1'31.42	

↳ gate closed

Maximum GS level reached = 106 mm

GS FLOW RATE 71 (video)

P_{tunnel} = 100 mbar   T = 20.1°C
$P_{reservoir}$ = 40 mbar   GS in dyke = 20 mm

Dyke valve and tunnel valve closed - Gate opened at $t_0 = 0$

P_{tunnel} (mbar)	Time	$P_{reservoir}$ (mbar)
34	1.53	
24	7.16	
20	11.52	40
19	14.17	
18	17.39	
17	26.37	
16.5	1'05.29	40
16.5	1'10.22	

↳ gate closed

Maximum GS level reached = 46 mm

16. ~~06~~ 08. 1999

P_{tunnel} = 100 mbar T = 20.1°C

$P_{reservoir}$ = 20.25 mbar 6S in dyke = 133.5 mm

Dyke valve and tunnel valve closed – Gate opened at $t_0 = 0$

P_{tunnel} (mbar)	Time
40	3.31
34	6.48
30	9.18
26	13.17
22	18.79
20	23.07
19	28.24
18	34.58
17	55.66
16.5	1'22.18
16.5	1'58.02
16.5	2'10.70

→ gate closed

Maximum 6S level reached = 158.5 mm

$P_{reservoir}$ = 22.75 mbar

16.06.1999

GS FLOW RATE 73 (video)

P_{tunnel} = 100 mbar   T = 20.1° C

$P_{reservoir}$ = atmospheric   GS in dyke = 260.5 mm

Dyke valve and tunnel valve closed - Gate opened at $t_0 = 0$

P_{tunnel} (mbar)	Time
52	1.52
46	4.41
40	7.36
34	11.35
30	14.41
26	19.29
24	21.84
22	25.86
20	31.46
19	35.91
18	43.67
17	1'02.77
16.5	1'39.21
16.5	1'44.32

↳ gate closed

Maximum GS level reached = 286 mm

16.06.1999

SET 1

Reservoir at 10 mbar Tunnel | 70 - 90 - 40 - 60 - 80
50 - 70 - 90 - 100 - 80 - 0

SET 2

Tunnel

Reservoir at 10 mbar 50 - 70 - 90 - 100 - 80 - 60 - 40 - 100
- 70

door pb

07.03.02

20 mbar 50 - 70 - 90 - 100 - 80 - 60 - ~~40~~ (?)
~~70~~

0 mbar 50 - 70 - 90 - 100 - 80 - 60 - ~~40~~

07.03.02

SET 3

(5) 10 mbar 50 - 70 - 90 - 100 - 80 - 60 - 40

(2) 20 mbar 50 - 70 - 90 - 100 - 80 - 60 - 40

(3) 30 mbar 50 - 70 - 90 - 100 - 80 - 60 - 40

(1) 0 mbar 50 - 70 - 90 - 100 - 80 - 60 - 40

(4) 40 mbar 50 - 70 - 90 - 100 - 80 - 60 - 40

Should do SET 1 at 0 mbar (71-73 in duke)

+ expts keeping tunnel valve closed

100 mbar

10
30
40
20
0

16.06.1999

GS FLOW RATE 74

Checked first that both the dike and tunnel are levelled.

Pressure gauges
P_1 = 992.7 - 992.8 mbar
P_2 = 991.6 - 991.7 mbar   atmospheric pressure
P_3 = 992.1 - 992.2 mbar

T = 20.4 °C

GS in reservoir $h_R = H - \begin{vmatrix} 312.5 \\ 313.0 \\ 313.0 \end{vmatrix} = 172$ mm

GS in dike h_D = 110 mm

At 17:00
P_1 = 990.8 - 990.9 mbar   tunnel
P_2 = 992.6 - 992.7 mbar   dike
P_3 = 990.8 - 990.9 mbar   reservoir

T = 25.3 - 25.4 - 25.5 °C

Gate N_2 pressure = 330 kPa

Pressure decreased in the tunnel
P_1 = 950.0 - 950.1 mbar
P_2 = 992.6 - 992.7 mbar
P_3 = 990.8 - 990.9 mbar

T = 25.3 °C

04.11.1999

Before opening the tunnel gate

$h_{dike} = 110.0$ mm
$P_1 = 950.6$ mbar
$P_2 = 992.3 - 992.4$ mbar
$P_3 = 990.8 - 990.9$ mbar
$T = 24.8°C$
$P_{N_2} = 320$ kPa

Dike valve closed and gate opened at $t = 0$

h_{dike} (mm)	time	P_1 (mbar) (tunnel)	P_2 (mbar) (dike)	P_3 (mbar) (reservoir)
[illegible]	2"85	955.3		
[illegible]	10.89	952.4	953.9	
	22.32	951.6	953.0	
[illegible]	36.79	951.1	952.6	990.9
[illegible]	47.79	950.8	952.3	
[illegible]	1'03.00	950.6	952.1	
280	1'14.32	950.5	951.9	
300	1'36.10	950.4	951.8	
320	2'09.35	950.3	951.7	
340	3'02.42	950.1	951.6	
348.5	3'38.95	950.1	951.5	
355.5	4'18.95	950.1	951.5 - 951.6	990.9; T = 24.7°C
362.5	5'34.19	950.0 - 950.1	951.4 - 951.5	990.9 - 991.0
365.5	6'31.23	950.1	951.4 - 951.5	990.9 - 991.0
368	7'40.60	950.0 - 950.1	951.4 - 951.5	990.9 - 991.0; T = 24.7°C
369	8'59.32	950.1 - 950.2	951.5 - 951.6	991.0
369.5	10'37.13	950.1 - 950.2	951.5 - 951.6	991.0 - 991.1
370.25	13'38.60	950.2	951.6	991.1; T = 24.6°C

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)
370.25	16'51.51	950.2-950.3	951.6-951.7	991.1
	T= 24.6°C			
370.25	18'14.57	950.3-950.2	951.6	991.1
	T= 24.6°C			
370.25	20'11.51	950.3	951.6-951.7	991.1-991.2
	T= 24.6°C			

Gate closed at 20'34.79 at 18H00 $\Rightarrow$

P_1 = 950.3 mbar
P_2 = 951.2 mbar
P_3 = 991.1-991.2 mbar
T = 24.6 °C

At 18H30

P_1 = 991.3 - 991.4 mbar
P_2 = 992.4 - 992.5 mbar
P_3 = 991.2 - 991.3 mbar
T = 24.2 °C

04.11.1999

GS FLOW RATE 75

At atmospheric pressure

h_D = 109 mm (still some GS on walls)
P_1 = 991.4 mbar
P_2 = 992.5 mbar
P_3 = 991.4 mbar

Pressure lowered in the tunnel

P_1 = 970.5 - 970.6 mbar
P_2 = 992.4 - 992.5 mbar
P_3 = 991.5 - 991.6 mbar
T = 24.1 - 24.2 °C

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)
	2.83	973.5	974.2	991.5
140	12.67	971.7	972.7	
160	22.43	971.1	972.2	991.5 - 991.6
180	35.70	970.8-970.7	971.7-971.8	991.5 - 991.6
200	57.20	970.4	971.4-971.5	991.5 - 991.6

T = 24.1 °C

220	1'28.39	970.0-970.1	971.1-971.2	991.6
233.5	2'11.67	969.9	971.0	991.6
240	2'49.23	969.8-969.9	970.9-971.0	991.6
244.5	3'34.58	969.8/9	970.9	991.6
248.25	4'49.27	969.7/8	970.8/9	991.6/7
249.25	6'20.64	-	970.7/8	991.6
249.5	8'05.96	-	-	991.6/7
249.75	10'06.20	-	970.8	-
-	12'10.55	969.8/9	970.8/9	991.7/8
-	13'50.17	-	-	991.7
-	15'02.64	-	-	-
-	15'20.80	-	-	-

T = 24.1 °C

04.11.1999

Gate closed at 15' 20.80 $\Rightarrow$

P_1 = 969.1/2 mbar
P_2 = 970.5/6 mbar
P_3 = 991.7/8 mbar

Once the pump is switched off

P_1 = 991.7/8 mbar
P_2 = 992.7/8 mbar
P_3 = 991.8/9 mbar
T = 24 °C

04.11.1999

GS FLOW RATE 76

At atmospheric pressure

h_D = 110 mm
P_1 = 996.1/2 mbar
P_2 = 995.5/6 mbar
P_3 = 995.7/8 mbar
T = 21.9 °C

Pressure lowered in the tunnel

P_1 = 934.8/9 mbar
P_2 = 995.7 mbar
P_3 = 995.8 mbar

At 10H00

h_D = 110.5 mm
P_1 = 935.1/2 mbar
P_2 = 995.8/9 mbar
P_3 = 995.8/9 - 996.0 mbar
T = 21.4 °C

Dike valve closed and gate opened at t = 0

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)
	3.17	937.7		
160	11.89	933.2	932.8	
200	23.32	932.5	932.2	995.9
240	38.45	932.0	931.8	995.9
260	48.32	931.8	931.6	995.9
280	59.19	931.6	931.4	995.8
300	1' 12.26	931.5/6	931.3	995.9
320	1' 27.10	931.4/5	931.1/2	995.9
340	1' 44.23	931.3/4	931.1	995.9/996.0
360	2' 04.42	931.2	931.0	995.9
380	2' 28.19	931.1/2	930.9/931.0	995.9
400	2' 56.01	931.0/1	930.9	995.9/996.0
~~410~~ 410	3' 14.01	931.0/1	930.9	995.9/996.0
420	3' 30.73	931.0	930.8	996.0

05. 11. 199

Gate closed at 4' 02.79 when GS reached its bottom (435)

↳ P_1 = 930.6/7 mbar
P_3 = 995.9/996.0 mbar
dike valve opened
T = 21.4°C

At 10H30
P_1 = 995.5/6 mbar
P_2 = 996.7/8 mbar
P_3 = 996.1/2 mbar
T = 21.3°C

05.11.1999

GS FLOW RATE 77

At 11H30 | h_{dike} = 108.5 mm (still some GS on wall)
P_1 = 996.4/5 mbar
P_2 = 997.5/6 mbar atmospheric pressure
P_3 = 996.2 mbar
T = 23°C

Tunnel pressure lowered | P_1 = 986.5/6 mbar
P_2 = 997.4/5 mbar
P_3 = 996.2 mbar

Stopwatch problem. Reset experiment.

After a few minutes | h_{dike} = 109 mm
P_1 = 986.6/7 mbar
P_2 = 997.6/7 mbar
P_3 = 996.1/2 mbar
T = 23.3°C

Dike valve closed and gate opened at t = 0

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	
	2.60	987.8	988.8	996.2	
120	12.45	987.2	988.5	996.2	
140	43.04	987.0	988.2	996.2	
156 156	1'32.48	986.7	988.0	996.1	
160	1'52.92	986.7	988.0	996.1/2	
165	2'31.19	986.6/7	987.9	996.1	T = 23.5°C
169.25	4'03.26	986.6/7	987.9/988.0	996.1/2	
170.5	5'11.42	986.6	987.9/988.0	996.0/996.1	
171	8'01.45	986.6	987.8/9	996.1	
171	9'52.07	986.5/6	987.9	996.0/1	
171	12'09.79	986.5/6	987.9	996.0/1	
171	13'13.86	986.5/6	987.9	996.0	
171	15'08.60	986.5/6	987.9/988.0	996.0/1	05.11.93

Gate closed at 15' 30.32

↳ | P_1 = 986.516 mbar
| P_2 = 987.516 mbar
| P_3 = 996.011 mbar
| T = 23.7°C

05.11.1999

GS FLOW RATE 78

At atmospheric pressure

h_D = 109 mm
P_1 = 995.8/9 mbar
P_2 = 997.3/4 mbar
P_3 = 995.7/8 mbar
T = 24.0°C

Tunnel pressure lowered

P_1 = 965.2/3 mbar
P_2 = 997.3/4 mbar
P_3 = 995.7 mbar

At 12H15, dike valve closed and gate opened (t = 0)

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
120	3.85				
140	10.03	966.0	967.4	995.7	
160	17.94	965.2	966.7	-	
180	27.57	964.6/7	966.2	-	
200	40.37	964.3	965.7	-	
220	55.22	963.9/964.0	965.5	-	
240	1'15.59	963.5/6	965.1/2	-	23.9
260	1'44.03	963.4	964.9	-	
275.75	2'15.31	963.3	964.8	-	
280	2'28.07	963.2	964.7	-	
289.25	2'54.25	963.0	964.6	-	23.9
300	3'41.88	963.0	964.5/6	995.6	
307.5	4'25.91	962.9	964.4	995.6	23.9
313	5'32.34	962.8/9	964.4	995.7	
316.5	6'38.41	962.7/8	964.3/4	995.6/7	
318.5	7'58.09	962.7	964.3	995.6	24.1
320	9'29.03	962.6	964.2	-	24.1
321	11'04.41	962.5/6	964.2	995.5/6	
321	12'53.72	962.4/5	964.1	995.4/5	24.1
321	14'52.22	962.5/6	964.1	995.5	24.1

05.11.1998

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T (°C)
321	16'15.37	962.4/5	964.1	995.4/5	24.1
321	17'24.85	962.4	-	-	24.1
321	18'39.59	962.4	-	995.4	24.1
321	20'08.34	962.3/4	964.0/1	995.4/5	24.2

Gate closed at 20'08.34

↳ P_1 = 961.4/5 mbar
P_2 = 963.6/7 mbar
P_3 = 995.3/4 mbar
T = 24.2 °C

05.11.1999

GS FLOW RATE 79

At atmospheric pressure

h_D = 109 mm
P_1 = 994.7/8 mbar
P_2 = 996.8 mbar
P_3 = 994.6/7 mbar
T = 25.3°C

At 13H45, tunnel pressure lowered

P_1 = 989.2/3 mbar
P_2 = 996.7/8 mbar
P_3 = 994.6 mbar
T = 25.1°C

Dike valve closed and gate opened at t = 0

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
	8.83	989.7	991.8	994.7	25.1
120	19.86	989.6	991.7	994.6	
127.5	34.23	989.5	991.6	994.6	25.2
134	56.73	989.4	991.5	994.6	25.2
140	1'36.01	989.3/4	991.4/5	-	25.3
142	2'09.07	-	-	-	25.3
143.25	3'01.76	-	-	-	25.4
143.5	4'26.48	989.3	991.4	-	25.4
143.75	5'37.73	-	-	994.6	-
144	6'36.54	989.2	991.3/4	994.5/6	25.4
144.25	7'37.89	989.2/3	-	-	-
144.25	8'51.79	-	-	-	-
144.25	10'07.57	989.1/2	991.3	994.5	-
144.25	10'30.38	-	991.3	994.5/6	-

Gate closed at 10'30.38 (13H55) ⟹

P_1 = 989.1/2 mbar
P_2 = 990.8/9 mbar
P_3 = 994.5/6 mbar

05.11.1999

GS FLOW RATE 80

At atmospheric pressure

h_D = 110 mm
P_1 = 994.1/2 mbar
P_2 = 996.0/1 mbar
P_3 = 994.1/2 mbar
T = 25.5°C

At 15H00, tunnel pressure lowered

Videotape 2

P_1 = 942.9/943.0 mbar
P_2 = 995.8/9 mbar
P_3 = 994.0/1 mbar
T = 25.1°C

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	
140	5.03	946.8	947.5		
180	12.13	?	?		
200	16.28	942.8	944.5		
220	21.41	942.3	944.0		
240	27.72	941.7	943.4	994.1	
260	34.97	941.3	943.0	994.1	
280	43.16	941.0	942.8	994.1	
300	52.69	940.7	942.5	994.1	
320	1'04.63	940.4/5	942.1/2	994.0/1	
340	1'19.13	940.2/3	942.0	994.0/1	T = 25.0°C
939.9/940.0 360	1'37.57	939.9/940.0	941.7/8	994.0/1	
380	2'00.97	939.8/9	941.6	994.0/1	
400	2'33.78	939.7	941.5	994.0/1	
410	2'55.50	939.6	941.3/4	994.0	
420	3'24.22	939.5	941.2/3	994.0/1	
?	4'13.16	939.4	941.2		
435	4'25.34				T = 25.0°C

Gate closed at 4'25.34 when GS reached its bottom - Dike valve opened

↳ P_1 = 935.6/7 mbar
P_2 = 995.4/5 mbar
P_3 = 993.9/994.0 mbar
T = 25.0°C

at 15H05

05.11.1999

GS FLOW RATE 81

At atmospheric pressure

h_D = 110 mm
P_1 = 993.7/8 mbar
P_2 = 994.5/6 mbar
P_3 = 993.7/8 mbar
T = 24.2°C

Tunnel pressure lowered

P_1 = 978.3/4 mbar
P_2 = 994.5 mbar
P_3 = 993.8/9 mbar
T = 24.1°C

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T (°C)
120	6.29	980.0	980.7	993.8	24.1
140	18.89	979.3	980.0	993.9	
160	37.89	978.9	979.6	993.9	
180	1'08.05	978.5	979.4	993.9	
193	1'45.39	978.4	979.1/2	993.9	
200	2'30.05	978.3/4	979.1	993.8/9	
204.5	3'14.36	978.2/3	979.1	993.8	
207	4'27.02	978.2/3	979.0/1	993.8/9	24.1
208	5'36.93	978.2/3	979.0	993.8/9	
208.75	6'35.73	978.1/2	979.0	993.8/9	24.0
208.75	7'44.70	978.2	979.0	993.9	
208.75	8'53.80	978.1/2	978.9/979.0	993.8/9	24.0
208.75	10'03.23	978.2/3	978.9/979.0	993.8/9	24.0
208.75	10'30.05	978.2			

Gate closed at 10'30.05 ∾ 16H30 =>

P_1 = 978.0/1 mbar
P_2 = 978.4/5 mbar
P_3 = 993.8/9 mbar

At 16H40

P_1 = 993.7/8 mbar
P_2 = 994.4 mbar
P_3 = 993.9/994.0 mbar
T = 23.9°C

05.11.1999

GS FLOW RATE 82

At atmospheric pressure

h_D = 109.5 mm
P_1 = 993.8/9 mbar
P_2 = 994.2/3 mbar
P_3 = 993.9/994.0 mbar
T = 23.7°C

At 17H00, tunnel pressure lowered

P_1 = 969.3/4 mbar
P_2 = 994.1/2 mbar
P_3 = 993.9 mbar

Dike valve closed and gate opened at t = 0

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T (°C)
120	4.17	971.8	972.1		
140	12.01	971.0	971.5	993.9	
160	21.54	970.4	970.9	993.9	
180	34.10	970.0/1	970.4/5	-	23.7
200	52.73	969.7/8	970.1/2	-	-
220	1' 18.95	969.4/5	969.9/970.0	993.9/994.0	
234	1'44.23	969.3/4	969.8/9	-	
240	2'02.32	969.3/4	969.7/8	993.9	23.7
249.5	2'33.76	969.2/3	969.6/7	993.9/994.0	
255.5	3'04.32	-	-	994.0	23.7
260	3'45.69	969.1/2	969.6	993.9/994.0	
263	4'34.86	969.2	969.6/7	-	23.7
265.5	5'52.32	969.1/2	969.6/7	993.9/994.0	
266.5	7'03.69	969.2	969.6	993.9/994.0	23.7
267	8'28.45	969.1/2	969.6/7	993.9	
267	9'44.23	969.2	969.6/7	993.9	23.6/7
267	10'43.57	969.2/3	969.6/7	993.9	23.7
267	12'00.42	969.2/3	969.6/7	993.9/994.0	23.6
267	12'30.26				

Gate closed at 12'30.26 ⟹
17H12

P_1 = 968.5/6 mbar
P_2 = 969.1/2 mbar
P_3 = 993.9/994.0 mbar

05.11.1999

GS FLOW RATE 83

At atmospheric pressure
(P1 already lowered)

h_D = 109 mm
P_1 = 959.9 / 960.0 mbar
P_2 = 994.2 mbar
P_3 = 993.9 / 994.0 mbar
T = 23.4°C

Dike valve closed and gate opened at t = 0

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T (°C)
120	3.04	963.5	963.2		
140	8.17	961.9	962.2		
160	14.35	961.3	961.5	993.9	
180	22.42	960.9	961.2	993.9	
200	31.95	960.5	960.8	993.9/994.0	
220	43.92	960.2/3	960.5/6	993.9	
240	59.95	960.0/1	960.3	993.9	
260	1'22.23	959.8	960.1	-	23.5
280	1'54.13	959.7	960.0	993.9	23.4
291.25	2'18.04	959.6	959.8/9	993.9	23.5
300	2'47.13	959.5/6	959.8/9	993.9/994.0	23.5
310	3'25.42	959.4/5	959.8	-	23.5
315.75	4'01.45	959.4/5	959.7/8	-	23.5
320	4'46.38	959.5/6	959.7/8	993.9	23.4
323.75	5'33.79	959.5	-	-	-
326	6'21.01	-	-	993.9/994.0	-
327.75	7'24.45	-	-	-	-
328.25	8'29.54	959.5/6	-	-	-
329.25	9'33.42	959.6	959.8	-	-
329.25	10'46.73	959.5/6	959.8	-	-
329.25	12'00.04	959.6/7	959.8/9	-	-

Video stopped at 12' 23.92

329.25	13'17.69	959.7	959.8/9	994.0	23.4
329.25	15'35.04	-	959.9/960.0	993.9/994.0	-
329.25	16'00.04				

Gate closed at 16'00.04 =>

P_1 = 959.3/4 mbar
P_2 = 959.3/4 mbar
P_3 = 994.0/1 mbar

At 17H55

P_1 = 994.1 mbar
P_2 = 994.1/2 mbar
P_3 = 994.0/1 mbar

05.11.1999

GS FLOW RATE 84

At atmospheric pressure

h_D = 110 mm
P_1 = 994.3/4 mbar
P_2 = 992.9/993.0 mbar
P_3 = 993.9/994.0 mbar
T = 19.8°C

Tunnel pressure lowered

P_1 = 948.4/5 mbar — ASG1
P_2 = 993.0/1 mbar — ASG2
P_3 = 993.9/994.0 mbar — ASG3

Dike valve closed and gate opened at t = 0

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
120	4.20	949.7	948.4	994.0	
140	10.05	949.2	948.0		
160	18.27	948.8	947.6		
180	27.80	948.5/6	947.4		
200	39.83	948.3/4	947.1		
220	53.23	948.1	947.0	994.0	19.9
240	1'10.05	948.0	946.8	993.9	
260	1'28.67	947.9	946.7	994.0	19.9
280	1'53.61	947.7/8	946.5/6	994.0	
291.25	2'10.14	947.7	946.5/6		
300	2'23.67	947.6/7	946.5		
312.75	2'45.49	947.6	946.4/5	994.0	
320	3'02.61	947.6	946.4	993.9	
330.75	3'26.61	947.5/6	946.4	994.0	19.9
340	3'54.17	947.5	946.4	994.0	
348.25	4'18.93	947.5	946.3	994.0	
354.5	4'43.64	947.5	946.3/4	994.0	
360	5'08.80	947.5	946.3	994.0/1	
366	5'33.77	947.4/5	946.3/4	994.0	19.9
371.25	6'03.61	947.3/4	946.3	994.0	
376	6'32.17	947.3/4	946.2/3	993.0	
380	7'06.05	947.3/4	946.2/3	994.0/1	19.9
384.75	7'45.33	947.3/4	946.3	994.0	19.9
389.5	8'35.02	947.3/4	946.2/3	994.0	
391.75	9'09.96	947.3/4	946.2	994.0 →	Pump stopped for ~3 s!
394.25	10'00.17	947.1/2	946.0/1	994.0	19.9
396.75	10'42.77	947.1/2	946.1/2	994.0 →	Pump stopped again for ~3 s!
398.25	11'33.89	946.8	945.8	994.0	
400	12'11.67	946.8/9	945.8	994.0	

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T (°C)
401.5	12'30.00	947.5/6	946.5/6	994.0 → pump stopped for ∼3s	
402.5	13'11.39	947.1/2	946.2	994.0	
403.5	13'48.52	947.2	946.2/3	994.0	
404.75	14'34.46	947.2/3	946.3	994.0 → pump stopped for ∼3s	
404.75	15'29.33	947.1/2	946.2	994.0	
406	16'22.93	PUMP STOPPED AGAIN			
406	17'24.80	947.0/1	946.1/2	994.0/1	
407.25	18'00.83	947.1	946.1/2	994.1 → pump stopped for ∼3s	
408.25	19'11.61	947.0/1	946.1	994.0/1	
	Pump stopped for ∼3s				20 °C
408.25	20'59.33	947.0	946.1/2	994.0/1	
408.25	21'17.93				

Gate closed at 21'17.93 ⟹

P_1 = 946.9/947.0 mbar
P_2 = 946.0/1 mbar
P_3 = 994.0/1 mbar
T = 20 °C

At 11H00

P_1 = 994.3/4 mbar
P_2 = 994.1/2 mbar
P_3 = 993.9/994.0 mbar
T = 20.5° C
h_D = 108.5 mm (still some GS on walls)
h_R = H − 315.5 = 169.5 mm

↳ more GS added in the set-up for the next serie of expts

08.11.1999

GS FLOW RATE 85

At atmospheric pressure | P_1 = 992.3/4 mbar ASG1
13H00 | P_2 = 993.5/6 mbar ASG2
| P_3 = 992.0/1 mbar ASG3

T = 22.1°C

GS in reservoir = h_R = H − 179.5 = 305.5 mm
GS in dike = h_D = 243.5 mm

Tunnel pressure lowered at 13H05 | P_1 = 981.6/7 mbar
| P_2 = 993.4/5 mbar
| P_3 = 992.0 mbar
Dike valve closed, gate opened at t = 0 | T = 22.2/3°C

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
	8.21	982.2	983.3	992.0	
253.5	17.03	982.0	983.3	992.0	
260	32.90	981.9/982.0	983.1/2	992.0	22.3
267.5	52.56	981.8/9	983.1	992.0	22.3
275.5	1'14.06	981.8	983.0	-	22.2
280	1'31.90	981.8	982.9/983.0	-	-
285.5	1'53.43	981.7	982.9	-	-
291	2'25.37	981.6/7	982.9	-	-
295	2'51.43	981.6	982.8	991.9/992.0	22.3
298.5	3'20.68	981.5/6	982.7/8	991.9	22.2
301.25	3'53.40	981.4/5	982.7/8 7/8	991.9/992.0	22.3
304	4'31.03	981.4/5	982.6 6	991.9	22.3
306	5'07.40	981.3/4	982.5/6	991.8/9	22.2
308	5'56.43	981.2/3	982.5	991.7/8	22.3
309.25	6'51.74	981.2/3	982.4/5	991.7/8	22.3
310.25	7'55.53	981.2	982.3/4	991.7/8	22.3
311.5	9'06.43	981.1/2	982.3	991.7	22.3
311.5	10'37.33	981.0/1	982.2/3	991.6/7	22.3

Video stopped at 11'25.49

312.25	11'58.40	981.0/1	982.1/2	991.6	22.3
312.25	13'18.09	980.9/981.0	982.1/2	991.6	-
312.25	14'02.62	980.9/981.0	982.0/1	991.6	-
312.25	15'08.81	980.9/981.0	982.0/1	991.6	-

Gate closed at 15'08.81 ⇒ | P_1 = 980.2/3 mbar
| P_2 = 981.5 mbar

08.11.1999

GS FLOW RATE 86

At atmospheric pressure

$P_1 = 990.2/3$ mbar
$P_2 = 990.6/7$ mbar
$P_3 = 990.1/2$ mbar
$T = 22.5°C$
$h_D = 243.5$ mm

Tunnel pressure lowered

$P_1 = 970.3/4$ mbar
$P_2 = 990.6/7$ mbar
$P_3 = 990.0/1$ mbar
$T = 22.5°C$

Dike valve closed and gate opened at $t = 0$

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T (°C)
	2.07	973.5	973.5		
260	15.79	971.5	971.9	990.1/2	
280	38.69	971.1/2	971.5/6	990.1	
300	1'08.32	970.9/971.0	971.4	-	
308.5	1'25.01	970.8/9	971.2	990.0/1	
320	1'50.69	970.7	971.1/2	990.0/1	22.5
329	2'15.79	970.6	971.1	990.0	-
340	3'03.17	970.5/6	971.0	990.1	-
346.25	3'27.03?	970.4/5	971.0	990.0/1	-
351.75	4'04.45	970.4	970.9/971.0	-	-
355.25	4'36.38	-	970.9/971.0	990.1	-
358.5	5'10.13	-	970.8/9	-	-
362	5'55.29	-	970.8/9	-	-
364.5	6'48.95	970.3/4	970.8/9	990.0/1	22.5
366.25	7'38.01	970.3/4	-	-	-
367.75	8'21.07	970.3	-	-	-
368.25	9'18.89	970.2/3	970.7/8	-	-
369	10'08.32	video stopped			
370	10'29.73	970.2/3	970.7/8	990.0	22.5
370.25	11'30.69	970.1/2	-	-	-
370.25	12'39.23	970.1/2	-	-	-
370.5	13'47.42	-	-	989.9/990.0	-
370.5	14'49.63	-	970.6/7	989.8/9	-
370.5	26'38.32	970.0	970.5/6	989.8	-
370.5	26'58.67	gate closed			

↳ $P_1 = 968.6$ mbar
$P_2 = 969.9$ mbar
$P_3 = 989.7/8$ mbar @ 15H10

GS FLOW RATE 87

At 15H40, at atmospheric pressure

$P_1 = 989.4/5$ mbar
$P_2 = 989.9$ mbar
$P_3 = 989.4/5$ mbar
$T = 22.6°C$
$h_D = 243.5$ mm

Tunnel pressure lowered

$P_1 = 958.8/9$ mbar
$P_2 = 989.8/9$ mbar
$P_3 = 989.4/5$ mbar
$T = 22.6°C$

Dike valve closed and gate opened at $t = 0$

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T (°C)
	4.31	961.0	961.0		
260	9.45	959.8	960.2	989.4	
280	21.45	959.3/4	959.7/8	989.4/5	
300	36.48	959.1	959.5/6	989.4/5	22.6
320	53.54	958.9	959.3	989.4	
340	1'16.01	958.6/7	959.1	989.3/4	
360	1'46.19	958.4/5	958.8/9	989.4	22.6
372	2'06.95	958.3/4	958.8/9	-	-
380	2'24.89	958.3	958.7/8	-	-
388.25	2'49.01	958.3	958.7	989.3/4	-
400	3'26.04	958.2	958.6/7	989.4/5	-
407	3'52.17	958.1	958.6	989.3/4	-
410	4'09.26	958.1/2	958.5/6	989.4	-
420	5'01.51	958.1	958.5/6	-	-
424.25	5'41.60	958.1	-	-	-
428.5	6'19.29	958.0/1	958.4/5	989.3/4	22.6
431.5	7'02.95	-	958.5/6	989.4/5	-
434	7'36.01	-	958.4/5	989.4	-
435	8'26.86	-	-	-	-

Gate closed at 8'26.86 when GS reached the tunnel entrance
Dike valve immediately opened

↳ $P_1 = 956.0/1$ mbar
$P_2 = 989.8$ mbar
$P_3 = 989.3/4$ mbar
$T = 22.6°C$ @ ~ 15H50/15H55

End of videotape 2

GS FLOW RATE 88

At 16H25, at atmospheric pressure

Videotape 3

$P_1 = 989.2$ mbar
$P_2 = 989.4/5$ mbar
$P_3 = 989.2$ mbar
$T = 22.4$ °C
$h_D = 243$ mm

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T (°C)
243	0	984.1/2	989.4/5	989.1/2	22.4
NONE	7.04	984.5	984.8	-	-
249.5	19.35	984.4	984.7	-	-
254.75	42.57	-	984.7/8	-	-
260	1'08.01	-	984.6/7	989.2	22.5
263	1'31.92	984.3/4	-	-	22.4
266.75	2'04.69	-	984.6	989.1/2	-
269.25	2'41.38	-	984.5/6	-	-
271.25	3'25.60	-	-	-	-
272.75	4'05.17	984.2/3	-	-	-
273.5	4'48.07	-	-	-	-

Video stopped at 5'12.79

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T (°C)
273.5	5'35.79	984.2/3	984.4/5	989.1/2	22.4
274.5	7'01.89	-	984.5/6	-	-
274.5	9'02.17	-	984.4/5	-	-
275	11'46.19	984.2	984.4/5	989.1	22.5
275	13'29.42	-	-	989.1/2	-
275	14'17.01	984.2/3	984.4	989.1	-
275	15'17.07	984.2	984.4/5	-	-
275	15'42.63	-	-	-	-

Gate closed at 15'42.63 $\Rightarrow$

$P_1 = 984.1/2$ mbar
$P_2 = 983.8/9$ mbar
$P_3 = 989.1$ mbar

08.11.1999

GS FLOW RATE 89

At 17H00, at atmospheric pressure

P_1 = 989.1/2 mbar
P_2 = 989.3/4 mbar
P_3 = 989.0/1 mbar
T = 22.6°C
h_D = 243.5 mm

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T (°C)
243.5	0	973.7/8	989.4/5	989.0/1	22.6
249.75	7.10	974.6	974.8		
260	18.51	974.4	974.7	989.1	22.6
273.5	37.73	974.2	974.5		
280	48.48	974.2	974.4	989.1/2	22.7
290.5	1'07.83	974.0.1	974.3	989.0/1	-
300	1'30.45	973.9/974.0	974.2	989.1	-
308.75	1'58.92	973.7/8	974.1	989.1	22.6
317.25	2'28.63	973.7	974.0/1	989.1	-
320	2'48.29	973.7	974.0	989.1/2	-
325	3'14.29	973.6/7	973.9	989.1	22.6
329.75	3'48.10	-	-	-	-
333	4'22.10	973.5/6	973.8/9	-	22.5
335.5	5'05.23	-	973.8	-	-
338	5'52.89	973.4/5	973.7/8	-	-
340	6'51.83	-	-	-	22.4
342	8'04.01	-	973.7	989.0/1	-
343	9'03.29	973.3/4	-	-	22.3
343.75	10'46.54	973.2/3	973.6/7	989.0	22.3
344.25	13'20.26	973.1/2	973.5/6	988.9/989.0	22.4
344.25	15'00.51	-	973.4/5	-	22.4
344.25	20'23.26	973.1	973.3	988.8/9	22.3
344.25	20'44.89				

Gate closed at 20'44,89 ⟹

P_1 = 971.7/8 mbar
P_2 = 972.6 mbar
P_3 = 988.8/9 mbar
T = 22.2°C at 17H20

Video stopped at 9'27.89

08.11.1999

GS FLOW RATE 90

At atmospheric pressure

$P_1 = 988.4/5$ mbar
$P_2 = 988.1/2$ mbar
$P_3 = 988.5$ mbar
$T = 21.7$ °C
$h_D = 243.5$ mm

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
243.5	0	947.9/948.0	988.1/2	988.4/5	21.6
260	7.75	948.4/5	948.1/2	988.5	
280	17.47	948.0/1	947.6/7	988.5	21.5
309	34.34	947.6	947.2		
320	42.19	947.4/5	947.1/2	988.5/6	21.5
340	57.03	947.2	946.9	988.5	-
360	1'14.63	946.9	946.6	-	-
380	1'36.31	946.7	946.4	-	-
400	2'03.09	946.5/6	946.2	988.5/6	-
410	2'20.31	946.4	946.1/2	988.5/6	21.5
424	2'42.47	946.3	946.0	988.6	21.6
435	3'07.22				

Gate closed at 3'07.22 when GS reached the tunnel entrance
Dike valve opened ↳

$P_1 = 944.2/3$ mbar
$P_2 = 988.2$ mbar
$P_3 = 988.6$ mbar
$T = 21.7$ °C

At 18H15

$P_1 = 988.7$ mbar
$P_2 = 988.3$ mbar
$P_3 = 988.6/7$ mbar

08.V.1999

GS FLOW RATE 91

At 10H05, at atmospheric pressure

P_1 = 990.1/2 mbar
P_2 = 988.8/9 mbar
P_3 = 989.7 mbar
T = 19.8°C
h = 243.5 mm

Room heater switched on (low level)

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T (°C)
243.5	0	964.8/9	989.3/4	989.9/990.0	20.0
250	9.04	966.5	964.1	-	20.0
260	18.60	964.9	964.0	989.9	20.1
270	30.69	964.8	963.8/9	-	-
280	42.92	964.7/8	963.8	-	-
291.5	58.76	964.6/7	963.6/7	-	-
300	1'13.79	964.5/6	963.5/6	989.9/990.0	-
312.5	1'35.07	964.4	963.5/6	-	-
320	1'53.35	-	963.4/5	-	-
331.25	2'18.32	964.3	963.4	-	-
340	2'46.32	964.2/3	963.3	-	20.2
351	3'18.48	964.2	-	-	-
360	3'58.57	964.1/2	963.2/3	990.0	-
367.75	4'27.45	964.0/1	963.1/2	-	-
373.25	5'04.17	964.0	963.2	-	-
380	5'55.01	963.9/964.0	963.1/2	-	-

Video stopped at 6'18.57

386.75	6'36.86	963.9	963.1/2	990.0/1	20.2
389.25	7'07.04	-	-	-	-
392.5	7'45.01	963.8/9	963.1	-	20.3
395.5	8'26.89	-	963.1/2	-	-
398.25	9'11.26	963.7/8	963.0/1	-	-
400	9'45.29	963.8	-	990.0	20.4
402.25	10'26.45	963.7/8	-	990.0/1	-
404.75	11'27.23	963.7/8	-	990.0	-
406.25	12'27.89	963.7	-	-	-
407.75	13'29.63	-	-	-	-
409.25	14'28.83	963.6/7	-	990.0/1	-
410.25	15'30.42	963.7	963.1/2	-	-

~~Video on for a few seconds at 12'04.69~~

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
411.25	16'35.32	963.7	963.1/2	990.1	20.4
411.75	17'48.51	963.6/7	963.1/2	990.0/1	20.4

Pump stopped working for a few seconds
↳ all readings off!

		961.0	960.5	990.1	20.4

Pressures readjusted manually (with vacuum regulators) at 19'11.00

	to	963.8/9	963.3/4	990.1/2	20.4

⇒ GS level goes up to 414.25 mm in the dike

414.25	20'19.54	963.9	963.4	990.1	20.4

GS level starts to go down ⇒ decided to stop the expt at 20'46.89

↳ P_1 = 962.2/3 mbar
P_2 = 962.6/7 mbar
P_3 = 990.1 mbar
T = 20.4 °C

at 10H35

At 10H45

P_1 = 990.5/6 mbar
P_2 = 990.3/4 mbar
P_3 = 990.2 mbar
T = 20.4°C

09.11.1999

GS FLOW RATE 92

At MH30, at atmospheric pressure

P_1 = 990.3 mbar
P_2 = 990.6/7 mbar
P_3 = 989.8/9 mbar
T = 21.0°C
h_D = 243.5 mm

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
243.5	0	939.2/3	990.6/7	989.8/9	21.1
250	3.55				
260	6.58				
270	10.52	938.0			
280	14.77	938.0	938.4		
300	24.11	937.7	938.1	989.8	21.1
320	35.05	937.4	937.8	989.9	-
340	47.08	937.2	937.6	-	-
360	1'00.96	937.0	937.3/4	989.8	-
380	1'17.43	936.7	937.2	-	-
400	1'36.64	936.6	937.1	-	-
410	1'47.55	-	937.0	989.9	-
420	1'57.14	936.5	936.9/937.0	-	-
435	2'18.27	936.4	936.8	989.8	-

Gate closed at 2'18.27 when GS reached the tunnel entrance

↳ P_1 = 935.1/2 mbar
P_2 = 990.7/8 mbar
P_3 = 989.9 mbar at MH40
T = 21.1°C

09. V. 1999

GS FLOW RATE 93

New series of experiments performed with $P_{reservoir} \neq$ atmospheric

At atmospheric pressure,

GS in reservoir $= h_{R_0} = 305.5$ mm
GS in dike $= h_{D_0} = 243.5$ mm

At 8H30

$P_1 = 990.3/4$ mbar tunnel
$P_2 = 989.4/5$ mbar dike
$P_3 = 969.3/4$ mbar reservoir
$T = 20.1°C$
$h_D = 110.5$ mm

$$\Rightarrow h_R = h_{R_0} + \frac{(h_{D_0} - h_D) A_D}{A_R} = 319.97 \text{ mm}$$

At 8H35, tunnel pressure lowered

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T (°C)
110.5	0	948.8/9	989.5/6	969.3/4	20.2
120	4.60	950.3	949.1		-
140	11.38	949.6/7	948.5	967.2/3	-
160	20.73	949.2	948.1/2	967.6	-
180	31.38	948.9/949.0	947.8	968.0	-
200	45.01	948.7	947.6	968.2	-
220	1'00.19	948.4/5	947.4	968.5/6	-
240	1'18.89	948.2/3	947.1/2	968.7/8	-
260	1'41.92	948.1	947.1	968.9/969.0	-
280	2'10.83	947.9/948.0	946.9/947.0	969.1/2	-
291.5	2'31.04	947.9	946.8	969.1/2	20.2
300	2'47.76	947.8/9	946.8/9	969.2/3	-
311.25	3'12.51	947.7/8	946.7/8	969.3	-
320	3'37.23	947.7/8	946.7	969.4	-
331.25	4'10.95	947.6/7	946.6	969.5	-
340	4'50.01	947.6/7	946.6	969.5	-
351.25	5'40.19	947.5/6	946.5	969.6/7	-
360	6'49.01	947.5	946.5	969.6/7	-
368	7'53.13	947.5	946.5	969.7/8	-

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T (°C)
371	8'38.32	947.4/5	946.4/5	969.7/8	20.2
374.5	9'23.13	947.4/5	946.4/5	969.7/8	-
377.5	10'21.10	947.4/5	946.4/5	969.8	-
380	11'19.54	947.4/5	946.4/5	969.8	-

Video stopped recording at 11'39.67

382.25	12'33.60	947.4/5	946.4/5	969.8	20.2
383.75	13'43.38	947.4/5	946.5/6	969.8/9	-
385.5	15'11.92	-	-	969.9/970.0	-
386.25	16'20.54	-	-	969.9	-
387.75	19'23.10	-	-	969.9/970.0	20.3
388.5	22'17.48	-	946.6	970.0	-
389.25	23'48.32	-	946.6/7	969.9/970.0	-
389.5	26'01.01	-	-	970.0	-
389.5	27'36.38	947.5/6	946.7	970.0/1	-
389.5	29'02.76	-	946.7/8	970.1	-

Pump stopped running at ~ 29'39 ⇐ battery flat

Valve closed at 29'56.35
Gate

↳ got a new battery

10.11.1999

GS FLOW RATE 94

~~At~~ 10H00

P_1 = 991.6/7 mbar
P_2 = 991.1/2 mbar
P_3 = 991.2/3 mbar
T = 20.7°C

Reservoir pressure lowered down to 969.8 mbar ⟹ h_0 = 107 mm (still some GS on wa

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T (°C)
107	0	959.7/8	991.1/2	969.8	20.9
120	5.72	961.5	961.1	967.6	-
140	14.13	961.0	960.6	968.1	-
160	24.57	960.6	960.3	968.5	-
180	37.57	960.4	960.1	968.8	-
190	45.59	960.3	960.0	968.9	-
200	55.31	960.2	959.9	969.1	-
210	1'05.53	960.1	959.7	969.3	-
220	1'17.07	960.0/1	959.7	969.4	-
230	1'30.31	959.9/960.0	959.6/7	969.4/5	-
240	1'46.03	959.8/9	959.5/6	969.6	20.9
250.25	2'05.78	959.7/8	959.5	969.7	-
260	2'29.07	-	959.4	969.8	-
270.25	2'58.57	959.7	959.3/4	969.8/9	-
276.25	3'18.44	959.7	959.3/4	969.9	-
280	3'37.41	959.6/7	-	-	-
285	3'57.03	-	959.3	969.9/970.0	-
290	4'25.03	-	959.2/3	970.0	20.9
293.75	4'55.28	959.6	-	970.0/1	-
297.75	5'28.66	959.6/7	-	970.1/2	-
300	5'57.41	959.5/6	-	-	-
303.5	6'33.19	959.6	-	-	-
305.25	7'05.50	-	-	-	-
307.5	8'03.22	959.5/6	959.1/2	-	21.0
310	9'10.41	-	-	-	-
311.25	10'15.47	-	-	970.2/3	-
312.25	12'02.44	959.6	959.2/3	970.2/3	21.0
313.25	14'13.41	959.5/6	959.2/3	970.3	-
313.25	16'26.28	-	-	970.2/3	21.1
313.25	18'09.03	-	959.1/2	-	-
313.25	19'33.59	-	-	-	-
313.25	20'00.07				

10.11.1999

Gate closed at 20' 00.07

$\Rightarrow$ | $P_1 = 959.415$ mbar
$P_2 = 957.9/958.0$ mbar
$P_3 = 970.1/2$ mbar at ~ 10H35

Dike valve opened $\Rightarrow$ | $P_1 = 959.5$ mbar
$P_2 = 990.9/991.0$ mbar
$P_3 = 971.5$ mbar
$T = 21.1$°C

Video was stopped at 9' 40.31

10.11.1999

GS FLOW RATE 95

At 11H10

h_{dike} = 103 mm
P_1 = 938.7/8 mbar
P_2 = 991.5 mbar
P_3 = 969.2/3 mbar
T = 21.7°C

still some GS on walls but pretty much OK (add 2 mm)

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T (°C)
120	4.14	940.5	940.3		
140	8.08	939.1	939.3	965.8	
160	13.11	?	?	?	
180	18.83	938.5	938.7	967.1	
200	26.02	938.2	938.3	967.6	
230	38.73	?	?	?	
240	43.49	937.7/8	937.9/938.0	968.1	21.7
260	55.33	937.5/6	937.7	968.4/5	-
280	1'09.49	937.4	937.6	968.6/7	-
300	1'25.55	937.2/3	937.5	968.8/9	-
320	1'45.58	937.1	937.3/4	969.0	-
340	2'10.67	937.0/1	937.2/3	969.1/2	21.7
360	2'41.14	936.9/937.0	937.1/2	969.4	-
371.25	3'01.61	936.9	937.1	-	-
380	3'22.89	936.8/9	-	969.5	-
391	3'50.36	936.7/8	937.0/1	969.5/6	21.8
400	4'19.20	936.8	-	969.6/7	-
410	4'56.80	936.7/8	-	969.7/8	-
420	5'41.29	-	-	-	-
426	6'14.33	936.7	936.9/937.0	969.8	-
430.75	6'48.55	-	937.0/1	969.9	21.8
435	7'30.67	-	-	-	-

Gate closed at 7'30.67 - Valve opened

$\Rightarrow$
P_1 = 936.6/7 mbar
P_2 = 991.6/7 mbar
P_3 = 971.7/8 mbar
T = 21.8°C

at 11H20

10.11.1999

GS FLOW RATE 96

10.11.1999

At 14H10

P_1 = 964.4/5 mbar
P_2 = 991.7/8 mbar
P_3 = 969.5/6 mbar
T = 23.7°C
h_D = 111 mm

Readjust pressures

P_1 = 963.9/964.0 mbar
P_2 = 991.6/7 mbar
P_3 = 969.1/2 mbar
T = 23.7°C
h_D = 110 mm

Dike valve closed and gate opened at $t=0$

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
120	4.76	966.9	968.3	966.6/7	23.7
140	12.76	965.8	967.3	967.3	-
160	23.10	965.2	966.7	967.8	-
180	35.92	964.8/9	966.3	968.1/2	-
200	53.48	964.5	966.0	968.4	-
210	1'04.54	964.3	965.7	968.6	-
220	1'17.04	964.2	965.7	968.8	23.6
230	1'33.57	964.1	965.5/6	968.9	-
240	1'53.51	963.9	965.3/4	968.9/969.0	-
250	2'18.23	963.8	965.3	969.1	-
260	2'55.45	963.6/7	965.1/2	969.1/2	23.6
264.75	3'25.38	963.5/6	965.1	969.2/3	-
270	4'05.42	963.4/5	965.0/1	-	-
273.25	4'34.10	963.5	965.0	969.3	-
275.5	5'10.57	963.4/5	964.9/965.0	-	-
Video switched off at 5'54.60					
278.25	6'14.23	963.3/4	964.8/9	969.3	23.6
280	7'08.29	963.3/4	964.8	-	-
281	8'32.32	963.2/3	964.7/8	-	23.5
281.25	11'17.89	-	964.6	-	-
281.25	13'15.89	963.1/2	964.5	969.2/3	-
281.25	15'09.79	-	964.4/5	-	23.3

Gate closed at 15'32.13 ⟹

P_1 = 962.9/963.0 mbar
P_2 = 963.9/964.0 mbar
P_3 = 969.2/3 mbar
T = 24.[illegible]°C

at 14H30

GS FLOW RATE 97

At 14H55

P_1 = 989.0 mbar
P_2 = 989.6/7 mbar
P_3 = 968.2/3 mbar
T = 22.6°C
h_D = 109 mm

Battery = 12.07 V

Tunnel pressure lowered

P_1 = 962.4/5 mbar
P_2 = 989.5/6 mbar
P_3 = 968.0/1 mbar
T = 22.6°C
h_D = 107.75 mm

Dike valve closed - Gate opened at t = 0

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
107.75	0	962.3	989.5	968.0/1	22.6
120	5.21	964.3	964.8	965.3	-
140	13.27	963.3	963.8	965.9/966.0	-
160	23.71	962.7	963.3	966.4	22.7
180	36.30	962.3	962.8	966.7/8	-
190	45.18	962.1	962.6	966.8	-
200	54.15				
210	1'05.12	961.7/8	962.2/3	967.2	22.7
220	1'18.93	961.5	962.0	967.4	-
230	1'33.65	961.4	961.9	967.5	-
243.75	2'01.68	961.2/3	961.7/8	967.7	22.7
250	2'16.84	961.2	961.6/7	-	-
256.75	2'35.56	961.1	961.5/6	-	-
260	2'50.40	961.0/1	-	967.7/8	-
264.25	3'06.06	961.0	961.5	967.8	22.8
269	3'30.53	960.9/961.0	961.4/5	967.9/968.0	22.7
274	4'03.21	960.8/9	961.3/4	967.9	22.8
277.5	4'32.77	-	-	967.9/968.0	-
280	5'00.33	-	961.3	968.0	-

Video stopped at 5'18.84

282.75	5'38.30	960.8/9	961.3	968.0	22.9
284	6'17.18	960.8	-	-	-
286.25	7'25.15	-	961.2	968.0/1	-

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
288	9'23.81	960.8	961.2	968.1	23.0
289	11'36.81	960.8/9	961.2/3	968.0/1	-
289.25	13'43.90	960.8	-	-	23.1
289.5	15'02.53	-	-	-	-
289.5	16'12.81	960.8/9	961.3	968.0/1	23.2
289.75	17'21.27	-	961.3/4	968.1	-
289.75	18'36.09	960.9	-	968.0/1	23.3
-	19'46.90	-	-	-	-
-	20'55.59	960.9/961.0	961.4/5	968.1	-
-	22'03.62	-	-	968.0/1	-

Gate closed at 22'29.65 =>

P_1 = 960.2/3 mbar
P_2 = 960.9/961.0 mbar
P_3 = 968.0/1 mbar

Battery = 12.04V at 15H25

GS FLOW RATE 98

At 16H00

P_1 = 989.7/8 mbar
P_2 = 990.5/6 mbar
P_3 = 969.3/4 mbar
T = 23.8°C
h_D = 114 mm

Battery = 12 V

Tunnel pressure lowered ⟹

P_1 = 954.1/2 mbar
P_2 = 990.6/7 mbar
P_3 = 969.3/4 mbar
T = 23.8°C

Reservoir and tunnel pressures readjusted ⟹ h_D = 110.5 mm at 16H05

Dike valve closed - Gate opened at t = 0

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T (°C)
110.5	0	953.7/8	990.6/7	968.7/8	23.6
130	5.57				
140	8.78	955.8	956.7	965.9	
170	19.25				
180	23.69	954.8	955.7/8	966.7	23.6
200	33.97	954.4	955.3/4	967.2	-
220	46.59	954.0/1	955.0	967.6	-
240	1'02.03	953.8	954.8	967.8	23.6
250.25	1'12.78	953.7	954.7	967.9	-
260	1'22.53	953.6/7	954.6	968.1	23.6
270	1'35.88	953.5	954.5	968.2	-
280	1'50.44	953.4	954.4	968.3	-
290	2'08.57	953.3/4	954.3	968.4/5	-
300	2'31.41	953.2/3	954.2/3	968.5/6	-
308.75	2'53.03	953.1/2	954.2	968.6/7	-
315.5	3'16.07	-	954.1/2	968.7	-
320	3'36.78	-	954.0/1	968.7/8	-
326.5	4'06.85	953.0/1	-	-	-
332.75	4'47.75	953.0	954.1	968.8/9	-
336.75	5'30.53	953.0/1	954.0/1	968.9	-
340	6'22.57	952.9/953.0	-	-	-

Video stopped at 7'10.63

10.11.1999

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
343.25	7'39.50	952.9/953.0	953.9/954.0	968.9	23.6
345	8'46.91	-	-	-	-
346	9'57.72	-	-	-	-
346.75	11'35.34	-	-	-	-
346.75	13'29.34	952.9	954.0	-	-
-	15'01.85	952.9/953.0	953.9/954.0	968.8/9	23.7
-	17'33.69	-	-	-	-

Gate closed at 18' 01.72 ⇒

P_1 = 952.8/9 mbar
P_2 = 953.5/6 mbar
P_3 = 968.8/9 mbar
T = 23.7° C

Battery = 11.97V at 16H25

10.11.1999

GS FLOW RATE 99

At 17H05

P_1 = 989.5/6 mbar
P_2 = 990.5/6 mbar
P_3 = 968.6/7 mbar
T = 24 °C
h_D = 110 mm

Battery = 11.92 V

Tunnel pressure lowered down to 943.2/3 mbar
Dike valve closed - Gate opened at t = 0

h dike (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
110	0	943.2/3	990.5/6	968.4/5	24.0
120	2.58				
140	6.52	944.3	945.3		
160	10.83	943.5	944.5	964.9	
190	19.29				
200	22.39	942.3	943.3	965.8	
220	29.49	941.9	942.9	966.2	23.9
240	38.43	941.5	942.5	966.7	
270	54.05				
280	1'00.73	940.9	942.0	967.2/3	
300	1'15.55	940.7	941.8	967.5	
309.5	1'24.11	940.6	941.6	967.6	
320	1'33.83	940.5	941.5/6	967.8	
329.5	1'45.02	940.3/4	941.5	967.9	23.9
340	1'58.05	940.2/3	941.3/4	968.0	-
349.5	2'11.70	940.2	941.3	968.0/1	-
360	2'28.89	940.1	941.2	968.2	-
370	2'49.33	939.9/940.0	941.0/1	968.3	-
380	3'13.77	-	941.0	968.3/4	-
390	3'42.83	939.9	940.8/9	968.4/5	-
397	4'09.49	939.8/9	-	968.5	-
404.5	4'43.73	939.7/8	940.7/8	968.5/6	-

Video stopped recording at 5'09.70

410	5'30.49	939.6/7	940.7/8	968.6	23.9
414.75	6'02.23	-	940.6/7	-	-
420	7'00.43	-	-	968.6/7	23.8
424	8'03.89	939.5/6	940.5/6	968.7	-
426.25	9'09.17	-	-	968.7/8	-

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
428.25	10'19.64	939.4/5	940.4/5	968.7/8	23.8
429.75	12'03.39	939.5	940.4	-	-
431	14'08.43	939.4	-	968.7	-
431.25	16'23.67	939.3/4	940.2/3	-	-
431.5	18'05.96	-	940.2	-	-
431.75	20'27.39	-	940.1/2	-	23.7
432	24'31.93	-	940.1	968.7/8	-
432	28'42.14	-	940.0	-	23.6
432	30'51.96	-	939.9/940.0	-	-
432	32'46.77	939.3	939.9	-	-
432	34'39.39	-	939.8/9	-	-
432	35'03.96	-	-	-	-

Gate closed at 35'03.96 ⟹

P_1 = 939.0/1 mbar
P_2 = 939.3 mbar
P_3 = 968.8/9 mbar
T = 23.6°C

Battery = 11.86 V at 17H47

10.11.1999

GS FLOW RATE 100

At 18H10

P_1 = 989.5/6 mbar
P_2 = 990.0/1 mbar
P_3 = 968.9 mbar
T = 23.6°C
h_D = 110 mm

Battery = 11.83 V

Tunnel pressure lowered down to 928.1/2 mbar
Dike valve closed - Gate opened at t = 0

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
110	0	928.1/2	989.8/9	968.6/7	23.6
140	4.83				
160	7.79	929.0			
180	11.48				
200	15.57	927.8	928.4	965.0	
220	20.48				
240	25.60	927.0	927.6	966.1	
260	31.69				
280	38.86	926.4/5	927.0	966.7	
300	47.23	926.3/4	926.9	966.9	
320	56.73	926.1/2	926.6/7	967.2/3	
340	1'07.95	925.9	926.5	967.5	
360	1'21.10	925.8	926.4	967.7/8	23.6
380	1'36.51	925.7	926.2	967.9/968.0	-
400	1'57.01	925.5/6	926.1	968.1	-
410	2'09.57	925.4/5	926.1	968.2/3	-
420	2'21.45	925.4	925.9/926.0	968.3/4	-
435	2'47.38	925.3/4	-	968.4/5	-

Gate closed / valve opened at 2'47.38 when GS reached the tunnel entrance

↳ P_1 = 925.0 mbar
P_2 = 990.0/1 mbar
P_3 = 971.4/5 mbar
T = 23.6 °C

10.11.1999

~~At~~ 18H15

P_1 = 989.9 / 990.0 mbar
P_2 = 990.4/5 mbar
P_3 = 989.8/9 mbar
T = 23.7°C

Battery = 11.83 V

10. 11. 1999

GS FLOW RATE 101

At 7:30 | Battery = 13.76 V (charged overnight from 18:30) not complete

P_1 = 992.9/993.0 mbar
P_2 = 991.9/992.0 mbar
P_3 = 992.5/6 mbar
T = 21.1°C
h_D = 243.5 mm

Pump started at 07:35. At 8H10, battery = 12.45 V

Reservoir pressure lowered | P_1 = 993.3/4 mbar
P_2 = 992.5/6 mbar
P_3 = 979.0 mbar
T = 21.1°C
h_D = 154 mm

Tunnel pressure lowered | P_1 = 958.8/9 mbar
P_2 = 992.6/7 mbar
P_3 = 978.8/9 mbar
T = 21.2°C

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
154	0	958.5/6	992.5/6	978.9/979.0	21.2
170	7.93				
180	12.64	959.4/5	958.8	977.0	
200	23.89	959.1/2	958.5	977.4	21.2
220	37.02	958.8/9	958.2	977.6/7	-
230	46.70	958.8			
240	54.02	958.7	958.0	977.9	-
250.25	1'04.29	958.5	957.8	978.0	21.2
260	1'15.87	958.4/5	957.7/8	978.2	
270	1'27.80	958.4	957.7	978.3	
280	1'42.70	958.2/3	957.5/6	978.3/4	21.2
290	1'57.61	958.1/2	-	978.4	-
300	2'16.05	958.1/2	957.4/5	978.5	-
309.5	2'37.20	958.0/1	957.3/4	978.5/6	-
320	3'02.29	958.0	-	978.6/7	21.2
329.5	3'31.77	-	957.2/3	978.7/8	-
335.75	3'54.89	957.9/958.0	-	978.8	-
340	4'15.17	957.9	-	978.8/9	-

h dike (mm)	time	P1 (mbar)	P2 (mbar)	P3 (mbar)	T(°C)
345.25	4'38.61	957.9	957.2	978.8/9	21.2
349.5	5' 01.14	957.8/9	-	978.9	-
353.5	5'24.20	957.8	-	978.9/979.0	-
357.25	5'55.70	957.8/9	957.1/2	-	-
360	6'19.33	957.8	-	-	-

Video stopped at 6' 34.80

364	6'56.14	957.7/8	957.1/2	979.0	21.2
367	7'34.23	-	-	-	-
369.75	8'20.89	-	-	-	-
372	9'07.80	-	-	-	-
374.75	10'15.52	957.7	-	-	21.2
377	11'40.08	-	-	979.0/1	-
378.5	13'02.11	957.7/8	957.2/3	979.1/2	-
380	14'07.02	-	957.2	-	-
381.5	16'24.23	-	957.2/3	-	21.3
381.5	17'56.36	957.8	957.3	979.2	-
382	20'11.77	-	-	979.2/3	-
382	22'32.58	957.8/9	957.4	-	-
382	25'06.02	-	957.4/5	979.3	-
382	27'32.33	957.9/958.0	-	979.3/4	21.4
382	28'02.89				

Gate closed/valve opened at 28'02.89 => | P_1 = 957.7/8 mbar
P_2 = 993.3/4 mbar
P_3 = 980.7 mbar

At 8H40 | P_1 = 993.8/9 mbar
P_2 = 993.4/5 mbar
P_3 = 980.4/5 mbar

Battery = 12.37 V

11.11.1999

GS FLOW RATE 102

At 9:30

Battery = 12.28 V
P_1 = 994.2/3 mbar
P_2 = 994.0/1 mbar
P_3 = 979.7 mbar
T = 21.6°C
h_D = 152 mm

Tunnel pressure lowered down to 970.2/3 mbar.
Dike valve closed / gate opened at t = 0

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T (°C)
152	0	970.2/3	994.0/1	979.6/7	21.6
160	5.37	971.5	971.2	977.9	
170	12.15				
180	18.24	971.0	970.8	978.3	21.6
190	26.15	970.8	970.5	978.5	-
200	35.49	970.5/6	970.3/4	978.6/7	-
210	46.43	970.4	970.2	978.8	-
220	56.56	970.3/4	970.1	978.8/9	-
230	1'09.77	970.2	969.9/970.0	979.0	-
240	1'25.77	970.0/1	969.8/9	979.0/1	-
250.25	1'45.06	969.9	969.6/7	979.1/2	-
260	2'05.97	969.8	969.5/6	979.3	-
270	2'35.74	969.7	969.4/5	979.4	-
280	3'13.47	969.6	969.3/4	979.4/5	-
284.5	3'31.97	969.5/6	969.3	-	-
290	4'09.12	969.4/5	969.2/3	979.5	-
293.5	4'33.30	-	-	979.5/6	-

Video stopped at 4'58.12

297.75	5'12.33	969.4	969.2	979.5/6	21.6
300	5'37.77	969.3/4	969.1/2	-	-
302.5	6'17.37	969.3	-	979.6	-
305.5	7'19.77	-	969.0/1	-	-
308.25	8'54.33	-	969.0	-	-
309.5	10'08.97	969.2/3	-	979.6/7	-
310.75	11'45.30	-	968.9/969.0	-	-
310.75	13'16.81	969.1/2	968.8/9	979.6	-
311	15'14.18	-	-	979.6/7	-
311.5	17'35.77	-	-	-	-

11 11 1999

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
311.5	22'34.68	969.0/1	968.8	979.6	21.6
312	26'42.47	-	968.7/8	-	-
312	28'58.33	968.9/969.0	-	979.5/6	21.7
312	30'05.87	-	968.7	-	21.6
312	31'22.97	-	-	-	21.7
312	32'37.81	-	-	-	-
312	33'48.09	-	968.6/7	-	-

Gate closed, valve opened at 33'48.09

↳ P_1 = 968.4/5 mbar
P_2 = 993.8/9 mbar
P_3 = 980.6/7 mbar
T = 21.7°C at 10H05

At 10H10
Battery = 12.21 V
P_1 = 994.1/2 mbar
P_2 = 993.8/9 mbar
P_3 = 979.7 mbar
T = 21.7°C

11.11.1999

GS FLOW RATE 103

At 10H35 | Battery = 12.17 V
P_1 = 994.0/1 mbar
P_2 = 993.8/9 mbar
P_3 = 979.5/6 mbar
T = 21.7°C
h_D = 151.5 mm

Tunnel pressure lowered down to 949.6/7 mbar at 10H40.
Dike valve closed, gate opened at t = 0

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
151.5	0	949.6/7	993.6/7	979.3/4	21.7
160	3.52	950.7	950.5		
180	9.39	949.9/950.0	949.6	976.6	
200	16.67	949.4	949.2	976.9	21.7
220	24.70	949.1	948.9	977.3	-
240	34.80	948.8	948.6	977.6	-
260	46.43	948.5	948.3/4	977.8	-
280	1'00.36	948.3	948.1	978.0	21.7
290	1'08.36	948.1/2	947.9/948.0	978.2/3	-
300	1'18.08	948.0/1	947.8/9	978.3/4	-
320	1'38.46	947.9	947.7	978.5	21.7
329.5	1'50.29	947.8	947.6	978.6	-
340	2'05.11	947.7	947.5	978.7	-
349.5	2'18.93	947.6/7	-	-	-
360	2'37.58	947.5/6	947.4	978.8/9	-
370	2'56.29	947.4/5	947.3/4	978.9/979.0	-
380	3'21.67	947.3/4	947.2/3	979.0	-
390	3'47.36	-	947.2	979.0/1	-
400	4'22.52	947.2/3	947.0/1	979.1	-
410	5'06.05	947.1/2	946.9/947.0	979.1/2	-
420	5'56.83	947.1	946.9	-	-
424.5	6'25.73	947.0/1	946.8/9	979.2/3	-
428.75	7'04.20	-	-	-	-
432.5	7'43.33	947.0	-	-	-
435	8'30.02	946.9/947.0	-	-	-

Gate closed / valve opened at 8'30.02 when GS reached the bottom of the tunnel entrance

11.11.1999

$\Rightarrow$ | $P_1 = 946.5/6$ mbar
$P_2 = 993.7/8$ mbar
$P_3 = 980.6/7$ mbar
$T = 21.7°C$ at 10H50

$\Rightarrow$ | $P_1 = 994.0/1$ mbar
$P_2 = 993.7/8$ mbar
$P_3 = 980.6/7$ mbar
Battery = 12.15 V

11.11.1999

GS FLOW RATE 104

At 10H20 | Battery = 12.12 V
P_1 = 993.9/994.0 mbar
P_2 = 993.8/9 mbar
P_3 = 979.1/2 mbar
T = 21.9°C
h_D = 150 mm (still some GS on walls)

Tunnel pressure lowered down to 975.1/2 mbar
Dike valve closed / gate opened at t=0

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
150	0	975.1/2	993.7/8	979.0/1	21.9
160	7.61	976.3	976.3	977.8	21.9
170	15.36	976.1	976.1	978.0	-
180	24.23	975.8	975.8/9		
190	34.02	975.7/8	975.8	978.2/3	21.9
200	46.02	975.5/6	975.6	978.4	-
210	1'00.83	975.4	975.4/5	978.5	-
220	1'18.52	975.3	975.3/4	978.6	-
230	1'39.39	975.2	975.2/3	978.7/8	-
240	2'07.67	975.0/1	975.1/2	978.8	-
250.25	2'51.55	974.9/975.0	975.0	978.8/9	21.9
254.5	3'15.89	974.8/9	974.9/975.0	978.9/979.0	-
260	3'54.23	-	974.9	979.0	-
263	4'31.46	974.8	974.8/9	-	-
266	5'17.80	974.7/8	-	-	-
268	5'58.23	974.6/7	974.7/8	-	-
269.25	6'50.14	-	974.7	-	-
270.5	7'57.02	-	974.7/8	-	-
271.75	9'49.02	974.5/6	974.6/7	978.9/979.0	-
272	11'39.05	974.4/5	-	-	-
272.25	13'13.55	-	-	978.9	-
272.5	15'04.33	-	974.5/6	978.9/979.0	22.0
272.75	17'11.52	974.3/4	-	978.8/9	-
273	18'43.52	-	-	-	-
273	20'35.29	-	-	-	22.0
273	22'12.08	974.3	974.5	-	-
273	23'37.05	974.2/3	974.4/5	978.7/8	-
273	24'33.23	974.2	974.4	978.7	22.1
273	25'00.55	-	-	-	-

11.11.1999 /

Video stopped at 6'18.43

Gate closed / valve opened at 25'00.55

↳ P_1 = 973.6 mbar
P_2 = 993.6/7 mbar
P_3 = 979.6/7 mbar
T = 22.1°C at 11H50

↳ P_1 = 993.5/6 mbar
P_2 = 993.7/8 mbar
P_3 = 979.2/3 mbar
T = 22.1°C
Battery = 12.08 V

11.11.1999

GS FLOW RATE 105

At 12H05 | Battery = 12.06 V
P_1 = 993.3/4 mbar
P_2 = 993.6/7 mbar
P_3 = 978.5/6 mbar
T = 22.2°C
h_D = 150 mm

Tunnel pressure lowered | P_1 = 938.4/5 mbar
P_2 = 993.6 mbar
P_3 = 978.3/4 mbar
T = 22.2°C
h_D = 149 mm

Pressures readjusted ⇒ | P_1 = 938.8/9 mbar
P_2 = 993.6/7 mbar
P_3 = 979.3/4 mbar
T = 22.2°C
h_D = 155 mm

Dike valve closed / gate opened at t = 0

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
155	0	938.8/9	993.6/7	979.3/4	22.2
160	2.26	942.5	942.1	975.7	
180	6.19	940.0	940.4	975.9	
200	11.89	939.5	939.8/9		
220	17.92	939.1	939.5	976.8	
240	24.95	938.7	939.2	977.1/2	
260	33.45	938.4	938.7	977.5/6	
280	43.38	938.1/2	938.5	977.7/8	
300	53.54	937.9/938.0	938.2/3	978.0	
320	1'06.45	937.7	938.1/2	978.1/2	22.3
340	1'21.60	937.5/6	938.0	978.3/4	-
360	1'39.13	937.3/4	937.8	978.5	-
380	2'01.01	937.2	937.6/7	978.7	-
390	2'13.83	937.1/2	937.6	978.8	-
400	2'28.23	937.1	937.5/6	978.9	
410	2'43.51	937.0/1	937.4/5	979.0	
420	2'59.57	936.9/937.0	937.4	-	
428.5	3'15.79	-	-	-	
435	3'30.67	-	-	-	

11.11.1999

Gate closed at 3' 30.67 when GS reached the bottom of the tunnel entrance

$$\Rightarrow \left| \begin{array}{l} P_1 = 936.2/3 \text{ mbar} \Rightarrow 993.0/1 \text{ mbar} \\ P_2 = 993.6 \text{ mbar} \\ P_3 = 979.3 \text{ mbar} \\ T = 22.4°C \end{array} \right.$$

11.11.1999

GS FLOW RATE 106

At 13H35

Battery = 11.96 V

P_1 = 991.9/992.0 mbar
P_2 = 992.8/9 mbar
P_3 = 977.8/9 mbar
T = 22.8°C
h_D = 153 mm

Tunnel pressure lowered down to 962.8/9 mbar
Dike valve closed / gate opened at t=0

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
153	0	962.8/9	992.7/8	977.6/7	22.9
160	3.76	964.7	965.6	975.4	-
180	12.83	963.9	964.6	975.8	22.9
200	23.79	963.3	964.2	976.2	-
220	37.26	962.9/963.0	963.7/8	976.5	-
240	54.54	962.6	963.5	976.7	-
250.25	1'05.19	962.4	963.3	976.8/9	-
260	1'17.51	962.3	963.1/2	976.9/977.0	-
270	1'31.23	962.2	963.0	977.0	-
280	1'47.26	962.0/1	962.9	977.2	-
290	2'05.42	961.9	962.7/8	977.2/3	-
300	2'29.17	961.8	962.6	977.3/4	22.9
309.5	2'57.17	961.6	962.5	977.4	-
317	3'23.45	961.5/6	962.4	-	-
320	3'36.69	961.4/5	-	977.4/5	-
324.5	3'55.51	-	962.3/4	-	-
329.5	4'30.01	961.3/4	962.3	977.5	-
334	5'01.01	961.3	962.2/3	-	-
337.75	5'39.73	-	962.1/2	977.5/6	-

Video stopped at 6'01.48

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
340	6'11.48	961.2/3	962.1/2	977.5/6	22.9
343	7'01.63	961.1/2	962.1	-	-
345	7'48.51	-	962.0/1	977.6/7	-
346.75	8'37.17	-	-	977.6	-
348	9'55.95	961.1	-	977.5/6	-
349.25	11'44.67	961.0/1	961.9/962.0	977.6	-
350	14'03.01	-	-	-	-
350	16'01.57	960.9/961.0	961.9	977.5/6	-

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T (°C)
350.5	18'15.17	960.8/9	961.8/9	977.5/6	23.0
-	20'47.60	-	-	977.5	-
351	23'51.89	960.7/8	961.7/8	-	-
-	26'05.45	960.7	961.6/7	977.4/5	-
-	28'51.45	960.6/7	-	977.4	-
-	31'27.57	-	-	-	-
-	33'37.35	960.6	-	-	23.1
-	34'25.67	960.5/6	961.5/6	977.3/4	-
-	35'01.57				

Gate closed after 35'01.57 at 14H15 ⇒

P_1 = 960.1/2 mbar
P_2 = 961.1/2 mbar
P_3 = 977.3/4 mbar
T = 23.1 °C

Battery = 11.90 V

↳

P_1 = 991.9 mbar
P_2 = 992.5/6 mbar
P_3 = 978.4/5 mbar

11.11.1999

11.11.1999

GS FLOW RATE 108

At 15H50

Battery = 11.78 V

P_1 = 991.5/6 mbar
P_2 = 992.4/5 mbar
P_3 = 977.2/3 mbar
T = 23.4°C
h_D = 152 mm

Tunnel pressure lowered down to 926.7/8 mbar at 15H55
Dike valve closed / gate opened at t = 0

h_{dike} (mm)	time	P_1 (mbar)	P_2 (mbar)	P_3 (mbar)	T(°C)
152	0	926.7/8	992.5	977.1	23.4
160	2.16				
180	5.31	928.4	929.2	972.7	
200	9.25				
220	13.19				
240	17.75	926.9	927.8	973.8	
260	23.41	926.5	927.4	974.2	
280	29.57	926.1	927.0	974.6	
310	40.03				
320	44.34	925.7/8	926.6	975.1/2	
340	53.72	925.5	926.4	975.4	23.4
360	1'03.44	925.3	926.2/3	975.7	-
380	1'16.16	925.1/2	926.0/1	975.8/9	-
400	1'30.94	924.9/925.0	925.9	976.1	-
420	1'47.34	924.8/9	925.8/9	976.3	-
435	2'02.16	924.8	925.7/8	976.3	-

Gate closed / valve opened at 2'02.16 when GS reached the tunnel entrance at 16H00

↳ P_1 = 924.1/2 mbar
P_2 = 992.5 mbar
P_3 = 979.1 mbar
T = 23.4°C

↳ P_1 = 991.8/9 mbar
P_2 = 992.4/5 mbar
P_3 = 978.8/9 mbar

11. 11. 1999

At 16H40

P_1 = 991.6/7 mbar
P_2 = 991.9 mbar
P_3 = 977.3/4 mbar
T = 23.2°C
h_D = 153 mm

Pump switched off at 16H42
Battery = 11.83V ⟹ start charging at 16H44

At 17H50

P_1 = 991.6/7 mbar
P_2 = 991.7/8 mbar
P_3 = 991.6/7 mbar
T = 22.9° C
h_D = 243.5 mm

11.11.1999

Flow rate experiments
with DGS 5
(expt n° 109 to 123)

01.09.2000

02.09.00 11 H35 Expt 109

DGS5

① $P_1 = 984.6/7$

$P_2 = 983.3/4$

$P_3 = 984.6/7$

$T = 20\,°C$

$h_{dike} = 32$ mm

02.09.00

$H_{res} = h - \underbrace{399.5\ \text{mm}}_{392.5} = 92.5$ mm

485

07.03.02

07.03.02

N_2 gate = 800 kPa

$P_1 = 984.6/7$

P_2 983.3

P_3 943.4/5/6/7/8

02.09.2000

02.09.00

2

11H45

P1 = 984.5/6
P2 = 983.2/3
P3 = 934.~~6/7~~ 2/3

P1 984.5/6
P2 (valve closed) 983.3/2
P3
944.0 → 944.7
Not very stable
↳ redirect tunnel to Vac.reg n° 1

02.09.2000

5cm 1.03

10cm 5.09

13 7.49

15 9.40

18 12.24

02.09.00

20 14.68 934.5

24 20.65

26 24.30 931.4/5

28 28.93 930.4/5

31 37.93 929.5/6

~~33 - 929.1~~

34 51.68 928.8/9

02.09.2000

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

360	1'05.47	928.3/4		
370	1'16.12	928.1/2		
380	1'31.06	927.9 928.0 res 984.5 983.2		
390	1'57.18	984.5 983.2 927.7/8		
395	2'16.47	984.4/5	983.2	927.7/8
397	2'33.27	927.7	984.5	983.2
398.75	3'03.21	984.5	983.2	927.6/7
02.09.2000 ∅ 400 ∅	3'41.62	984.5	983.2	927.6/7
400.75	4'33.03	984.5	–	927.5
02.09.00 401.75 ∅	5'35.03	–	983.1/2	–
402.5 ∅	7'27.03	984.4/5	983.1	927.4
same	8'53.90	984.4/5	983.1/2	927.3/4

20°C

02.09.2000

3

	Same	10'19.12	984.4/5	983.1/2	927.3
✓	403.~~25~~ t 07.03.02	12'56.24	984.5	983.2	927.3
✓	403.5	15'19.97	984.5/4	983.1/2	927.2/3
	404.~~5~~ t 07.03.02 .25	19'32.56	984.5/6	983.2	927.2
	404.~~7~~5 .7 t 07.03.02	22'46.90	984.5/6	983.2~~5~~	927.1/2
	405.~~5~~ 25 t 07.03.02	28'49.65	984.5/4	983.2/1 t 07.03.02	927.0 926.9
	407	45'21	984.3/4	983.0	926.7
20°C	Same	52.37	984.2/3	982.9	926.5
	same	1h00min24	984.2	982.8/9	926.4/5

Stop at 12H55

~~404.25~~
~~404.5~~

$\Delta P = 58$ mbar

02.09.2000

02.09.00

Expt 110

DG85

At 13H 40

$$\begin{cases} P_1 = 983.4 \\ P_2 = 982.2/1 \\ P_3 = 983.4 \\ T = 20.5°C \end{cases}$$

$P_{N_2} = 800\ kPa$

$h_{dyke} = 31.5$ mm (still a bit on walls)

$$\hookrightarrow \begin{cases} P_1 = 983.3 \\ P_2 = 982.0 \\ P_3 = 953.0/952.9 \end{cases}$$

02.09.2000

6	2.23			
8	4.69			
10	7.02	959.1		
~~13~~ 15	15.33	954.3		
18	23.23	952.6		
20	30.87	951.5		
22	42.58	950.6		
			1	2
23	52.29	950.2	983.3	982.0
24	1'07.77	949.9	–	–/1
246.25	1'29.02	949.8	–	982.0/1
25	2'11.55	949.6/7	983.3	982.0
251.5	3'16.70	949.6	–	982.0/981.9
same	4'17.96	949.5/6	983.2/3	981.9
same	5'22.52	949.4/5	983.1/2	981.9
252	14'48.80	949.2	983.0	981.7
252	16'50.36	949.1	983/982.9	981.7

ΔP ~ 34

T = 21°C

↳ closed 14H05

02.09.2000

02.09.00

Expt III

At 14H35

$P_1 = 982.4/3$
$P_2 = 981.2$
$P_3 = 982.4$
$T = 21°C$

↳ 15H05

$P_1 = 981.7/8$
$P_2 = 980.5/6$
$P_3 = 972.0/971.9$
$T = 21°C$
$h = 32$ mm

5	3.89	974.8		
7	11.23	973.2	981.7	980.5
9	29.83	972.1	981.7/8	980.5/6
95	47.43	971.9	981.7/8	980.6
96	1' 16.05	971.8	981.8	980.5/6
96.25	2' 22.14	971.8/9	981.7/8	–
96.5	4'36.61	971.8/7	981.7	980.5/6
96.5	11'02.02	971.6/7	981.6	980.4

↳ stop 11' 42.80 @ 15H20 21°

02.09.2000

Expr 112

02.03.08

AA 15H50

P_1 = 981.1/2
P_2 = 979.9/980.0
P_3 = 981.1/2
T = 21°C

AA 15H55

P_1 = 981.1/2
P_2 = 979.9
P_3 = 937.~~0~~/936.9
T = 21°C
h_0 = 32mm

07.03.08

5	1.01	
9	4.15	950.3
14	8.23	939.3
19	12.89	
24	18.67	929.9

02.09.2000

29	28.67	927.8		
31	34.35	927.1		
33	41.54	926.5		
34	47.19	926.2		
35	51.79	926.1		
36	59.29	925.8		
37	1'09.48	925.6	981.1 979.9	
38	1'26.26	925.4/5		
387.25	1'46.04	925.3	–	–
39	2'01.35	925.3	–	–
392.~~5~~	2'20.42	925.3/4	981.1/0 979.9/8	
393.~~5~~5 07.03.02	2'43.95	925.3	–	979.8/9
394.25	4'14.48	–	–	
same	7'23.17	925.3/4	981.0/980.9	979.6/7
same	12'51.26	925.3	–	–

↳ close 13'15.95 T=21°C 16H10

02.09.2000

Expt 113 -1

02.09.00

At 16 H 40

t 07.03.02

$P_1 = 980.6/7$
$P_2 = 979.5/4$
$P_3 =$ ~~985.3~~ $937.0/1$
$T = 22°C$
$h = 32$ mm

8	3.29			
11	5.93	951.0		
15	9.89	945.0		
19	15.14			
21	18.55	939.9		
24	24.87			
26	30.80	937.7		
28	39.83	936.8		
30	54.58	936.2	979.4/5	980.6
31	1'08.49	935.9	-	-5/=
32	1'39.02	935.7/8	979.4/5	980.5/6

02.09.2000

113-2

02.09.00

		(3)	(2)	(1)
323.5	2'22.46	935.7/8	979.4/5	980.5/6
same	4'54.67	935.8/9	979.4/5	980.5/6
—	8'21.27	935.7/8	~~979~~.3/4	980.5
	↳ stop			

02.09.2000

Expt 114-1

At 17 H25

P_1 = 980.3/4 mbar
P_2 = 979.2/3 mbar
P_3 = 961.2/3 mbar
T = 22°C
h = 32 mm

↳ P_3 959.5

			(1)	(2)
5	1.66			
7	4.78	967.3		
9	8.41	964.7		
11	13.03	962.9		
13	20.16	961.3		
14	25.22	960.7		
15	32.03	960.2		
16	45.59	959.7/8	980.4	979.3
165.25	1'03.19	959.6	980.3/4	979.3/
167.5	2'03.50	959.5	980.3/4	979.1
T=22°C same	3'38.63	959.5	980.3/4	979 2/3

02.09.2000

Expt 114-2

02.09.00

same	5'02.34	959.5/6	980.3/4	979.2/3
same	10'07.88	959.6	980.3	979.2

↳ closed

02.09.2000

Expt 115

02.09.00

~~At~~ 17H40

P_1 = 980.2/3
P_2 = 979.1/0
P_3 = 976.1/0
h = 32 mm
T = ~~25~~°C

4	2.12	977.6		
5	10.06	976.7		
54.5	20.59	976.5/6	980.3	979.1/2
56.5	51,21	976.4/5	980.2/3	–
–	2'26.12	976.4/5	980.3	979.1/2
–	4'41.21	976.4/5	980.3/4	979.1/2
–	5'26.37 (closed)	976.5	–	–

T = 21.5°C
17H50

02.09.2000

~~needs~~ $h_d = 110$ mm ~~eqt 76440~~ 07.03.02

$h_d = 243.5$mm → alten

→ such h_d v 110 / 150

~~$h_d = 150$~~ 07.03.02

200.5

02.09.2000

407 mm

~ 35 110 34 mbar 252 mm

~ 10 111 10 mbar 96.5 mm

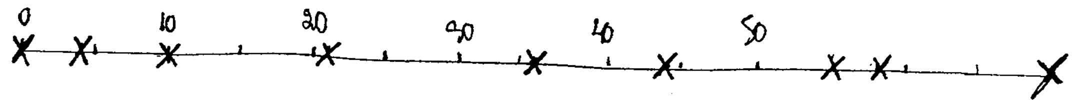
2.09.2000 ~ ~~20~~ 54 112 55 mbar

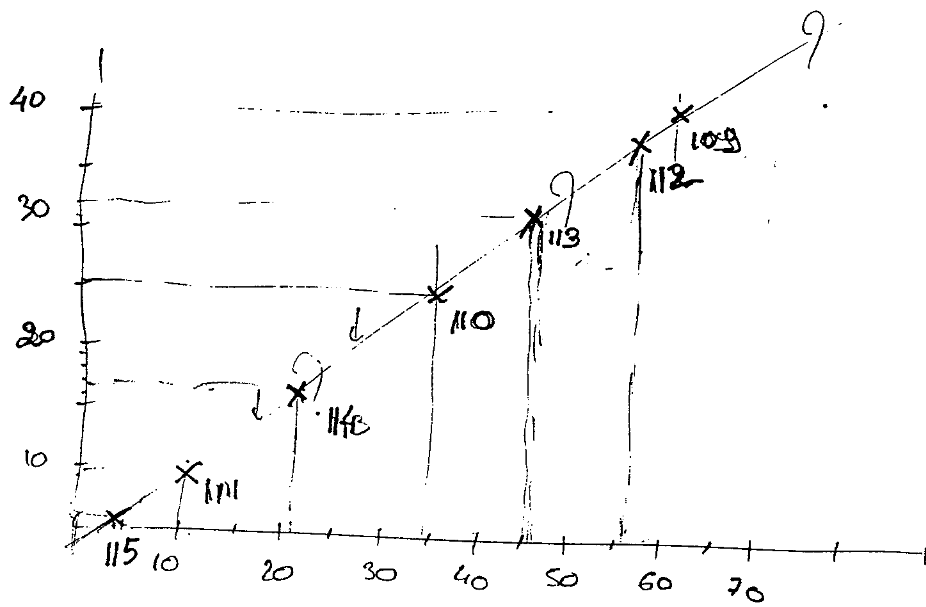
~ ~~20~~ ~~20~~ 45 113 44 mbar

~ ~~20~~ ~~45~~ 20 114 21 mbar

~ 70 115 4 mbar
116

↳ fill up w/ more GS





02.09.2000

02.09.00

Expt 116-1

~~At~~ 18H00

$P_1 =$ 980.3/4
$P_2 =$ 979.2/3
$P_3 =$ 915.5/6
$T =$ 21.5°C
$h_d =$ 32 mm

6	1.18	
9	3.49	952.9
15	7.93	935
20	11.93	
25	16.03	919
29	20.30	915.6
33	26.03	913.6
36	31.62	912.5/9
39	38.49	911.6/5
41		

02.09.2000

43 53.43 909.2

~ 56 ~ closed gate 909.2/3

18H02

$P_1 = 980.4/5$

$P_2 = 979.2/3$

$P_3 = 909.4/5$

check $h_{res} = H - 392.5$

$h_{dyke} = 32$ mm

At 18H25 $P_1 = 980.3/4$ $T = 21°C$

$P_2 = 979.1/2$

$P_3 = 980.3/4$

02.09.2000

02.09.00

In prep of expt
117 more GS added to reservoir

LL → $\begin{cases} h_{dike} = H - 315\,mm = 170 \\ h_{res} = 108\,mm \end{cases}$

07.03.02

18H40

prepare more GS at 5%

big 10l bottle = 3093. 6/7 g

+GS = 4255. 5/6 = 1161.9 g GS

07.03.02

58.095 H_2O

Th. Tot weight 4313.7

Real 4313. 8 g

07.03.02

02.09.2000

02.09.00

Expt 117

①

18H55

h_{res} = H − 31.5 cm = 170 mm

h_{dike} = 108 mm

T = 21.5°C

P_1 = 980.5/6

P_2 = 979.3/4

P_3 = 980.4/5

↳

P_1 = 980.4/5

P_2 = 979.3/4

P_3 = 970.~~7~~/[illegible]

07.03.02

02.09.2000

Expt 117 ②

02.09.00

Lab # = 522

12	3.49	973.2		
14	10.67	971.8		
15	16.27	971.4	980.5	979.3
16	24.58	970.8	980.4	979.3/4
17	42.77	970.4	980.5	979.4
173.75	1' 10.02	970.3	980.5	979.3/4
174.75	1' 41.89	970.2	980.4/5	979.3/4
175.5	2' 41.08	970.1/2	980.4/5	979.3
same	3' 57.33	–	–	–
176	5' 13.27	970.1	980.4/5	–
same	7' 17.93	970.0/1	980.5/4	979.3/4
same	8' 23.02	970.0/1	980.5	979.3/4
same	9' 45.39	970.0/1	980.5/6	–
–	10' 02.17 closed			

$P_1 = 980.5$
$P_2 = 979.3/4$
$P_3 = 969.3/4$
$T = 21°C$

19410

02.09.2000

Ar 19H15

$P_1 = 980.6/5$
$P_2 = 979.3/4$
$P_3 = 951.3/4$
$T = 21°C$
$h = 108.5 mm$

13	2.28	9663.9		
16	6.16	958.9		
19	10.91	955.2		
21	14.85	953.6		
23	19.57	952.1		
25	25.78/	951.1		
27	34.22	950.1		
29	47.69	949.3	979.4/80.6	
30	1'00.07	948.9	-	980.5/6
31	1'19.16	948.6	979.3/4	980.6
07.03.02 315 ~~317.25~~	1'43.66	948.5	979.3/4	980.5/6
317.5	2'26.34	948.4	979.3/4	–
same	3'25.59	948.4	–	–
317	4'32.47	948.4	–	–

02.09.2000

~~same~~ 318 7'31.88 948.4 979.3/4 980.5/6

07.03.02

348 9'14.37 – T= 21°C

– –

348 10'23,07 – – –

318 10'34.13
closed

$P_1 =$ 980.6/5
$P_2 =$ 979.3/4
$P_3 =$ 947.8
T= 21°C

19H30

02.09.2000

At 9H25

$P_1 = 983.6/7$
$P_2 = 982.2$
$P_3 = 983.6/7$
$T = 19°C$
$h_y = 108$ mm
$h_R = H - 315$

Expt 119-1

At 9H35

$P_1 = 983.7/8$
$P_2 = 982.3/4$
$P_3 = 963.9/964.0$
$T = 19°C$

12	2.13	971.6		
14	6.60	969.0		
16	4.54	967.4		
18	18.51	966.2		
19	23.42	965.7		
20	29.19	965.2		
21	37.57	964.8		
22	50.86	964.4	983.7	982.3/2
23	1'15.54	964.0/1	983.7/8	982.3

03.09.2000

Expt 119-2

		3	1	2
234.25	1'47.89	964.0	983.7/8	982.3
236 ~~235.75~~	2'17.45	964.0/963.9	983.7/8	982.2/3
07.03.09 236.25	2'57.92	964.0/963.9 T = 19 °C	983.6/7	982.2/3
same	4'14.01	964.0/963.9	983.7/8	982.3/4
same	6'25.69	964.0/1	983.7/6	982.2/3
same T = 19 °C	8'57.23	964.0/1	983.7	982.2/3
same	10'05.38	964.0/1	983.~~7~~	982.2/3

07.03.09

→ stop @ 10'20.57

→ $P_1 = 983,7$
$P_2 = 982.3/2$
$P_3 = 963.9$
$T = 19\,°C$

9H45

03.09.2000

Expt 120

At 9H55

$P_1 = 983.8/7$
$P_2 = 982.3/4$
$P_3 = 964.0/1$

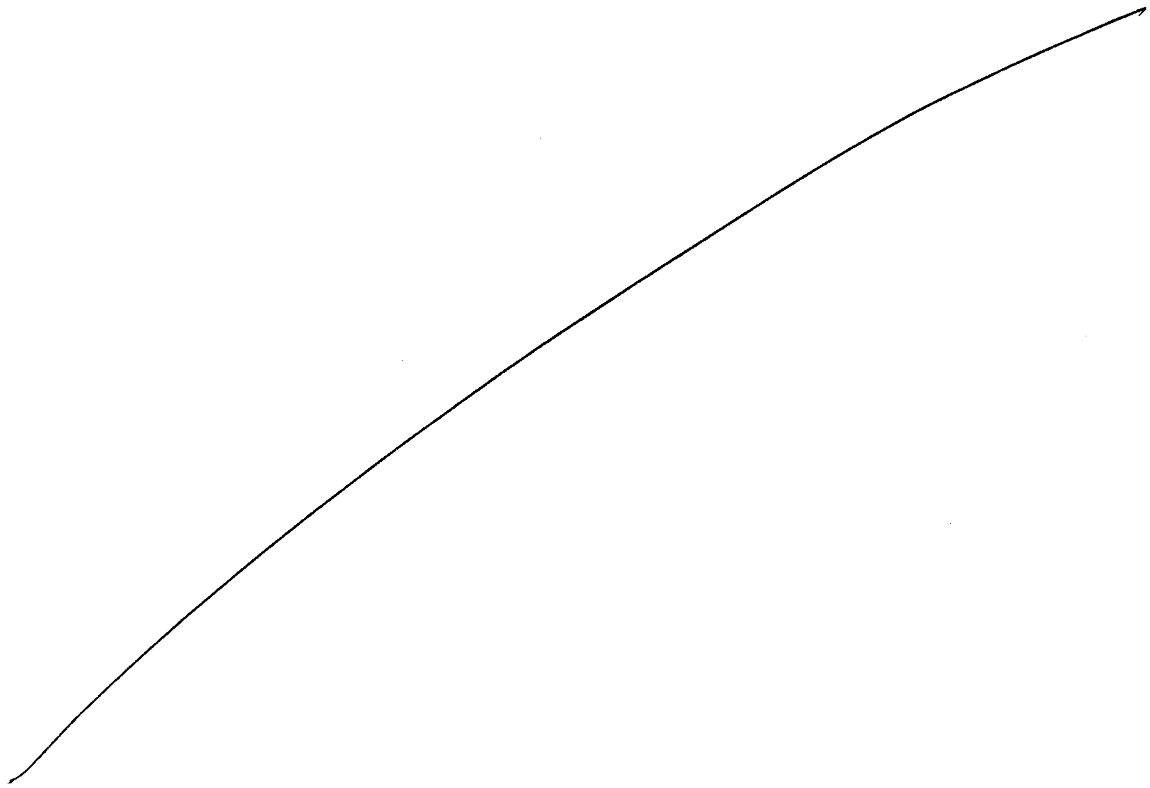
At 10H10

$P_1 = 983.8$ mbar
$P_2 = 982.5/4$ mbar
$P_3 = 978.9$ mbar
$h_d = 108$ mm
$T = 19°C$

12	7.05	979.5	982.4/5	983.7/8
13	18.43	979.3	–	–
134.75	29.52	979.2	982.5/4	983.8
138	52.33	979.1	982.5/4	983.8
139	1'30.39	979.0/1	–	–
same	2'09.43	979.0/1	982.5	–
same	2'55.87	–	982.4/5	983.7/8
same	3'53.55	979.0	–	–
same	6'05.36	–	982.5	983.7/8
same	7'23.00	–	982.4/5	–
same	8'10.03 ↳ closed	–	–	–

↳

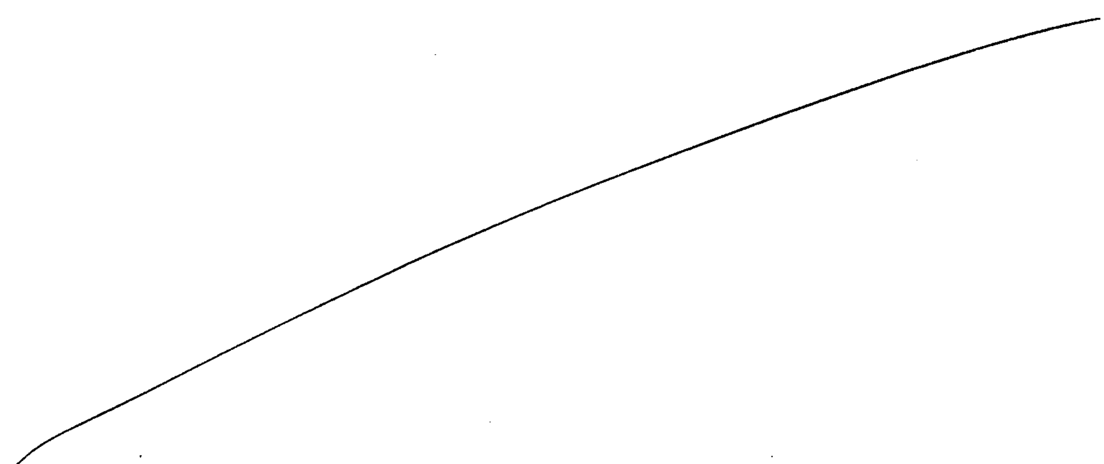
03.09.2000



gate closed

$P_1 = 983.8$
$P_2 = 982.4/5$
$P_3 = 978.9/979.0$
$T = 19.5\,°C$

10H20



03.09.2000

03.09.00

Expt 121-1

At 10H30

P_1 = 983.7/8 mbar
P_2 = 982.4/5 mbar
P_3 = 934.3 mbar
h_d = 108.5 mm
T = 19.5°C

13	1.77	954.7
18	6.08	949.7
24	12.87	~~93~~ 9.3
28	19.33	937.4
31	25.61	936.2
33	31.05	935.6
35	38.27	935.0
37	47.05	934.7
39	1'00.17	934.3
40	1'10.55	934.1
41	1'23.58	934.0

07.03.02

07.03.02

03.09.00

Expt 121-2

03.09.00

			③	②	①
	42	1'45.02	933.8	982 4/5	983.7
	42.75	2'05.67	933.7	982.5	983.7/8
	43	2'38.14	–	–	–
	(431.5 no) 432.5	3'24.39	–	982.5/6	983.8
	433.5	4'03.58	933.7/8	982.5	983.7/8
T=19.5°C	~~07.03.0~~ 434 (433.5)	5'22.14	933.8	982.5/4	–
	same	6'46.02	–	–	–
	same	8'47.14	–	982.5/6	–
T=20°C	Same	10'09.27	933.8/9	982.5/6	983.7/8
	same	12'21.49	–	–	–
	same	14'11.83	933.8	982.5	–

↳ close

↳ $P_1 = 983.7/8$
$P_2 = 982.5/6$
$P_3 = 933.8$
$T = 20°C$

at 10H45

03.09.2000

Expt 122-1

At 11H35

$P_1 = 983.3/4$ mbar
$P_2 = 982.2/3$ mbar
$P_3 = 943.5/6$ mbar
$h = 108.5$ mm
$T = 20°C$

13	1.95	960.1	
16	5.13	953.5	
20	9.83	949.9	
23	14.51	947.5	
26	20.48	946.3	
28	26.10	945.5	
30	33.23	944.8	
31	38.01	944.5	
32	43.45	944.1	
33	50.01	943.9	
34	58.26	943.7	
35	1' 10.86	943.5	982.1/2 983.2
36	1' 33.13	943.3	982.1/2 983.3

[redacted]

03.09.2000

Expt 122-2   03.09.00

36~~5~~.75	1'56.89	943.2	982.1/2	983.3
368.5	2'27.45	943.1/2	982.1/2	–
369.5	3'06.13	943.1/2	982.0/1	–
				T=20°C
same	4'23.42	943.1/2	–	–
same	5'25.07	–	982.1/2	983.3/4
same	7'06.79	–	982.0/1	–
same	8'41.01	9432.3	–	983.3
–	9'55.86	943.1/2	–	–
–	10'08.67	–	–	–

↳ close

11H45

↳ P_1 = 983.3
P_2 = 982.1/0
P_3 = 943.1/2
T = 20°C

03.09.2000

Expr 23-1

At 12H30, P_1 = 982.9 / 983.0 mbar
P_2 = 981.7 mbar
P_3 = 957.213 mbar
T = 20.5°C
h = 108 mm

12	1.66	968.5		
15	6.13	963.6		
18	12.03	961.3		
20	16.88	960.2		
22	23.97	959.1		
23	28.91			
24	34.66	958.1		
25	42.22	957.8		
26	53.66	957.5	981.6/7	982.9/8
27	1'16.37	957.2	981.7	982.9
274.5	1'44.41	957.1	981.6/7	982.8/9
276	2'23.66	957.0/1 T = 20.5°C	–	982.9
276.25	3'25.85	957.0/1	–	–

03.09.2000

Expt 123-2

03.09.00

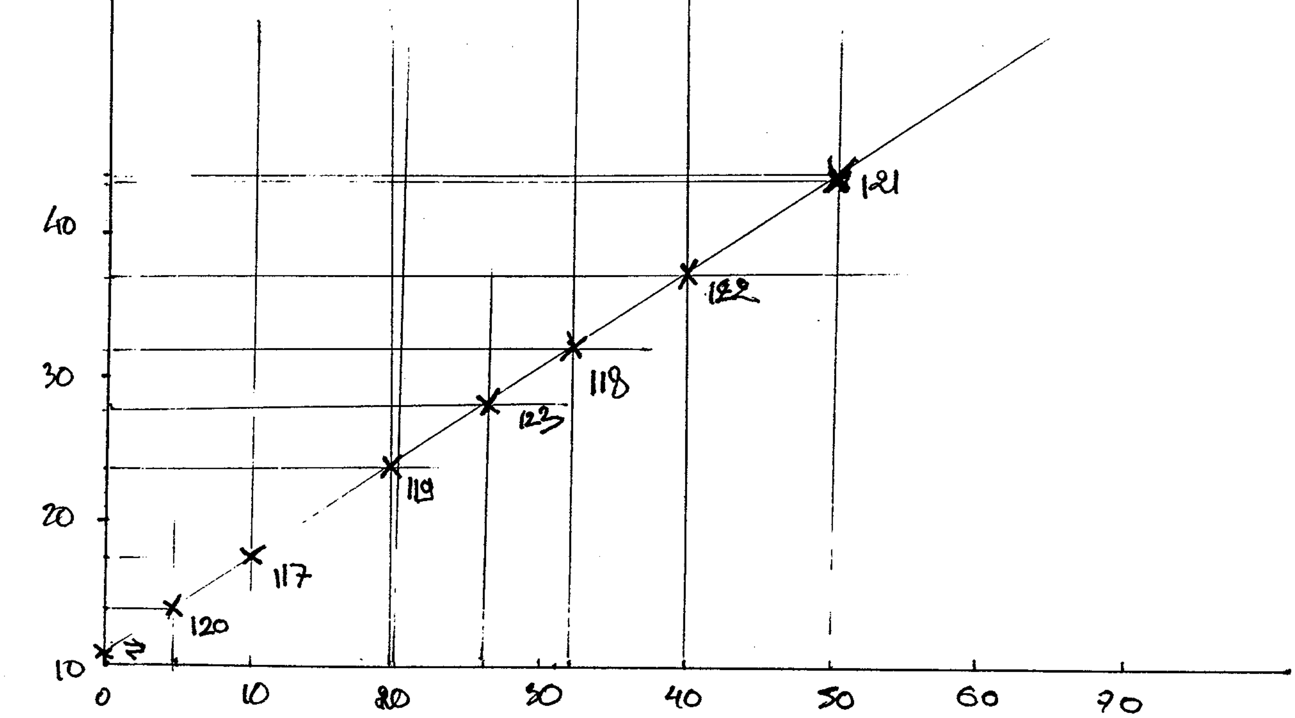
		③	②	①
276.5	4'35.47	957.1	981.7/6	982.9
same	6'48.03	957.0/1	981.7/6	982.8/9
same	7'35.34 T= 20.5°C	-	-	-
same	8'31.44	-	-	982.8
same	9'23.47	957.0	981.5/6	982.8
same	10'54.25	-	981.5/6	-
same	11'35.19 gate closed	-	-	-

↳ P_1 = 982.8 mbar
P_2 = 981.5/6 mbar
P_3 = 956.9/957.0 mbar
12H45 T= 20.5°C
h =
H_{res} = H -

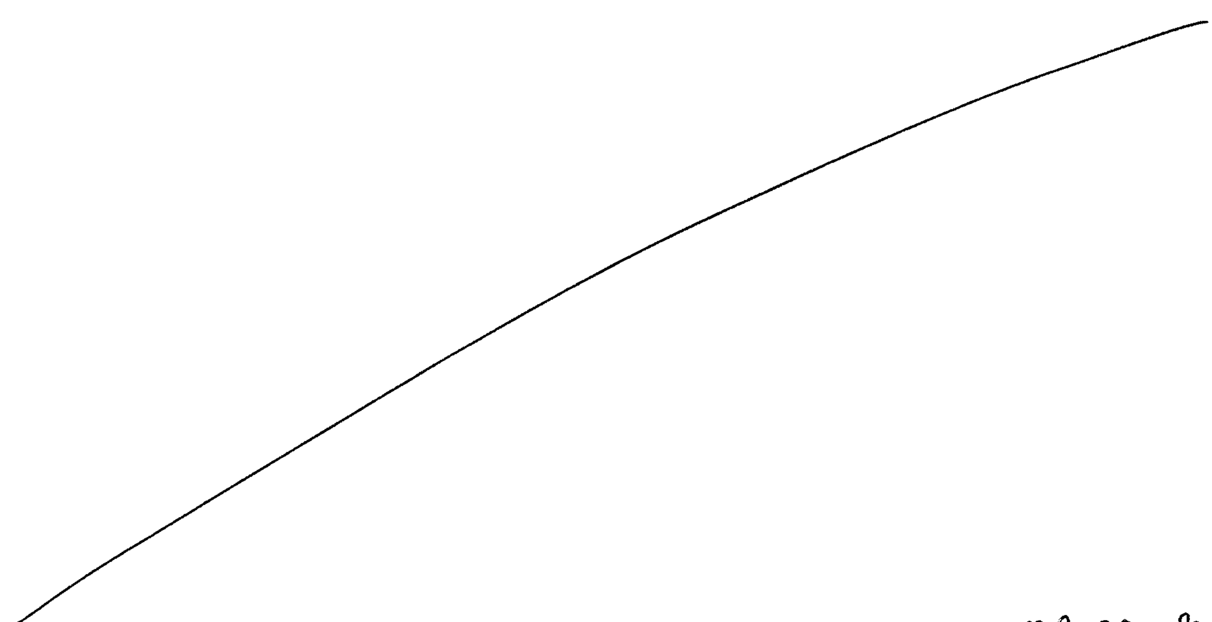
↳ tunnel expts
with h_{dike} = 108 mm

03.09.2000

~~6~~



02.09.00		117	10 mbar	
		118	32 mbar	~ 318 mm
03.09.00	~ ~~20~~	119	19.8 mbar	236 mm
	~ ~~15~~	120	4.8 mbar	139 mm
	~ ~~50~~	121	50 mbar	433.5 mm
	~ 40	122	40.2 mbar	369.5mm
	~ 25	123	26 mbar	276.5 mm



03.09.2000

Flow rate experiments
with DG815
(expt no 124 to 130)

06.09.200

Expt 124-0
DGS15

Wedn. 06.09.00

(i)

At 9H30

$P_1 = 983.5/6$
$P_2 = 982.4/5$
$P_3 = 983.7/8$
$T = 20\,°C$
$h_d =$ 149.5 to 150.5 mm
$h_{Res} =$ H − (279 to 280 mm)

Remove some DGS15 from reservoir & prepare for a dyke expt.

At 10H25

$P_1 = 983.8/9$
$P_2 = 982.6/7$
$P_3 = 984.0/983.9$
$T = 19.5°C$
$h_d =$ 105 mm ⇒ add a bit more
~~h_{Res}~~ N_2 gate = $\boxed{8[illegible]0 \text{ kPa} \; 810}$
07.03.02

At 10H55

$P_1 = 983.8$
07.03.02
$P_2 = 982.6/7$
$P_3 = 983.9/984.0$
$T = 19.5°C$
$h_d = 108$ mm
$h_{Res} =$ same as GSW5 = 170 mm

06.09.2000

Expt 12? DG315

②

At 11H15

P_1 = 983.8/9
P_2 = 982.6/5
P_3 = 963.4/5
h_d = 108 mm
T = 19.5°C

DG515

Video from 33:26:26

P_1 = 983.9/984.0
P_2 = 982.7
P_3 = 963.2/3
T = 19.5°C

at 11H20

15	2.71	975.0		
18	7.09	970.6		
20	10.71	968.2		
22	15.56	966.0		
~~23~~	19.65	964.5		
24	26.49	963.8		
248.75	45.47	963.1	961.7/8	983.8
249.00 (75)	1'45.15	963.1	961.8	983.8/9
249.~~00~~ (25	3'25.93	963.1	961.8	983.8/9
same	5'20.33	963.1/2	961.8/9	983.8

06.09.2000

Expr 124-2
DG815

06.09.00
3

249 (.25) 6'23.74 963.1/0 961.8 983.8.

249 (.25) 6'41.68 closed

NH30

P_1 = 983.8
P_2 = 964.4/5
P_3 = 962.1
T = 19.5° C

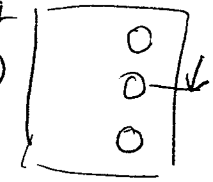
06.09.2000

Expt 125-1
DGSIS

At 11H55

$P_1 = 983.5/4$
$P_2 = 981.8.9$
$P_3 = 943.5/6$ → had to readjust after closing a valve in circuit
$T = 19.5°C$
$h = 108$ mm

(942.8)



↳ $P_3 = 943.7/8$

15	1.01	973.5		
19	4.69	966.9		
25	9.95	958.0		
30	15.54	950.4		
34	22.23	946.6		
36	28.45	944.8	943.9	
37	35.13	944	942.8	
37.6 (25, or 37.65)	47.60	943.7	942.4	983.4/5
"	1'19.19	943.8/7	942.6/7	983.4/5
"	2'09.60	943.8/9	942.7/8	983.4/5

06.09.2000

Expt 125-2
DGS15

⑤

376.5 (or .25) same | 3'40.42 5'14.83 | 943.8/9 – | 942.7/6 – | 983.3/4 –

↳ closure

12 M 10

$P_1 = 983.3/4$

~~$P_2 = 946$~~ $P_2 =$ ~~982.2~~ 982.2/3

$P_3 = 942.5/4$

T= 19.5°C

~~6~~ 07.03.02

06.09.2000

Expt 126-1

⑥

Ar 12H30

$P_1 = 983.1/0$
$P_2 = 982.1/0$
$P_3 = 953.3/2$
$T = 20°C$
$h_d = 108$ mm

15	1.69	973.5		
19	5.85	967.3		
23	10.57	961.9		
26	15.50	957.9		
28	20.63	956.0		
29	24.94	955.1		
30	32.16	954.3		
305	42.53	953.9	952.9	983.0/1
306	1'03.53	953.9/954.0	952.9 953.0	983.1/0
305.5	1'56.82	954.0/1	953.0/1	983.0/1
305.5	2'31.37	–	–	–
305.5	3'45.78	–	–	–
–	4'18.31	954.1	953.1	983.0/1

06.09.2000

Expt 126-2
DGS15

(7)

		P3	P2	P1
305.5	4'47.37	954.1/0	953.0/1	983.0/1

closure

12H35

$P_1 = 983.0/1$
$P_3 = 952.9/953.0$ 06.09.00
$T = 20°C$
$P_2 = 981.9 / 982.0$

06.09.2000

Expr 127-1
DGS15

(8)

At 12H55

$P_1 = 982.7/8$
$P_2 = 981.6$
$P_3 = 972.8/9$
$T = 20°C$
$h = 108$ mm

13	2.15			
15	6.56	975.7		
16	10,47	974.6		
17	20.27	973.6	972.2/3	
172	31.93	973.3/4	972.0/1	982.7
172.5	1'04.27	973.2/3	972.0/1	982.7
-	1'49.18	-	-	982.6/7
-	2'29.62	-	-	-
-	3'06.03	-	972.0/1	-
-	3'49.43	973.2	971.9/972.0	982.6
-	4'25.18	-	-	-
-	4'47.71	-	-	

↳ closure ⇒ $P_1 = 982.6/7$ $P_3 = 972.7$ T=20
13H00

06.09.2000

Expt 128

DGS15

At 13H10

$P_1 = 982.4/5$
$P_2 = 981.4/3$
$P_3 = 977.3/4$
$T = 20.5°C$
$h = 108$ mm

12	0.96			
13	4.58	~~978.2~~		
14	13.14	977.6	976.3	
142	23.23	977.5	976.2	982.4
142.5	53.83	977.4/5	976.2/3	982.4
142.5	1'24.93	–	–	–
–	1'57.33	–	–	982.4/5
–	2'27.02	–	–	–
–	3'14.08	977.4	976.1/2	982.3/4
–	3'52.55	–	–	–

closure $\Rightarrow$

$P_1 = 982.3/4$
$P_3 = 977.3$ $P_2 = 976.8/9$
$T = 20°C$

13H15

06.09.2000

Expt 129-1

DGS15

At 13H25

$P_1 = 982.2$
$P_2 = 981.2$
$P_3 = 932.8/9$
$T = 20°C$
$h = 108$ mm

Ready
$P_1 = 982.2/3$
$P_2 = 981.1$
$P_3 = 933.0$

15	0.65	
19	4.18	965.7
24	8.15	957.4
29	12.81	949.0
34	17.65	943.9
39	22.59	937.8
41	28.18	935.3
43	34.90	932.9

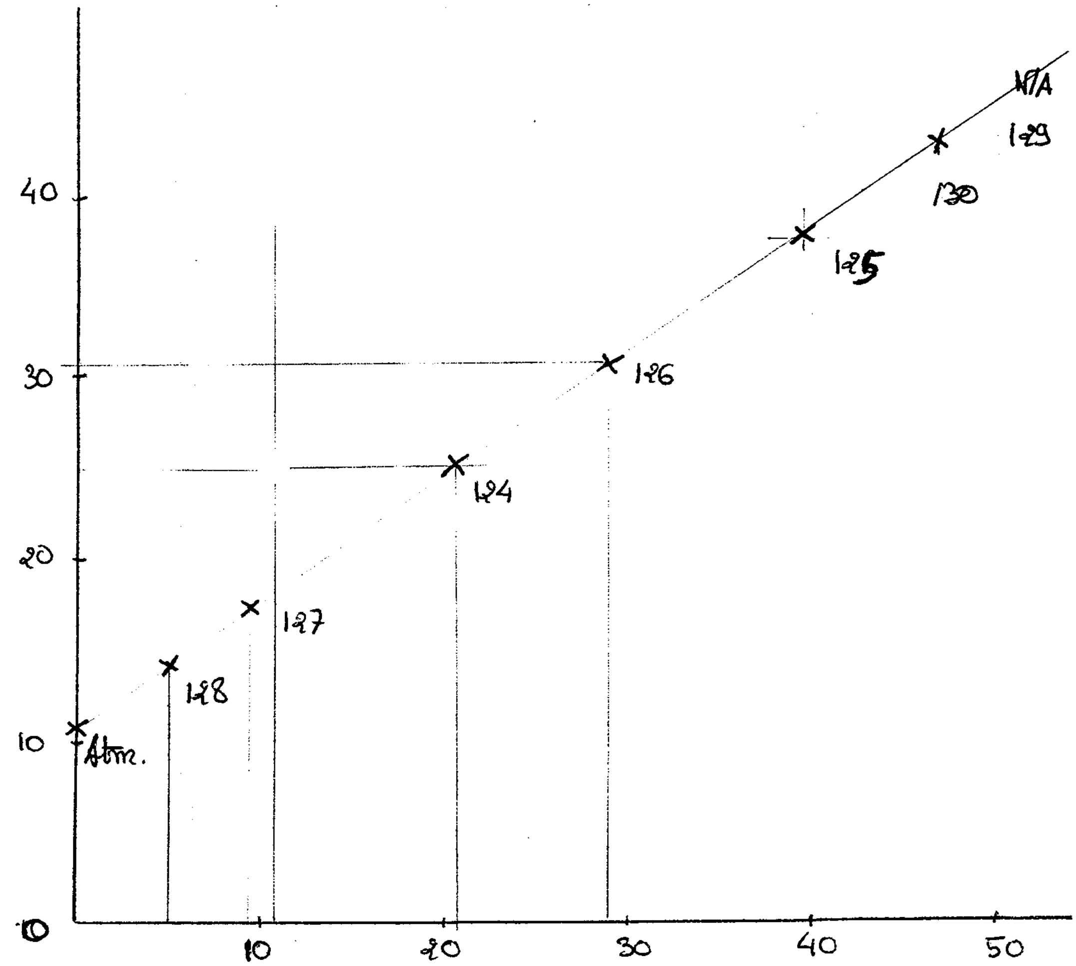
closedgate 40.47

$P_1 = 982.2$
$P_3 = 932.2$

13H35
$T = 20.5°C$

06.09.2000

DG815



Expt#	ΔP(mbar)	h(mm)
124	20.7	249
125	39.5	376.5
126	29.0	305.5
127	9.4	172.5
128	5.0	142.5
129	~ 50.0	N/A

Expt#	ΔP(mbar)	h(mm)
130	46.8	425.5

06.09.2000

Expr 130 - 1
DGS 15

(11)

15HD5

$P_1 = 980.8/9$
$P_2 = 979.7/8$
$P_3 = 944.8/9$ → readjust to 945.7/8
$T = 21°C$
$h = 108$ mm

$\Delta P = 35!$
No
↓
readjust
to 935.7/8 mbar

~~$P_3 = 945.8/9$~~ 07.03.02

15H10

$P_1 = 980.7/8$
$P_2 = 979.7$
$P_3 = 935.6/7$
$T = 21°C$

06.09.2000

Expt 130-2
D6S15

15	.088			
20	5.13	962.4		
25	9.41	954.7		
30	14.19	947.0		
35	19.85	940.6		
39	26.63	936.7		
41	32.75	934.9	933.8	
42	39.09	934.0	933.1	
427.5	54.37	933.7	932.7	980.8/7
427	1'26.22	933.8/9	932.9/933.0	980.7/8
426.5	2'24.34	933.9/934.0	933.1/0	–
425.5	3'06.69	934.0	933.1/2	–
–	3'37.34	934.0	933.1/2	980.7/8
–	4'00.78	–	–	–
–	4'31.91	934.0/1	933.1/2	–
–	4'48.13	–	–	–

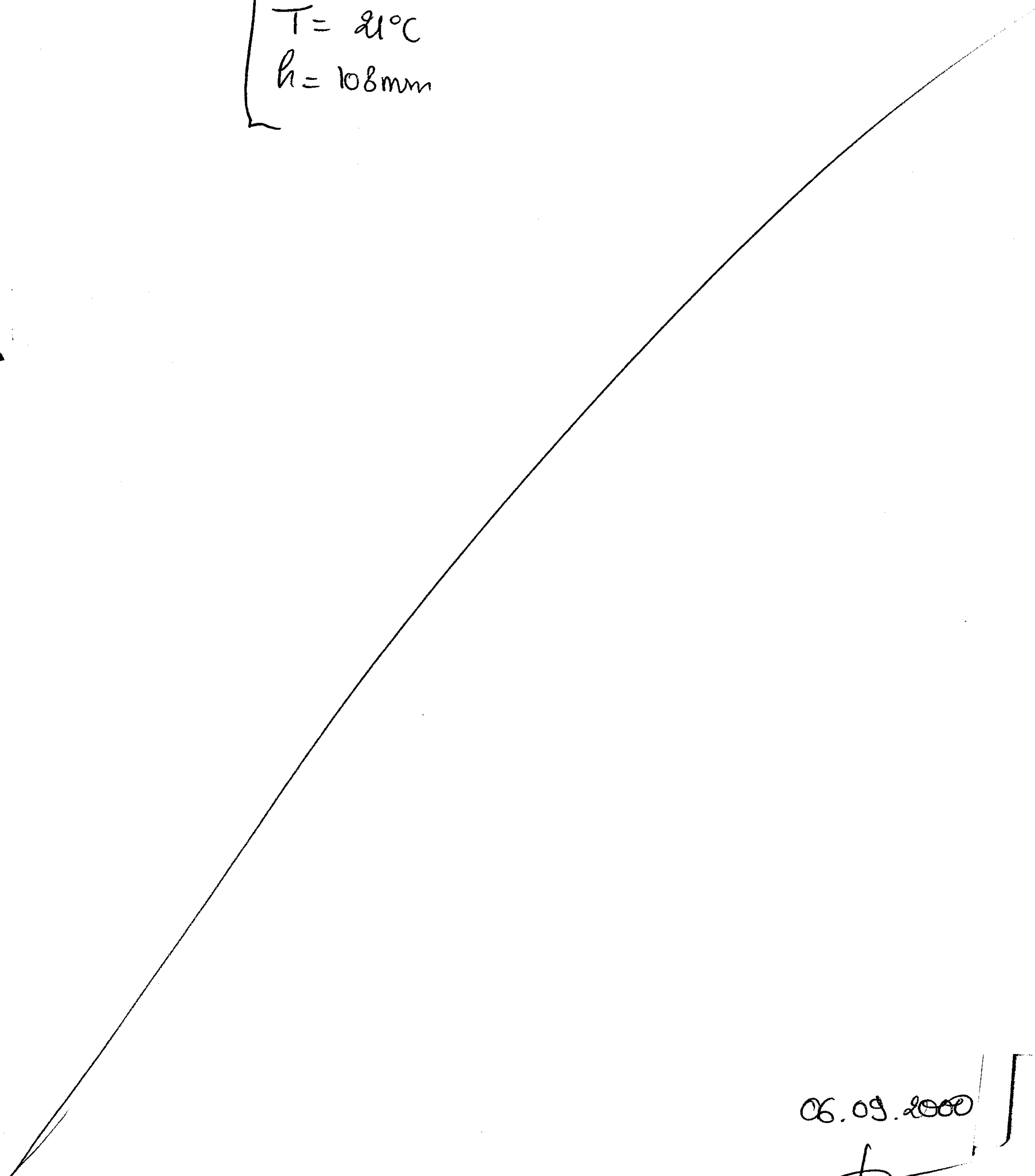
↳ closure ⇒ $P_1 = 980.7/6$ $P_3 = 932.3/4$
$P_2 = 940.3/4$ $T = 21\,°C$

06.09.2000

Expt 130-3
DGS15

15H20

$P_1 = 980.6/7$
$P_2 = 979.6/7$
$P_3 = 980.8$
$T = 21°C$
$h = 108mm$



06.09.2000

re 1/15/2002

187

re = Rebecca Emmot

Tunnel experiments
with pure golden syrup
(expt no D to 34)

188
re
1/15/2002

11.07.1999

11.07.1999

189
re 1/15/2002

Tunnel 650 (video)

At atmospheric pressure

GS level in reservoir = H - 150 mm
GS level in dyke = 272 mm
T = 23.4°C

Tunnel visible length = 372.5 mm
Tunnel visible part marked every 20 mm

For the experiment

$V_{reservoir} = 0$
$V_{dyke} = 33$ mbar
$V_{tunnel} = 80$ mbar

Reservoir valve left opened, dyke valve closed

Mark	Time
2	5.63
10	12.57
12	28.00 (?)
14	40.59
16	55.88
18	1'07.22
22	1'35.44

$V_{tunnel} = 50$ mbar

$V_{tunnel} = 50$ mbar
$V_{dyke} = 36$ mbar) ?!!!

07.03.02

After 3' ~~23~~, h_{GS} at tunnel entrance = 23 mm

Valve closed at 5' 19.48 $\Rightarrow$ $V_{tunnel} = 46$ mbar

190
re 1/15/2002

Tunnel GS 1 (video)

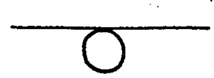
| GS height in reservoir $= H - 170.5$ mm $= 315$ (485 written above H)
| GS height in dyke $= 250.5$ mm

at atmospheric pressure

For the experiment

$V_{reservoir} = 0$
$V_{dyke} = 36$ mbar
$V_{tunnel} = 100$ mbar

Reservoir valve left opened, dyke valve closed
level of GS in dyke at the top of the gate

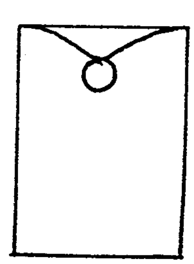


$\Rightarrow h =$

$T = ?$

Gate opened at $t_0 = 0$ $\Rightarrow$ initial vacuum drop in tunnel
back to 96 mbar at 3"87

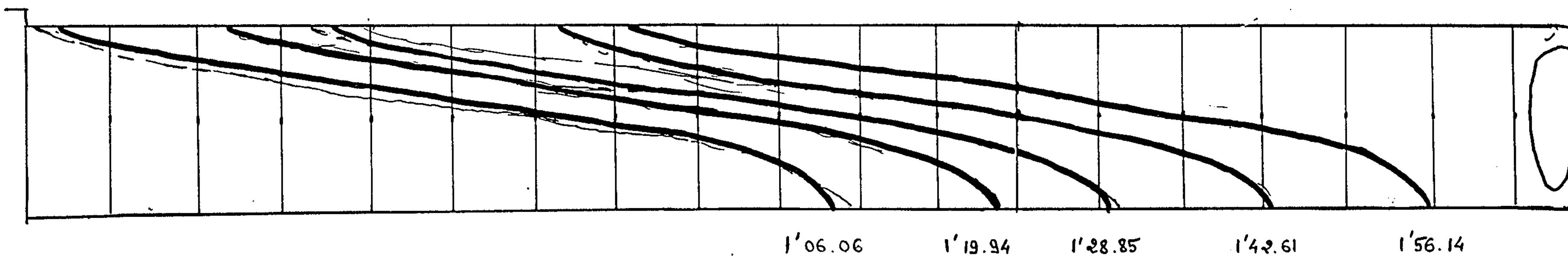
Gate closed at 2' 16.33 $\Rightarrow$ $V_{tunnel} = 51$ mbar
Valve



15.07.1999

Tunnel GSI - 100 mbar vacuum

P = 900 mbar



191
re 1/15/200

20.07.1999

192
re 1/15/2002

Tunnel GS1

Red marks on screen (black marks on tunnel)		Bottom		Top
1		13.47	13.26	1' 11.69
2		18.53	18.17	1' 18.01
3		23.13	23.35	1' 24.89
4		29.03	29.45	1' 33.32
5		35.09	35.07	1' 39.89
6		41.37	41.42	1' 44.92
7		47.44	47.86	1' 49.51
8	(not visible)	54.66	55.54	1' 55.17
9		1' 01.91	1' 02.13	2' 06.01
10		1' 08.03		2' 13.76
11		1' 14.72		
12		1' 21.34		
13		1' 28.19		
14		1' 34.19		
15		1' 41.31		
16		1' 48.37		
17		1' 56.03		
18		2' 03.28		

20.07.1999

Flow front profile	Time	
1	1'06.06	
2	1'19.82	1'20.06
3	1'29.22	1'28.47
4	1'42.94	1'42.27
5	1'55.91	1'56.37

20.07.1999

194
re 1/15/2002

20.07.1999

195
re 1/15/2002

Tunnel GS2 (video)

GS height in dyke = 241 mm
at atmospheric pressure

For the experiment

$V_{reservoir} = 0$
$V_{dyke} = 36$ mbar
$V_{tunnel} = 50.5$ mbar

Reservoir valve left opened, dyke valve closed
Level of GS in dyke at the top of the gate

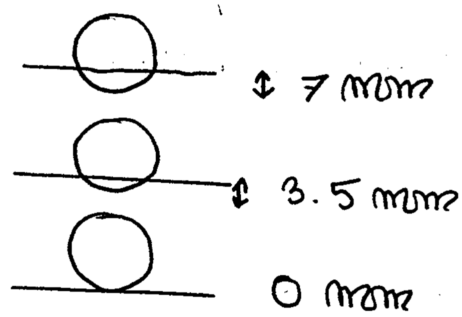
$\Rightarrow h =$

T = ?

Gate opened at $t_0 = 0$ $\Rightarrow$ initial vacuum drop in tunnel back to 44 mbar after 4"76

15.07.1999

Mark	Time
6	1'06.73
8	1'56.17
10	3'07.07
12	5'42.45
14	10'11.63



Gate closed at 10'44.17 $\Longrightarrow$ $\left| \begin{array}{l} V_{tunnel} = 47 \text{ mbar} \\ V_{dyke} = 36 \text{ mbar} \end{array} \right.$

15.07.1999

Tunnel GS3 (video)

GS height in dyke = 240 mm
at atmospheric pressure

For the experiment

$V_{reservoir} = 0$

$V_{dyke} = 36$ mbar

$V_{tunnel} = 81$ mbar

Reservoir valve left opened, dyke valve closed
level of GS in dyke at the top of the tunnel entrance

$\Rightarrow h =$

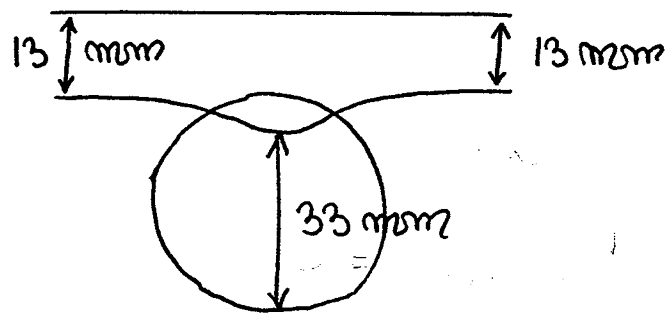
T = 22.7° C

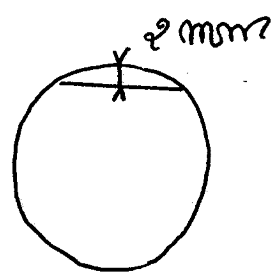
Gate opened at $t_0 = 0$ $\Longrightarrow$ initial vacuum drop in tunnel
back to 72 mbar at 4"37

15.07.1999

Mark	Time
2	13.75
6	29.57
8	36.07
10	44.94
12	54.53
	1' 13.25
-2	3'03.07
s reached nd of tunnel	~ 3' 27

P_{tunnel} = 73 mbar





Tunnel valve closed at 3' 50" 13

15.07.1999

19.07.1999

Tunnel GS 4 (video)

GS height in reservoir = H - 183 mm
GS height in dyke = 240 mm

at atmospheric pressure

For the experiment,

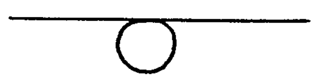
$V_{reservoir} = 0$

$V_{dyke} = 36$ mbar

$V_{tunnel} = 200$ mbar

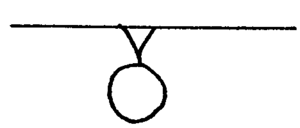
Reservoir valve left opened, dyke valve closed.

Level of GS in dyke at the top of the tunnel entrance

 $\Rightarrow h =$

$T = 20.3°C$

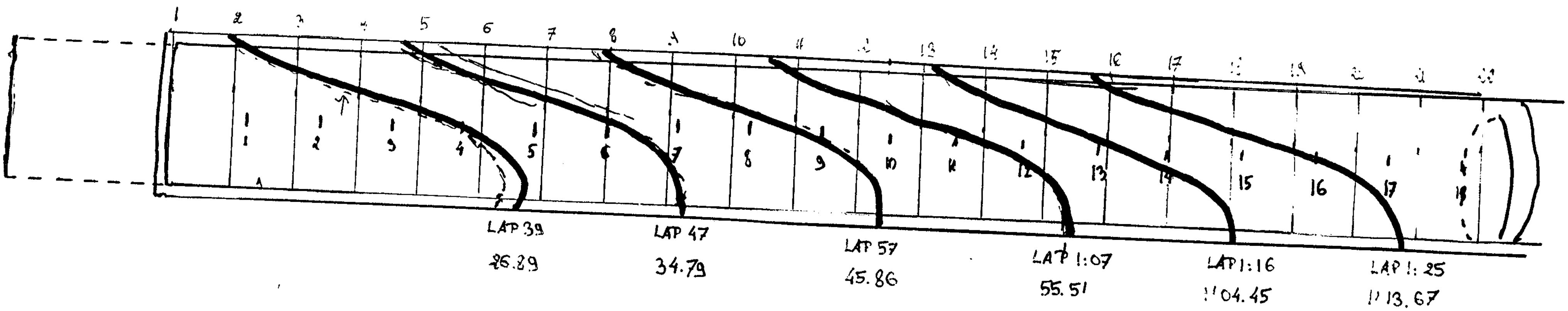
Gate opened at $t_0 = 0$ - Tunnel valve closed after 1' 18.80

$\Rightarrow$ 

19.07.1999

Tunnel GS4 - 200 mbar vacuum

T = 800 mbar



re 1/15/2002

20.07.1999

Tunnel GS 4

201 ~~15~~
re 1/15/200

Red marks on screen	Bottom		Top
1	~~7.15~~ 6.74		24.24
2	9.45		26.47
3	12.76	20.07.99	28.97
4	16.89		32.09
5	20.29		35.18
6	23.73		37.56
7	27.04		40.30
8	30.10		45.59
9	33.29		48.49
10	36.35		52.15
11	40.10		55.71
12	43.17		59.18
13	46.67		1'03.18
14	49.89		1'06.65
15	53.35		1'10.53
16	56.48		1'14.15
17	1'00.01		1'17.47
18	1'03.45		
19	1'06.79		
20	1'10.04		
21	1'13.29		
22	1'16.83		

20.07.1999

Flow front profile	Time
1	26.89
2	34.79
3	45.86
4	55.51
5	1' 04.45
6	1' 13.67

20.07.1999

19.07.1999

203 ~~17~~

re 1/15/200:

Tunnel GS 5 (video)

GS height in reservoir = H - 188 mm
GS height in dyke = 248 mm

at atmospheric pressure

For the experiment,

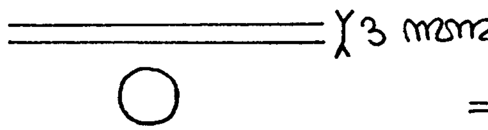
$V_{reservoir} = 0$ $\quad$ $P_{reservoir} = 1000$ mbar (1013.25 mbar !)

$V_{dyke} = 36$ mbar

$V_{tunnel} = 400$ mbar

Reservoir valve left opened, dyke valve closed.

Level of GS in dyke above tunnel entrance:



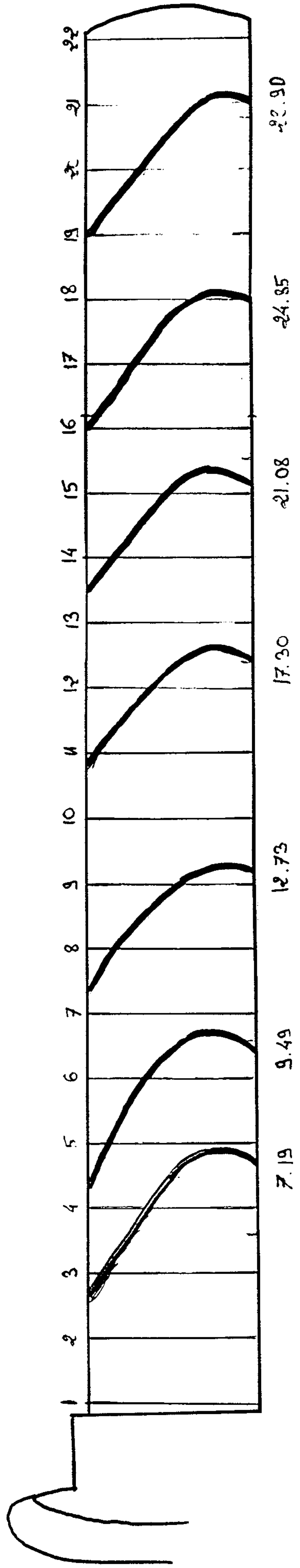
$\Rightarrow h =$

T = 20.7°C

Gate opened at $t_0 = 0$ - Tunnel valve closed after 31"07.

19.07.1999

re 1/15/2002



GS5 - 400 mbar vacuum

P = 600 mbar

19.07.1999

20.07.1999
205 ~~15~~
re 1/15/200

Tunnel GS5

Red marks on screen	Bottom	Nose	Top
1	2.11	2.05	4.35
2	3.19	3.13	6.47
3	3.96	3.88	7.57
4	5.37	5.23	9.27
5	7.14	7.10	10.50
6	8.72	8.47	11.70
7	9.80	9.69	13.07
8	11.31	11.03	14.38
9	12.33	12.35	15.69
10	13.08	13.59	17.01
11	15.17	15.07	18.69
12	16.66	16.25	19.95
13	17.83	17.69	21.50
14	19.41	18.91	22.69
15	20.55	20.32	24.31
16	22.03	21.75	25.60
17	23.23	23.17	27.09
18	24.75	24.50	28.23
19	25.93	25.86	29.85
20	27.34	27.25	30.92
21	28.58	28.57	
22	30.19	30.29	

20.07.1999

Flow front profile	Time			
1	7.27	7.19	7.12	
2	9.52	9.54	9.40	
3	12.77	12.76	12.65	
4	17.43	17.26	17.21	
5	21.11	21.17	21.09	20.93
6	24.93	24.76	24.77	24.93
7	28.89	28.92	28.93	28.87

20.07.1999

19.07.1999
207 ~~[illegible]~~
re 1/15/2002

Tunnel GS 5 (video)

GS height in reservoir = H − 180 mm
GS height in dyke = 244 mm

at atmospheric pressure

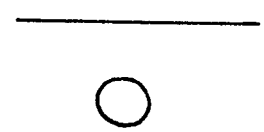
For the experiment,

$V_{reservoir} = 0$

$V_{dyke} = 36$ mbar

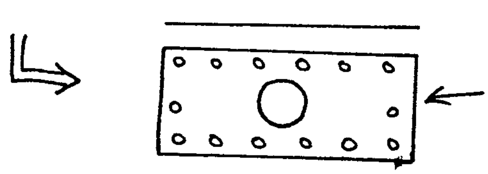
$V_{tunnel} = 800$ mbar

Reservoir valve left opened, dyke valve closed.
Level of GS in dyke at the top of the dyke



$T = 20.8°C$

Gate opened at $t_0 = 0$ − Tunnel valve closed after 16″ 18

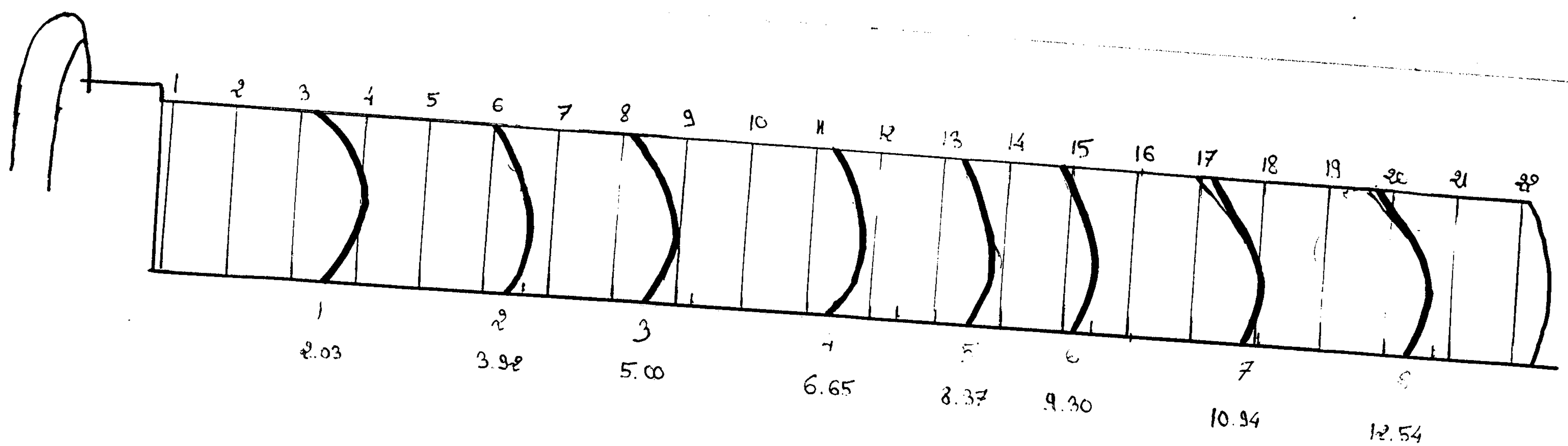


19.07.1999

re 1/15/2002

Tunnel GS6 - 800 mbar vacuum

P = 200 mbar



20.07.1999

20.07.1999
209 ~~23~~
re 1/15/200

Tunnel GS 6

Red marks on screen	Time			
2	1.57	1.54[x]		
3	1.68[(1)]			
4	2.08[(*)]	2.03[+]		
5	2.46[(2)]	2.50[B]		
6	3.45			
7	4.07[(3)]	4.19[o]	4.23[x]	4.23[A]
8	4.67[(2)]	4.63[+]		
9	5.01[(1)]			
10	5.77	5.82[B]		
11	6.24[(*)]			
12	6.75[(3)]	6.75	7.01[x]	7.04[A]
13	7.84[(1)]	7.89[o]	7.72[+]	
14	8.41[(2)]			
15	9.03	9.16[B]		
16	9.69[(3)]	9.78[(*)]	9.69[x]	
17	10.31			
18	10.82	11.01[A]		
19	11.46[(1)]			
20	12.17[(2)]	12.19[x]	12.19[B]	
21	12.69[(3)]			
22	13.40[(*)]	13.42[A]		

20.07.1999

Flow front profile			Time			
1	2.02		2.03	2.04		
2	4.02	3.93	3.86		3.87	
3	5.02		5.03	4.95		
4	6.73	6.59			6.55	6.73
5	8.33		8.50	8.23	8.42	
6	9.43				9.11	9.36
7		10.87	10.92	11.04		
8	12.58	12.67	12.53		12.36	

20.07.1999

20.07.1999
211 ~~25~~
re 1/15/2002

Tunnel marks positions for GS1

	On screen	
1	21	
		22.25
2	43.25	
		21.25
3	64.5	
		22.75
4	87.25	
		21
5	108.25	
		21.25
6	129.5	
		20.25
7	149.75	
		21.25
8	171	
		20.75
9	191.75	
		20.5
10	212.25	
		19.75
11	232	
		20.25
12	252.25	
		21.5
13	273.75	
		21.75
14	295.5	
		20.5
15	316	
		21.5
16	337.5	
		23
17	360.5	
		21.5
18	382	

⟹ 21.24 average
20 real

↳ 1mm screen = 0.9418

scale

20.07.1999

Tunnel diametre on screen = 48 mm

20.07.1999

213 ~~27~~
re 1/15/200.

Red marks positions for GS4/GS5/GS6

calculated with scale 1 : 1. 1604

	On screen	Real (from gate)
1	2.25	32.6109 ↳ add 30 mm
2	17.25	
3	32.25	
4	47.25	
5	62.25	
6	77.25	
7	92.25	
8	107.25	
9	122.25	
10	137.25	
11	152.25	
12	167.25	
13	182.25	
14	197.25	
15	212.25	
16	227.25	
17	242.25	
18	257.25	
19	272.25	
20	287.25	
21	302.25	
22	317.25	

20.07.1999

Tunnel visible length on screen = ~~319~~ 325 mm (ad

(real 372.5mm) ← add 30 mm for gate

Tunnel diametre on screen = ~~3~~38.5 mm

(real 40mm)

screen	real
1 mm	1.1677
	1.0389 !

Black marks on tunnel (on screen) — Real (measured on tunnel)

1	20.5	
		17.75
2	38.25	
		17.25
3	55.5	
		17.0
4	72.5	
		17.5
5	90	
		17.25
6	107.25	
		16.75
7	124	
		17
8	141	
		17.5
9	158.5	
		16.5
10	175	
		15.5
11	190.5	
		16.5
12	207	
		18
13	225	
		16.5
14	241.5	
		18.5
15	260	
		17.5
16	277.5	
		17.5
17	295	
		18.5
18	318.5	

⟶ average 17.24

real 20

↳ 1 mm screen = 1.1604

Scale

~~t~~ 07.03.02

20.07.1999

(GS7)

4-9-99 215 ~~99~~
re 1/15/2002

H - 260.5 mm = reservoir

at atm

dyke = 165 mm

GS7.avi whole
GS7.avi frame
-6800 → 0
(6.8s)

dyke 36 mbar

34~~3~~ MB

V_{tunnel} = ~~1~~000 mbar

~~to~~ 07.03.02

levelled

record rate
1000

V_{reser} = 0

V_{dyke} = ~~36~~ ~~?~~ ~~to~~ 07.03.02
58.5

T = 20.9

6mm
lens

valve reservoir closed! => $P_{reser} \neq$ cste (atm)

GS8

H - 168 mm = reservoir
dyke 253 mm

atm

record rate
1000 6mm lens

16H15 T = 21.3 °C

GS8.avi
308 MB

V_{res} = atm

Dyke 40 mbar

top — GS
0

P_{tunnel} = 0 mbar

04.09.1999

re 1/15/2002 GS 9

res = H − 179 mm

dyke 249 mm

P_{res} = atm

P_{tunnel} = 600 mbar

V_{dyke} = 40 mbar

17H30

T = 20.7 °C → h_{res} = H − 206 mm

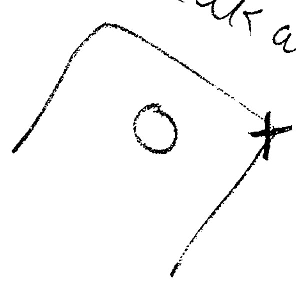
~~0~~ 04.09.99

zoom lens 12.5 mm / 10

250 E → 32.8

→ 23.4 °C (use of light)

didn't press button of camera (beginning wipe out!)



leak at top of tank

→ to redo

→ h = H − 234 mm reservoir

04.09.1999

GS9.avi 94M

21 / 21
re 1/15/200:

GS10 res = H − 186 mm
dyke = 240 mm

P_{res} = ~~atm~~

18H00

P_{tunnel} = 600

V_{dyke} = 40

T= → res H − 214 mm

- camera same as GS 9

↳ 23.6°C (temp)
after

163K

04.09.1999

GSH re 1/15/2002

14 410

$h_{dyke} = 267$ mm

$h_{res} = H - 156$ mm

zoom lens (12.5 mm) open at 2
no secondary light
250 E (resolu: 240 x 210)

T = 22.1 °C

V_{dyke} = 36 mbar GS to the top

few bubbles v. small (< 1 mm Ø) homogeneously distri

$\hookrightarrow h_{res} = H - 182$ mm

V_{tunnel} = 600 mbar

$\hookrightarrow H - 210 = h_{res\,final}$

save in GSH.avi 209 Mb

05.09.1999

GS 12

re 1/15/2007

$h_{dyke} = 273$ mm

$h_{res} = H - 155$ mm   15H20

{ zoom lens (12.5mm) open at 2.8
secondary light (photon beard redhead lamphead)
1000 (240x210)

$T = 22.\cancel{4}$°C without light (before exp)

$V_{dyke} = 36$ mbar   GS to top

↳ $h_{res} = H - 179$ mm

$V_{tunnel} = 1000$ mbar

↳ $H - 208 = h_{res\ final}$

$T = 22.6$°C

save in GS12.avi (413 Mb)

let camera running too long

↳ missed start!

05.09.1999

GS13

$h_{dyke} = 269$ mm

$h_{res} = H - 158$ mm

H10

{ zoom lens (12.5 mm) open at > 4
secondary light
500 E (240 x 210)

$T = 22.~~7~~°C$

- $V_{dyke} = 36$ mbar G8 to top

(will prob. have a leak
↳ due to clean)

↳ $h_{res} = H - 184$ mm

$V_{tunnel} = 100$ mbar

↳ $h_{res} = H - 212$ mm

- $T = 22.8°C$

save in GS13.avi
(206 Mb)

had a leak
(gate contours
inside
dyke)

05.09.1999

re 1/15/2002

GS14

$h_{dyke} =$ ~~278~~ 265 mm

$h_{res} = H - 162$ mm

17H40

Zoom lens (12.5 mm) open at 8

secondary light

250E

$T = 22.\cancel{6}0$ °C

$V_{dyke} = 36$ mbar (GS to top

↳ $h_{res} = H - 186$ mbar

$V_{tunnel} = 700$ mbar

↳ $h_{res\,fin} = H - 216$ mm

$T = 22.7$ °C

save in GS14. avi

(166Mb)

05.09.1999

GS15

18M35

$h_{dyke} = 257$ mm

$h_{res} = H - 167$ mm

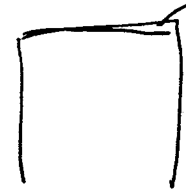
Zoom lens (12.5mm) open at 8
Secondary light

250E

- $T = 23.0°C$

$V_{dyke} = 30$ mbar (GS top)

still



air bit trapped

~~fog~~

? bubbles ?

- $\hookrightarrow h_{res} = H - 193$ mm $\hookrightarrow$ dila° gaz

$V_{tunnel} = 800$ mbar

$\hookrightarrow h_{res} = H - 220$

$T = 22.9°C$

save GS15. avi (138 Mb)

05.09.1999

GS16

$h_{dyke} = 253$ mm

$h_{res} = H - 171$ mm

lens / camera } same

19H40

~~T~~ = 22.8°C

$V_{dyke} = 36$ mbar (less air than GS15)

$\hookrightarrow h_{res} = H - 197$ mm

$V_{tunnel} = 1000$ mbar

T = 22.8°C

$\hookrightarrow h_{res\,fin} = H - 225$

save as GS16.avi (92 MB

~~T=2~~

05.09.1999

224 GS17 -500 mbar
-e 1/15/2002

$h_{dyke} = 246$ mm

21400

$h_{res} = H - 177$ mm

Lens (12.5 mm) open at 11
secondary light
125E (6555 (240 x 210)

T = 23.4°C

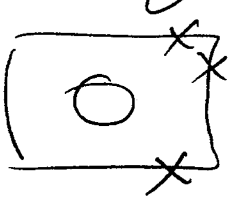
~~Δ 07.03.02~~ dyke = 36 mbar
↳ $h_{res} = H - 204$ mm

$V_{tunnel} = 500$ mbar

T = 23.9

leak
||
~~Δ 070302~~ fuike

↳ $h_{res\,fin} = H - 234$ mm



Save as GS17avi (115 Mb)

05.09.1991

DGSO-18

15-12-2000

Insert n°1 in place at the top of the dike
(stuck with silicone sealant)

At 18H00

P_1 = 983.7/8 mbar
P_2 = 985.5/6 mbar
P_3 = 983.4/5 mbar
T = 23.5°C
H_{res} = h - 325 = 160 mm
h_{dyke} = 105.5 ⟹ h_{dyke} = 175.5 mm

Nicolet

Time / pt = 20 µs
Trigger position = pretrig 1%
7 transducers operation

High-speed video 500 FPS

DGSO pumped up the dike

P_{dike} = 923.2/3 mbar
H_{res} = h - 366.5 = 118.5 mm

At 18H10

P_1 = 383.6/7 mbar
P_2 = 985.7/8 mbar
P_3 = 983.6/7 mbar
T = 23.5°C

P data saved as files

f_000001.tiff to f_004368 in VdgsO_18
PdgsO_18

226
re 1/15/2002

DG30-15

15-12-2000

Insert n° 1 in place at the top of the dike

At 18H55 | P_1 = 984.1/2 mbar
P_2 = 985.9/986.0 mbar
P_3 = 983.8 mbar
T = 23.5°C
H_{res} = H - 331 = 154 mm
h_{dyke} = 101 mm ⟹ 171 mm

Nicolet | Time/pt = 20 μs
Trigger position = pretrig 1%

High-speed video 500 FPS

At 19H10 | P_1 = 984.0/1 mbar
P_2 = 985.8/9 mbar
P_3 = 983.7 mbar
T = 24 °C

DG30 pumped up the cell | P_{dike} = 919.7/8 mbar
H_{res} = H - 369 = 116 mbar

6 bubbles about 6 mm in size at the top of the cell (○)

Changed glass tube and readjusted pressures P_{dike} = 914.5/6 mbar

At 19H35 | P_1 = 82.8/9 mbar
P_2 = 985.5/6 mbar
P_3 = 983.4 mbar
T = 24°C

Bubbles coming out of the gate ⟹ need to clean the gate

DGSO - 20

15 - 12 - 2000

Insert n° 1 in place at the top of the dike

At 20 H 15

$P_1 = 983.4$ mbar
$P_2 = 985.3/4$ mbar
$P_3 = 983.1$ mbar
$T = 24.0\,°C$
$H_{res} = H - 335 = 150$ mm
$H_{dyke} = 97.5$ mm $\Longrightarrow$ 167.5 mm

Nicolet

Time / pt = 250 µs
Trigger position = pretrig 1%

High-speed video 30 FPS

DGSO pumped up the cell

$P_{dyke} = 917.3/4$ mbar
$H_{res} = H - 374 = 111$ mm

Few bubbles trapped.

At 20 H 30

$P_1 = 682.1$ mbar
$P_2 = 985.0/1$ mbar
$P_3 = 982.9$ mbar
$T = 24\,°C$

re 1/15/2002

15-12-2000

Insert n°1 in place at the top of the dyke

At 21H10

P_1 = 983.4/5 mbar
P_2 = 985.2/3 mbar
P_3 = 983.0/1 mbar
T = 24°C
H_{res} = H - 336 = 149 mm
h_{dyke} = 97 mm ⟹ 167 mm

Nicolet

Time / pt = 40 µs
Trigger position = pretrig 1%

High-speed video 250 FPS

DGSO pumped up the cell

P_{dyke} = 912.5 mbar
H_{res} = h - 375 = 110 mm

Few bubbles.

At 21H20

P_1 = 182.7/8 mbar
P_2 = 985.2/3 mbar
P_3 = 983.0/1 mbar
T = 24°C

Bubbles escaping from gate

At 21H20, after the run

P_1 = 983.4/5 mbar
P_2 = 985.2/3 mbar
P_3 = 983.0/1 mbar
T = 24°C

DGSO-22

16-12-2000

Insert n°1 in place at the top of the dyke

At 11H50 | P_1 = 990.8/9 mbar
P_2 = 991.9 / 992.0 mbar
P_3 = 990.8/9 mbar
T = 22°C
H_{res} = h - 322.5 = 162.5 mm
h_{dyke} = 107.5 mm ⟹ 177.5 mm

Nicolet | Time / pt = 100 µs
Trigger position = pretrig 1%

High-speed video 125 FPS

DGSO pumped up the cell | P_{dyke} = 922.1/2 mbar
H_{res} = H - 364 = 121 mm

At 12H08 | P_1 = 589.9 mbar
P_2 = 992.0/1 mbar
P_3 = 990.6/7 mbar
T = 23°C

re 1/15/2002

16-12-2000

Insert n°1 in place at the top of the dyke

At 13H32

P_1 = 991.3/4 mbar
P_2 = 992.9/993.0 mbar
P_3 = 991.0/1 mbar
T = 24°C
H_{res} = H - 326 = 159 mm
h_{dyke} = 103 mm = 173 mm

Nicolet
Time/pt = 250 µs
Trigger position = pretrig 1%

High-speed video 30 FPS

DGSO pumped up the cell at 13H35

P_{dyke} = 917.8/9 mbar
H_{res} = H - 370 = 115 mm

At 13H39

P_1 = 790.9/791.0/791.1 mbar
P_2 = 992.9/993.0 mbar
P_3 = 991.0/1 mbar
T = 24°C

DGSO - 24

16-12-2000

Insert n°1 in place at the top of the cell

At 14H25

$P_1 = 991.3/4$ mbar
$P_2 = 993.0/1$ mbar
$P_3 = 990.9/991.0$ mbar
$T = 24°C$
$H_{res} = H - 325 = 160$ mm
$h_{dyke} = 106$ mm $\Rightarrow$ 176 mm (added more DGSO after previous expt)

Nicolet
Time/pt = 250 µs
Trigger position = pretrig 1%

High-speed video 30 FPS

DGSO pumped up the cell
$P_{dyke} = 929.6/7$
$H_{res} = H - 364$ mm $= 121$ mm

At 14H32

$P_1 = 889.5/6$ mbar
$P_2 = 993.0/1$ mbar
$P_3 = 990.9/991.0$ mbar
$T = 24°C$

At 14H35 after run once the valve at the end of the tunnel is closed

$P_1 = 888.7/8$ mbar
$P_2 = 992.9/993.0$ mbar
$P_3 = 990.8/9$ mbar
$T = 24°C$

re 1/15/2002

DGSO 25

16-12-2000

Insert n° 1 in place at the top of the cell

At 15H30

P_1 = 992.1/2 mbar
P_2 = 993.8/9 mbar
P_3 = 991.7/8 mbar
T = 24.0°C
H_{res} = H - 325 = 160 mm
h_{dyke} = 104.5 mm ⇒ 174.5 mm

Nicolet
Time/pt = 250 μs
Trigger position = pretrig 1%

High-speed video 30 FPS

At 15H40, DGSO pumped up the cell

P_{dyke} = 922.5/6 mbar
H_{res} = H - 368 = 117 mm
P_3 = 992.4/5 mbar

For the expt

P_1 = 914.5/6/7 mbar
P_2 = 994.6/7/8 mbar
P_3 = 992.5/6/7 mbar
T = 24.0°C

measured just before opening the gate

During the experiment, P_1 = 915.3 mbar

At 15H47,

P_1 = 993.2/3 mbar
P_2 = 995.0/1 mbar
P_3 = 992.8/9 mbar
T = 24.0°C

DG50-26

16-12-2000

Insert n° 1 in place at the top of the cell

At 16H20 | $P_1 = 993.4/5$ mbar
$P_2 = 995.2/3$ mbar
$P_3 = 993.0/1$ mbar
$T = 24.0°C$
$H_{res} = H - 328.5$ mm $= 156.5$ mm
$h_{dyke} = 102$ mm $\Rightarrow 172$ mm

Nicolet | Time/pt = 40 µs
Trigger position = pretrig 1%

High-speed video 250 FPS

At 16H27, DG50 pumped up the cell | $P_{dyke} = 992.2/3$ mbar
$H_{res} = H - 370 = 115$ mm

$P_1 = 993.6$ mbar, $P_3 = 993.2$ mbar

At 16H32 | $P_1 = 492.3/4$ mbar
$P_2 = 995.2/3$ mbar
$P_3 = 993.0/1$ mbar
$T = 24.0°C$

At the end of the run, when closing the tunnel valve,
$P_1 \sim 517.7$ mbar (valve closed)

At 16H36 | $P_1 = 993.4/5$ mbar
$P_2 = 995.2$ mbar
$P_3 = 993.0$ mbar
$T = 24.0°C$

1/15/2002

16-12-2000

Insert n°1 in place at the top of the cell

At 17H00 | P_1 = 993.6/7 mbar
P_2 = 995.4/5 mbar
P_3 = 993.3/4 mbar
T = 24.0°C
H_{res} = H − 321.5 = 163.5 mm
h_{dyke} = 109 mm ⇒ 179 mm (more DGSO added after previous expt)

Nicolet | Time/pt = 40 µs
Trigger position = pretrig 1%

High-speed video 250 FPS

At 17H06, DGSO pumped up the cell | P_{dyke} = 931.5/6 mbar
H_{res} = H − 360 = 125 mm

P_1 = 993.4/5 mbar P_3 = 993.4/5 mbar

At 17H10 | P_1 = 993.0/1 mbar
P_2 = 995.5/6 mbar
P_3 = 993.4/5 mbar
T = 24.0°C

Big bubbles coming out from gate.
P_1 ~ 322 mbar

At 17H15 | P_1 = 993.8/9 mbar
P_2 = 995.6/7 mbar
P_3 = 993.5/6 mbar
T = 24°C

DGSO-28

16-12-2000

Insert no 1 in place at the top of the cell

At 17H40

P_1 = 994.1/2 mbar
P_2 = 995.9/996.0 mbar
P_3 = 993.9/994.0 mbar
T = 23.5°C
H_{res} = H - 326 = 159 mm
h_{dyke} = 118.5 mm => 188.5 mm

Nicolet
Time/pt = 40 µs
Trigger position = pretrig 1%

High-speed video 250 FPS

At 17H45, DGSO pumped up the cell

P_{dyke} = 922.9/923.0 mbar
H_{res} = H - 364 = 121 mm
T = 23.5°C
P_1 = 993.9/994.0 mbar
P_3 = 994.0/1 mbar

At 17H55,

P_1 = 393.4/5 mbar
P_2 = 995.9/996.0 mbar
P_3 = 994.0/1 mbar
T = 23.5°C

(during run, P_1 = 425.0 mbar)

At 18H00, after the run

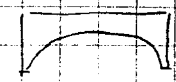
P_1 = 994.2 mbar
P_2 = 995.8/9 mbar
P_3 = 993.9/994.0 mbar
T = 23°C

re 1/15/2002

16.12.2000

DGSO - 29

17-12-2000

Insert n° 2 in place at the top of the cell 

At 13H30 | $P_1 = 994.6/7$ mbar
$P_2 = 996.4/5$ mbar
$P_3 = 994.6/7$ mbar
$T = 23.0°C$
$H_{res} = H - 313.5 = 171.5$ mm
$h_{dyke} = 117$ mm $\Rightarrow$ 187 mm

Nicolet | Time/pt = 20 µs
Trigger position = pretrig 1%

High-speed video 500 FPS

Wee leak between the cell and the tunnel via the gate (DGSO rises up in the cell while pumping down the pressure in the tunnel):
$P_{dyke} \longrightarrow 991.0$ mbar
$h_{dyke} \longrightarrow 152$ mm ($\Rightarrow$ 222 mm)
P_{tunnel} cannot go below ~ 700 mbar

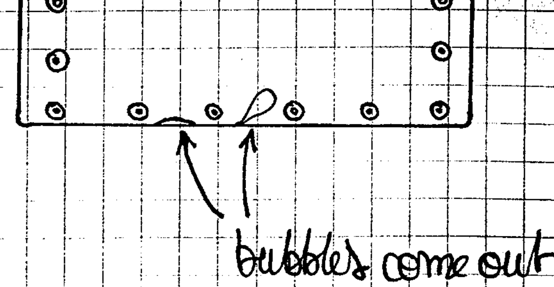
$\Rightarrow$ try with DGSO at top of the cell then lowering P_{tunnel}

$\Rightarrow$ while decreasing the pressure in the cell, P_{tunnel} decreases as well, down to the same value as P_{dyke}:

P_{tunnel} = 953.5 mbar	then	949.4/5 mbar
P_{dyke} = 954.3/4 mbar		950.3/4 mbar

↳ change O'ring in gate mechanism

P_{tunnel} = 947.7/8 mbar
P_{dyke} = 948.4/5 mbar



At 14H33,
P_{tunnel} = 992.4 mbar
P_{dyke} = 992.4/5 mbar ⟺ DG50 up the cell
P_3 = 993.2/3 mbar
$H_{res} = H - 352 = 133$ mm
T = 25.0°C

After changing O'ring and using loads of silicone grease, the lowest pressure achievable in the tunnel is 62.0/1/2 mbar (still a little noise of air at the rear of the gate but system is stable) ⟹ go for $\Delta P \sim 900$ mbar

At 14H42
P_1 = 92.5/6 mbar
P_2 = 995.3/4 mbar
P_3 = 993.0/1 mbar
T = 23.5°C

During the experiment, P_1 = 103.3 mbar just before closing the valve. Also big bubble came out from the door.

At 14H46, after the run
P_1 = 993.6/7 mbar
P_2 = 995.3/4 mbar
P_3 = 993.0/1 mbar
T = 24.0°C

<u>Question</u>: Could the jet be triggered by the big bubble coming out of the door? Is there always a bubble coming out of the door?

17.12.2000

DGSO-30

17-12-2000

Insert no 2 in place at the top of the cell

At 15H35

P_1 = 992.8/9 mbar
P_2 = 994.5/6 mbar
P_3 = 992.5/6 mbar
T = 23.0°C
H_{res} = H - 317 = 168 mm
h_{dyke} = 114 mm ⟹ 184 mm

Nicolet
time/pt = 40 µs
trigger position = pretrig 1%

High-speed video 250 FPS

The pressure in the tunnel is stable, but after a while, a big bubble comes out from the closed gate (DGSO is at the top of the cell)

P_{tunnel} = 959.8 mbar
P_{dyke} = 953.3 mbar

Bubbles keep coming out from the door plate.

P_{tunnel} = 962.3 mbar rising slowly
P_{dyke} = 948.7/8 mbar

Close the valve at the end of the tunnel and leave the system resting for a few minutes.

↳ at 15H50

P_{dyke} = 935.6/7 mbar
P_{tunnel} = 992.5/6 (tunnel valve closed)
P_3 = 992.1/2 mbar

At 15H52

$P_{dyke} = 992.5$ mbar
$P_1 = 926.0/1$ mbar
$P_3 = 992.0/1$ mbar
$T = 23.0°C$
$H_{res} = H - 357 = 128$ mm

At 15H58

$P_1 = 291.2/3$ mbar (went up to 315 mbar)
$P_2 = 993.9/994.0$ mbar
$P_3 = 991.9/992.0$ mbar
$T = 23.0°C$

Transducer P_2 didn't record any signal.

17.12.2000

DGSO-31

17-12-2000

Insert no 2 in place at the top of the cell

At 17H05 | $P_1 = 991.4$ mbar
$P_2 = 992.6$ mbar
$P_3 = 991.3/4$ mbar
$T = 22.0°C$ (air conditionning off)
$H_{res} = H - 320 = 165$ mm
$h_{dyke} = 110$ mm $\Rightarrow$ 180 mm

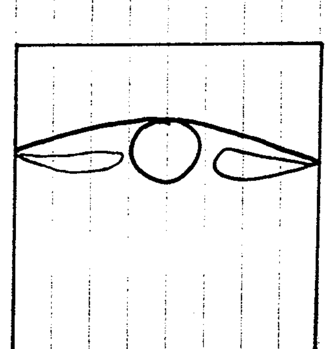
Nicolet | Time/pt = 50 µs
Trigger position = pretrig 1%

High-speed video 125 FPS

At 17H15, DGSO pumped up the cell | $P_{dyke} = 913.5$ mbar
$H_{res} = H - 357 = 128$ mm
$P_3 = 991.2/3$ mbar
$T = 22.0°C$

However P_1 (tunnel pressure decreases) | $P_1 = 965.8/9$ mbar
$P_2 = 917.6/7$ mbar

Big bubbles come out from both sides of the gate into the cell:



OK if valve at the end of the tunnel is closed $\Rightarrow$ no more air bubbles

Lower pressure in the tunnel.

At 17H20 | P_1 = 991.5/6 mbar
P_2 = 992.5 mbar
P_3 = 991.2/3 mbar
T = 22.0°C

At 17H23, after run | P_1 = 991.1/2 mbar
P_2 = 992.3/4 mbar
P_3 = 991.1/2 mbar
T = 22.0°C

17.12.2000

17-12-2000

Insert n° 2 in place at the top of the cell

At 18H00
$P_1 = 990.8/9$ mbar
$P_2 = 992.0/1$ mbar
$P_3 = 990.8/9$ mbar
$T = 22.5°C$
$H_{res} = H - 324 = 161$ mm
$h_{dyke} = 106$ mm $\Rightarrow$ 176 mm

Nicolet
Time / pt = 125 µs
Trigger position = pretrig 1%

High-speed video 60 FPS

Same as before when pumping up DGSO in the cell
$P_2 = 910.2/3$ mbar
$P_1 = 939.6$ mbar and decreasing
but no bubble this time.

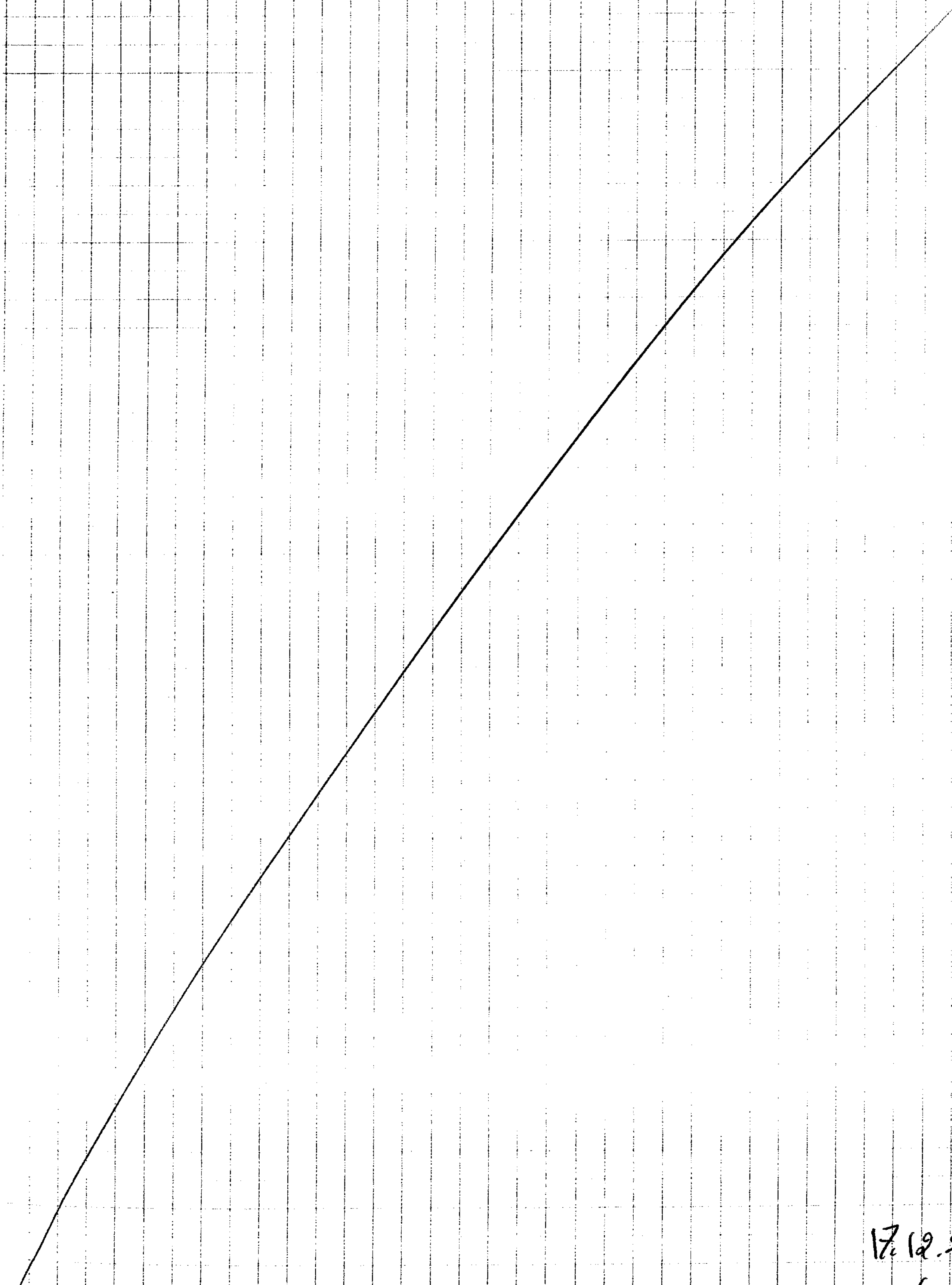
At 18H05
$P_1 = 945.2/3$ mbar
$P_2 = 924.2/3$ mbar
$P_3 = 990.8/9$ mbar
$T = 23.0°C$
$H_{res} = H - 363 = 122$ mm

At 18H11
$P_1 = 689.7/8$ mbar
$P_2 = 992.2/3$ mbar
$P_3 = 990.8$ mbar
$T = 23.0°C$

one big bubble from the siphon

At 18H13

$P_1 = 990.9$ mbar
$P_2 = 992.2/3$ mbar
$P_3 = 990.8$ mbar
$T = 23°C$



17.12.2000

17-12-2000

Insert no 2 in place at the top of the cell

At 18H46
P_1 = 990.8/9 mbar
P_2 = 991.9/992.0 mbar
P_3 = 990.7/8 mbar
T = 22.5°C
H_{res} = H − 327 = 158 mm
h_{dyke} = 103 mm ⟹ 173 mm

Nicolet
Time/pt = 250 µs
Trigger position = pretrig 1%

High-speed video 30 FPS

At 18H55, DGSO pumped up the cell
P_{dyke} = 925.2/3 mbar
H_{res} = H − 366 = 119 mm
T = 23.0°C
P_1 = 990.7/8 mbar
P_3 = 990.5/6 mbar

Bubbles are coming out of the gate ⟹ next time, use silicone sealant around the outside of the gate.

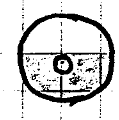
At 19H00
P_1 = 890.0/1 mbar
P_2 = 991.9 mbar
P_3 = 990.4/5 mbar
T = 23.0°C

When tunnel section eventually filled up, P_1 = 891.3/4 mbar

When DG30 reached pressure transducer

n° 4	(P_{T4})	P_1 = 891.1/2 mbar
n° 5	(P_{T5})	P_1 = 891.0/1 mbar
n° 7	(P_{T7})	P_1 = 890.9/ mbar

Towards the end of the run, P_1 = 890.8 mbar

At the end of the run, P_1 = 890.5 mbar  end of tunnel

At 19H07

P_1 = 990.6/7 mbar
P_2 = 991.9 mbar
P_3 = 990.4/5 mbar
T = 23.5°C

Transducer P_2 didn't record any signal.

17.12.2000

DGSO-34

17-12-2000

Insert 2 in place at the top of the cell

At 19H45

P_1 = 990.4/5 mbar
P_2 = 991.6/7 mbar
P_3 = 990.2/3 mbar
T = 22.0 °C (heating on)
H_{res} = H - 322 = 163 mm (DGSO added after previous run)
h_{dyke} = 109 mm ⟹ 179 mm

Nicolet

Time/pt = 350 μs
Trigger position = pretrig 1%

High-speed video 30 FPS

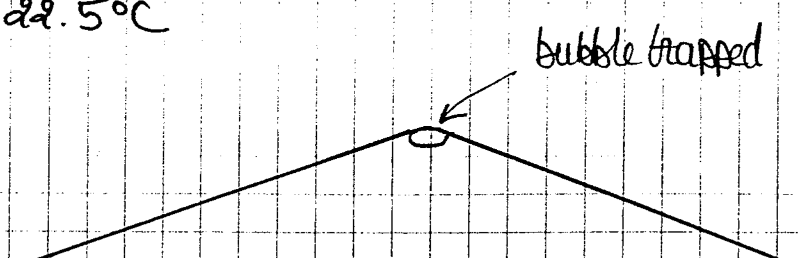
This time, lower P_{tunnel} before lowering P_{dyke} ⟹ same as before

At 19H55, DGSO pumped up the cell

$P_{dyke} = P_2$ = 924.4/5 mbar
P_3 = 989.9/990.0 mbar
T = 22.0 °C
H_{res} = H - 359 = 126 mm

At 20H00,

P_1 = 915.1/2 mbar
P_2 = 991.3/4 mbar
P_3 = 989.9/990.0 mbar
T = 22.5 °C



After 1'13.15 in the run $P_1 = 916.2/3$ mbar

After 1'16.32 $P_1 = 915.9$ mbar

At 20H10

$P_1 = 990.1$ mbar

$P_2 = 991.4$ mbar

$P_3 = 989.9/990.0$ mbar

$T = 23.0\,°C$

17.12.2000

re 1/15/2002

Tunnel experiments with DGS5
(expt n° 1 to 6)

03.09.2000

re 1/15/2002

03.09.2000

03.09.00
251 ~~65~~
re 1/15/200

Expt GSW5-1

page 1

$P_1 = 981.2$
$P_2 = 980.1/2$
$P_3 = 981.2/3$
$T = 22°C$

at 15H00

↳ Lower tunnel Pressure ($\Delta P \sim 200$ mba.)

P_1 = G 007630
P_3 = G 008236 (tunnel)
P_2 = G 007631 (dyke)
(limited cal)

High speed video set up @
60 FPS
display size 256 x 120
01 09-03-00

~~2 min 28 sec~~
t 07.03.02

Nicolet set up @
time/point ~~500~~ 250 μs (4 0 KHz)
t 07.03.02 t 07.03.02
↳ sweeptime ~~4.368~~ min
2.185 min
trigger position: pretrig 1% (~~2.621 sec~~)
1.310 sec
t 07.03.02

Checked all leveled
Arm Nicolet
Arm videos

Nicolet data: files
W51/001A5.WFT
in foldername
GSW 5A1.WFT
t 07.03.02
03.09.2000

15H30

GSWS-1
page 2

$P_1 = 981.1/2$

$P_2 = 980.0/1$

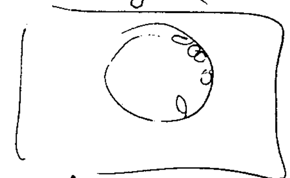
$P_3 = 779.4/3$

$T = 22°C$

↳ GSW to top of dike

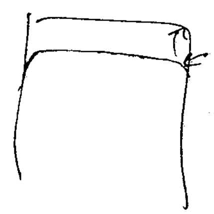
↳ pb: air bubbles coming out of the gate

16H20 from gate or from tunnel?



+ air bubble trapped top right corner

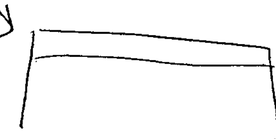
due to shape ~~tilt~~ when rising



↳ dike not levelled on purposed slightly inclined

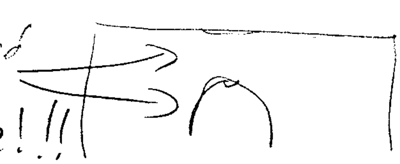
dike higher

higher GS



17H05 still air bubbles being trapped

17H30 come from gate!!!



03.09.2002

At 17H35 top dyke 918.5 mbar = P_2 re 1/15/.. ~~67~~

GSWS-1
page 3

7 bubbles (top)

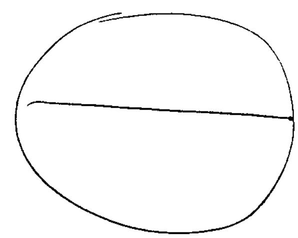
P_1 reservoir = 980.3/4

P_3 tunnel = 779.1 mbar

T = 22.5°C

~~T~~ = 779.0/778.9 cst.

back of dike



1.'03.36 end tunnel

forgot tunnel value !!!

03.09.2000

254

re 1/15/2002

03.09.2000

Expt GSWS - 2-1

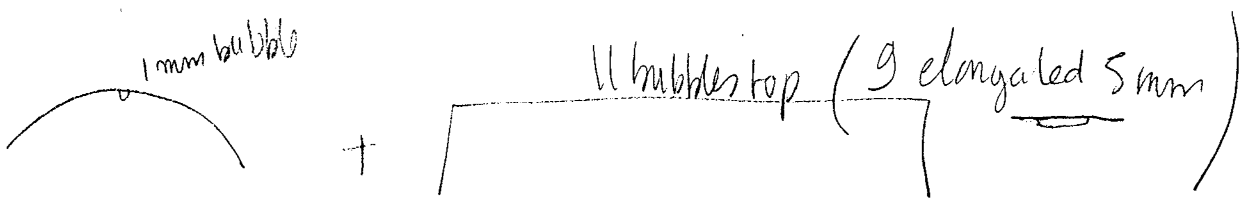
added more GSWS → [Res = H-272
h dike 156.5 → 158]

18H40 { P_1 = 980.1/2 mbar
P_2 = 979.1/2 mbar
P_3 = 980.1/2 mbar
T = 22.5°C }

Level tunnel

GSWS to top of dyke P_2 = 925.5/6 mbar
↳ close dyke valve

Lower tunnel pressure (ΔP ≈ 200 mbar)
(P_3 initial 979.9/980.0)



re 1/15/2002 Expt GS05

200 mbars

high speed video

02 09-03-00
60 FPS

camvideo

0:27:26:00

Nicolet sweeptime 2.185 min (250 μs = ΔT)

P_1 = 980.4/3 mbar
P_2 = 979.3/4 mbar
P_3 = 779.5 mbar
T = 22°C

19H30

t = 4.02 sec 840.1 = P_3 !!!

19H35

P_1 = 980.4
P_2 = 979.3/4
P_3 = 980.4/5
T = 22.0 °C

→ HSvideo saved
T saved Nicolet gsw52.wft / w5200×as.wft +108
Labview c:\data\gs52.dat

03.09.2000

03.09.00

Ar 20H30

$P_1 = 980.7/8$
$P_2 = 979.6/5$
$P_3 = 980.7$
$T = 21.5°C$

Frame/time code	Temps (video)	Elapsed time (PC)
1	0	0
1000		16.650
233	3.8667	
61 ~~53~~	1.0000	1.000
189	3.1333	3.133
377	6.2667	6.267
545	9.0667	9.067
647	10.767	10.7667
999	16.6333	16.633
1001	16.6667	

07.03.02

07.03.02

03.09.2000

re 1/15/2002

0

500 FPS $\longleftrightarrow$ ~ 8 sec
250 FPS $\leftrightarrow$ 17.4680 sec

Download images into PC:
ReadCam
↳ File
↳ Read Camera ...

setup camera on 'live' mode

GSWS-2 lasted ~ 10 sec. max

04.09.2000

04.09.00

① Expresso5-3

300 mbars

10H30

$P_1 = 983.6/7$
$P_2 = 982.2/3$
$P_3 = 983.6/7$
$T = 19°C$
$h_d = 156.5$ to 158 mm (had to be out of level to prevent bubbles)
$h_R = H - 272$ mm

10H45

$P_1 = 983.7/8$
$P_2 = 982.2/3$
$P_3 = 983.7$
$T = 19°C$

↳ rise in dyke $P_2 = 928.5$ mbar

high speed video
03 09-04-00 ⇒ ~ 8 sec
500 FPS

Nicolet
Sweeptime = 10.486 sec
~~Sample~~ time/pt = 20 μs (50 KHz
~~t~~ 07.03.07
trigger position: 1% Pretrig (104.838 ms)

04.09.2000

(2)

Expt GS005-3

At 11H00 dyke OK
P lowered in tunnel

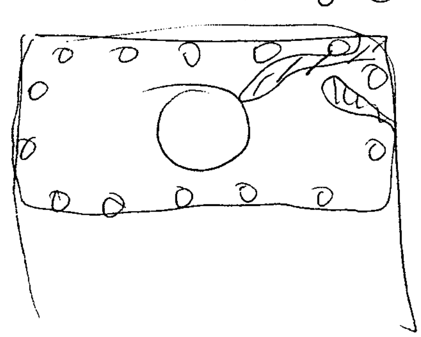
$\hookrightarrow$ $P_3 = 683.5/4$ mbar
$P_1 = 983.6/7$
$P_2 = 982.3/4$
$T = 19.5°C$

$P_3 = 683.2/3$

Just before opening gate $P_3 = 683.0/682.9$ mbar

At 11H15
$P_1 = 983.5/6$
$P_2 = 982.1/2$
$P_3 = 983.5$
$T = 20°C$

Note Bubbles escaping from door



and entrained in tunnel

04.09.2000

③ 261
re 1/15/2002

Expt GSW5-3

data saved in file :

Nicolet gsw53 . wft

↳ w5300 * as . wft

* = 1 to 8

H speed video 4000 frames saved in S003TC. 1

Lab view c:\data\ gs53 . dat

04.09.2000

1/15/2002

Expt GSW5-4 ①

600 mbars

- Clean tunnel and its end
  check and clean door
  check ~~tunnel~~ air-proof (check at ~~vacuum~~ pressure of ~350 mbar — 07.03.02
  close valve ⇒ P held OK,

  Tunnel level

$$\begin{cases} h_{dike} = 155.5 \text{ to } 156.5 \text{ mm} \\ h_R = H - 273 \text{ to } 274 \text{ mm} \end{cases}$$

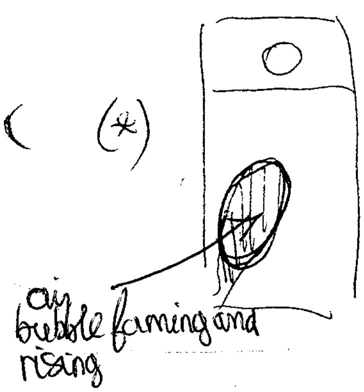
- At 12H20

$$\begin{cases} P_1 = 983.3/2 \text{ mbar} \\ P_2 = 982.2 \text{ mbar} \\ P_3 = 983.3/2 \text{ mbar} \\ T = 21.5°C \end{cases}$$

tunnel = 383.8/4 12H25
then close valve
↳ 12H30 395.0

GS up the dyke:

Try to get rid of air in door mechanism:
- tunnel at P atm (air goes tunnel→dike gate)
- lower P in reservoir and dike at same value
- then have P_{dike} lower than P_{res}
- so GS cover gate ⇒ wait



nothing much happen
but an air leak at bottom of tank (*)

04.09.2000

04-09-00

263

5 re 1/15/200

Expt GSCW5-4

2

↳ go back to Normal routine : few air bubbles trapped in GSCW5 due to bottom air leak

↳ wait for a while until they have all disappear.

DGS5

At 13H00

$P_1 = 983.0 / 982.9$

$P_2 = 981.8 / 9$

$P_3 = 982.9 / 983.0$

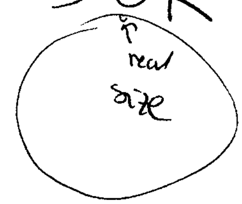
$T = 22°C$

↳ tunnel down to $P_3 = 382.8/7$ mbar

valve closed

DGS up the dyke :

- very very slowly when reached top of gate ⇒ OK



- top of dyke : one big

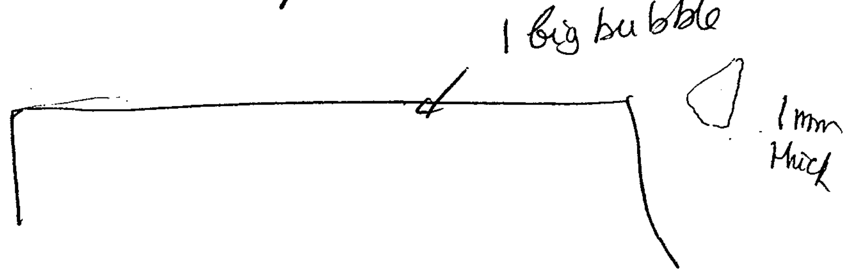
↳ wait

04.09.2000

Exp... (4) (5)

~~78~~ 264 re 1/15/2002

P_2 dike top = 928.6/7 mbar



P_1 reservoir = 982.8 mbar

P_2 back to atm = 981.7

P_3 tunnel = 381.2/1

T = 21.5°C

H speed video 500 FPS - 04 09-04-00

Normal video 29:23:15

Nicolet sweeptime 10.486 s ($\Delta t = 20\,\mu s$)

13H20

381.2 mbar = P_3

982.7/8 = P_1

981.7 = P_2

(*

no air leak at gate but one at bottom of dike →

04.09.2000

Expr GSWS (4)

~~OK~~ as no bubble reach top before the expt (7) ended

At 13H30

P_1 = 982.7/6
P_2 = 981.5/6
P_3 = 982.6/7
T = 22 °C

Data saved in file:

Nicolet gsw54.wft

↳ w5400 * as.wft

Hspeedvideo 2500 frames saved in S004TC.1

Labview c:\data\gs54.dat

video 29:23:15 → 29:50:25

04.09.2000

re 1/15/2002

Expt GSW5-5

1 800mbars

N.B. pressure transducer cable n° 3 (pin might be damaged in near future (cable slightly bent pin OK)

Considering using high speed video @ 1000 FPS
↳ recording time = 4.3670 sec

↳ Nicolet timebase : { sweep time = 5.243 sec
Δt = 10 µs (100 KHz)
pretrig = 52.419 ms (1%)

At 14H45 { P_1 = 981.7/8
P_2 = 980.7/8
P_3 = 981.8/9
T = 22.5°C
h = 155.5 to 157 mm
h_R = H − 275 to 275.5 mm

↳ tunnel down to ~~2784~~ 07.03.02

had difficulties in getting lower than 185 mb
check etancheity of tunnel and trap
↳ OK
check around vacuum control system
↳ when trying to lower P further, P not stable (181 to 185)

04.09.2000

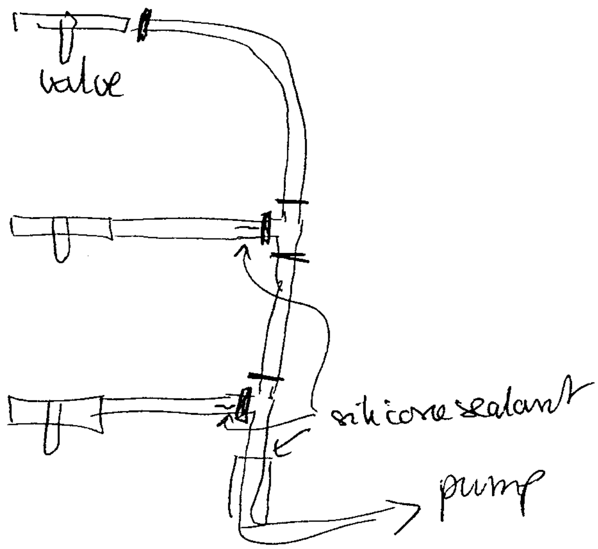
Expt GSWS-5

2

04.09.00

07.03.02

↳ inspection revealed cracks on tubing



⟹ pb sorted out using silicone sealant!

pump down straight to ~100 mbar!

GSWS to top of dyke

<u>bubble state</u>: good!

4 ~5 mm ones at top
+ few tiny ones

P_2 = 926.9 / 927 mbar at top of dyke

P_1 = 981.6 mbar

T = 22.5°C

04.09.2000

Expt GSW5 3
268
re 1/15/2002
③

⑩

At 15H15
$P_1 = 981.4/5$
$P_2 = 980.5/6$
$P_3 = 181.0/180.9$
$T = 23°C$

start 15H20

$\hookrightarrow \sim$ 232 mbar in tunnel at end of expt

bubbles came from gate mechanism

At 15H35
$P_1 = 981.2/1$ mbar
$P_2 = 980.2/3$ mbar
$P_3 = 981.2$ mbar
$T = 23°C$

Data saved in

video ~~29.S.22~~ to 07.03.02
up to 30:20:29

Nicolet gsw55. wft
$\hookrightarrow$ w5500 * as . wft

Labview gs55. dat

highspeed video 3000 frames in S~~66~~5 tc.1 → expt to be redone if too (bubbles)
to 07.03.02

04.09.2000

Expt GSWS-6
(1)

goombars

04.09.00

stef...
re

N.B. pressure transducer cable no 3 broken: spin cut and stuck into transducer!

put cable in place and will see how it runs
(⇒ checkrun first w/ Nicolet)

4.368 s

High speed video setup at { 1000 FPS
06 09-04-00

Nicolet setup at { sweeptime = ~~8.243~~ 2.621 ~~t~~ sec 07.03.02
Δt = 5 μs (200 KHz)
Pretrig (1%) 26.209 ms)

Normal video from 30:20:29

Use same procedure as in expt GSWS-4 to get rid of air trapped in gate mechanism

At 16H25 { P_1 = 980.8/9
P_2 = 980.0/979.9
P_3 = 980.9/981.0
T = 23°C
h_d = 154 to 155 mm
h_{Res} = H − { 274
275.5 }

04.09.2000

re 1/15/2002 Expt GSW 5-6 2

At 16H40

P_1 = 980.4/5
P_2 = 979.8/9
P_3 = 980.7
T = 23°C

P_3 does not decrease further down than ~150 mbar
Still pb with tubing near control panel. Add more silicone sealan

⇒ P_3 = 30.4/3 mbar lowest reachable

(etancheity of tunnel system fine)
(from 30.0 to 40.~~7~~ in ~5 min)
07.03.02

Dyke

P_2 dyke = 926.1/2 mbar

At top
1 bubble ~5 mm
otherwise very few

At 17H05

P_1 = 980.5
P_2 = 979.8/~~7~~ 07.03.02
P_3 = 29.5/6
T = 24°C

04.09.2000

~~At~~ 17H40

$$\begin{cases} P_1 = 980.5/4 \\ P_2 = 979.7/8 \\ P_3 = 980.7/8 \\ T = 23.5°C \\ h_d = 153 \text{ to } 154 \text{ mm} \\ h_R = H - \left| \begin{matrix} 277 \\ 275.5 \text{ mm} \end{matrix} \right. \end{cases}$$

(13)

271 ~~85~~
(rd) 1/15/2002

During clean up, broke the end of the glass tube (turned into its "renfoncement"

↳ carry on expts without P data
next

↳ ~~07.05~~ 07.03.02 can't ~~because~~ does not have a spare tube cut at end ready (all ⊏⊐)

↳ (prepare overnight the spare one with P transducer

Data save

Nicolet w5600 * as .wff files in gsw56.wff

Labview gs56.dat

high speed 2500 frames saved in S006tc.1

camvideo up to 30:50:14

04.09.2000

re 1/15/2002

(14)

Summary of expts done with GSW5

dyke
h_i = 32 mm
h_i = 108 mm

↳ Give up w/ 243 mm

tunnel
~~200~~
~~400~~ 300 ~~t~~ 07.03.02
600
~~800~~
~1000

↳ go direct to GSW15 and Unload GSW5

plan

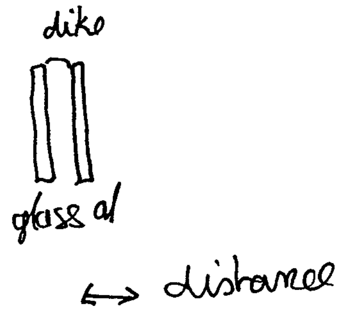
50
100
200
400
600
800
1000

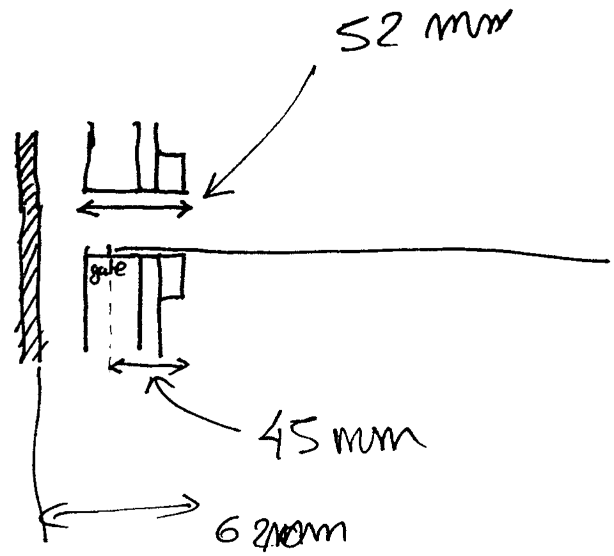
7 tunnels

then dyke at 110 mm ~~t~~ 07.03.02

04.09.2000

re 1/15/2002

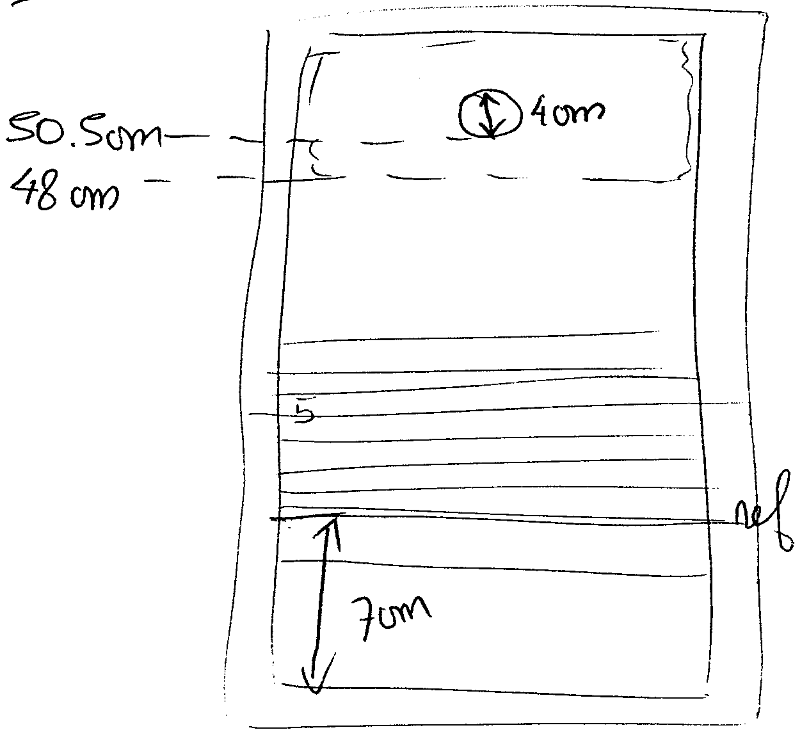




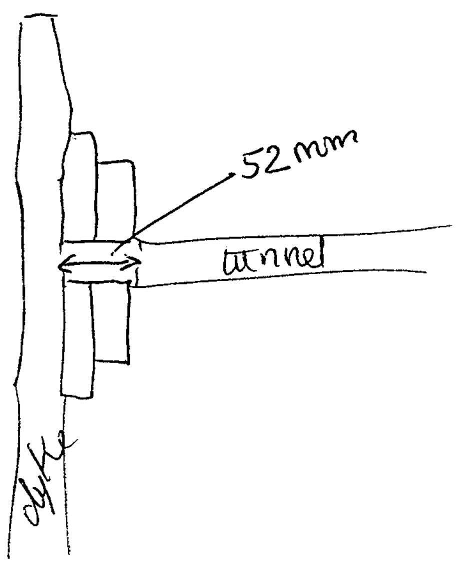
04.09.2000

re 1/15/2002

HScell



line 0 = ref line for dyke expt mea at 7 cm above bottom of dyke reservoir



re 1/15/2002

Tunnel experiments with DGS15
(expt no 1 to 30)

re 1/15/2002

04.09.2000

04.09.00

16

Prepare more DG815

flask vide 642.7g

+GS 1208.5g

⟶ 565.8g

⇓

needs 84.87g H_2O

⇓

Theo 1293.4g

Real 1293.4g

04.09.2000

re 1/15/2002

At 8H00

$P_1 = 983.5/6$
$P_2 = 982.4/5$
$P_3 = 983.8/7$
$T = 19°C$

More GSW15 :

649.5g

1388.1g

↳ 738.6g GS

↳ needs 110.79 g H_2O

↳ theo 1498.89
real 1499.0

At 11H00

$P_1 = 984.0/1$
$P_2 = 983.2/3$
$P_3 = 984.4$
$T = 21.5°C$ (AC off while preparing GSW15)

05.09.2000

re 1/15/2002 ②

- Transducers set on new tube in the morning
  Tunnel hold 35 mbar vacuum

Nicolet time/pt = 200 μs (5.0 KHz)
trigger

DGS15-1 ①

EXPT DGS15-~~1~~

- h_d = 158.75 → 159.25 mm
  h_R = H - (270 to 271 mm)

~~At~~ UH55
P_1 = 983.8/9
P_2 = 982.7
P_3 = 983.9
T = 21°C

P_2 top dyke 928.1 mbar
~6 bubbles (5 mm)

05.09.2000

280 P_3 = 683.0/682.9 P_2 = 982.4
re 1/15/2002 P_1 = 983.4/5

DGS15-1
2

At 12H50
P_1 = 983.1/2
P_2 = 982.1/2
P_3 = 983.2/3
T = 21.5°C

Lasted
<1s

Forgot to switch on the P transducers conditionner units!!! => no P data available.

05.09.2000

DGS15-2 1

281
re 1/15/2007

EXPT DGS15-2

At 14H15

$P_1 = 981.8/9$
$P_2 = 981.0/980.9$
$P_3 = 982.0/981.9$
$T = 23°C$
$h_D = 157$ to 158 mm
$h_{Res} = H -$ 271 to 271.5 mm

Check tunnel (762.7 mbar) 77.4/5 mbar

$P_{dyke} = 924.8/9$ mbar

Bubbles

one small ~ 0.25 mm

3 "large" at top area thickness < 1 mm

05.09.2000

DGS... ② Labview

282

re 1/15/2002

Sampling rate : 10000 samples / sec
buffer size : 20000

High Speed video

2000 FPS
display size 256 x 120 ⇒ ~ 2sec
02 09-05-00

Video from ~~31:18:09~~ (31: 20:17)
~~6~~ 07.03.02

Nicolet

time/pt = 2 μs (500 KHz)
sweep time = 1.049 sec
Pretrig 1% ⇒ 10.484 ms

At 14H55

P_1 = 981.2/3 mbar
P_2 = 980.5/4 mbar
P_3 = 39.5/6 mbar
T = 23°C

At 16H20

P_1 = 980.3/2
P_2 = 979.6/7
P_3 = 980.4/5
T = 24°C

05.09.2000

DGS 15 - 2

3

05-09-2000

Data saved as :

Nicolet dg200* a / b / as . wtf in folder Pdgs15_2

MSvideo 4368 frames in folder Vdgs15_2

Labview dgs15_2.dat

05.09.2000

re
1/15/2002

Expt DGS15-3

1

At 17 H30

P_1 = 979.8/7
P_2 = 979.1/2
P_3 = 980.0 /979.9
T = 23.5
h_d = 156 to 157 mm
h_R = H - (272 to 273 mm)

High speed video

2000 FPS
display size 256×120
03 09-05-00

Video from 31:54:19

Nicolet

time/pt = 4 us (250 KHz) 07.03.02
sweep time = ~~1.049 sec~~ 2.097 sec
pretrig 1% => ~~10.484 ms~~ 20.968 ms

Labview

sampling at 10000 samples/sec
buffer size: 20000
dgs15_3.dat

Check tunnel etancheity at 200 mbar (fine)

↳ prepare dyke & gate at 17 H45 (~ 428 mbar)

05.09.2000

05-09-00

Expt DGS 15-3

2

P_2 dyke = 926.5 mbar

P_1 = 979.6/7

P_3 = 979.6

T = 24°C

18H00

At 18H05

P_1 = 979.6/7

P_2 = 979.1/2

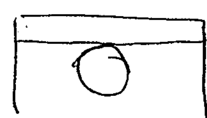
P_3 = 979.3/4

T = 24° C

Just before opening gate, P_{tunnel} = 979.6/7

At end of expt

gap of 25 mm at top of dike



→ DGS level

At 18H07

P_1 = 979.7/6

P_2 = 979.1

P_3 = 979.8/9

T = 24°C

(~10 psi)

(

05.09.2000

/15/2002 Expt DGS 15 – 3
③

Data saved as: Folder Dgs15_3

Nicolet dg3/001as. wft

Labview dgs15_3. dat

MS video frames in folder Vdgs15_3

05.09.2000

Expt DGS15-4
1

05-09-2000

- At 19H00

$P_1 = 979.7/8$
$P_2 = 979.0/1$
$P_3 = 979.9/980.0$
$T = 23°C$
$h_{dyke} = 153 - 154$ mm
$h_{res} = H - (275$ to 276.5 mm$)$

Check tunnel etancheity at 95 mbar
Prepare dyke at 360 mbar

- $P_{dyke} = 924.8/9$ mbar at 19H15
$P_1 = 979.6/7$
$P_3 = 979.8/9$
$T = 23°C$

At dyke top
07.03.02
1 bubble
1 bubble
+ few small ones
all < 1 mm thickness

↳ $P_{tunnel} = 579.1/2$ mbar

05.09.2000

Expr DGS15-4

2

High speed video
- 2000 FPS (2.1835 sec)
- 04 09-05-00

Nicolet
- sweep time = 2.097 sec
- $\Delta t = 4\,\mu s$

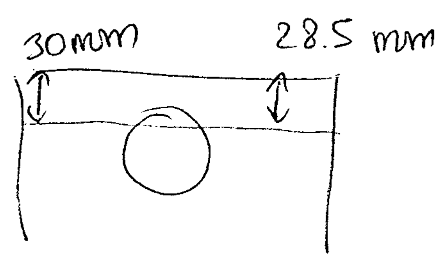
Labview
- 10000 samples/sec
- buffer = 20000
- dgs15_4.dat

(636)

Video from 32:29:08

At 19H30
- P_1 = 979.9/980.0
- P_2 = 979.1/2
- P_3 = 579.1
- T = 23°C

End of expt: dyke



05.09.2000

At 19H35

$P_1 = 980.0/1$
$P_2 = 979.1/2$
$P_3 = 980.1/2$
$T = 23°C$

Expt DG15 4 Pe 1/15/200

3

05-09-2000

Labview : acquisition stop before signal!
(data in dgs15_4.dat)
↳ take smaller sampling rate

Nicolet saved in folder Pdgs15_4
as file dg4 001 as . wft

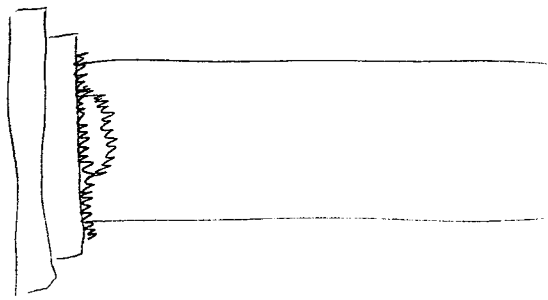
MS video saved in folder Vdgs15_4 (4366 frames)

05.09.2000

Expt DGS15 -

Tube broke at its dyke end while putting it back in place (heard noise at previous expt)

⇒ silicone sealant on crack and all around connector



Fingers crossed for last expt!

At 20H20

$P_1 = 980.4/5$

$P_2 = 979.6/7$

$P_3 = 980.6/7$

$T = 22.5°C$

$h_{dyke} = 151$ to 152 mm

$h_{res} = H - (277$ to 278 mm$)$

Check tunnel etancheity ⇒ had more sealant

⇒ 275 mbar heard cracking

⇐ down to 230

⇐ then valve closed at 270 mbar not bad at all!

05.09.2000

re 1/15/2002

Expt DGS15-5

2

05.09.00

=> decide to run

Prepare dyke at 404 mbar

Top of dyke = 922.1/2 mbar

3 bubbles (○)

P_1 = 980.6/7 mbar

P_3 = 980.5/6

T = 22° C

P_2 = 979.8/7

20H35

Video from 32:59:17

Nicolet

time / pt 100 μs

Trigger position: Pretrig = 524.188 ms (1%)

sweep time = 52.429 sec (524288 pts)

High speed video

60 fr / sec => recording

60 FPS

05 09-05-00

Don't bother w/ Labview

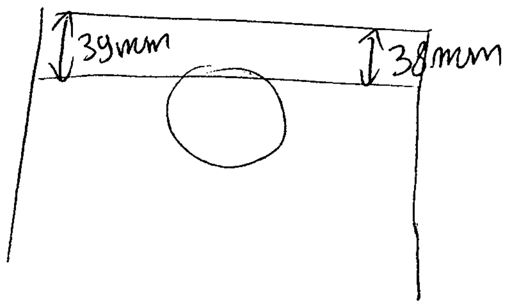
05.09.2000

re 1/15/200

Expt DGS 15-5
3

At 20H50

$P_1 = 980.8/9$
$P_2 = 980.0/980$
$P_3 = 879.4/5$
$T = 22°C$



At 20H55,

$P_1 = 980.9/981.0$
$P_2 = 980.0/979.9$
$P_3 = 981.2/1$
$T = 22°C$

Save data

Nicolet folder Pdgs15_5
as files dg500las.wft

High speed video folder Vdgs15_5
(500 frames)

05.09.200

06-09-00 (re) 1/15/2002

Expt DGS15-6

①

glass tube broken
little pieces of glass near entrance
silicone sealant around tunnel connector
~~still~~ DGS on tunnel floor (see picture)

At 15H45

$P_1 = 980.312$
$P_2 = 979.413$
$P_3 = 980.415$
$T = 21°C$
$h_{dyke} = 151$ mm (levelled)
$h_{Res} = H - 274$ mm

Check tunnel etancheity at P = ~~[illegible]~~ mbar 07.03.02
Preparing dyke @ 430 mbar 102 → 120 in ~ 1 min

Nicolet

sweep time = 1.049 sec (524288 pts)
time / pt = 2 μs (500 KHz)
Pre Trig 1% (10.484 ms)

High Speed video

06 09-06-00
2000 FPS

06.09.2000

re 1/15/2002

Trans	Nicolet Channel
6	3B
5	3A
8	4B
7	4A
4	2B
3	2A
2	1B
1	1A

18H20

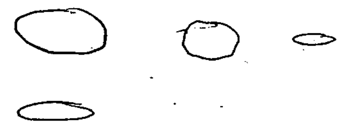
$P_1 =$ 979.8/7
$P_2 =$ 978.8/9
$P_3 =$ 979.9 / 980.0
T = ~~acc~~ back 152 mm
$h_d =$ 22°C

06.09.2000

re 1/15/2002

Dyke = ~~926.6 mbar~~

927.2 t 06.09.00 5. bubbles at top



$P_1 = 979.617$

$P_3 = 979.9 / 980$

$T = 22°C$

17H35

Data saved as dg600*as.wtf

↳ Pdgs15_6

06.09.2000

Re 1/15/2002

DG815-7

12 Dec 2000

$H_{res} = H - 320.5$ mm
$h = 107$ mm
at P_{atm}

$P_1 = 993.1/2$
$P_2 = 994.5$
$P_3 = 993.3/4$

$P_{dyke} = 938.1/2$
h dyke top
$H_{res} = H - 364$ mm

16H30
$P_3 = 993.2/3$
$P_1 = 33.3/2/4$ (tunnel)
$T = 22°C$
$P_2 = 935.8$ (readjusted as bubble came out of hole)
$P_1 = 33.4/5$

19H40
$P_1 = 993.0/1$ mbar
$P_2 = 994.2/3$ mbar
$P_3 = 993.2/3$ mbar
$T = 22°C$

12.12.2000

13 Dec. 00

Expt DG315-8

$\Delta P \sim 600$ mbar

1000 FPS
display size 256 x 120
08 12-13-00

Nicolet time/pt = 5 μs

h_{Res} = H - 323 mm
h_{dyke} 103mm

P_1 = 987.3/4
P_2 = 989.0/988.9
P_3 = 987.2/1
T = 23.5°C

16 HSO

17400

P_{dyke} = 927.6
P_{tunnel} 386.3/4

T = 23.5

P_2 = 989.0/1
P_3 = 987.2

13.12.2000

P_1 ~~387.1/0~~ 386.9 07.03.02

P_2 989.1/2 17H05

P_3 987.2/3

↳ 410 in tunnel

17H10

P_1 987.5/6

P_2 989.1/2

P_3 987.3/4

T 23.5°C

13.12.2000

re 1/15/200

Expt DGS15 - 9

$\Delta P \sim 300$ mbar

1000 FPS
display size 256 x 120
0 9 12-13-00

1500
3000

Nicolet time/pt = 5μs

h_{Res} = H − 327 mm

h_{dyke} = 100.5 mm

P_1 988.1/2
P_2 989.6/7
P_3 987.9
T 23

18H10

P_{dyke} = 931.6 mbar
P_{tunnel} = 687.4/5
T = 23°C

18H30

(H_{res} = h − 373 mm)

P_2 = 989.8/9
P_3 = 988,1/0

13.12.2000

re 1/15/200

P_1 988.5/6

P_2 990.0/1

P_3 988.2 18H40

T = 23.5

13.12. 2000

Expt DGS15-10

500 FPS 1/15/2002

Δ Nicolet = 10 μs

$\Delta P = 100$ mbar

$P_1 = 989.1$
$P_2 = 990.6$ 07.03.02 19H15
$P_3 = 988.8$ 07.03.02
$T = 23°C$

h_{dy} 97.5
$H_{res} = H - 333$

$P_{dyke} = 932.7$ 07.03.02

19H20
$P_1 = 885.8$
$P_2 = 990.6/7$
$P_3 = 988.8/9$
$T = 23$

19H30
$P_1 = 989.2/3$
$P_2 = 990.8/9$
$P_3 = 989.0$
$T = 23$

13.12.2000

Expt DGS 15-11

$\Delta P \approx 200$ mbar

500 FPS

Δt Nic $= 10\,\mu s$

$P_1 = 990.8/9$

$P_2 = 992.2/3$

$P_3 = 990.6/7$

$T = 23°C$

21H30

$P_{dy} = 96$

$H_{res} = H - 334$ mm

$P_{dyke} = 932.2$

21H35

$P_{tunnel} = 790.7/8$

$P_2 = 992.3/4$

$P_3 = 990.7/8$

T 23°C

13.12.2000

re 1/15/2002

21H55 P_1 991.1/2

P_2 992.5/6

P_3 990.9/991

T 23°C

13.12.2000

re 1/15/2002

P_1 996.7/6
P_2 998.110
P_3 996.5/6
T 23

10 H05

DGS 12

h_{res} = H_335
h_{dy} = 94

250 FPS

Nic $\Delta t = 40\,\mu s$

pretrig 205.675 ms

P_{dyke} 938.9/939.0 $\Rightarrow$ $\Delta P = 60$

10H20

$\hookrightarrow \Delta P \approx 70$

P_1 925.5/4
P_2 998.2/1
P_3 996.~~#~~6/5
T 23

07.03.02

14.12.2000

305
re 1/15/2002

DGS 15-13

$P_1 = 995.9 / 996.0$
$P_2 = 997.4/5$
$P_3 = 995.7/8$
$T = 23$

11H20

$h_{dyk} = 97 mm$

$H_{res} = h - 334$

$P_{dyke} = 990.4/5 \Rightarrow H_{res} = h - 379$

P_1 594.~~7~~ 5 ~~6~~ 07.03.02
P_2 997.2/3
P_3 995 5/6
T 23

11H25

11H30
P_1 995.6/7
P_2 997.2/1
P_3 995.4/5
T 23

1000/2500

14.12.2000

re 1/15/2002

Expt DG815-14

$\Delta P \sim 800$

2000 FPS

$\Delta T_{Nic} = 1\,\mu s$

12H10

$P_1 = 995.0/1$

$P_2 = 996.5/6$

$P_3 = 994.6/7$

$T = 23.5$

$h_{dy} = 95$ mm

$h_{Res} = H - 334$ mm

$P_{dyke} = 939.5/6$

$h_R = H - 376$ mm

12H15

$P_1 = 994.3/2$

$P_2 = 996.5/6$

$P_3 = 994.6$

$T = 24$

12H25

$P_1 = 994.8/$

$P_2 = 996.4$

$P_3 = 994.5/4$

$T = 24$

14.12.2000

re 1/15/200

Expr DGS15-15

°C

+

$\delta P \sim 700$

13H20

P_1 993.8/9

P_2 995.6/7

P_3 993.4

T 24

h_{dry} 93 mm

$H_{res} = h - 336$

1000 FPS

1 µsec

$P_{dyke} = 935.2/3$

$H_{res} = h - 379$

13H27

$P_1 =$ 992.8/9 07.03.02

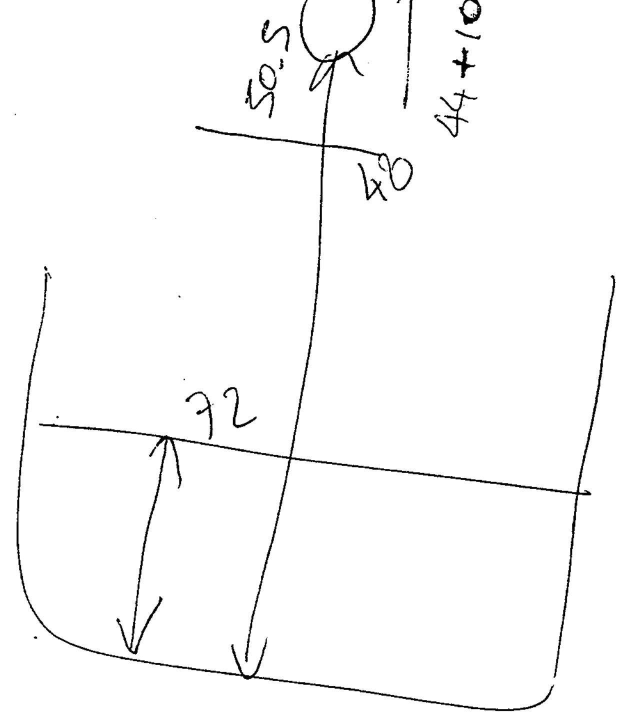
$P_2 =$ 995.7/8

$P_3 =$ 993.5/6

$T = 24$

14.12.2000

re 1/15/2002



(9 M35

$P_1 = 994.6$
$P_2 = 995.6/7$
$P_3 = 994.6/7$
$T = 21.5°C$

14.12.2000

Expt DG815-16

1/15/2002

9μs
1000 FPS

14H50

07.03.02

P_1 = 993.6/7
P_2 = 995.1/2
P_3 = 993.3/4
T = 23.5°C
h_{dy} = 89 mm
h_{res} = H - 339 mm

14H55

h_{dyke} = 937.9
h_{res} = H - 381

P_1 = 493.4/~~8~~3 07.03.02
P_2 = 995.1/0
P_3 = 993.3
T = 23.~~0~~ °C

07.03.02

14.12.2000

RE
1/15/2002 Exp LDGS15 - 17

P_1 = 993.3/4 h_{dy} = 87.5 mm
P_2 994.7/8
P_3 993.1/0 h_{Ros} = H - 340
T. 23°C

H - 385
P_{dy} I_{Ke} = 935.2/3
1000 FPS
1 ms

Tunnel 99.2 / 8

14.12.00

14.12.2000

DGS15-18

18-12-2000

Insert n°1 in place at the top of the cell

At 14H11

$P_1 = 993.2/3$ mbar
$P_2 = 995.0/1$ mbar
$P_3 = 993.0/1$ mbar
$T = 24.0°C$
$H_{res} = H - 339 = 146$ mm
$h_{dyke} = 90$ mm $\Rightarrow$ 160 mm

Nicolet

Time/pt = 1 µs
Trigger position = pretrig 1%

High-speed video 1000 FPS

At 14H15, DGS15 pumped up the cell

$P_{dyke} = 937.7/8$ mbar
$H_{res} = H - 380 = 105$ mm

At 14H20,

$P_1 = 993.8/9$ mbar
$P_2 = 995.1/2$ mbar
$P_3 = 993.0/1$ mbar
$T = 24.0°C$

At 14H25, once expt is finished

$P_1 = 993.3/4$ mbar
$P_2 = 995.1/2$ mbar
$P_3 = 993.1$ mbar
$T = 24.0°C$

18.12.2000

re 1/15/2002

DG315-19

18-12-2000

Insert n°1 in place at the top of the cell

At 15H04

$P_1 = 993.8/9$ mbar
$P_2 = 995.5/6$ mbar
$P_3 = 993.5/6$ mbar
$T = 24.0$ °C
$H_{res} = H - 342 = 143$ mm
$h_{dyke} = 87$ mm $\Rightarrow$ 157 mm

At 15H06, DG315 pumped up the cell

$P_{dyke} = 937.3/4$ mbar
$H_{res} = H - 383.5 = 101.5$ mm

Nicolet

Time/pt = 1 μs
Trigger position = pretrig 1%

High-speed video 1000 FPS

At 15H12

$P_1 = 108.8$ to 109.1 mbar (lowest achievable pressure
$P_2 = 995.6/7$ mbar
$P_3 = 993.6/7$ mbar
$T = 24.0$ °C

At 16H00

$P_1 = 994.6/7$ mbar
$P_2 = 996.2/3$ mbar
$P_3 = 994.3/4$ mbar
$T = 23.5$ °C

Transducer P_2 didn't record any signal $\Rightarrow$ use cable 8 for the next run

18.12.2000

DGS15-20

18-12-2000

Insert no 1 in place at the top of the cell

<u>Note</u>: transducer P_2 recorded on channel 2 (1B) but used cable 8 (problem during the previous expt either with P_2 itself or with cable 2)

At 16H09

$P_1 = 994.7/8$ mbar
$P_2 = 996.2/3/4$ mbar
$P_3 = 994.4/5$ mbar
$T = 23.0°C$
$H_{res} = H - 944 = 141$ mm
$h_{dyke} = 85$ mm $\Rightarrow$ 155 mm

Nicolet
Time/pt = 1 µs
Trigger position = pretrig 1%

High-speed video 1000 FPS

At 16H11, DGS15 pumped up the cell

$P_{dyke} = 936.9/937.0$ mbar
$H_{res} = H - 387 = 98$ mm

At 16H15,

$P_1 = 492.3/4/5$ mbar
$P_2 = 996.4/5/6$ mbar
$P_3 = 994.6/7$ mbar
$T = 23.5°C$

At 16H45

$P_1 = 995.3/4$ mbar
$P_2 = 996.9/997.0$ mbar
$P_3 = 995.1/2$ mbar
$T = 23.0°C$

18.12.2000

re 1/15/2002

DG315-21

18-12-2000

Insert n°1 in place at the top of the cell

At 17H02

$P_1 = 995.6/7$ mbar
$P_2 = 997.2/3$ mbar
$P_3 = 995.4/5$ mbar
$T = 23.5°C$
$H_{res} = H - 342 = 143$ mm
$h_{dyke} = 88$ mm $\Rightarrow$ 158 mm

Nicolet

Time /pt = 5 µs
Trigger position = pretrig 1%

High-speed video 1000 FPS

DG315 pumped up the cell

$P_{dyke} = 939.0/1$ mbar
$H_{res} = H - 388 = 97$ mm

At 17H07

$P_1 = 694.9/695.0$ mbar
$P_2 = 997.3/4$ mbar
$P_3 = 995.6/7$ mbar
$T = 23.5°C$

At 17H15

$P_1 = 996.0$ mbar
$P_2 = 997.5/6$ mbar
$P_3 = 995.7/8$ mbar
$T = 23.0°C$

18.12.2000

DGS15-22

18-12-2000

Insert n° 1 in place at the top of the cell

At 17H38
P_1 = 996.3/4 mbar
P_2 = 997.9 mbar
P_3 = 996.2/3 mbar
T = 22.5°C
H_{res} = H - 343 = 142 mm
h_{dyke} = 86.5 mm => 156.5 mm

Nicolet
Time/pt = 5 µs
Trigger position = pretrig 1%

High-speed video 500 FPS

DGS15 pumped up the cell
P_{dyke} = 938.8 mbar
H_{res} = H - 385 = 100 mm

At 17H43
P_1 = 895.2/3/4 mbar
P_2 = 997.9/998.0 mbar
P_3 = 996.3/4 mbar
T = 22.5°C

leak from the gate (see on the video)

At 17H45
P_1 = 996.4/5 mbar
P_2 = 998.0/1 mbar
P_3 = 996.3/4 mbar
T = 22.5°C

18.12.2000

RE 1/15/2002

18-12-2000

Insert no 1 in place at the top of the cell

At 18H20 | P_1 = 997.4/5 mbar
P_2 = 998.9 mbar
P_3 = 997.2/3 mbar
T = 23.0°C
H_{res} = H-343 = 142 mm
h_{dyke} = 86.5 mm ⟹ 156.5 mm

Nicolet | time/pt = 50 μs
trigger position = pretrig 1%

High-speed video 250 FPS

DGS15 pumped up the cell | P_{dyke} = 938.9/939.0 mbar
H_{res} = H-385 = 100 mm

At 18H27 | P_1 = 996.3/4 mbar
P_2 = 999.2/3 mbar
P_3 = 997.5/6 mbar
T = 23.0°C

leak in the gate

At 18H34 | P_1 = 997.9/998.0 mbar
P_2 = 999.4/5 mbar
P_3 = 997.7/8 mbar
T = 23.5°C

18.12.2000

DGS15-24

18-12-2000

Insert n°1 in place at the top of the cell

At 18H48 | P_1 = 998.2/3 mbar
P_2 = 999.8/9 mbar
P_3 = 998.0/1 mbar
T = 23.5°C
H_{res} = H-343 = 142 mm
h_{dyke} = 86.5 mm ⇒ 156.5 mm

Nicolet | Time / pt = 10 µs
Trigger position = pretrig 1%

High-speed video 500 FPS

At 18H54, DGS15 pumped up the dike | P_{dyke} = 942.5 mbar
H_{res} = H-385.5 = 99.5 mm

At 18H59 | P_1 = 797.0/1 mbar
P_2 = 1000.0 mbar
P_3 = 998.3/4 mbar
T = 23.5°C

At 19H19 | P_1 = 999.0/1 mbar
P_2 = 1000.0 mbar
P_3 = 998.8/9 mbar
T = 23.5°C

18.12.2000

Re 1/15/2002

DGS15-23

18-12-2000

Insert n°1 in place at the top of the cell

At 19H20
P_1 = 999.1/2 mbar
P_2 = 1000.0 mbar
P_3 = 998.9 mbar
T = 23.5 °C
H_{res} = H - 344 = 141 mm
h_{dyke} = 86 mm ⇒ 156 mm

Nicolet
Time/pt = 5 µs
Trigger position = pretrig 1%

High-speed video 500 FPS

Run the experiment with cell not filled up : h_{dyke} = 86 mm
and compare with experiment DGS15-20 ↳ 156 mm

At 19H25
P_1 = 497.7/8 mbar
P_2 = 1000.0 mbar
P_3 = 998.9/999.0 mbar
T = 23.5°C
h_{dyke} = 86 mm ⇒ 156 mm

At 19H30
P_1 = 999.3/4 mbar
P_2 = 1000.0 mbar
P_3 = 999.0/1 mbar
T = 23.5°C

18.12.2000

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BTM00276

D 6815 - 26   19-12-00

Dyke not filled to top

ΔP = 300 mbar
500 FPS
5 μs

10:44

P_1 1001.0
P_2 1001.0 / 1002.0
P_3 1001.0
h_{dy} 84.5
H_{res} = h - 345.5
T 21°C

10:46

07.03.02

P_1 = 700.~~45~~ 2/1/3
P_2 = 1001/1002
P_3 = 1001
T = 21

P_1 = 1001
P_2 = 1002/1001
P_3 = 1001

19.12.2000

328
1/15/2002

DG815-27 19-12-00

$\Delta P = 700$
1000 FPS
1 μs

11M40

P_1 1000
P_2 1002
P_3 1000
h_{dy} 84.5
$H_{res} = h - 345$
T 24

dyke not filled to top

11M43

P_1 ~~300~~. 1/2 07.03.02
P_2 1002
P_3 1000
T 24°C

1000
1000

11M45

P_1 ~~[illegible]~~ 1000
P_2 1002
P_3 1000
T 24

19.12.2000

DGS15-28 19-12-00

$\Delta P = 100$ mbar
~~1250 FPS~~ ~~125~~ 30 FPS
250 µs 07.03.02

P_1 999.2/3
P_2 1000.0
P_3 999.2/3
T 23.5
h_{dy} 85 mm
$H_{res} = h - 345$

dike not filled up to top

12450
P_1 899.1/~~0~~ 07.03.02
P_2 1001.0/1000.0
P_3 999.1/2
T 24°C

$\Longrightarrow$ decided to change FPS and

19.12.200

322 ~~ro~~
1/15/2002

P_1 899.2/3
P_2 ~~1~~000.0
P_3 999.0 / 998.9
T 24° C
P_{dry} = 85.5

P_1 up to 970 initially decreasing

P_1 recorded vocally on small video

→ 897.2/3 when tunnel filled

13H20
P_1 = 998.3/4
P_2 = 999.9
P_3 = 998.2
T = 23

1500
(600)

19.12.2000

Re 1/15/2002

DGS 15-29 19-12-00

$\Delta P = 860$
1000 FPS
2 μ

13H5

07.03.02

P_1 998.3/4
P_2 999.8/9
P_3 998.1/2
$T = 23$
h_{dy} 84
$h_{res} = H - 346$

dike not filled to top

minimum P_{tunnel} readable 128 mbar
go for
$\to \Delta P = 860$ mbar

07.03.02

07.03.02

13H3

P_1 123.0
P_2 99.6
P_3 998.0/997.9 998.2
T 23.5

13H48

P_1 997.7/8
P_2 999.1/2
P_3 997.5/6
T 23

19.12.2000

324 re
1/15/2002

DGS15-30 19-12-00

$\Delta P = 400$
500 FPS
5 μs

P_1 997.0/1
P_2 998.5/4
P_3 996.9/8
T 23
h_{dw} 84.5
$h_{res} = h - 346$

dike not filled to top

14h19

P_1 995.2/3/1 $t_{07.03.02}$
P_2 998.5/6/4
P_3 996.9
T 23 997.0

14h40

$t_{07.03.02}$
P_1 996.7/8
P_2 998.2/3/1
P_3 996.6/5
T 23.5

19.12.2000

1/15/2002
Re

CD

DG815 ~~18~~ ~~19~~ ~~20~~ ~~21~~ ~~22~~ ~~23~~ ~~24~~

07.03.02

~~25~~ ~~26~~ ~~27~~ ~~28~~ ~~29~~ ~~30~~

DG830 ~~18~~ ~~19~~ ~~20~~ ~~21~~ ~~22~~ ~~23~~ ~~24~~ ~~25~~ ~~26~~ ~~27~~

DG85 ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~

07.03.0

ASG

tunnel	AN 008463	SN 0050000334	(Dec 04, 00)
dike	AN 008466	SN 0050000371	(Dec 06, 00)
reservoir	AN 008464	SN 005000333	(Dec 04, 00

insert glass plate thickness 6.5 mm
length 45.5 cm
width 19.65 cm

80	280
133.5	330
182	380
229	430

Positions of P transducers (retirer 30 mm)

28
29

19.12.2000

from tube cut

Re 1/15/2002

19.12.2000

327
RE 1/15/2002

I have reviewed scientific notebook 371 and find it in compliance with QAP-001. There is sufficient information regarding procedure used for conducting the research and acquiring and analyzing the data so that another qualified scientist could repeat the activity or activities recorded in this scientific notebook.

H. Lawrence McKague 1/15/02

H. Lawrence McKague
GLGP Element Manager

HLMcKague

Re 1/15/2002

[illegible]
1/15/02