ROYAUME DE BELGIQUE

MINISTERE DES AFFAIRES ECONOMIQUES

ADMINISTRATION DES MINES - SERVICE GEOLOGIQUE DE BELGIQUE

13, rue Jenner - 1040 Bruxelles

SOME A. P. L. APPLICATIONS FOR OFF-LINE PLOTTERS

par

D. DERAYMAEKER - S. DEWILDE - G. VANDENVEN

PROFESSIONAL PAPER 1975 N° 8

Dejonghe

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SOME A.P.L. APPLICATIONS FOR OFF-LINE PLOTTERS

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CONTENTS

Introduction

The Belgian Geological Survey has been using tele-processing IBM-terminals in the A.P.L. language for several years.
All this time the jobs happened to be calculus problems such as differential equations, integrals, regression lines, least squares and statistics.
Since the spring of 1974 however we had the possibility to use off-line Calcomp-plotters.
As our geologists spend great time making their draws, we decided to make them save much time by giving them a handy and efficient drawing-tool : an off-line plotter connected to our A.P.L. -terminals.
The only duty left was the concepting of a suitable A.P.L. -Plotter interface.
This long and difficult task has been realised by S. DEWILDE and his results are presented in the first part of this publication.
In the following parts we'll give short explications about the Geological Survey's current applications of this interface in the domains of mineralogy, hydrology and sedimentology.
It is obvious that these applications have no other ambition than being time savers for the user and that all the presented functions could be easily extended to cover wider domains of applications.

1. Description of the essential functions for using the A.P.L. -off-line CALCOMP plotter interface

1.1. INITPLOT

This function creates the space on disk in a file named KEEP.PLOT and must be executed for every new A.P.L. -off-line plot user and also when you want to start plotting with a fresh and clean KEEP.PLOT data set.

1.2. PLOT XYP

This function plots any argument of length 3, if the 3rd element satisfies following conditions :

P = 3 2 ¯2 or ¯3

For P = 3 the pen stays up in the point XY (coordinates in cm) and there is no specific plot at all.

For P = 2 the pen is down and the point XY is really plotted.
The negative values of P act in the same way but moreover they make the point XY the new plot origin for all following plot instructions untill a new negative P appears.

<u>Example</u>   PLOT 1 1 ¯3

The pen goes to the point 1,1 up and this point 1,1 is the new plot origin.

1.3. <u>PLCLOSE X,Y</u>

The end of a plotting session must always be followed by the PLCLOSE function that closes the KEEP.PLOT data set.
The argument XY leads the pen to a point XY (in cm) where the next drawing is going to start.

1.4. <u>APLCOPY</u>

After PLCLOSE the draw is still stored on disk. The APLCOPY function takes care of the transfer to any tape that can be loaded on the off-line plotter.
This function is conversational.

1.5. <u>'TITLE' AXIS X, Y, POS, AXL, ANGL, START, SCALE</u>

The AXIS function draws axes with features following the right argument of the function.
The length of the right argument must be = 7.
X and Y : are the coordinates in cm for the axis' origin.
POS : if = ¯1 axis' annotations stand horizontal.
      if = 1 axis' annotations become vertical.
AXL : fits the axis' length in cm.
      if AXL is negative the axis' annotations are upride the axis.
      if AXL is positive the axis' annotations are downside the axis.
ANGL : gives in degrees the angle that our axis should make with the positive X-axis in a 90° XY-system.
START : gives the begin value for the axis' annotations.
SCALE : gives the increment between two consecutive annotation marks.
The left argument is a character vector that prints the name of the axis downside the axis.

1.6. 'NAME' SYMBOL X, Y, HEIGHT, ANGL

The SYMBOL function allows to add litteral informations to the drawings. The text 'NAME' is written on the drawing from the point X,Y (in cm) in a heigth of HEIGTH cm and with an ANGL angle with the positive X-axis.

1.7. FLOAT NUMBER X, Y, HEIGHT, ANGL, POS

Using SYMBOL for litteral informations with many figures would take too much space and CPU. In these cases it is more conveniant to use the NUMBER function that plots floating point numbers.
The number FLOAT will be plotted from the point X,Y (in cm), in a height of HEIGHT cm and with an ANGL angle with the positive X-axis.
POS determines the shape of the number FLOAT that has to be plotted.

If POS =	¯1	FLOAT is plotted as	: integer number
=	0	" " " "	: integer number with decimal point
=	1	" " " "	: number with 1 decimal
=	2	" " " "	: number with 2 decimals
=	3	" " " "	: number with 3 decimals.

1.8. THEN and TO

Example : PLOT X_1,Y_1 TO X_2,Y_2 THEN X_3,Y_3

When using TO the pen moves down from 1 point to another. Thus in our example there will be a line from X_1,Y_1 to X_2,Y_2.
When using THEN the pen moves up from 1 point to another. In this case there will only be a translation of the pen from X_2,Y_2 to X_3,Y_3 without any drawing effect.

1.9. NEWPEN Y

Generally the plotter has different pens to use : for the drum plotter this number is three, for the flat bed it is four. So the NEWPEN function decides which of those pens is going to be used to really draw.
One can easily see the use of this function for making draws in different colours and ink draws with different pen widths.
Thus when using the flat bed plotter the argument Y may be 1, 2, 3 or 4, when using the drum Y may be 1, or 3.

1.10. Discussion

It is obvious that the few functions that have been presented here only represent the base of a plotting alfabet. When using the plotter intensively the user will find his specific needs and with the help of the basic functions he will be able to concept himself routines for drawing rectangle, triangles, circles, grids and so on.
If any user should have problems in these domains he always may contact S. DEWILDE or D. DERAYMAEKER. We will be very glad to help him.

2. Mineralogical applications

2.1. The STEREOGRP group

Eliminating the human errors in dealing with large amounts of data, and the great time saving obtained by using a computerised data processing led us to concept the STEREO program for SCHMIDT equal area projections of mineral fabric diagrams.
The A.P.L. language gives us the possibility to make program running conversional and with immediate results. The STEREO program produces an output for equal area projections of structural data together with the point-counted equal area projections diagrams. However the final contouring of these diagrams could be achieved automatically it has to be done by hand because we don't yet dispose of an appropriated contour-mapping software.
The needed functions for the stereoprocessing are grouped in the STEREOGRP group. The main function 'STEREO' is niladic and without explicit result. It has the calling instructions for actioning the different subfunctions. There is first of all the REK1ST function that takes care of the data input : directions measured in degrees can be individually entered or more conveniantly one can put them in a numerical vector, so mistakes can be corrected before the program's running. Dip data are introduced in a character vector where each measure has 5 signs like in 030SE, that is 3 figures and two-litteral couple of NE, NW, SW or SE : this litteral couple is required to make the sign corrections due to the quadrant positions.
REK1ST then calculates directions in radians and XY-coordinates for the projections upon the SCHMIDT-net. One may notice that this way of processing is suitable for any data. However the geologist has generally developped his

own system : the STEREO function can be very easy adapted to such personalised desiderata.
We have developped ourselves two 'Personalised' stereo versions that are grouped as STEREOVDV and STEREODJ.
The main differences can be found in the data entry that is no longer affected to REK1ST but is considered as right argument of the STEREO function.
The new stereo functions are called STER1 and STER2 and are monadic functions without explicit results.
The REK1ST function becomes REK1 and achieves further identical performances as formerly the REK1ST function. Since data are introduced in a character vector it was necessary to introduce some preparing functions that would give suitable output for the REK1 function.
These functions are called PRLD and ADPT in the STEREODJ group and PRDV in the STEREOVDV group.
Returning to the main functions, that may thus be STEREO, STER1 or STER2 we get the ADAPT90 function that handles with the observations of 90°DIP, that have two polar points in the projection. These observations are compressed from the result of REK1ST (or REK1) into the XY table.
A new small two-dimensional array is defined and reshaped to double number or rows. Then the X and Y signs are adapted following directions values $<$ or $>$ 90°.
The user has now the choice to have the entered data and the corresponding XY coordinates printed or not. If the answer is positive the PRINTST functions prints out a number table which is a very handy help for interpretating the drawing results afterwards.
The equal area projections itself is achieved in the DRAWST function which contains two sub-functions PLINIT and PLTEST. PLINIT is the usual function to initialize the plot data set on disk. The PLTEST function accepts the litteral information to identify the drawings.
These informations are all entered conversionnally.
At this point the first draw is completed and the user may end the session.
If he wants a point counted diagram of the equal area projections he answers yes and stereo will continue with the GRLEV function.
The GRLEV function uses the same 20 cm Ø circle.
The point counted equal area projection diagram is formed in the GRLEV or GRLEV1 function.

Upon a standard 20 cm Ø circle we consider a square grid with a 1 square cm unit. At the gridpoints we put circles with a radius of 1 cm so they represent 1 % of the total area. In each little circle the number of plotted points is registered and expressed afterwards in a symbol at the gridpoint. The symbols are selected from the character vector

A '0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZ'

These operations are executed in the BAND function.

Restrictions on the available space pushed us to introduce a loop in the use of the BAND function, so BAND now only works with plotted points situated in an area limited by X-1 and X+1 value where X is an integer going from -9 to +9.

So far we loose the points situated nearly upon the diagram's edge.

The BANDO function does just identical operations as BAND but works with the points situated in the area of the circle between R=9 and R=10, here the gridpoints are situated every 10° upon the circle's circumference. One may notice that here the symbols in the gridpoints represent the sum of the original gridpointvalue and the value of the 180° opposed gridpoint.

Drawing operations are terminated as usual in the PLCLOSE function.

The STEREOGRP and the needed plot functions take 25 K of space.

A ordinary 200 point running takes about 2 min 20 sec of CPU.

At this moment drawings are stored upon disk. To use them on the off-line plotter we must have them transferred to tape. The APLCOPY function does this job. As this same transfer appears in every function we'll describe further, we won't discuss it there.

Example of a STEREO run

The used version is STER2 and here this function works with ST229E as right argument. ST229E is a character vector of length 1170 and contains the dip and direction data.

The equal area projection diagram is showed at plate 1, for the point counted diagram see at plate 2.

SERVICE GEOLOGIQUE DE BELGIQUE

BELGISCHE GEOLOGISCHE DIENST

CANEVAS SCHMIDT

OBJET : STRATIFICATIONS

PLANCHETTE : LANGERT 229E

AFFL. : NR CARNET 1-89

MESURES PAR : G.VANDENVEN (AOUT 1974)

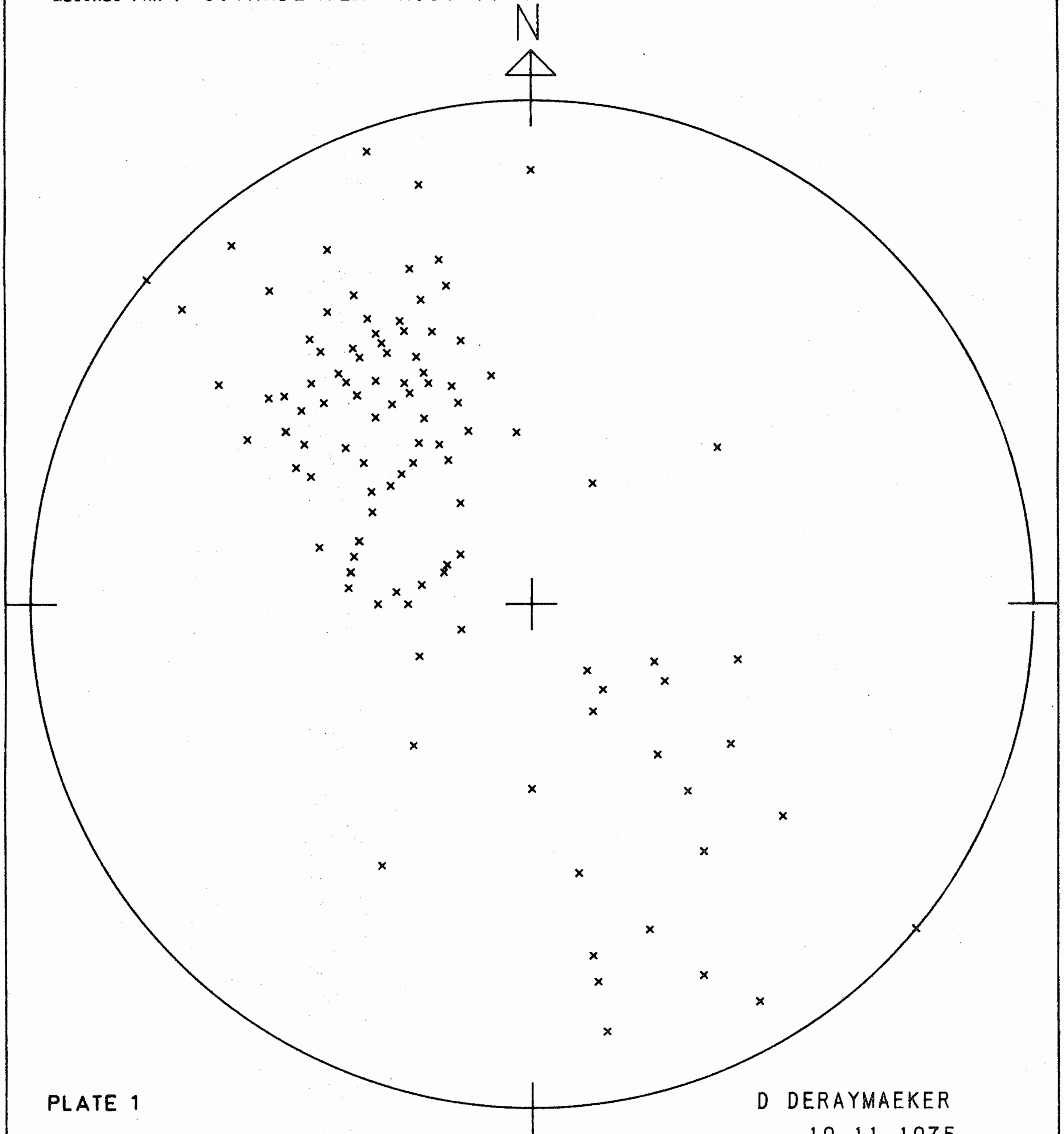

PLATE 1

D DERAYMAEKER

19 11 1975

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BELGISCHE GEOLOGISCHE DIENST

CANEVAS SCHMIDT

OBJET : STRATIFICATIONS

PLANCHETTE : LANGERT 229E

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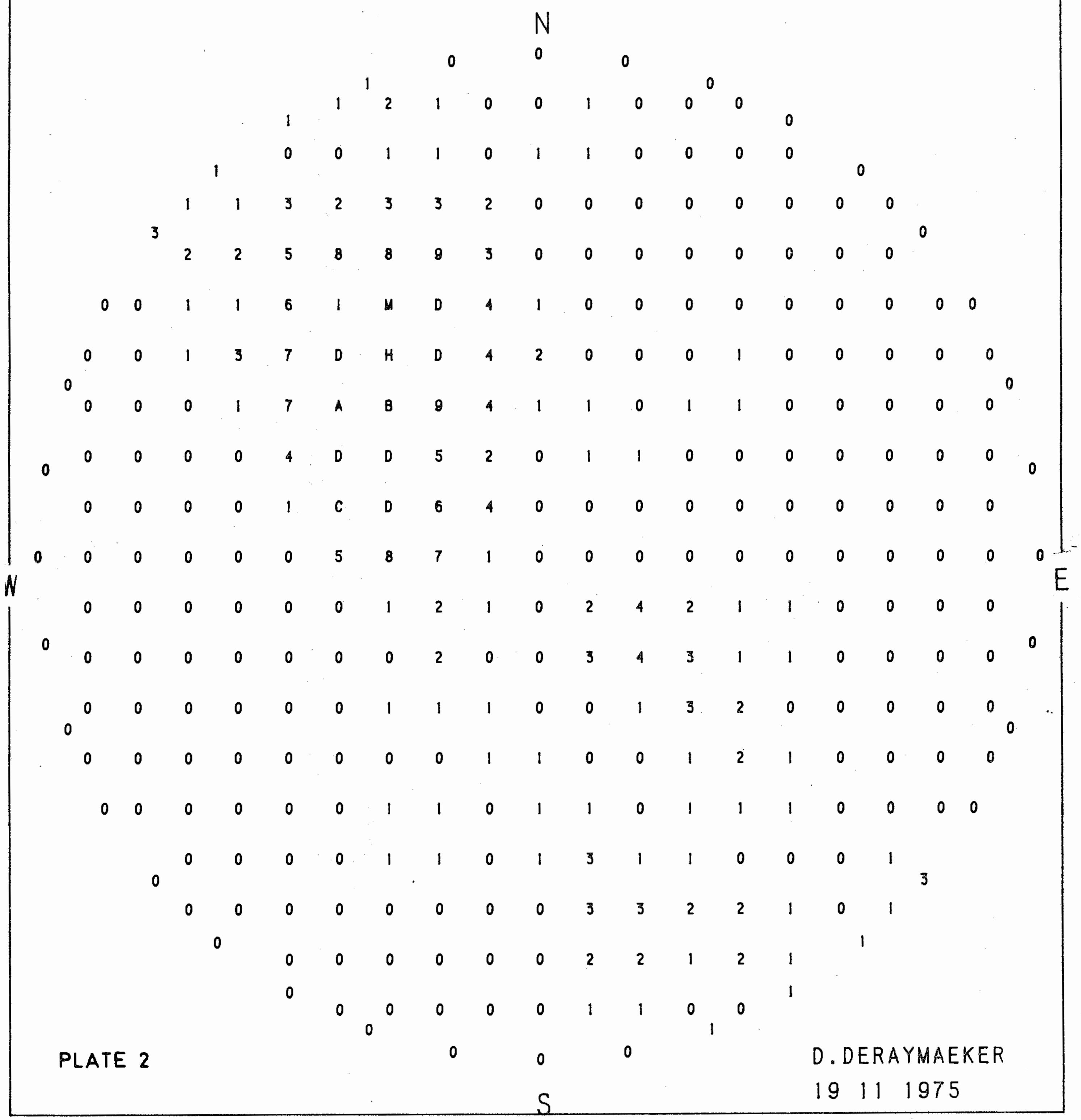


PLATE 2

D.DERAYMAEKER
19 11 1975

3. Hydrological applications

3.1. The LOGPOMP group

Level observations in the beginning or at the end of pumping test are generally logarithmically spaced in time.
The LOGPOMP group was created to handle with those level observations.
The main function POMPLOG is dyadic and without explicit result.
The left argument is a character vector with information about the plotted data. The numerical right argument contains the level observations. The plot data set is as always initialized in the PLINIT function.
The A4LOG1 function draws a semi-logarithmic network with a logarithmic X-axis for time and an arithmetic Y axis for the levels. As usual the user choices the stepvalue for the Y axis' increment. The observations are plotted as a 3 column-matrix.
Hereafter the data set is closed and drawing is ended.
This group takes 8 K of space. An average run takes about 22 sec of CPU.

Example of a POMPLOG run (plate 3)

```
      'OLMEN2 II P 16-17/10/75' POMPLOG OLMEN2[;1]
DRAWNAME?:OLM2P
WAARNEMINGSTIJDEN IN MIN?
⎕:
      LOGTIMES
WAARDE ↑YAS/CM?
⎕:
      0.1
END OF DRAW AFTER 0 MIN 17 SEC 643 MSEC
VOLUME NUMBER:53
LABEL NUMBER:4
0
COPY EXECUTED
```

STER2 ST229E

VALUES PRINTED?YES

	DIRECTION	PENDAGE	X	Y
1	50	30SE	2.80391727	¯2.35276594
2	30	42SE	2.53404407	¯4.38909308
3	50	45SE	4.14580265	¯3.47874148
4	55	45SE	4.43321892	¯3.10417330
5	40	54SE	4.12695050	¯4.91830808
6	30	55SE	3.26505576	¯5.65524246
7	65	40SE	4.38371583	¯2.04416026
8	117	22SW	2.40433361	1.22506916
9	50	82SE	7.10741838	¯5.96383214
10	120	50NE	¯5.17599549	¯2.98836239
11	50	70SE	6.21384285	¯5.21403325
12	40	80SE	5.84318977	¯6.96364240
13	65	50SE	5.41675220	¯2.52587304
14	60	55SE	5.65524246	¯3.26505576
15	50	55SE	5.00235564	¯4.19747477
16	60	60SE	6.12372436	¯3.53553391
17	50	18NW	¯1.69473347	1.42205023
18	70	58NW	¯6.44276133	2.34497335
19	40	40SE	3.10909634	¯3.70527673
20	44	48SE	3.99576162	¯4.13773228
21	40	36SE	2.80908486	¯3.34773697
22	55	20SE	2.01163761	¯1.40856382
23	45	52SE	4.38371147	¯4.38371147
24	80	38SE	4.53428041	¯.79951597
25	55	50NW	¯4.89584632	3.42810850
26	40	30SE	2.35276594	¯2.80391727
27	50	50SE	4.57843680	¯3.84176463
28	35	40NW	¯2.77432914	3.96215263
29	30	42SE	2.53404407	¯4.38909308
30	25	22NW	¯1.14041285	2.44562325
31	38	56SE	4.08758002	¯5.23186384
32	50	40NW	¯3.70527673	3.10909634
33	130	32NW	¯2.98611851	2.50565094
34	65	42SE	4.59324775	¯2.14186660
35	160	12NE	¯.50559323	¯1.38910598
36	30	25NW	¯1.53045919	2.65083307
37	85	28SE	3.40827321	¯.29818527
38	140	40SW	3.10909634	3.70527673
39	65	40SE	4.38371583	¯2.04416026
40	60	27SE	2.85911012	¯1.65070800
41	35	14SE	.98855485	¯1.41180264
42	35	32SE	2.23585880	¯3.19313730
43	55	60SE	5.79227965	¯4.05579788
44	50	14NW	¯1.32027207	1.10783981
45	90	75SW	8.60918669	.00000000
46	80	45NW	¯5.32974115	.93977717
47	60	48SE	4.98148618	¯2.87606238
48	80	60NW	¯6.96364240	1.22787804
49	60	52SE	5.36892814	¯3.09975211
50	50	30SE	2.80391727	¯2.35276594

51	80	60*NW*	6.96364240	1.22787804
52	75	75*SE*	8.31583577	¯2.22822148
53	75	60*SE*	6.83012702	¯1.83012702
54	80	65*NW*	¯7.48312467	1.31947678
55	45	30*SE*	2.58819045	¯2.58819045
56	60	60*SE*	6.12372436	¯3.53553391
57	70	48*SE*	5.40522920	¯1.96734254
58	20	30*SE*	1.25188061	¯3.43951371
59	30	42*SE*	2.53404407	¯4.38909308
60	30	30*SE*	1.83012702	¯3.16987298
61	60	50*SE*	5.17599549	¯2.98836239
62	60	70*SE*	7.02484799	¯4.05579788
63	60	30*SE*	3.16987298	¯1.83012702
64	60	40*SE*	4.18887416	¯2.41844763
65	70	38*SE*	4.32656001	¯1.57473906
66	70	35*SE*	3.99615770	¯1.45448245
67	50	45*SE*	4.14580265	¯3.47874148
68	55	32*SE*	3.19313730	¯2.23585880
69	75	45*SE*	5.22755290	¯1.40071858
70	60	42*SE*	4.38909308	¯2.53404407
71	50	45*SE*	4.14580265	¯3.47874148
72	60	40*SE*	4.18887416	¯2.41844763
73	55	40*SE*	3.96215263	¯2.77432914
74	60	35*SE*	3.68287886	¯2.12631110
75	60	50*SE*	5.17599549	¯2.98836239
76	65	52*SE*	5.61865894	¯2.62002369
77	25	15*SE*	.78011913	¯1.67297087
78	60	80*NW*	¯7.87250828	4.54519478
79	75	55*SE*	6.30760336	¯1.69011723
80	30	45*SE*	2.70598050	¯4.68689571
81	50	48*SE*	4.40638322	¯3.69739453
82	35	50*SE*	3.42810850	¯4.89584632
83	35	46*SE*	3.16945296	¯4.52644793
84	35	65*SE*	4.35835722	¯6.22437918
85	35	50*SE*	3.42810850	¯4.89584632
86	55	50*SE*	4.89584632	¯3.42810850
87	55	60*SE*	5.79227965	¯4.05579788
88	65	45*SE*	4.90490240	¯2.28719355
89	70	85*SE*	8.97809425	¯3.26775907
90	80	75*NW*	¯8.47839380	1.49496958
91	70	30*SE*	3.43951371	¯1.25188061
92	40	55*NW*	¯4.19747477	5.00235564
93	20	30*SE*	1.25188061	¯3.43951371
94	155	20*NE*	¯1.03784737	¯2.22567086
95	0	25*SE*	.00000000	¯3.06091837
96	25	15*SE*	.78011913	¯1.67297087
97	0	20*SE*	.00000000	¯2.45575608
98	20	15*SE*	.63134152	¯1.73459657
99	70	54*SE*	6.03319801	¯2.19590449
100	50	40*SE*	3.70527673	¯3.10909634

101	70	60*SE*	6.64463024	¯2.41844763
102	60	20*NW*	¯2.12674715	1.22787804
103	40	50*SE*	3.84176463	¯4.57843680
104	50	58*SE*	5.25218716	¯4.40710831
105	65	70*NW*	¯7.35160240	3.42810850
106	55	60*SE*	5.79227965	¯4.05579788
107	55	50*SE*	4.89584632	¯3.42810850
108	55	52*SE*	5.07833655	¯3.55588953
109	10	18*SE*	.38416489	¯2.17870735
110	40	30*SE*	2.35276594	¯2.80391727
111	10	30*SE*	.63559644	¯3.60464655
112	30	30*SE*	1.83012702	¯3.16987298
113	50	55*SE*	5.00235564	¯4.19747477
114	165	35*NW*	¯1.10065962	4.10771761
115	5	30*SE*	.31901216	¯3.64632567
116	15	36*SE*	1.13108070	¯4.22125065
117	50	50*SE*	4.57843680	¯3.84176463
118	60	40*SE*	4.18887416	¯2.41844763
119	30	30*SE*	1.83012702	¯3.16987298
120	20	30*SE*	1.25188061	¯3.43951371
121	5	22*SE*	.23518513	¯2.68817829
122	15	30*SE*	.94734345	¯3.53553391
123	10	30*SE*	.63559644	¯3.60464655
124	20	30*SE*	1.25188061	¯3.43951371
125	30	30*SE*	1.83012702	¯3.16987298
126	130	30*NE*	¯2.80391727	¯2.35276594
127	90	30*NE*	¯3.66025404	¯.00000000
128	10	30*SE*	.63559644	¯3.60464655
129	40	90	¯6.42787610	7.66044443
130	40	90	6.42787610	¯7.66044443

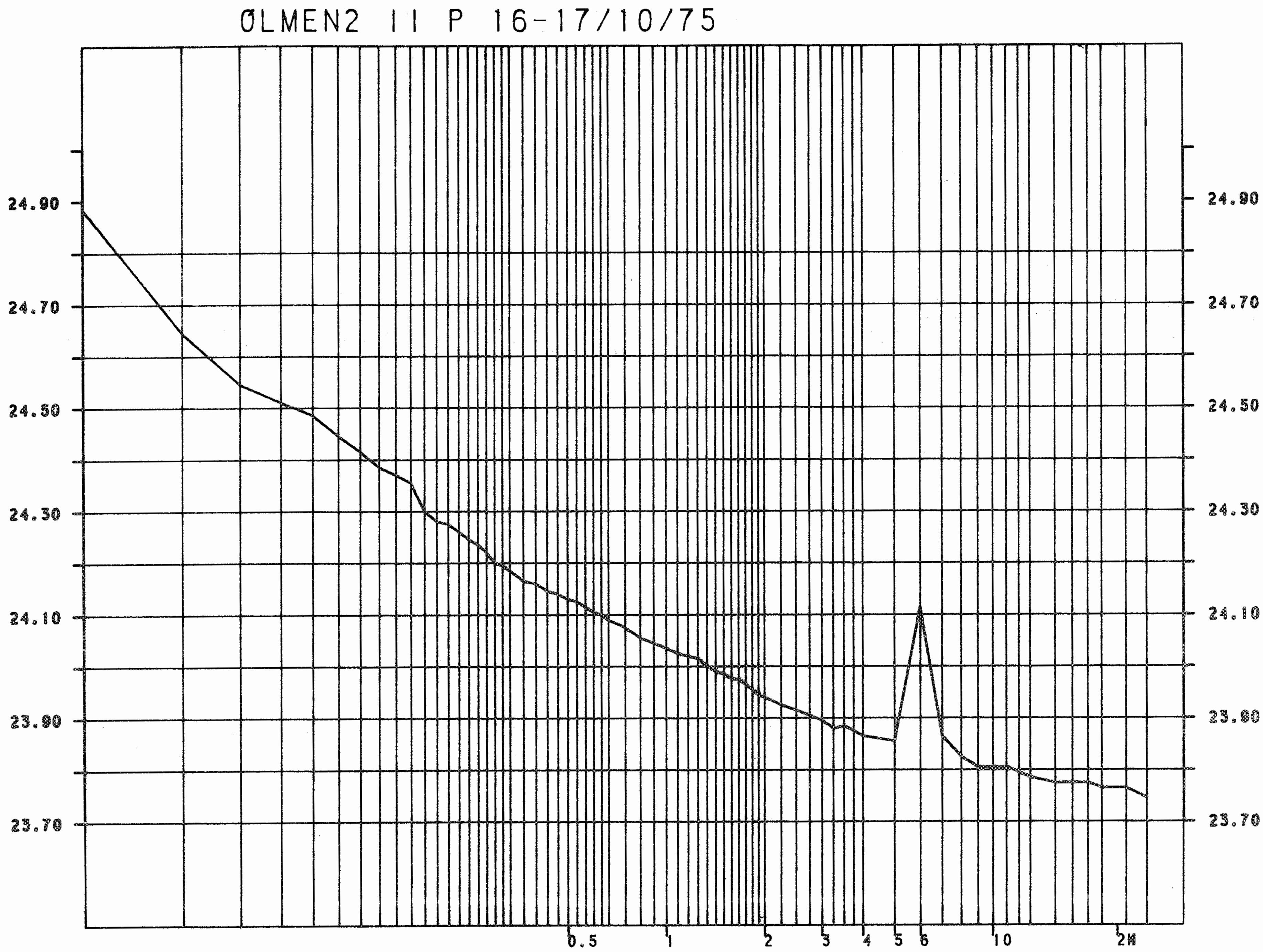


PLATE 3.

DERAYMAEKER D. 24 10 1975

3.2. The POMPING2 group

During pumping tests most of the level observations are arithmetically spaced in time. The POMPING2 group was concepted to handle with such level observations, spread over several following months.
The main function POMP2 is a dyadic function with numerical arguments and without explicit result.
The left argument must be a vector of length four and it should contain the beginning day of the observations, the number of the beginning months, the last day and the number of the last month. The right argument has to be a numerical vector representing the observation data.
The observations are plotted as a 3 colums-matrix in an arithmetic two-axes system with the X-as for time and the Y-as for the observation levels.
As in all our plotter applications we let the user choice the Y axis' increment.
Identification and complementary information about the plotted data can be entered conversationnally in the HEAD function, that accepts endless input.
However one must avoid to reenter too frequently : the character plot height starts at 0.4 cm but decreases 0.1 cm with every new input line.
A ordinary draw takes are 33 sec. of CPU and this groups takes 5 K of space.

Example of a POMP2 run (plate 4)

```
                  13 10 5 11 POMP2 BR11

      DRAWNAME?:BR01
      WAARDE← YAS/CM?
      ⎕:
           0.2

      NAME?BRECHT PUT 1.1
      CONTINUE TEKST?YES
      NAME?13/10 5/11 1974
      CONTINUE TEKST?NO
      END OF DRAW AFTER 0 MIN 18 SEC 617 MSEC

      VOLUME NUMBER: 53
      LABEL NUMBER: 10
      0
      COPY EXECUTED
```

BRECHT PUT1.1 13/10 5/11 1974

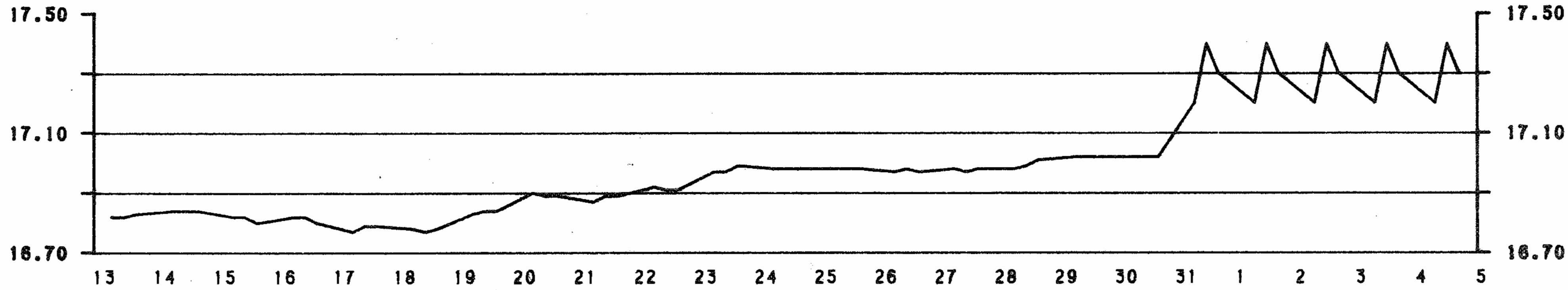


PLATE 4.

3.3. The JREGEN3 group

The JREGEN3 group was made to represent annual or monthly precipitations for 1 observation station. The main function JREG3 is dyadic without explicit result. The left argument is a numerical vector containing the annual observation data for the station.
The right argument is a numerical vector too but it specifies the months to be plotted by their number : this argument may have no length greater than 12.
The plotter data set is initialized in the PLINIT function. The data are represented in a histogram where the horizontal axis reproduces time and the vertical axis the observations. The X-axis has a fixed scale of 0.2 cm/day. However the user has a conversional control of the Y-axis' increment. Litteral information about the observations may be entered conversionally too. The GRREG function puts the right monthnames beneath the X-axis, and traces limits of each month also. Finally the PLCLOSE arguments (A+3) and -2 are chosen in that way to allow a continual use of the plotter with A4 format paper without stopping or recharging the tapes.
An ordinary data treatment takes 30 sec CPU. The JREGEN3 group takes 4.9 K of space.

Examples of JREG3 (plates 5-6)

```
              EA21 JREG3 ι12

      DRAWNAME?:REG01
      WAARDE↑ YAS/CM?
      ⎕:
            5
      STATIONNAME?
      DAGELIJKSE NEERSLAG WUUSTWEZEL 1974
      END OF DRAW AFTER 1 MIN 5 SEC 523 MSEC

      VOLUME NUMBER: 53
      LABEL NUMBER: 11
      0
      COPY EXECUTED
```

NEERSLAG MEERLE 1/2 31/5 1974

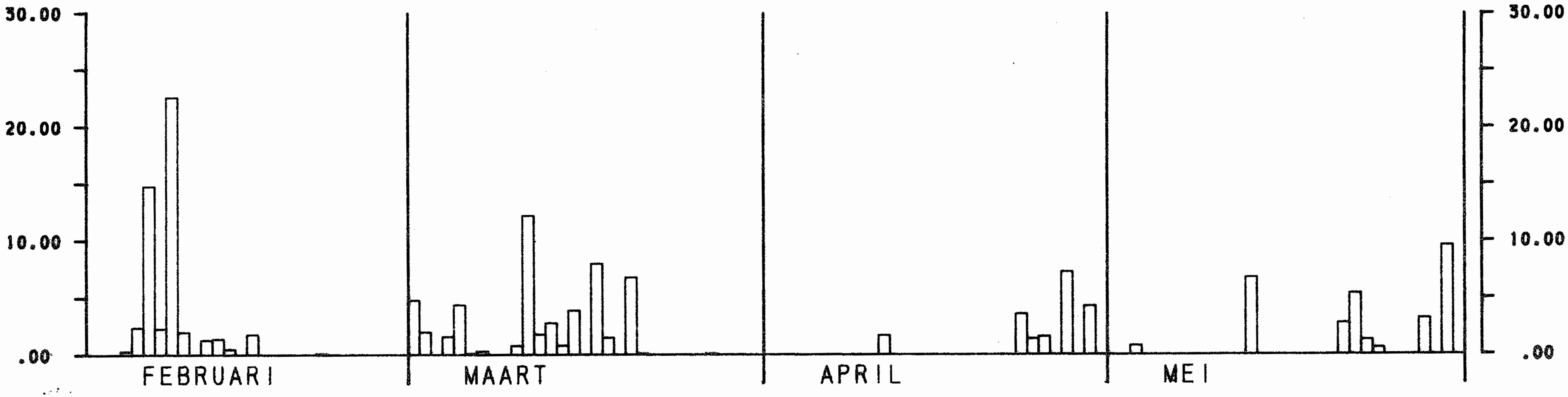


PLATE 6.

DERAYMAEKER D. 11 9 1975

3.4. The LUCHTDRUK group

The LUCHTDRUK group was concepted to surimpose air pressure variations upon liminigraph registration sheets, with each sheet covering an eight day period.

The main function PRES2H is dyadic without explicit result. The left argument is a character vector with the station's name and the period of observations. The numerical right argument represents the pressure observations. Since we work with 12 observations/day the right argument must have a length of 96, if it is not conform there is a branch out off the function.

The pressure variations are graphically represented by a broken line in two-axis system. The PRYAS function takes care of the axes drawing. The X-axis has a fixed length of 38.4 cm, that is 1.2 cm for every hour. The Y-axis' increment is conversionally controlled by user. At the right end of the X-axis we have a second Y-axis with no other aim than to facilitate readings to the user.

The GRIDP function draws horizontal gridlines with a 1 cm interval and vertical gridlines with a 1.2 cm interval.

The observations are plotted as an ordinary three-column matrix plot.

Finally the PLCLOSE arguments allow continued processing on the plotter.

An ordinary data treatment takes of 30 sec CPU. The LUCHTDRUK group takes 10 K of space.

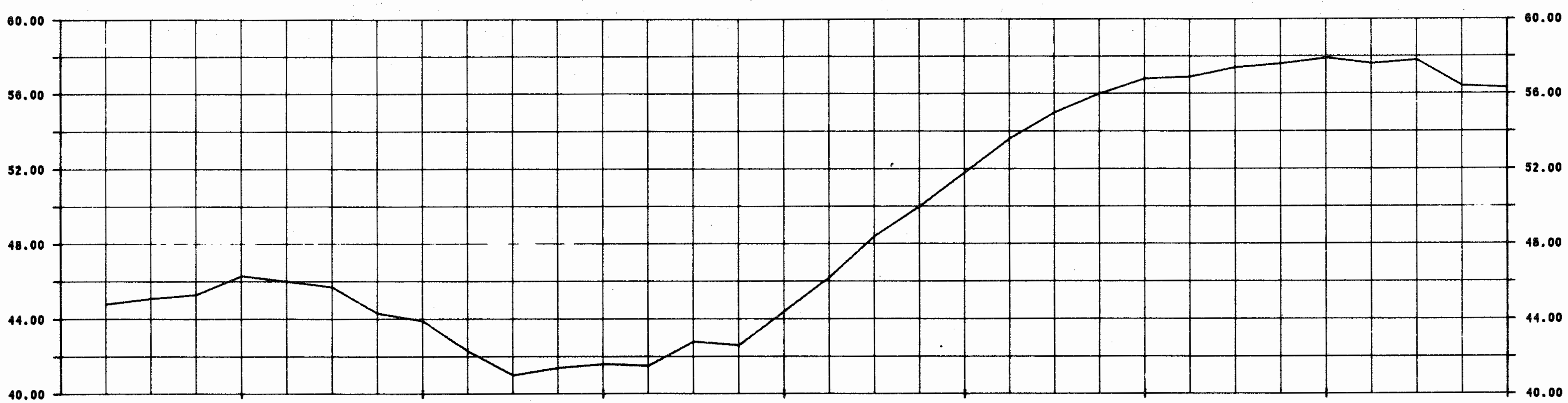
Example of a PRESS2H run (see plate 7)

```
'LUCHTDRUK UKKEL 1/5 8/5 1974' PRESS2H 32↑,DRUK

DRAWNAME?UKK01
WAARDE↑ PEILEN/CM?
⎕:
      2
DRAW EXECUTED AFTER 0 MIN 18 SEC 984 MSEC

VOLUME NUMBER:53
LABEL NUMBER:9
0
COPY EXECUTED
```

LUCHTDRUK UKKEL 1/5 8/5 1974



BRON : K.M.I

PLATE 7.

DERAYMAEKER D. 11 9 1975

4. Sedimentological applications

4.1. The GRANULOGRP group

In 1974 we introduced a first automatisation for handling with the results of pipet grain size analyses.* This first try was constantly improved to become an efficient tool.

The GRANULOGRP needs as input the bruto weithts of the grain size analysis. With these data we may have an output of the procentual weights for each fraction, a number of statistical parameters and some histograms and cumulative functions of the procentual weights.

Our pipet grain size analyses are of two types : these where the coarse fraction (> 53 mm) is sieved, and those where it is not. As the data entry and the preparing actions are identical for both we only had to concept different functions for the statistical calculus.

The functions that are essential for the two analyse-types are grouped in the COMMON group, with GRANULO as main function. The GRANULO function is niladic and contains the branch instructions for activating the right functions. There are two global vars : BEK10 and BEK100. There are 10 x 4 tables with the empty weights of the recipients used to take the pipet samples.

The ENTRY function is conversional and takes care of the data entry. The litteral information about the analysis has to be entered here too. Hereafter comes the selection following the analysis type.

The AN5 group contains all the functions for analyses without sieving of the > 53 mm fraction. ANL5 calculates the procentual weights for the fractions < 2 mm, 2-10, 10-20, 20-53 and > 53 mm. In PRINT5 these results are immediately printed as a table together with the litteral information about the data.

The AN12 group contains the functions needed for the analyses with sieving. First of all the procentual weights are calculated in AN12 for the fractions : < 2, 2-10, 10-20, 20-53, 53-74, 74-105, 105-149, 149-211, 211-295, 295-420 and 420-2000 mm.

1974. DERAYMAEKER D. : Un programme A.P.L. pour les calculs d'analyses granulométriques. (Service Géologique de Belgique, P.P. n° 7)

The ordinary statistical parameters are determined in the STAT12 function. If the user wants it he can have the procentual weights plotted in histograms or in cumulative functions with an arithmetic Y axis. The X axis that represents the grain size may be arithmetic (in mm) or logarithmic (Ø 2 scale). For the moment these drawings are printed on the A.P.L. terminal. It is sure that we would obtain the wanted plot precision by using the off-line plotter. In this direction we will extend the development of this application.
The GRANULOGRP takes about 25 K of space. An ordinary GRANULO mn takes 0.05 sec of CPU.

Example of a GRANULO run

GRANULO
NAAM LEGE BEKERREEKS:
BEK10
LABORANT ANALYSEDATE APLOPR
NBM 3 11 1975 NDD
PLANCHET PLAATS BORING DIEPTEN
31W BRUSSEL TEST 1 2 3 4 5 6 7 8 9 10
TOTWEIGHT BEKRKS TYPE5-12 STAT PLOT
⎕:
20 1 5 0 0
WEIGHTS, NAFOSF
⎕:
MT
IS THAT ALL?Y

INPUT BRUTO GEWICHTEN — LEEGGEWICHTEN BEKERS

POIDS BRUTS INTRODUITS — POIDS VASES VIDES

25.4360	25.1904	26.5288	36.7821	1	26.4649	25.1456	25.3938	23.9410
26.9117	24.0264	24.9510	39.7920	2	24.8914	23.9710	26.8589	26.7635
27.9569	26.0028	25.2446	41.6499	3	25.2178	25.9775	27.9325	24.2360
28.9455	25.0190	23.6897	41.2200	4	23.6593	24.9914	28.9210	24.3782
24.6810	24.6185	26.0875	42.8924	5	26.0508	24.5825	24.6522	26.4939
24.9580	27.9291	24.0870	27.6510	6	23.9672	27.8390	24.8790	24.3179
27.7176	25.0498	26.0550	26.4040	7	25.9091	24.9591	27.6446	24.3486
26.4770	24.0628	23.9770	28.6337	8	23.8292	23.9721	26.4120	25.2304
25.3800	28.8798	24.2930	37.6286	9	24.2156	28.8162	25.3280	28.4318
27.8186	25.5936	27.4626	36.6125	10	27.3869	25.5280	27.7551	24.4497

NAFOSFAAT : .0136

ALLES OK?
YES

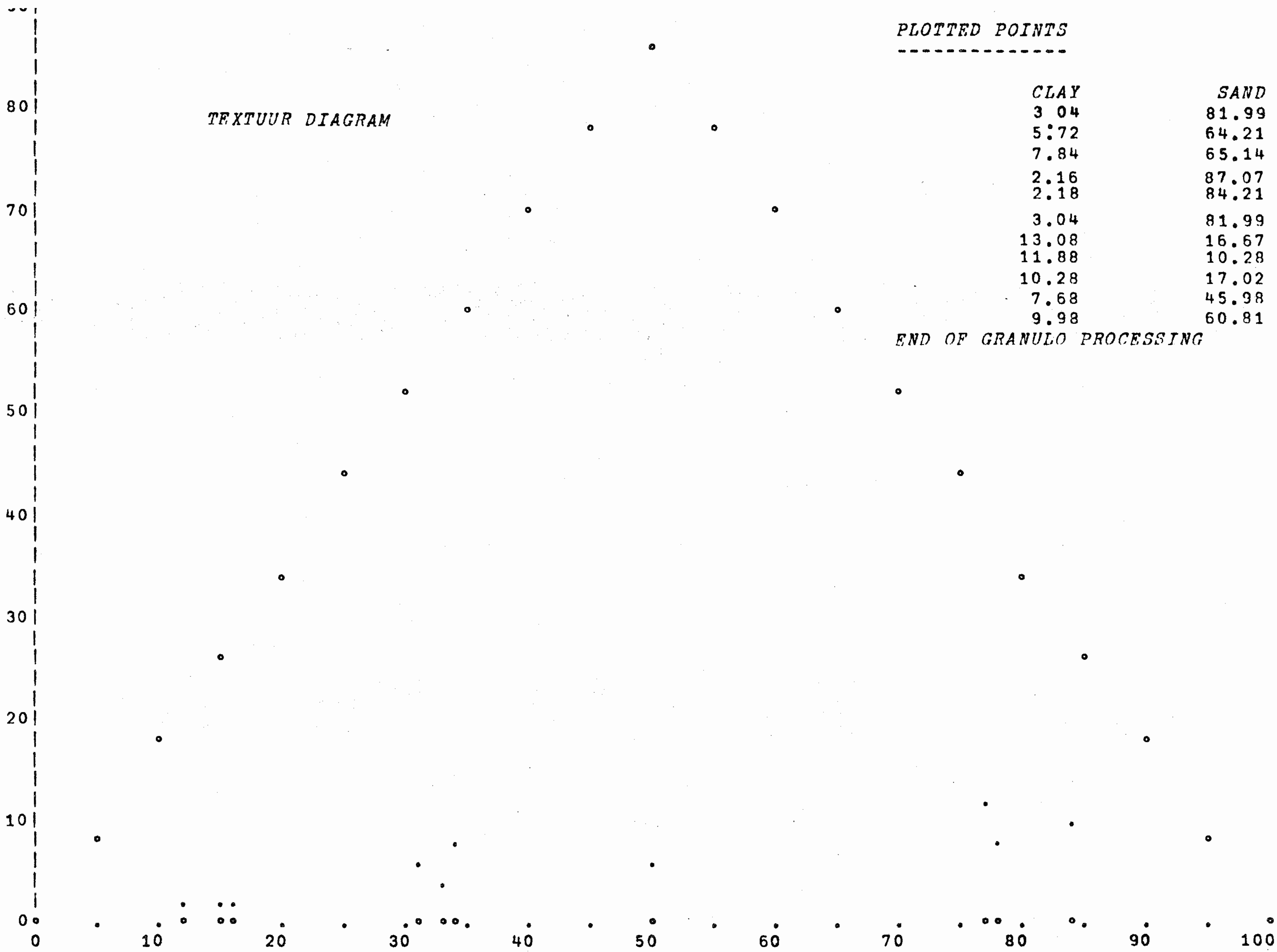
BELGISCHE GEOLOGISCHE DIENST — KORRELGROOTTE ANALYSE
SERVICE GEOLOGIQUE DE BELGIQUE — ANALYSE GRANULOMETRIQUE

LABO : B MARIN 3 11 1975
APL : DERAYMAEKER DAN 18 11 1975

31W BRUSSEL TEST

FRACTIEGEWICHTEN IN °/°

LABONR	< 2	2-10	10-20	20-53	2-53	> 53 MU	TEXTUUR
1	5.720	.520	3.820	25.734	30.074	64.206	P:LIGHT SANDLOAM
2	7.840	.520	.840	25.657	27.017	65.143	P:LIGHT SANDLOAM
3	2.160	.180	.300	10.290	10.770	87.069	Z:ZAND
4	2.180	.620	.560	12.431	13.611	84.209	Z:ZAND
5	3.040	1.440	.140	13.387	14.967	81.992	Z:ZAND
6	13.080	2.220	5.940	62.094	70.254	16.665	L:SANDLOAM
7	11.880	3.540	11.040	63.263	77.843	10.277	A:LOAM
8	10.280	5.140	11.420	56.143	72.703	17.017	L:SANDLOAM
9	7.680	2.320	2.760	41.256	46.336	45.984	L:SANDLOAM
10	9.980	.420	2.020	26.766	29.206	60.814	P:LIGHT SANDLOAM



PLOTTED POINTS

CLAY	*SAND*
3 04	81.99
5.72	64.21
7.84	65.14
2.16	87.07
2.18	84.21
3.04	81.99
13.08	16.67
11.88	10.28
10.28	17.02
7.68	45.98
9.98	60.81

END OF GRANULO PROCESSING

5. <u>Appendix</u> :

FUNCTION LISTINGS

```
      )GRP LOGPOMP

POMPLOG RECT    REPS    A4LOG1  P1YAS   APLCOPY CODE    NEWPEN  CORRECT

      ∇POMPLOG[⎕]∇
    ∇ N POMPLOG P;A;X;B;MIN;SC;T
[1]   ⍝N=NAAM STATION  P=PEILENVEKTOR
[2]    T←⎕AI[2]
[3]   ⍝ PEN1= 0.3MM / PEN2= 0.4MM
[4]    PLINIT A←10↓⍞,0ρ⍞←'DRAWNAME?:'
[5]    NEWPEN 1
[6]    29.6 REPS 21
[7]    PLOT 3 1 ¯3
[8]    A4LOG1
[9]    P1YAS
[10]   NEWPEN 2
[11]   PLOT⍉(3,B)ρ(¯1↓X),P,3,(B-1)ρ2
[12]   PLCLOSE 30 ¯1
[13]   T←1↓, 1 4 ρ 0 60 60 1000 ⊤(⎕AI[2]-T)
[14]   'END OF DRAW  AFTER ',(⍕T[1]),' MIN ',(⍕T[2]),' SEC ',(⍕T[3]),' MSEC'
[15]   APLCOPY
    ∇
      ∇RECT[⎕]∇
    ∇ RECT PM;C
[1]    →(6=ρPM)/L1
[2]    →0,0ρ⎕←'INCORRECT NUMBER OF PARAMETERS IN RECT'
[3]   L1:C← 4 2 ρ0,PM[4],PM[3],PM[4],PM[3],3ρ0
[4]    PLOT(PM[1 2]),(2+0=PM[6])
[5]    PLOT(PM[1 2 5] ROT C),4ρ2
    ∇
      ∇REPS[⎕]∇
    ∇ LX REPS LY;I;B
[1]   ⍝DRAWS KRUISREPERES
[2]    NEWPEN 1
[3]    B← 4 4 ρ ¯2 ¯2 1 0 ¯2 ,(LY+2), 1 0 ,(LX+2), ¯2 1 0 ,(LX+2),(LY+2), 1 0
[4]    I←1
[5]   L1:3 SYMBOL B[I;]
[6]    →(4≥I←I+1)/L1
[7]    I←'DERAYMAEKER D.     ',⍕⌽3↑⎕TS
[8]    (I) SYMBOL(LX-6), ¯1.5 0.2 0
    ∇
```

```
      ∇A4LOG1[⎕]∇
    ∇ A4LOG1;A;I;B
[1]   RECT 0 0 20 17 0 1
[2]   (N) SYMBOL 3 17.3 0.4 0
[3]   PLOT 0 0 3
[4]  ⍝ VERTICAL GRIDLINES
[5]   X←(⍳20),(20+2×⍳10),(40+5×⍳16),(120+15×⍳8),(240+60×⍳10)
[6]   A←⍴1↓X←6.25×(10⍟X,¯1↑X)
[7]   I←1
[8]  L1:PLOT(X[I],0) TO(X[I],17) TO(X[I+1],17) TO(X[I+1],0)
[9]   →((I←I+2)≤63)/L1
[10] ⍝ TIKMARKS
[11]  B←6.25×(10⍟ 30 60 120 180 240 300 360 600 1440)
[12]  A← 0.5 1 2 3 4 5 6 10 24
[13]  I←1
[14] L2:13 SYMBOL B[I], ¯0.1 0.2 0
[15]  (⍕A[I]) SYMBOL B[I], ¯0.4 0.2 0
[16]  →((I←I+1)≤9)/L2
[17]  'H' SYMBOL(B[9]+0.2), ¯0.4 0.2 0
    ∇

      ∇P1YAS[⎕]∇
    ∇ P1YAS;MAX;LY;LX
[1]  ⍝ GLOBAL VARS MIN;SC;P;B
[2]   MAX←10×⌈⌈/(P÷10)
[3]   MIN←10×⌊⌊/(P÷10)
[4]   SC←⎕,0⍴⍞←'WAARDE↑ PEILENAS/CM?'
[5]   LY←(MAX-MIN)÷SC
[6]   OY←⌊/(17-LY)÷2
[7]   B←⍴P←OY+(P-MIN)÷SC
[8]   (5 5 ⍴'MAX :MIN :SC  :LY  :OY  :'),⍕ 5 1 ⍴MAX,MIN,SC,LY,OY
[9]   CORRECT
[10]  NEWPEN 2
[11] ⍝1STE YAS
[12]  '∆H' AXIS 0,OY,1,(-(LY)),90,MIN,SC
[13]  PLOT 20,OY,3
[14] ⍝2DE YAS
[15]  ' ' AXIS(LX←20),OY,1,LY,90,MIN,SC
[16] ⍝HORIZONTAL GRIDLINES
```

```
[17]  NEWPEN 1
[18]  OY←OY,(OY+⍳⌊LY),2⍴⌊LY
[19]  I←1
[20] L1:PLOT(0,OY[I]) TO(LX,OY[I]) THEN(LX,OY[I+1]) TO(0,OY[I+1]) THEN(0,OY[I+2])
[21]  →((I←I+2)≤¯4+⍴OY)/L1
    ∇
      ∇APLCOPY[⎕]∇
    ∇ APLCOPY;K;VOL;DSN;LB;VV
[1]   VV←⍕⎕AI[2]
[2]   VOL←⍕(⍎⍞),0⍴⍞←'VOLUME NUMBER : '
[3]   DSN←,CODE 1↑⎕AI
[4]   LB←⍕(⍎⍞),0⍴⍞←'LABEL NUMBER : '
[5]   '' CHK 'K' TRY 'SW DSN←WORK.T',VV,',DISP←NEW,SPACE←(80,(20,10)),RECFM←FB,LRECL←80,BLKSIZE←800,CODE←E'
[6]   K←80↑'//BZZSPACE JOB (ZZ00,6199,45S),''45,DE WILDE S'',CLASS=C'
[7]   '' CHK K
[8]   K←80↑'//ST  EXEC APLCOPY,VOL=''',',L000',VOL,''',LB=''',LB,''',DSN=''',DSN,''',MEMB=''',MEMB,''''
[9]   '' CHK K
[10]  K←''
[11]  'K' TRY 'SUB DSN←WORK.T',VV
[12]  'COPY EXECUTED'
    ∇
      ∇CODE[⎕]∇
    ∇ R←CODE X
[1]   R←'ABCDEFGHIJKLMNOP'[⎕IO+⍉(8⍴16)⊤X]
    ∇
      ∇CORRECT[⎕]∇
    ∇ CORRECT;A
[1]   →('Y'≠1↑19↓⍞,0⍴⍞←'CORRECTIONS NEEDED?')/0
[2]  L1:⍎A←17↓⍞,0⍴⍞←'ENTER CORRECTIONS'
[3]   →('Y'=1↑5↓⍞,0⍴⍞←'MORE?')/L1
    ∇
```

```
      )GRP POMPING2

POMP2   HEAD   REPS   P2YAS   P2XAS   APLCOPY CODE   NEWPEN  MONTHS  CORRECT

      ∇POMP2[⎕]∇
    ∇ D POMP2 P;A;T;X;L;LX
[1]   T←⎕AI[2]
[2]  ⍝ PEN1= 0.3MM / PEN4= 0.4MM
[3]   PLINIT A←10↓⍞,0⍴⍞←'DRAWNAME?:'
[4]   NEWPEN 1
[5]   PLOT 1 1 ¯3
[6]   P2YAS
[7]   P2XAS
[8]   X←,(⍉(3,L)⍴0,⍳(L-1))+(L,3)⍴ 0.3 0.5 0.7
[9]  ⍝DATAPLOT
[10]  NEWPEN 2
[11]  PLOT⍉(3,⍴X)⍴,X,P,3,(¯1+⍴X)⍴2
[12]  HEAD
[13]  29.6 REPS 21
[14]  PLCLOSE 30 ¯1
[15]  T←1↓, 1 4 ⍴ 0 60 60 1000 ⊤(⎕AI[2]-T)
[16]  'END OF DRAW AFTER ',(⍕T[1]),' MIN ',(⍕T[2]),' SEC ',(⍕T[3]),' MSEC'
[17]  APLCOPY
    ∇
      ∇HEAD[⎕]∇
    ∇ HEAD;A;I
[1]   PLOT 0 0 3
[2]   I←0
[3]  L1:A←5↓A←⍞,0⍴⍞←'NAME?'
[4]   A SYMBOL(4+I),(LY+2-I),(0.4-0.1×I),0
[5]   I←I+1
[6]   →('Y'=1↑A←15↓A←⍞,0⍴⍞←'CONTINUE TEKST?')/L1
    ∇
      ∇REPS[⎕]∇
    ∇ LX REPS LY;I;B
[1]  ⍝DRAWS KRUISREPERES
[2]   NEWPEN 1
[3]   B← 4 4 ⍴ ¯2 ¯2 1 0 ¯2 ,(LY+2), 1 0 ,(LX+2), ¯2 1 0 ,(LX+2),(LY+2), 1 0
[4]   I←1
[5]  L1:3 SYMBOL B[I;]
[6]   →(4≥I←I+1)/L1
[7]   I←'DERAYMAEKER D.      ',⍕⌽3↑⎕TS
[8]   (I) SYMBOL(LX-6), ¯1.5 0.2 0
    ∇
```

```
      ∇P2YAS[⎕]∇
    ∇ P2YAS;MAX;MIN;SC;OY;LY;I;J
[1]   NEWPEN 2
[2]   MAX←⌈/(⌈P×10)÷10
[3]   MIN←⌊/(⌊P×10)÷10
[4]   SC←⎕,0ρ⍞←'WAARDE÷ YAS/CM?'
[5]   LY←(MAX-MIN)÷SC
[6]   (4 5 ρ'MAX :MIN :SC  :LY  :'),⍕ 4 1 ρMAX,MIN,SC,LY
[7]   CORRECT
[8]   B←ρP←(P-MIN)÷SC
[9]  ⍝1STE YAS
[10]  ' ' AXIS 0 0 1 ,(-(LY)),90,MIN,SC
[11]  PLOT 0 0 3
[12]  J← 31 28 31 30 31 30 31 31 30 31 30 31
[13]  →(D[2]≠D[4])/L3
[14]  →L2,ρL←LX←D[3]-D[1]
[15] L3:L←LX←(J[D[2]]-D[1])+D[3]
[16] L2:PLOT 0,LX,3
[17] ⍝2DE YAS
[18]  ' ' AXIS LX,0,91,LY,90,MIN,SC
[19] ⍝HORIZONTAL GRIDLINES
[20]  NEWPEN 1
[21]  OY←0,(⍳⌊LY),2ρ⌊LY
[22]  I←1
[23] L1:PLOT(0,OY[I]) TO(LX,OY[I]) THEN(LX,OY[I+1]) TO(0,OY[I+1]) THEN(0,OY[I+2])
[24]  →((I←I+2)≤¯2+ρOY)/L1
    ∇
      ∇P2XAS[⎕]∇
    ∇ P2XAS;A;I;SY;PL
[1]  ⍝GLOBAL VARS:D;LX
[2]   A←1
[3]   →(D[2]=D[4])/L2
[4]   LX←LX-D[3]
[5]  L2:SY←D[1],D[1]+⍳LX
[6]   PL←0,⍳LX
[7]  L0:I←1
[8]  L1:(⍕SY[I]) SYMBOL PL[I], ¯0.5 0.2 0
[9]   →((ρPL)≥I←I+1)/L1
[10]  →(D[2]=D[4])/0
[11]  SY←⍳D[3]
[12]  PL←LX+⍳D[3]
[13]  D[2]←D[4]
[14]  →(2≥A←A+1)/L0
    ∇
```

```
      ∇YREG[⎕]∇
    ∇ YREG;A
      NEWPEN 2
     ⍝GLOBAL VARS AX;SC;MIN
      A←10×⌈⌈/(Y÷10)
      MIN←10×⌊⌊/(Y÷10)
      SC←⎕,0⍴⍞←'WAARDE↑ VAN Y/CM?'
      (3 5 ⍴'MAX :MIN :SC  :'),⍕ 3 1 ⍴A,MIN,SC
      CORRECT
      →(12≠⍴M)/L2
      →L1,⍴Y←Y÷SC
    L2:Y←Y[(J[(M[1]-1)]+⍳+/J[M])]÷SC
    L1:AX←(A-MIN)÷SC
      ' ' AXIS 0 0 1 ,(-(AX)),90,MIN,SC
    ∇
      ∇GRREG[⎕]∇
    ∇ GRREG;I;A
     ⍝GLOBAL VARS: MONTHS;AX;J
      J←(I←1)+0,+\A←J[M]×0.2
    L1:(MONTHS[M[I];]) SYMBOL J[I], ¯0.5 0.3 0
      →((I←I+1)≤⍴1↓J)/L1
      A←¯1↓1↓J,¯1↑J
      I←1
      NEWPEN 2
    L2:PLOT(A[I],¯0.5) TO(A[I],AX) THEN(A[I+1],¯0.5)
      →((I←I+1)≤⍴1↓A)/L2
    ∇
      ∇RECT[⎕]∇
    ∇ RECT PM;C
      →(6=⍴PM)/L1
      →0,0⍴⍞←'INCORRECT NUMBER OF PARAMETERS IN RECT'
    L1:C← 4 2 ⍴0,PM[4],PM[3],PM[4],PM[3],3⍴0
      PLOT(PM[1 2]),(2+0=PM[6])
      PLOT(PM[1 2 5] ROT C),4⍴2
    ∇
```

```
    )GRP JREGEN3
JREG3   YREG    GRREG   RECT    APLCOPY CODE    REPS    NEWPEN  CORRECT MONTHS

      ∇JREG3[⎕]∇
    ∇ Y JREG3 M;A;I;J;AX;SC;MIN;T
[1]    →(12>⍴M)/M
[2]    T←⎕AI[2]
[3]   ⍝ PEN1= 0.3MM / PEN2= 0.4MM
[4]   ⍝1 DAG= 2MM     GLOBAL VARS :MONTHS
[5]   ⍝ Y= PEILEN STATION      M= NR TE PLOTTEN MAANDEN
[6]    PLINIT A←⍞,0⍴⎕←'DRAWNAME?'
[7]    NEWPEN 1
[8]    PLOT 2 2 ¯3
[9]    J← 31 28 31 30 31 30 31 31 30 31 30 31
[10]   YREG
[11]   A←⍞,0⍴⎕←'STATIONNAME?'
[12]   (A) SYMBOL 6,(AX+0.5), 0.4 0
[13]   PLOT 0 0 3
[14]   I←0
[15]   NEWPEN 1
[16] L1:RECT(A←0.2×I), 0 0.2 ,Y[I+1], 0 1
[17]   J← 31 28 31 30 31 30 31 31 30 31 30 31
[18]   →((I←I+1)≤¯1++/J[M])/L1
[19]   NEWPEN 2
[20]   ' ' AXIS(A+0.5), 0 1 ,AX,90,MIN,SC
[21]   A REPS AX
[22]   GRREG
[23]   PLCLOSE(A+3),¯2
[24]   T←1↓, 1 4 ⍴ 0 60 60 1000 ⊤(⎕AI[2]-T)
[25]   'END OF DRAWING AFTER ',(⍕T[1]),' MIN ',(⍕T[2]),' SEC ',(⍕T[3]),' MSEC'
[26]   APLCOPY
[27]   →0
[28] M:'LENGTH ERROR IN RIGHT ARGUMENT'
    ∇
```

```
      ∇APLCOPY[⎕]∇
    ∇ APLCOPY;K;VOL;DSN;LB;VV
[1]   VV←⍕⎕AI[2]
[2]   VOL←⍕(⍎⍞),0ρ⍞←'VOLUME NUMBER : '
[3]   DSN←,CODE 1↑⎕AI
[4]   LB←⍕(⍎⍞),0ρ⍞←'LABEL NUMBER : '
[5]   '' CHK 'K' TRY 'SW DSN←WORK.T',VV,',DISP←NEW,SPACE←(80,(20,10)),RECFM←FB,LRECL←80,BLKSIZE←800,CODE←E'
[6]   K←80↑'//BZZSPACE JOB (ZZ00,6199,45S),''45,DE WILDE S'',CLASS=C'
[7]   '' CHK K
[8]   K←80↑'//ST  EXEC APLCOPY,VOL=''','L000',VOL,''',LB=''',LB,''',DSN=''',DSN,''',MEMB=''',MEMB,''''
[9]   '' CHK K
[10]  K←''
[11]  'K' TRY 'SUB DSN←WORK.T',VV
[12]  'COPY EXECUTED'
    ∇
      ∇CODE[⎕]∇
    ∇ R←CODE X
[1]   R←'ABCDEFGHIJKLMNOP'[⎕IO+⍉(8ρ16)⊤X]
    ∇
      ∇REPS[⎕]∇
    ∇ LX REPS LY;I;B
[1]  ⍝DRAWS KRUISREPERES
[2]   NEWPEN 1
[3]   B← 4 4 ρ ¯2 ¯2 1 0 ¯2 ,(LY+2), 1 0 ,(LX+2), ¯2 1 0 ,(LX+2),(LY+2), 1 0
[4]   I←1
[5]  L1:3 SYMBOL B[I;]
[6]   →(4≥I←I+1)/L1
[7]   I←'DERAYMAEKER D.      ',⍕⌽3↑⎕TS
[8]   (I) SYMBOL(LX-6), ¯1.5 0.2 0
    ∇
      ∇CORRECT[⎕]∇
    ∇ CORRECT;A
[1]   →('Y'≠1↑19↓⍞,0ρ⍞←'CORRECTIONS NEEDED?')/0
[2]  L1:⍎A←17↓⍞,0ρ⍞←'ENTER CORRECTIONS'
[3]   →('Y'=1↑5↓⍞,0ρ⍞←'MORE?')/L1
    ∇
```

```
      )GRP LUCHTDRUK2H

PRESS2H PRYA    REPS    GRIDP   NEWPEN  APLCOPY CODE    CORRECT

      ∇PRESS2H[⎕]∇
    ∇ N PRESS2H P;A;I;LX;LY;T;OY
[1]    T←⎕AI[2]
[2]   ⍝ N=NAAM STATION + DATA DER WAARNEMINGEN     P=PEILENVEKTOR(NUMERIEK)
[3]   ⍝ PEN1= 0.3MM / PEN2= 0.4MM
[4]    →(96≠⍴P)/M
[5]    PLINIT A←10↑⍞,0⍴⍞←'DRAWNAME?:'
[6]    NEWPEN 1
[7]    PLOT 2 2 ¯3
[8]    PRYA
[9]    I←1
[10]   (N) SYMBOL 3,(LY+1), 0.3 0
[11]  ⍝TIKMARKS XAS
[12]  L1:13 SYMBOL(4.8×I), 0 ¯0.5 0.5 0
[13]   →(8≥I←I+1)/L1
[14]   GRIDP
[15]  ⍝ DATAPLOT
[16]   NEWPEN 2
[17]   PLOT⍉(3,B)⍴(0.4×⍳B),P,3,(B-1)⍴2
[18]   LX REPS LY
[19]   NEWPEN 1
[20]   ('BRON : K.M.I') SYMBOL 0 ¯1.8 0.2 0
[21]   PLCLOSE 42 ¯2
[22]   T←1↓, 1 4 ⍴ 0 60 60 1000 ⊤(⎕AI[2]-T)
[23]   'DRAW EXECUTED AFTER ',(⍕T[1]),' MIN ',(⍕T[2]),' SEC ',(⍕T[3]),' MSEC'
[24]   APLCOPY
[25]   →0
[26]  M:'LENGTH ERROR IN RIGHT ARGUMENT'
    ∇
```

```
      ∇PRYA[⎕]∇
    ∇ PRYA;MIN;MAX;SC;I
[1]   ⍝ GLOBAL VARS : LX;LY
[2]    MAX←10×⌈⌈/(P÷10)
[3]    MIN←10×⌊⌊/(P÷10)
[4]    SC←⎕,0ρ⍞←'WAARDE↑ PEILEN/CM?'
[5]    LY←(MAX-MIN)÷SC
[6]    (4 5 ρ'MAX :MIN :SC  :LY  :'),⍕ 4 1 ρMAX,MIN,SC,LY
[7]    CORRECT
[8]    B←ρP←(P-MIN)÷SC
[9]   ⍝YASSEN
[10]   NEWPEN 2
[11]   ' ' AXIS 0 0 1 ,(-(LY)),90,MIN,SC
[12]   PLOT 38.4 0 3
[13]   ' ' AXIS(LX←38.4), 0 1 ,LY,90,MIN,SC
    ∇


      ∇REPS[⎕]∇
    ∇ LX REPS LY;I;B
[1]   ⍝DRAWS KRUISREPERES
[2]    NEWPEN 1
[3]    B← 4 4 ρ ¯2 ¯2 1 0 ¯2 ,(LY+2), 1 0 ,(LX+2), ¯2 1 0 ,(LX+2),(LY+2), 1 0
[4]    I←1
[5]   L1:3 SYMBOL B[I;]
[6]    →(4≥I←I+1)/L1
[7]    I←'DERAYMAEKER D.     ',⍕⌽3↑⎕TS
[8]    (I) SYMBOL(LX-6), ¯1.5 0.2 0
    ∇
      ∇GRIDP[⎕]∇
    ∇ GRIDP;I
[1]    NEWPEN 1
[2]   ⍝VERTICAL GRIDLINES
[3]    I←1
[4]   L2:PLOT((1.2×I),0) TO((1.2×I),LY) THEN((1.2×(I+1)),LY) TO((1.2×(I+1)),0) THEN((1.2×(I+2)),0)
[5]    →(31≥I←I+2)/L2
[6]   ⍝HORIZONTAL GRIDLINES
[7]    OY←0,(⍳⌊LY),2ρLY
[8]    I←1
[9]   L1:PLOT(0,OY[I]) TO(LX,OY[I]) THEN(LX,OY[I+1]) TO(0,OY[I+1]) THEN(0,OY[I+2])
[10]   →((I←I+2)≤¯1+ρOY)/L1
    ∇
```

```
      ∇STEREO[⎕]∇
    ∇ STEREO;B;XY;PE;A1;A2;A3;A4;A5
[1]    T←⎕AI[2]
[2]    B←REK1ST
[3]    B←0↑,XY←AJUST90 B
[4]    →('N'=1↑15↓⍞,0⍴⍞←'VALUES PRINTED?')/L1
[5]    ⎕←B←PRINTST
[6]   L1:PE←B←0↑,XY←XY[; 2 1]
[7]    DRAWST
[8]    →('N'=1↑20↓⍞,0⍴⍞←'NEED POINT COUNTING?')/L2
[9]    GRLEV
[10]   PLCLOSE 25 0
[11]   T←1↓, 1 4 ⍴ 0 60 60 1000 ⊤(⎕AI[2]-T)
[12]  L2:'END OF DRAWING AFTER ',(⍕T[1]),' MIN',(⍕T[2]),' SEC ',(⍕T[3]),' MSEC'
[13]   APLCOPY
    ∇

      ∇REK1ST[⎕]∇
    ∇ Y←REK1ST;RDI;A;RPE;REF;XST;YST;NW;NE;SW;SE;DI
[1]   ⍝GLOBAL VARS: PE
[2]    NW←' ¯1  1'
[3]    NE←' ¯1 ¯1'
[4]    SE←'  1 ¯1'
[5]    SW←'  1  1'
[6]    DI←PE←⍳0
[7]   LO:DI←DI,⎕,0⍴⎕←'ENTER DIRECTIONS'
[8]    →('N'=1↑,⍞,0⍴⎕←'IS THAT ALL?')/LO
[9]    A←⍴RDI←(○2÷360)×DI
[10]  L2:PE←PE,' ',⍎⍞,0⍴⎕←'ENTER  PENDAGES  LIKE 045SW'
[11]   →('N'=1↑,⍞,0⍴⎕←'IS THAT ALL?')/L2
[12]   →(((⍴PE)÷6)≠⍴DI)/L1
[13]   PE←(A,5)↑(A,6)⍴PE←⌽' ',⌽,1↓PE
[14]   RPE←(○÷360)×⍎,(A,4)↑(A,3)↑PE←PE,(A,1)⍴((¯1+A)⍴','),' '
[15]   REF←(A,2)⍴⍎(A,6)⍴⍎(A,¯3)↑PE
[16]   XST←REF[;1]×(((|1○RDI)×(|1○RPE)×20)÷(2*0.5))
[17]   YST←REF[;2]×(((|2○RDI)×(|1○RPE)×20)÷(2*0.5))
[18]   Y←⍉(4,A)⍴XST,YST,DI,⍎,(A,4)↑(A,3)↑PE
[19]   →0
[20]  L1:→0,⍴⎕←'LENGTH ERROR'
    ∇
```

```
      ∇PRINTST[⎕]∇
    ∇ Z←PRINTST;B;C;N
[1]   ⍝GLOBAL VARS XY , PE
[2]    C←'     DIRECTION     PENDAGE                    X                         Y        '
[3]    C←(0 1 0 1 0 \[1] 2 70 ⍴C,70⍴'-')
[4]    B←((PE[;(¯2↑¯1↓⍳(¯1↑⍴PE))]),[1](((1↑⍴XY)-1↑⍴PE),2)⍴' ')
[5]    N←⍳(1↑⍴XY)
[6]    Z←C,[1](6 0 7 0 7 0 ⍕N,XY[; 3 4]),B,(24 8 ⍕XY[; 1 2])
    ∇
      ∇DRAWST[⎕]∇
    ∇ DRAWST;B
[1]    PLINIT B←10↓B←⍞,0⍴⍞←'DRAWNAME?:'
[2]    PLTEST
    ∇
      ∇PLTEST[⎕]∇
    ∇ PLTEST;I;A
[1]    RECT 0 0 21 29.6 0 0
[2]    10 CIRCL 10.5 11
[3]    3 SYMBOL 10.5 11 1 0
[4]    13 SYMBOL 10.5 21 1 0
[5]    6 SYMBOL 10.5 21.5 1 0
[6]    'N' SYMBOL 10.2 22.2 0.7 0
[7]    13 SYMBOL 10.5 1 1 0
[8]    13 SYMBOL 0.5 11 1 90
[9]    13 SYMBOL 20.5 11 1 90
[10]   I←1
[11]   PLOT 10.5 11 ¯3
[12] L1:0.12 CROSS XY[I;]
[13]   →((1↑⍴XY)≥I←I+1)/L1
[14]   PLOT ¯10.5 ¯11 ¯3
[15]   TITLE
    ∇

      ∇AJUST90[⎕]∇
    ∇ Y←AJUST90 TF;A;NT;HT
[1]   ⍝GLOBAL VARS :TF;PE∇
[2]    A←90=TF[;4]
[3]    NT←A/[1] TF
[4]    TF←(~A)/[1] TF
[5]    PE←(~A)/[1] PE
[6]    A←,⍉(1,⍴A)⍴A←NT[;3]
[7]    HT←(○÷180)×(⍉(2,(⍴A))⍴(A+90),A+270)
[8]    Y←TF,[1] HT←2⌽⍉(4,2×(⍴A))⍴A,A,NT[;4],NT[;4],10×((2○(,⍉HT)),1○(,⍉HT))
    ∇
```

```
      ∇GRLEV[⎕]∇
    ∇ GRLEV;J;A;BXY
[1]     PLOT 25 0 ¯3
[2]     RECT 0 0 21 29.6 0 0
[3]     PLOT 0 0 ¯3
[4]     TITLE1
[5]     PLOT 10.5 11 ¯3
[6]     J←9
[7]     A←'0123456789ABCDEFGHIJKLMNOPQRSTYVWXYZ'
[8]   L2:BAND J
[9]     →((J←J-1)≥¯9)/L2
[10]    ' BAND EXECUTED'
[11]    J←1
[12]    X̲Y̲←0⍴BXY←(81≤+/(X̲Y̲*2))⌿X̲Y̲
[13]  L1:BANDO J
[14]    →((J←J+1)≤18)/L1
[15]    ' BANDO EXECUTED'
    ∇

      ∇TITLE[⎕]∇
    ∇ TITLE
[1]     'CANEVAS SCHMIDT' SYMBOL 1 27 0.3 0
[2]     'SERVICE GEOLOGIQUE DE BELGIQUE' SYMBOL 11 28 0.3 0
[3]     'BELGISCHE  GEOLOGISCHE DIENST' SYMBOL 11 27 0.3 0
[4]     'OBJET :' SYMBOL 1 26 0.2 0
[5]     ⍞←'ENTER OBJECT :'
[6]     (A1←14↓⍞) SYMBOL 4 26 0.3 0
[7]     'PLANCHETTE :' SYMBOL 1 25 0.2 0
[8]     ⍞←'ENTER PLANCHETTE :'
[9]     (A2←18↓⍞) SYMBOL 4 25 0.3 0
[10]    A3←⍕⌽3↑⎕TS
[11]    (A3) SYMBOL 16 0.3 0.3 0
[12]    'D DERAYMAEKER' SYMBOL 15 1 0.3 0
[13]    'AFFL. :' SYMBOL 1 24 0.2 0
[14]    ⍞←'ENTER AFFL. :'
[15]    (A4←13↓⍞) SYMBOL 4 24 0.3 0
[16]    'MESURES PAR :' SYMBOL 1 23 0.2 0
[17]    ⍞←'MESURED BY :'
[18]    (A5←12↓⍞) SYMBOL 4 23 0.3 0
    ∇
```

```
      ∇TITLE1[⎕]∇
    ∇ TITLE1
[1]   'CANEVAS SCHMIDT' SYMBOL 1 27 0.3 0
[2]   'SERVICE GEOLOGIQUE DE BELGIQUE' SYMBOL 11 28 0.3 0
[3]   'BELGISCHE  GEOLOGISCHE DIENST' SYMBOL 11 27 0.3 0
[4]   'OBJET :' SYMBOL 1 26 0.2 0
[5]   (A1) SYMBOL 4 26 0.3 0
[6]   'PLANCHETTE :' SYMBOL 1 25 0.2 0
[7]   (A2) SYMBOL 4 25 0.3 0
[8]   (A3) SYMBOL 16 0.3 0.3 0
[9]   'AFFL. :' SYMBOL 1 24 0.2 0
[10]  (A4) SYMBOL 4 24 0.3 0
[11]  'MESURES PAR :' SYMBOL 1 23 0.2 0
[12]  (A5) SYMBOL 4 23 0.3 0
[13]  'D.DERAYMAEKER  ' SYMBOL 16 1 0.3 0
[14]  'W' SYMBOL ¯0.5 10.5 0.4 0
[15]  'S' SYMBOL 10.5 0 0.4 0
[16]  'E' SYMBOL 21.5 10.5 0.4 0
[17]  'N' SYMBOL 10.5 21.5 0.4 0
    ∇
      ∇BAND[⎕]∇
    ∇ BAND PM;BXY;MXY;V;I;VV
[1]   BXY←((X̲Y̲[;1]≥PM-1)∧(X̲Y̲[;1]≤PM+1))⌿X̲Y̲
[2]   MXY←⍉ 2 19 ρ(19ρPM),10-ι19
[3]   BXY←0ρV←BXY←(2 1 3 ⍉(19,ρBXY)ρBXY)-((1↑ρBXY),(ρMXY))ρMXY
[4]   V←1++⌿1>((V[;;1]*2)+V[;;2]*2)*0.5
[5]   MXY←0ρV←1↑ρVV←(100>+/(MXY*2))⌿MXY,V
[6]   I←1
[7]  L1:A[VV[I;3]] SYMBOL VV[I; 1 2],0.2,0
[8]   →((I←I+1)≤V)/L1
    ∇
      ∇BANDO[⎕]∇
    ∇ BANDO J;B;S;L;I
[1]   L←ι0
[2]   I←1
[3]  L0:B←10×(2○DTR J×10),(1○DTR J×10)
[4]   S←+/1≥+/((BXY-(ρBXY)ρB)*2)
[5]   L←+/L,S
[6]   →(L<36)/L1
[7]   L←35
[8]  L1:J←J+18
[9]   →(2≥I←I+1)/L0
[10]  A[(L+1)] SYMBOL B, 0.2 0
[11]  A[(L+1)] SYMBOL(-B), 0.2 0
[12]  J←J-18
    ∇
```

```
      ∇GRANULO[⎕]∇
    ∇ GRANULO;TX;CNT;FW;F;ID;X;A;TW;N;BEK
[1]   ENTRY
[2]   X← 1 6 15 36.5 63.5 89.5 127 180 253 357.5 1210
[3]   →L12×⍳12=TW[3]
[4]   FW←ANL5
[5]   TX←CNT←⍳0
[6]   CNT←0
[7]   F←TEX5 FW
[8]   PRINT5
[9]   TEXDR FW
[10]  →0,⍴⎕←'END OF GRANULO PROCESSING'
[11] L12:FW←ANL12
[12]  F←TEX12 FW
[13]  PRINT12
[14]  STAT12 FW
[15]  →(TW[5]=0)/L2
[16]  PLOT12
[17] L2:'END OF GRANULO PROCESSING'
    ∇


      ∇ENTRY[⎕]∇
    ∇ ENTRY;CNT;NA;B;DEP
[1]   ⍝GLOBAL VARS: TW;N;ID
[2]   ⎕IO←1
[3]   BEK←⍙,BEK←⍞,0⍴⎕←'NAAM LEGE BEKERREEKS:'
[4]   ID←,⍞,0⍴⎕←'LABORANT ANALYSEDATE APLOPR'
[5]   ID← 2 30 ⍴(15↑⍙,3↑ID),(¯15↑¯4↓4↓ID),(30↑⍙,¯3↑ID)
[6]   CNT←0
[7]   NA←5↑B←((N⍳' ')-1)↑N←,⍞,0⍴⎕←'PLANCHET PLAATS BORING DIEPTEN'
[8]   NA←NA,30↑B←((N⍳' ')-1)↑N←((⍴B)+1)↓N
[9]  L1:NA←NA,¯10↑B←((N⍳' ')-1)↑N←((⍴B)+1)↓N
[10]  CNT←CNT+1
[11]  →L1×⍳0≠⍴N
[12]  DEP←((CNT-2),10)⍴45↓NA
[13]  N←⍕(((1↑⍴DEP),45)⍴45↑NA),DEP
[14]  TW←,⎕,0⍴⎕←'TOTWEIGHT BEKRKS TYPE5-12 STAT PLOT'
    ∇
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```
      ∇ANL5[⎕]∇
    ∇ C←ANL5;WA;D
[1]   ⍝ BEREKENT DE NETTO ∘/∘ GEWICHTEN VOOR 5 FRAKTIES
[2]   ⍝   VOLWEIGHTS INLEZEN 41 21 1 61
[3]   ⍝    LEEGWEIGHTS INLEZEN 1 21 41 61
[4]   ⍝GLOBAL VAR :BEK;TW
[5]    C←WA←⍳0
[6]   L1:WA←WA,⎕,0⍴⍞←'WEIGHTS, NAFOSF'
[7]    →('N'=1↑,⍞,0⍴⍞←'IS THAT ALL?')/L1
[8]    FWCHECK
[9]    →('N'≠1↑⍞,0⍴⎕←'ALLES OK?')/L2
[10]  C1:D←⎕,0⍴⎕←'ENTER NR AND CORRECTED VALUE'
[11]   WA[D[1]]←D[2]
[12]   →('Y'=1↑⍞,0⍴⍞←'MORE CORRECTIONS?')/C1
[13]  L2:→((0≠4|¯1+⍴WA)∨(45<⍴WA))/L4
[14]   C←(((¯1+⍴WA)÷4),4)⍴¯1↓WA
[15]   WA←(1 1 1 0)\((1↑⍴C),3)⍴¯1↑WA
[16]   C←C-WA+BEK[((TW[2]-1)+⍳(1↑⍴WA)); 3 2 1 4]
[17]   C←⍉(4,(×/⍴C)÷4)⍴((C[;1],(C[;2]-C[;1]),(C[;3]-C[;2]),C[;4]÷40)×4000÷TW[1])
[18]   C←(1 1 1 0 1 \C)
[19]   C[;4]←100-+/C
[20]   →0
[21]  L4:→0,⍴⎕←'LENGTH ERROR'
    ∇

      ∇TEX5[⎕]∇
    ∇ R←TEX5 Y;A;T;LB;B;CB
[1]   ⍝ BEPAALT DE TEXTUUR VOOR ANALYSEN MET 5 FRAKTIES
[2]   ⍝GLOBAL VARS TX;CNT
[3]   TE:B←(3×CNT)↓CB←,⍉(3,(1↑⍴Y))⍴Y[;1],(+/Y[; 2 3 4]),Y[;5]
[4]    LB←(⍴CB)÷3
[5]    CNT←CNT+1
[6]    A←3↑B
[7]    →(0≠+/((16↑' ')≠(T←16↑,((∧/(A[3]>82.5),A[1 2]< 8 17.5)=1)/'Z:ZAND')))/T1
[8]    →(0≠+/((16↑' ')≠(T←16↑,((∧/(A< 17.5 32.5 92.5),A> 8 10 67.5)=1)/'S:SAND')))/T1
[9]    →(0≠+/((16↑' ')≠(T←16↑,((∧/(A< 12 50 67.5),A[2 3]> 20 50)=1)/'P:LIGHT SANDLOAM')))/T1
[10]   →(0≠+/((16↑' ')≠(T←16↑,((∧/(A< 22.5 85 67.5),A[2 3]>15)=1)/'L:SANDLOAM')))/T1
[11]   →(0≠+/((16↑' ')≠(T←16↑,((∧/(A[1 3]< 30 15),A[2]>62.5)=1)/'A:LOAM')))/T1
[12]   →(0≠+/((16↑' ')≠(T←16↑,((∧/(A< 45 70 82.5),A[1 3]> 30 65)=1)/'E:SANDY CLAY')))/T1
[13]   →(0≠+/((16↑' ')≠(T←16↑,((∧/(A[1]>45),A[2 3]< 55 65)=1)/'U:HEAVY CLAY')))/T1
[14]  T1:TX←TX,T
[15]   →(CNT<LB)/TE
[16]   R←⍕(((⍴TX)÷16),16)⍴TX
    ∇
```

```
      ∇PRINT5[⎕]∇
    ∇ PRINT5;TEX;TI;PR;CAL;LAB;PR
[1]   ⍝ GLOBAL VARS:: ID;FW;N;F
[2]    A←(30↑'BELGISCHE GEOLOGISCHE DIENST'),¯30↑'KORRELGROOTTE ANALYSE'
[3]    0 0 0 1 1 0 1 0 ⍀ 3 60 ⍴A,(30↑'SERVICE GEOLOGIQUE DE BELGIQUE'),(¯30↑'ANALYSE GRANULOMETRIQUE'),60⍴'-'
[4]    LAB←⍕30↑ID[1;]
[5]    CAL←⍕15↑ID[2;]
[6]    (2 8 ⍴(8↑'LABO :'),8↑'APL   :'), 2 30 ⍴ID←LAB,CAL,¯15↑⍕⌽3↑⎕TS
[7]    0 1 1 0 0 \[1] 2 45 ⍴(45↑N[1;]),45⍴'-'
[8]    TEX←(0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 \F)
[9]    1 0 0 ⍀ 1 70 ⍴¯70↑'FRACTIEGEWICHTEN IN ∘/∘'
[10]   PR← 1 1 1 1 0 1 \[2] FW
[11]   PR[;5]←+/FW[; 2 3 4]
[12]   TI←'     LABONR         < 2               2-10       10-20       20-53              2-53'
[13]   TI←TI,'                 > 53 MU      TEXTUUR          '
[14]   TI← 1 1 0 \[1] 2 105 ⍴(¯105↑TI),105⍴'-'
[15]   TI,[1] PR←N[;45+⍳10],(10 3 15 3 10 3 10 3 15 3 15 3 ⍕PR),TEX
[16]   0 0 0 0 0 1 0 \[1] 1 65 ⍴¯65↑'TEXTUUR DIAGRAM'
[17]   ID←F←N←⍳0
    ∇


      ∇TEXDR[⎕]∇
    ∇ T←TEXDR Y;M;A;B;CB;CNT;PP
[1]   ⍝ TEKENT TEXTUURDRIEHOEK ALEEN MET PAREN VAN CLAY EN SAD
[2]   ⍝WORKS ONLY WITH DATA PAIRS OF CLAY AND SAND∇
[3]    M← 1 0 1 \[2]⍉ 2 21 ⍴(¯22↑21↑5×⍳20),((300*3)×5×⍳10),10↑1↓⌽(300*3)×5×⍳10
[4]    CNT←0
[5]   AB:B←(2×CNT)↓CB←,PP←⍉(2,(1↑⍴Y))⍴Y[;1],Y[;5]
[6]    CB←(⍴CB)÷2
[7]    CNT←CNT+1
[8]    A←2↑B
[9]    B←2↓B
[10]   M←M,[1](1 1 0 ⍀(INV 2 2 ⍴ 0 1 ,(300*3),1)+.×(A[1]×100÷3),(300÷3)×(100-A[2]))
[11]   →(CNT<CB)/AB
[12]   50 100 PLOT1 M
[13]   (1 1 0 1 0 ⍀ 3 30 ⍴(30↑'PLOTTED POINTS'),(30↑14⍴'-'),(¯15↑'CLAY'),¯15↑'SAND'),[1] 15 2 ⍕PP
    ∇
```

```
     ∇FWCHECK[⎕]∇
   ∇ FWCHECK;A;B;C
[1]   ⍝ GLOBAL VARS:BEK;TW;WA
[2]   ⍝ SUBFUNCTIE IN ANL5, VERBETERINGEN UITGEVOERD IN ANL5 ZELF
[3]    A← 10 4 10 4 10 4 10 4
[4]    0 1 \[1] 1 90 ⍴(40↑¯30↑'INPUT BRUTO GEWICHTEN'),¯50↑28↑'LEEGGEWICHTEN BEKERS'
[5]    0 1 0 \[1] 1 90 ⍴(40↑¯30↑'POIDS BRUTS INTRODUITS'),¯50↑28↑'POIDS VASES VIDES'
[6]    B←(¯1+TW[2]+⍳(11-TW[2]))
[7]    C←(⍴¯1↓WA)÷4
[8]    (A⍕(C,4)⍴¯1↓WA),(10 0 15 4 ,2↓A)⍕(C,5)↑B,BEK[B;]
[9]    0 1 0 \[1] 1 50 ⍴50↑'NAFOSFAAT          :',4⍕¯1↑WA
   ∇

     ∇ANL12[⎕]∇
   ∇ W←ANL12;A
[1]   ⍝GLOBAL VARS: BEK;TW
[2]   ⍝ BEREKENT DE NETTO ∘/∘GEWICHTEN VOOR 12 FRAKTIES
[3]   ⍝INLEZEN VOLWEIGHTS 41 21 1 61
[4]   ⍝INLEZEN LEEGWEIGHTS 1 21 41 61
[5]    →L1,⍴W←⍳0
[6]   L2:→L1,⍴W←⍳0,0⍴⎕←'LENGTH ERROR'
[7]   L1:W←W,⎕,0⍴⎕←'WEIGHTS,NAFOSF'
[8]    →L2×⍳13≠⍴W
[9]    A←(4↑W)-(BEK[(TW[2]); 3 2 1 4]+⌽0,3⍴¯1↑W)
[10]   A←(1 1 1 0 1 \A←(A[1],(-/A[2 1]),(-/A[3 2]),(A[4]÷40))×4000÷TW[1])
[11]   A[4]←100-+/A
[12]   W←¯1↓W←A,(4↓W×100÷TW[1])
[13]  ⍝ AANPASSING VAN DE GROVE FRAKTIES∇
[14]   A←(~4↓W∊0)/4↓W
[15]   A←1↓A←A-((+/1↓A)-1↑A)÷((⍴A)-1)
[16]   W←(4↑W),A
   ∇
     ∇TEX12[⎕]∇
   ∇ R←TEX12 Y;A;T
[1]   ⍝ BEPAALT DE TEXTUUR VOOR ANALYSEN MET 12 FRAKTIES
[2]    A←Y[1],(+/Y[2 3 4]),+/4↓Y
[3]    →(0≠+/((15↑' ')≠(T←15↑,((∧/(A[3]>82.5),A[1 2]< 8 17.5)=1)/'Z:ZAND')))/T1
[4]    →(0≠+/((15↑' ')≠(T←15↑,((∧/(A< 17.5 32.5 92.5),A> 8 10 67.5)=1)/'Z:S:SAND')))/T1
[5]    →(0≠+/((15↑' ')≠(T←15↑,((∧/(A< 12 50 67.5),A[2 3]> 20 50)=1)/'P:LIGHT SANDLOAM')))/T1
[6]    →(0≠+/((15↑' ')≠(T←15↑,((∧/(A< 22.5 85 67.5),A[2 3]>15)=1)/'L:SANDLOAM')))/T1
[7]    →(0≠+/((15↑' ')≠(T←15↑,((∧/(A[1 3]< 30 15),A[2]>62.5)=1)/'A:LOAM')))/T1
[8]    →(0≠+/((15↑' ')≠(T←15↑,((∧/(A< 45 70 82.5),A[1 3]> 30 65)=1)/'E:SANDY CLAY')))/T1
[9]    →(0≠+/((15↑' ')≠(T←15↑,((∧/(A[1]>45),A[2 3]< 55 65)=1)/'U:HEAVY CLAY')))/T1
[10]  T1:R←⍕ 1 15 ⍴T
   ∇
```

```
      ∇PRINT12[⎕]∇
    ∇ PRINT12;TEX;TI;PR;CAL;LAB;F̲W̲
[1]   ⍝ GLOBAL VARS:ID;F;N;FW
[2]    A←(30↑'BELGISCHE GEOLOGISCHE DIENST'),¯30↑'KORRELGROOTTE ANALYSE'
[3]    0 0 0 1 1 0 1 0 ⍀ 3 60 ⍴A,(30↑'SERVICE GEOLOGIQUE DE BELGIQUE'),(¯30↑'ANALYSE GRANULOMETRIQUE'),60⍴'-'
[4]    LAB←⍕30↑ID[1;]
[5]    CAL←⍕20↑ID[2;]
[6]    (2 8 ⍴(8↑'LABO :'),8↑'APL   :'), 2 30 ⍴ID←LAB,CAL,10↑⍕⌽3↑⎕TS
[7]    0 1 0 0 \[1](1 60 ⍴(¯40↑'KAARTBLAD   :'),20↑¯10↑5↑,N)
[8]    1 1 0 \[1](2 50 ⍴(30↑5↓,N),(¯10↑'BORING   :'),(10↑¯20↑,N),(¯40↑'DIEPTE   :'),¯10↑,N)
[9]    TEX←(0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 \F)
[10]   1 1 0 0 ⍀ 2 33 ⍴(¯33↑'FRACTIEGEWICHTEN IN ∘/∘'),¯33↑22⍴'-'
[11]   F̲W̲← 1 1 1 1 1 0 0 1 1 1 1 1 \[2] F̲W̲←⍕⍉ 2 11 ⍴(¯1↓F̲W̲),1↓F̲W̲← 0 2 10 20 53 74 105 149 211 295 420 2000
[12]   F̲W̲[;7]←'-'
[13]   (⍕ 11 20 ⍴' '),(⍕F̲W̲),(11 10 ⍴10↑' MU   :'),9⍕⍉ 1 11 ⍴11↑FW
[14]   0 1 1 0 \[1]((2 30 ⍴(¯30↑23↑'TEXTUUR   :'),¯30↑23↑10⍴'-'), 1 0 \[1] F)
[15]   N←ID←F←⍳0
    ∇
```

```
      ∇PLOT12[⎕]∇
    ∇ PLOT12;S
[1]    'HISTOGRAM OF FRACTION WEIGHTS IN ∘/∘ >< PHI GRAIN SIZE'
[2]    50 80 PLOT1 FW VS1(-(2⍟X÷1000))
[3]    'HISTOGRAM OF FRACTION WEIGHTS IN ∘/∘ >< MM GRAIN SIZE'
[4]    50 80 PLOT1 FW VS1 X
[5]    'CUMULATIVE SUM OF PHI GRAIN SIZE'
[6]    FW←0↑S←+\FW
[7]    50 80 PLOT1 S AND1 50 AND1 25 AND1 75 VS1(-(2⍟X÷1000))
[8]    'CUMULATIVE SUM OF MM GRAIN SIZE'
[9]    50 80 PLOT1 S AND1 50 AND1 25 AND1 75 VS1 X
    ∇
```

```
      ∇PTILE[⎕]∇
    ∇ R←PTILE Y;A;B;YA;YB;NS;X
[1]   ⍝GLOBAL VARS:S ;FW;X
[2]    X← 2 10 20 53 74 105 149 211 295 420 2000
[3]    A←¯1↑(~A∊0)/A←X×S<Y
[4]    B←(<\~B∊0)/B←X×S>Y
[5]    YA←¯1↑(~YA∊0)/YA←S×S<Y
[6]    YB←(<\~YB∊0)/YB←S×S>Y
```

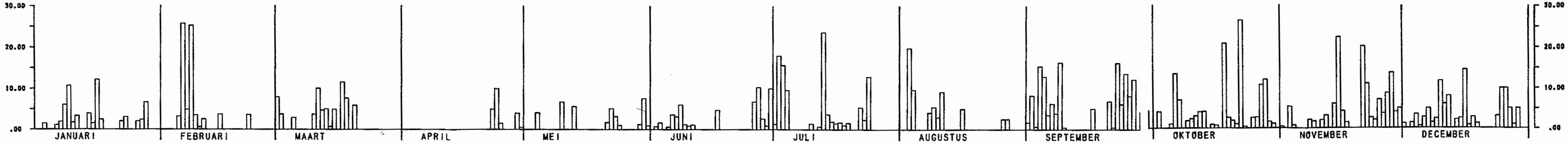
```
    X←A+⍳(B-A)
    →(Y=95)/L1
    YA←YB←B←A←0↑,NS←YA++\,((B-A)⍴(YB-YA)÷(B-A))
  L2:→0,⍴R←(⌈/X×NS<Y)+(Y-⌊/NS×NS>Y)×(⌊/X×NS<Y)÷((⌊/NS×NS>Y)-(⌈/NS×NS<Y))
  L1:X←420+20×⍳79
    →L2,⍴NS←YA++\(79⍴(YB-YA)÷((B-A)×79))
  ∇

    ∇STAT12[⎕]∇
  ∇ STAT12 Y;PL;FI;ST;STA;RES;PHI;A;S
  ⍝∘GLOBAL VARS: STAT;FW;X
  ⍝BEREKENT DE PARAMETERS VERMELD IN 30 50⍴STAT
   S←+\A←FW←11↑Y
   PL←9⍴10
   →(A←<\~S[1]> 5 10 16 25 50 75 84 90 95)/P5,P10,P16,Q1,MD,Q3,P84,P90,P95
  P5:PL[1]←PTILE 5
  P10:PL[2]←PTILE 10
  P16:PL[3]←PTILE 16
  Q1:PL[4]←PTILE 25
  MD:PL[5]←PTILE 50
  Q3:PL[6]←PTILE 75
  P84:PL[7]←PTILE 84
  P90:PL[8]←PTILE 90
  P95:PL[9]←PTILE 95
   S←0↑FI←-(2⍟PL÷1000)
   PHI←-(2⍟X÷1000)
   STA←PL[5],FI[5],X[(FW⍳⌈/FW)],(-(2⍟X[(FW⍳⌈/FW)]÷1000)),((+/FW×X)÷+/FW),(10*((+/FW×(10⍟X))÷+/FW))
   PHI←0↑STA←STA,((+/FW×PHI)÷(+/FW)),((PL[3]+PL[7])÷2),((PL[3]+PL[7]+PL[5])÷3)
   STA←STA,((PL[6]-PL[4])÷2),((FI[4]-FI[6])÷2),((FI[2]-FI[8])÷2)
   STA←STA,((PL[6]÷PL[4])*0.5),((+/FW×((X-(+/FW)÷+/FW)*2)÷(+/FW))*0.5)
   STA←STA,((PL[7]-PL[3])÷2),(((PL[7]-PL[3])÷4)+(PL[9]-PL[1])÷6.6),((PL[4]+PL[6]-2×PL[5])÷2)
   STA←STA,(((PL[4]÷PL[6])÷(PL[5]*2))*0.5),(10⍟PL[4]×PL[6]÷(PL[5]*2))
   STA←STA,(-(10⍟|10⍟PL[4]×PL[6]÷(PL[5]))÷0.602),((PL[1]+PL[9]-2×PL[5])÷(PL[7]-PL[3]))
   STA←STA,(((PL[3]+PL[7]-2×PL[5])÷2×(PL[7]-PL[3]))+(PL[1]+PL[9]-2×PL[5])÷2×(PL[9]-PL[1]))
   STA←STA,((PL[8]-PL[2])÷(PL[6]-PL[4]))
   STA←STA,((FI[2]-FI[8])÷(FI[4]-FI[6])),((FI[1]-FI[9])÷((FI[3]-FI[7]-1)))
   FI←PL←0↑STA←STA,((PL[1]-PL[9])÷2.44×(PL[4]-PL[6]))
   RES←(30 50 ⍴STAT),(0 1 1 1 1 1 1 1 1 1 0 1 1 1 1 1 1 1 0 1 1 1 1 1 1 0 1 1 1 1 \[1] 6⍕⍉ 1 26 ⍴STA)
   →((A⍳1)=⍳5)/S1,S2,S3,S4,S5
  S1:→0,⍴⎕←((TW[4]=1)/(1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1 1 1 1 0 0 1 1 1 0 0 /[1] RES))
  S2:→0,⍴⎕←((TW[4]=1)/(1 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1 1 0 1 1 1 1 1 0 0 0 0 0 0 0 /[1] RES))
  S3:→0,⍴⎕←((TW[4]=1)/(1 1 1 1 1 1 1 1 0 0 1 1 1 0 1 1 0 0 1 1 1 1 1 0 0 0 0 0 0 0 /[1] RES))
  S4:→0,⍴⎕←((TW[4]=1)/(1 1 1 1 1 1 1 1 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 /[1] RES))
  S5:→0,⍴⎕←((TW[4]=1)/(1 0 0 1 1 1 1 1 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 /[1] RES))
  ∇
```

30 50p<u>STAT</u>

MEASURES OF CENTRAL TENDENCY		
MM MEDIAN	MD	:
PHI MEDIAN	MDΦ	:
MM MIDPOINT OF MODAL CLASS	MO	:
PHI MIDPOINT OF MODAL CLASS	MOΦ	:
MM ARITHMETIC MEAN	MA	:
MM GEOMETRIC MEAN	MG	:
PHI ARITHMETIC MEAN OR LOG MEAN	XΦ	:
INMAN PHI MEAN	MΦ	:
FOLK MEAN	MZ	:
MEASURES OF DISPERSION		
MM QUARTILE DEVIATION	QDA	:
PHI QUARTILE DEVIATION	QDΦ	:
PHI PERCENTILE DEVIATION	PDΦ	:
TRASK'S SORTING COEFFICIENT	So	:
MM ARITHMETIC STANDARD DEVIATION	SΦ	:
INMAN PHI DEVIATION	SΦ	:
INCLUSIVE GRAPHIC STANDARD	S1	:
MEASURES OF ASYMMETRY		
MM QUARTILE SKEWNESS(ARITHMETIC)	SKA	:
GEOMETRIC MM QUARTILE SKEWNESS	SKG	:
TRASK'S LOG OF SKEWNESS	LOG SK	:
PHI QUARTILE SKEWNESS	SKΦ	:
SECOND PHI SKEWNESS	α2Φ	:
INCLUSIVE GRAPHIC SKEWNESS	SKI	:
MEASURES OF PEAKEDNESS		
ARITHMETIC QUARTILE KURTOSIS	KQA	:
PHI QUARTILE KURTOSIS	KQΦ	:
PHI KURTOSIS MEASURE	BΦ	:
GRAPHIC KURTOSIS		:

DAGELIJKSE NEERSLAG TURNHOUT 1974



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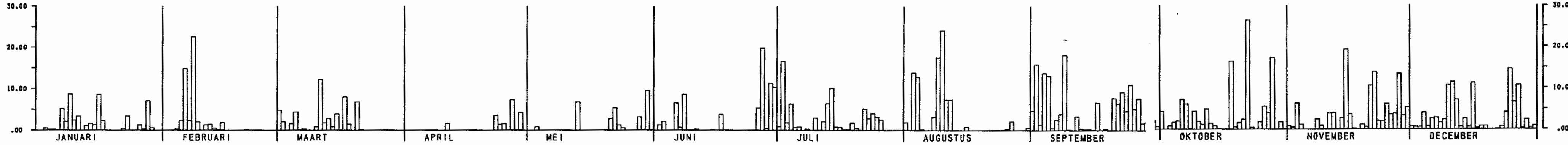

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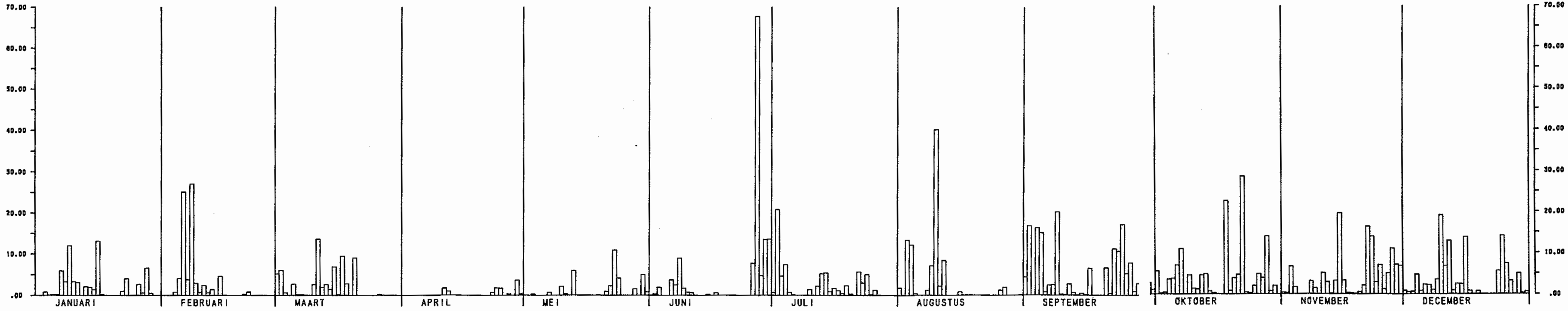

PLATE 5.

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