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Geophysical profile data processing programs for the Hewlett Packard model 2647A graphics terminal

by

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Illustrations

Introduction

The computer programs presented herein process up to four types of geophysical data measured in profile traverses by different methods. The data can then be plotted in profile form showing the data obtained by all the methods used. At present the four possible data types which can be processed are electromagnetics (MAXMIN), magnetics (MAG), self-potential (SP), and topography (TOPO). In addition to displaying all the data for each profile on one illustration, a stack profile data plotting program allows plotting single data types from several profiles in a plan map. Also, the data may be listed in tabular form for each profile.

The programs are written specifically for the Hewlett Packard (HP) model 2647A graphics terminal, a HP-9872B X-Y plotter and a HP-7245B plotter-printer. However, the programs, which are written in Basic, can be modified to operate on other HP devices which use Basic. Conversion of the Basic language programs to devices other than HP may be somewhat more difficult in asmuchas many of the plotting commands are unique to HP devices.

The programs are interactive, that is, they allow the user a wide degree of latitude as to how he wants the data input, processed, and displayed simply by answering prompted questions.

Data Input Program

The data input program listed in Appendix I allows the user to input his profile data from the keyboard, process the data, and store the processed data on tape for later plotting and listing. Normally all four data types are input for each profile and stored in one tape file. The data may be input in any order the user desires; he must indicate how many types he wishes to input, however. The program prompts the user for file name, project, line

number, method and other information needed to identify the data. In addition, the user inputs the first and last station numbers as well as the measurement interval. Station data must be input in ascending order, that is, the data for the smallest station number first followed by the next larger station data. Station numbers as used here refer to distances along a traverse. In order to have profiles plotted in the normal north- or east-looking view, number stations on the west and north should begin with the smallest station numbers. A typical data-input session showing data input of two methods is shown in figure 1.

Figure 1. Near Here.

For each method used, the user may make certain corrections to his data. For Slingram data the user may choose to correct the raw data for variable coil separations necessary to maintain constant horizontal coil separation in rough terrain. The correction factors used for Slingram data are:

IP_c: $IP_o + ((1-(\cos(\tan^{-1} \%grade/100)))^3 x100) \times (1/\cos(\tan^{-1} \%grade/100))^3$

OP_c: $OP_o \times (1/\cos(\tan^{-1} \%grade/100))^3$

where IP_c and IP_o are the in-phase corrected component and in-phase observed component respectively, and OP is the out-of-phase component (APEX Parametrics Limited, 1978).

SP data input allows for a user-supplied base shift to the input data. No other adjustments are made on the data.

Magnetic data may be input in a base-to-base loop mode in which the program linearly adjusts observed readings according to the rate of drift, observed at two successive base observations. Optionally, the use may input

```
RUN
**********PROFILE DATA INPUT PROGRAM**********
This program recieves data of three geophysical methods plus
you may input topographic data, the geophysical methods are:
Slingram, self-potential and magnetics. The input data are
corrected and recorded as one or more profiles on tape. You
can process these methods in any order.  The maximum number
of input points is 50 for Slingram and 100 for the others.
Most questions are answered  Y or N, the default answer is the
left response shown in the prens (Y OR N)
FILE NAME (Max 6 Characters):TEST1
 PROJECT TITLE? (Max. 18 Characters):EXAMPLE
LINE OR PROFILE NAME? (Max. 18 Characters);100N
HOW MANY METHODS TO BE PROCESSED? 2
DISTANCE UNITS  (METERS OR FEET)?FEET
Use MAXMIN for SLINGRAM, SP for SELF POTENTIAL, MAG for MAGNETICS
and TOPO for TOPOGRAPHY,  input them in any order you wish.
WHAT IS THE NEXT METHOD?:MAXMIN
**********( START FEEDING OF EM DATA )**********
DATE OF SURVEY? (EX JUN18-80):JAN23-81
INPUT STATION DATA IN ASCENDING ORDER WEST AND NORTH
SHOULD BE THE SMALLEST NUMERICAL STATION NUMBERS !!!
LOCATION OF FIRST STATION? EX.(-450):0
LOCATION OF LAST STATION? EX.(550):300
NUMBER OF FREQUENCIES USED? (UP TO 5):3
INPUT THESE FREQUENCIES ONE BY ONE:222
INPUT THESE FREQUENCIES ONE BY ONE:888
INPUT THESE FREQUENCIES ONE BY ONE:3555
FREQUENCY 1 ----- 222
FREQUENCY 2 ----- 888
FREQUENCY 3 ----- 3555
 ANY MISTAKES? (N OR Y):N
HOW MANY DATA POINTS?:2
COIL AND STATION SPACINGS SHOULD BE IN THE SAME UNITS
COIL SPACING? (ex.200):200
STATION SPACING? digits only (ex.50):100
DO YOU WANT TO INCLUDE COIL TILT (Y OR N):N
ENTER Re AND Im VALUES
NEXT Re AND Im DATA:2,8
NEXT Re AND Im DATA:4,10
NEXT Re AND Im DATA:7,15
**********( FEED NEXT ROW )**********
NEXT Re AND Im DATA:-2,-5
NEXT Re AND Im DATA:-6,-8
NEXT Re AND Im DATA:-9,-16
**********( FEED NEXT ROW )**********
 1  2  8  4  10  7  15  0
 2 -2 -5 -6 -8 -9 -16  0
ANY MISTAKES (within any row)? (N OR Y):N
DO YOU WANT TO SHIFT DATA ONE ROW?(Y OR N):N
DO YOU WANT TO PRINT OUT DATA (Y OR N):N
DO YOU WANT SLOPE CORRECTION? (N OR Y):N
Use MAXMIN for SLINGRAM, SP for SELF POTENTIAL, MAG for MAGNETICS
and TOPO for TOPOGRAPHY,  input them in any order you wish.
WHAT IS THE NEXT METHOD?:SP
**********( ENTER SP DATA )**********
DATE OF SURVEY?:JAN23-81
FIRST STATION LOCATION:0
LAST STATION LOCATION:200
HOW MANY SP DATA POINTS:2
STATION SPACING (DIGITS ONLY ):200
TYPE IN DATA ONE BY ONE:-45
TYPE IN DATA ONE BY ONE:-90
  1       0      -45
  2     200      -90
ANY MISTAKES? (N OR Y):N
CHANGE THE BASE LEVEL? (N OR Y):N
**********PRINTING CORRECTED SP DATA TO TAPE **********
  1       0      -45
  2     200      -90
WANT TO DO ANOTHER LINE? (N OR Y):N

*****I'M FINISHED, TAKE A BREAK*****
>
```

Figure 1. Example of data input session, showing input of two methods.

magnetic data already adjusted for diurnal changes.

Topographic data can be computed from slopes supplied for Slingram data corrections or may be input separately by supplying station to station slope data.

Profile plotting program

The profile plotting program listed in Appendix II allows the user to graphically display any or all of the data measured along a specific profile. In the default or standard plotting mode, the program will plot the (Re) and imaginary (Im) parts of four frequencies of Slingram data in the upper two-thirds of the plotting area, and plots the SP-MAG and TOPO data in the lower one-third of the plotting area as shown in figure 2. The coil

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Figure 2. Near Here.

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spacing (L) and the measurement interval (X) are shown in the upper right hand corner of the plot along with the plot identification. The value along the x-axis are in feet or meter as selected by the user. Optionally the user may set his own plotting areas and plot data in any order he wishes. As an example figure 3 shows three data sets plotted by selecting the areas for the

---

Figure 3. Near Here.

---

individual elements of the data set. The user may, if he wishes, plot only a portion of the profile simply by inputting the starting and ending stations of interest.

The plot program uses a bi-cubic spline subroutine to fit the plotted line through the data set (de Boor, 1978). The user supplies the smoothing interval and hence can control the degree of smoothing. Normally a smoothing

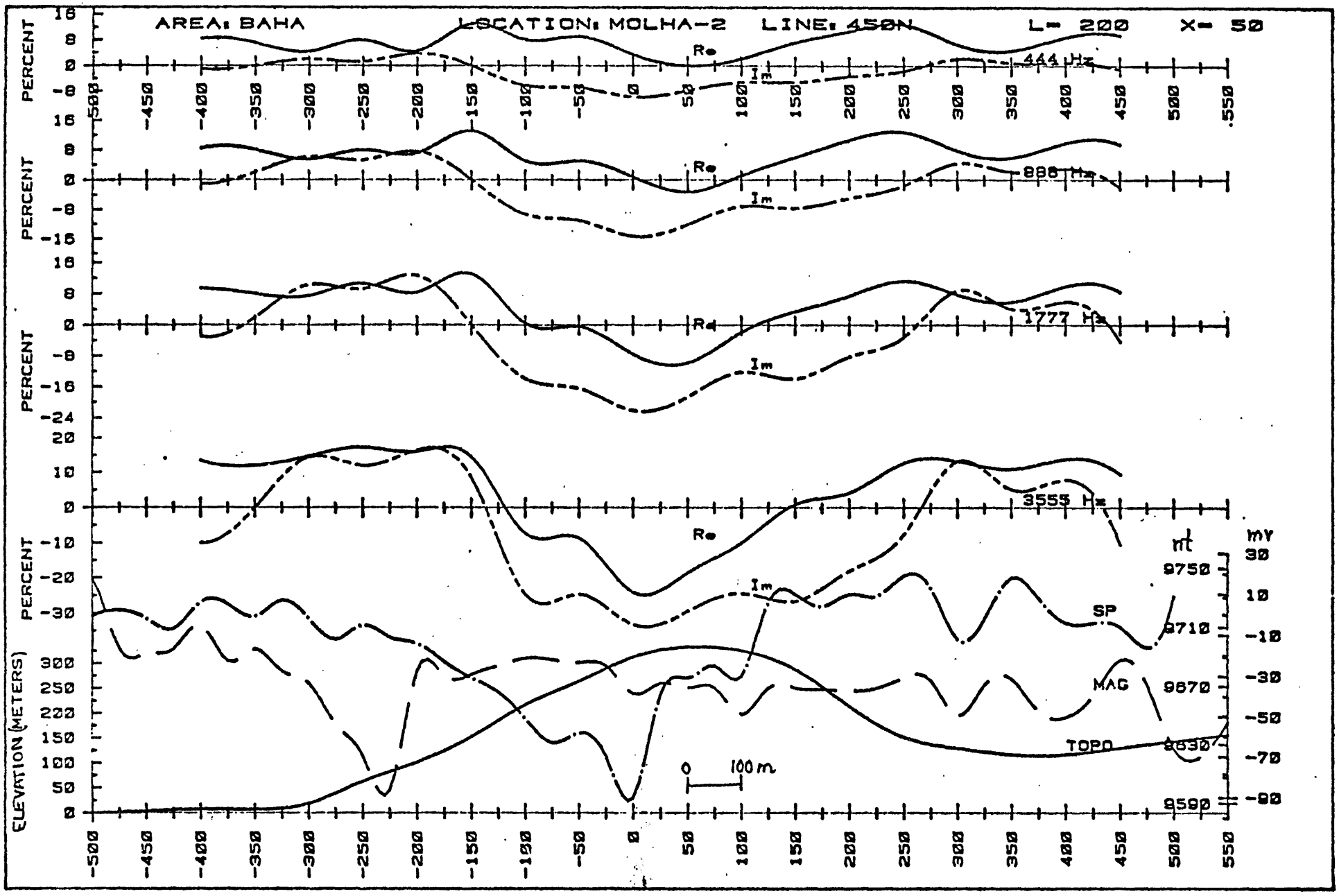

Figure 2. Plot showing configuration of data using plot program standard or default conditions.

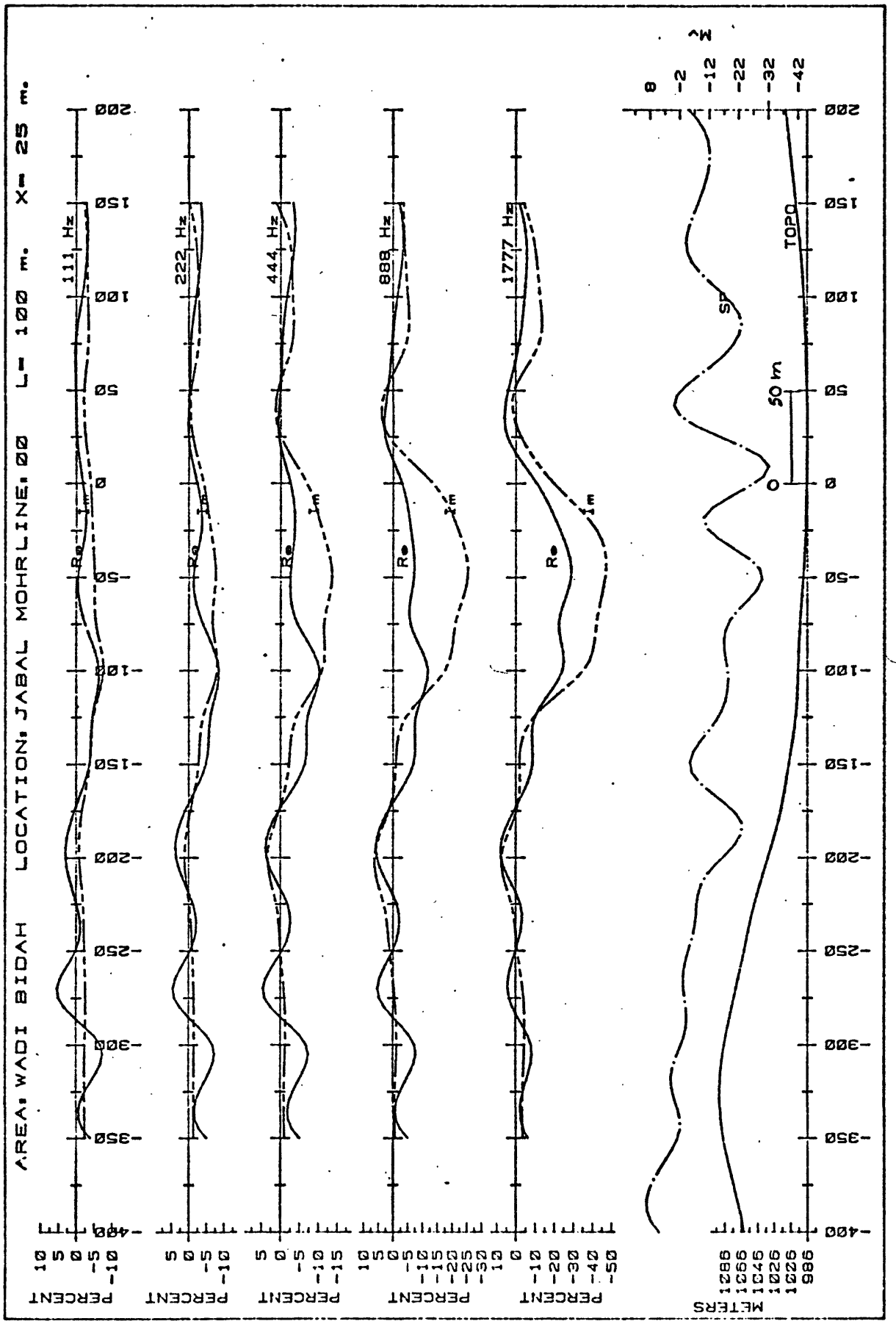

Figure 3. Data plotted by selecting plot areas for individual elements of the data sets.

interval of one-fifth of the data measurement interval produces an eye-pleasing plot.

Stacked profile plotting program

The stacked profile plotting program listed in Appendix III allows the user to plot multiple profiles in correct plan view. That is, the X-axis positioned at the zero or profile reference value is plotted in the proper Y-position in respect to the other profiles. An example is a shown in figure 4,

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Figure 4. Near Here.

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where five profiles of SP data were made with profile spacing varying from 100 to 150 m apart. The Y-scale shown at the bottom left applies to all the profiles with the zero for each profile located at the X-axis position.

As in the other plot routines, the program prompts the user for the necessary information to produce stacked profiles. One word of caution: because the profile data is stored in separate files on the data tape, the user must select the data set he wishes to plot from the various files of data in the proper order.

Data printing program

The printing program, listed in Appendix IV, lists in tabular form data recorded in each data file. If one or more of the methods are not present in the data file, that column of data is left blank. An example of the tabular listing is shown in figure 5.

Figure 5. Near Here.

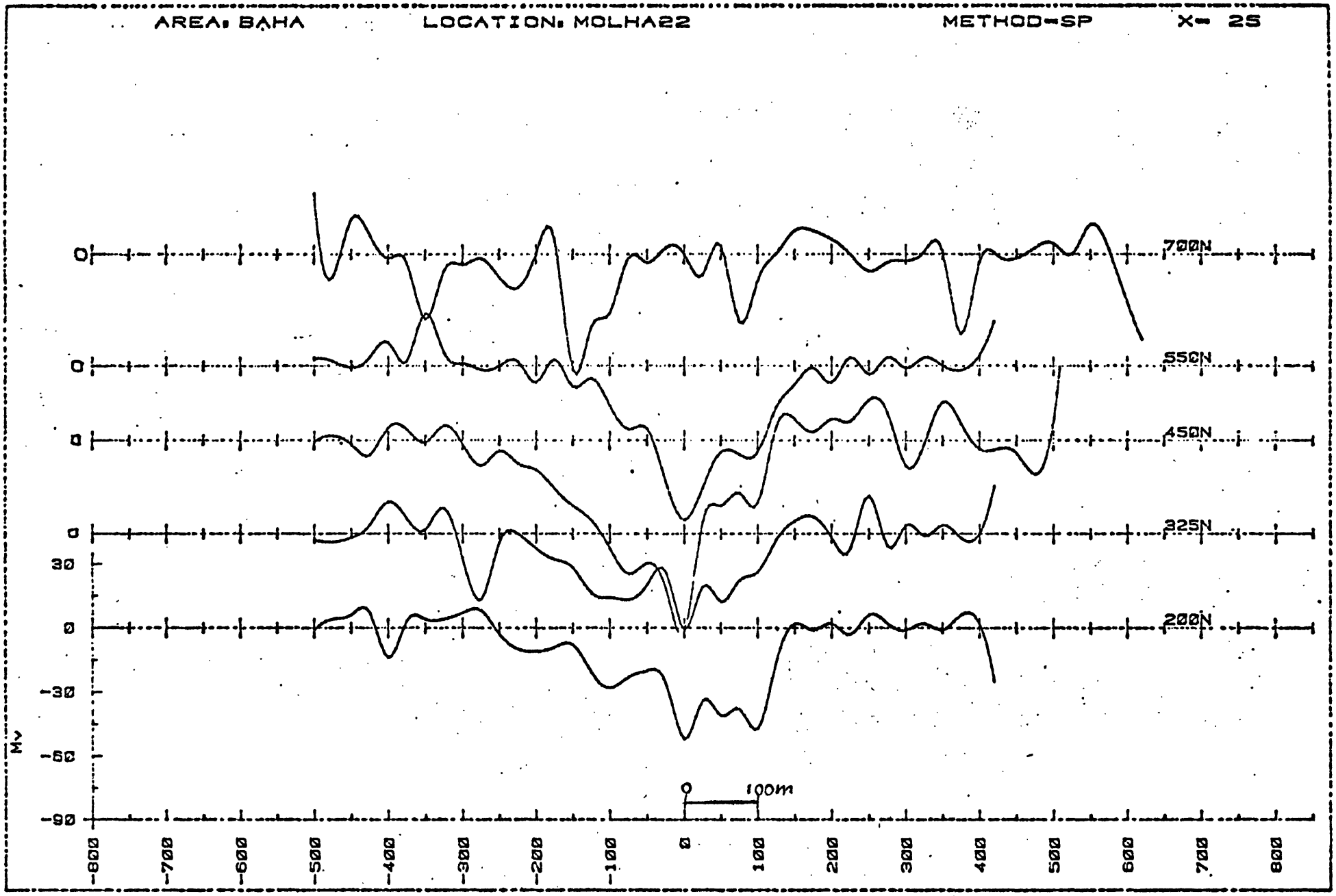

Figure 4. Plot showing stacked profiles of SP data plotted in their proper relationship to each other.

FILE> MARAWA PROJECT> BAHA LINE> 50S UNITS> METERS

STATION	SLINGRAM										SP	TOPO	MAG
	Frq	444		888		1777		3555		0	mv.		nT
		re.	im.	re.	im.	re.	im.	re.	im.	re.	im.			
-450.0											-8	0	9534
-425.0											-9		9537
-400.0											-10	21.6	9535
-375.0											-34		9536
-350.0		.38	2.2	1.4	3.3	2.5	4.4	4.7	4.7	0	0	-92	43.2	9530
-325.0												-133		9526
-300.0		1.7	2.0	3.8	3.1	4.8	3.1	6.9	6.9	0	0	-224	57.8	9526
-275.0												-227		9514
-250.0		-18	-11	-22	-13	-31	-15	-39	-39	0	0	-187	55.4	9506
-225.0												-185		9502
-200.0		-19	-10	-23	-11	-30	-12	-39	-39	0	0	-177	57	9511
-175.0												-271		9516
-150.0		-13	-9.	-18	-9.	-21	-9.	-31	-31	0	0	-421	58.5	9497
-125.0												-382		9498
-100.0		-15	-8	-18	-8	-22	-8	-30	-30	0	0	-259	58.5	9514
-75.0												-221		9513
-50.0		-7.	-1.	-9.	5.0	-10	16.	-1.	-1.	0	0	-196	57	9526
-25.0												-173		9534
0.0		6.5	11.	9.5	18.	14.	34.	30.	30.	0	0	-131	52.2	9538
25.0												-79		9542
50.0		4.7	8.0	7.7	15.	8.7	27.	18.	18.	0	0	-16	46.7	9541
75.0												17		9537
100.0		5.7	5.0	7.7	10.	9.8	15.	16.	16.	0	0	9	41.2	9534
125.0												-26		9532
150.0		7.1	5.0	9.1	11.	13.	17.	25.	25.	0	0	-38	38.8	9534
175.0												-21		9538
200.0		9.6	3.0	13.	5.0	16.	6.0	28.	28.	0	0	24	30.9	9544
225.0												59		9546
250.0		8.5	3.1	10.	-6.	15.	7.2	29.	29.	0	0	59	18.9	9528
275.0												39		9534
300.0		4.5	-2.	4.5	-3.	1.5	-7.	-2.	-2.	0	0	37	11	9546
325.0												4		9539
350.0		4	-6	3	-11	-5	-19	-20	-20	0	0	-28	11	9539
375.0												-77		9539
400.0		-.8	-4.	-.8	-7.	-5.	-14	-18	-18	0	0	-341	13.4	9547
425.0												-150		9540
450.0		.73	-2.	1.7	-3.	-2.	-9.	-12	-12	0	0	-90	18.9	9531
475.0												-35		9494
500.0		2.8	12.	7.9	25.	17.	40.	40.	40.	0	0	-10	27.6	9595
525.0												5		9553
550.0		9.0	11.	14.	20.	22.	32.	47.	47.	0	0	-10	40.4	9550
575.0												-10		9549
600.0		6.5	-15	-.8	-23	-14	-33	-32	-32	0	0	-45	55.8	9554
625.0												-85		9551
650.0												-271	71.2	9552
675.0												-471		9552
700.0												-421	86.6	9554

Figure 5. Data listing of profile data for multiple methods.

References Cited

Apex, 1978, Operators manual, Apex Parametrics Ltd, 200 Steetcase Road E., Markham, ONT. Canada, L3R1G2.

de Boor, Carl, 1978, A practical guide to splines in book: Applied Mathematical Sciences, v. 17, New York Springer-Verlag, 392 p.

Appendix I

Profile data input program

```
H#6
 5 PRINT "***********PROFILE DATA INPUT PROGRAM***********"
 10 PRINT "This program recieves data of three geophysical methods plus"
 15 PRINT "you may input topographic data, the geophysical methods are:"
 20 PRINT "Slingram, self-potential and magnetics. The input data are  "
 25 PRINT "corrected and recorded as one or more profiles on tape. You "
 30 PRINT "can process these methods in any order.  The maximum number "
 35 PRINT "of input points is 50 for Slingram and 100 for the others."
 40 PRINT "Most questions are answered  Y or N, the default answer is the"
 45 PRINT "left response shown in the prens (Y OR N)"
 50 DIM Fr(5),S(100),M(100),Re(5,50),Im(5,50),X(100)
 55 Id$="Y"
 60 ASSIGN "RIGHT TAPE" TO #1
 65 Rpt=0
 70 PRINT CHR$(7);\ INPUT "FILE NAME (Max 6 Characters):",Fnm$
 75 PRINT CHR$(7);\ INPUT " PROJECT TITLE? (Max. 18 Characters):",Title$
 80 PRINT CHR$(7);\ INPUT "LINE OR PROFILE NAME? (Max. 18 Characters);",Ln$
 85 PRINT CHR$(7);\ INPUT "HOW MANY METHODS TO BE PROCESSED? ",Mt
 90 PRINT CHR$(7);\ INPUT "DISTANCE UNITS  (METERS OR FEET)?",Ut$
 95 PRINT #1;Fnm$
 100 PRINT #1 USING 105;Title$,Ln$,Mt,Ut$
 105 IMAGE 18A,",",18A,",",DDD,",",6A
 110 FOR K=1 TO Mt
 115 PRINT "Use MAXMIN for SLINGRAM, SP for SELF POTENTIAL, MAG for MAGNETICS"
 120 PRINT "and TOPO for TOPOGRAPHY,  input them in any order you wish."
 125 PRINT CHR$(7);\ INPUT "WHAT IS THE NEXT METHOD?:",Mth$
 130 IF Mth$="MAXMIN" THEN GOTO 150
 135 IF Mth$="SP" THEN GOTO 900
 140 IF Mth$="MAG" THEN GOTO 1080
 145 IF Mth$="TOPO" THEN GOTO 1410
 150 PRINT "**********( START FEEDING OF EM DATA )**********"
 155 PRINT CHR$(7);\ INPUT "DATE OF SURVEY? (EX JUN18-80):",Dat$
 160 PRINT "INPUT STATION DATA IN ASCENDING ORDER WEST AND NORTH"
 165 PRINT "SHOULD BE THE SMALLEST NUMERICAL STATION NUMBERS !!!"
 170 PRINT CHR$(7);\ INPUT "LOCATION OF FIRST STATION? EX.(-450):",Ss
 175 PRINT CHR$(7);\ INPUT "LOCATION OF LAST STATION? EX.(550):",Ls
 180 PRINT CHR$(7);\ INPUT "NUMBER OF FREQUENCIES USED? (UP TO 5):",F
 185 IF Rpt=0 THEN GOTO 225
 190 An$="N"
 195 PRINT CHR$(7);\ INPUT " USE THE PREVIOUS FREQUNCIES? (N OR Y):",An$
 200 IF An$="Y" THEN GOTO 240
 205 PRINT CHR$(7)
 210 IF An$="N" THEN INPUT "HOW MANY FREQ. USED? (UP TO 5):",F
 215 GOTO 225
 220 IF Rpt>0 THEN GOTO 280
 225 FOR J=1 TO F
 230 PRINT CHR$(7);\ INPUT "INPUT THESE FREQUENCIES ONE BY ONE:",Fr(J)
 235 NEXT J
 240 FOR J=1 TO F
 245 PRINT "FREQUENCY";J;"-----";Fr(J)
 250 NEXT J
 255 An$="N"
 260 PRINT CHR$(7);\ INPUT " ANY MISTAKES? (N OR Y):",An$
 265 IF An$="N" THEN GOTO 280
 270 PRINT CHR$(7);\ INPUT "CHANGE FREQ. Ex. (3,888):",J,Fr(J)
 275 GOTO 240
 280 PRINT CHR$(7);\ INPUT "HOW MANY DATA POINTS?:",Ns
 285 Rpt=Rpt+1
 290 PRINT "COIL AND STATION SPACINGS SHOULD BE IN THE SAME UNITS"
 295 PRINT CHR$(7);\ INPUT "COIL SPACING? (ex.200):",Cs
 300 PRINT CHR$(7);\ INPUT "STATION SPACING? digits only (ex.50):",Ds
 305 An$="Y"
 310 PRINT CHR$(7);\ INPUT "DO YOU WANT TO INCLUDE COIL TILT (Y OR N):",An$
```

```
315 PRINT "ENTER Re AND Im VALUES "
320 FOR I=1 TO Ns
325 FOR J=1 TO F
330 PRINT CHR$(7);\ INPUT "NEXT Re AND Im DATA:",Re(J,I),Im(J,I)
335 NEXT J
340 IF An$="N" THEN GOTO 355
345 PRINT CHR$(7);\ INPUT "COIL TILT:",S(I)
350 GOTO 365
355 S(I)=0
360 PRINT "***********( FEED NEXT ROW )*****************"
365 NEXT I
370 Rt=0
375 FOR I=1 TO Ns
380 PRINT I;
385 FOR J=1 TO F
390 PRINT Re(J,I);Im(J,I);
395 NEXT J
400 PRINT S(I)
405 NEXT I
410 IMAGE DDDD.D,DDDD.D,
415 IMAGE 5(DDDD.D,)
420 IF Rt=1 THEN GOTO 740
425 IF Rt=2 THEN GOTO 820
430 An$="N"
435 PRINT CHR$(7);\ INPUT "ANY MISTAKES (within any row)? (N OR Y):",An$
440 IF An$="N" THEN GOTO 525
445 PRINT CHR$(7);\ INPUT " ELEMENT OR ROW? (E OR R):",Er$
450 IF Er$="E" THEN GOTO 485
455 PRINT CHR$(7);\ INPUT "WHICH ROW?",P
460 FOR J=1 TO F
465 PRINT CHR$(7);\ INPUT "INPUT correct Re AND Im Values:",Re(J,P),Im(J,P)
470 NEXT J
475 PRINT CHR$(7);\ INPUT "Corrected Tilt?",S(P)
480 GOTO 430
485 PRINT CHR$(7);\ INPUT "ROW OF THE MISTAKEN ELEMENT?:",P
490 PRINT CHR$(7);\ INPUT "IS IT TILT?(Y OR N):",Grd$
495 IF Grd$="Y" THEN GOTO 515
500 PRINT CHR$(7);\ INPUT "MISTAKEN FREQ. NO. (1 TO 5)?:",J
505 PRINT CHR$(7);\ INPUT "CORRECT Re and Im Val. OF THIS FREQ.:",Re(J,P),Im(J,
510 PRINT CHR$(7);\ INPUT "DO YOU WANT TO CORRECT TILT?(Y OR N):",Grd$
515 IF Grd$="Y" THEN PRINT CHR$(7);\ INPUT "CORRECTED TILT:",S(P)
520 GOTO 430
525 Ash$="N"
530 PRINT CHR$(7);\ INPUT "DO YOU WANT TO SHIFT DATA ONE ROW?(Y OR N):",Ash$
535 IF Ash$="N" THEN GOTO 720
540 PRINT CHR$(7);\ INPUT "DO YOU WANT TO ELIMINATE ONE ROW?(Y OR N):",Qe$
545 IF Qe$="N" THEN GOTO 625
550 PRINT CHR$(7);\ INPUT "WHICH ROW NO.?",P
555 FOR I=P TO Ns
560 PRINT I;
565 FOR J=1 TO F
570 IF I=Ns THEN GOTO 585
575 Re(J,I)=Re(J,I+1)
580 Im(J,I)=Im(J,I+1)
585 PRINT Re(J,I);Im(J,I);
590 NEXT J
595 IF I=Ns THEN GOTO 605
600 S(I)=S(I+1)
605 PRINT S(I)
610 NEXT I
615 PRINT CHR$(7);\ INPUT "DO YOU NEED MORE ELIMINATION?(Y OR N):",Qt$
620 IF Qt$="Y" THEN GOTO 540
625 PRINT CHR$(7);\ INPUT "DO YOU WANT TO ADD A LINE IN BETWEEN?(Y OR N):",Q$
```

```
630 IF Q$="N" THEN GOTO 430
635 PRINT CHR$(7);\ INPUT "WHICH ROW NO.?:",P
640 FOR I=P TO Ns
645 Ic=Ns+P-I
650 PRINT Ic;
655 FOR J=1 TO F
660 IF I=Ns THEN GOTO 675
665 Re(J,Ic)=Re(J,Ic-1)
670 Im(J,Ic)=Im(J,Ic-1)
675 PRINT Re(J,Ic);Im(J,Ic);
680 NEXT J
685 IF I=Ns THEN GOTO 695
690 S(Ic)=S(Ic-1)
695 PRINT S(Ic)
700 NEXT I
705 PRINT CHR$(7);\ INPUT "ARE YOU FINISH ADDING LINES?(Y OR N):",Adm$
710 IF Adm$="N" THEN GOTO 625
715 GOTO 430
720 Rt=1
725 An$="Y"
730 PRINT CHR$(7);\ INPUT "DO YOU WANT TO PRINT OUT DATA (Y OR N):",An$
735 IF An$="Y" THEN GOTO 375
740 An$="N"
745 PRINT CHR$(7);\ INPUT "DO YOU WANT SLOPE CORRECTION? (N OR Y):",An$
750 IF An$="N" THEN GOTO 820
755 FOR I=1 TO Ns
760 A=COS(ATN(S(I)/100))
765 Ac=(1-A^3)*100
770 B=(1/A)^3
775 FOR J=1 TO F
780 Re(J,I)=(Re(J,I)+Ac)*B
785 Im(J,I)=Im(J,I)*B
790 NEXT J
795 NEXT I
800 Rt=2
805 An$="N"
810 PRINT CHR$(7);\ INPUT "PRINT CORRECTED EM DATA? (N OR Y):",A
815 IF An$="Y" THEN GOTO 375
820 PRINT #1;Mth$;",";Dat$;",";Ss;",";Ls;",";Ds;",";Ns;",";F;",";Cs
825 Csh=Cs/2
830 FOR I=1 TO Ns
835 M(I)=Ss+Csh+Ds*(I-1)
840 PRINT #1;M(I),",",S(I)
845 NEXT I
850 FOR J=1 TO F
855 PRINT #1;Fr(J)
860 FOR I=1 TO Ns
865 PRINT #1;Re(J,I),",",Im(J,I)
870 NEXT I
875 NEXT J
880 FOR I=1 TO Ns
885 Re(1,I)=S(I)
890 NEXT I
895 GOTO 1760
900 PRINT "***************( ENTER SP DATA )*****************"
905 PRINT CHR$(7);\ INPUT "DATE OF SURVEY?:",Dat$
910 PRINT CHR$(7);\ INPUT "FIRST STATION LOCATION:",Sp
915 PRINT CHR$(7);\ INPUT "LAST STATION LOCATION:",Lp
920 PRINT CHR$(7);\ INPUT "HOW MANY SP DATA POINTS:",Np
925 PRINT CHR$(7);\ INPUT "STATION SPACING (DIGITS ONLY ):",Dp
930 FOR I=1 TO Np
935 PRINT CHR$(7);\ INPUT "TYPE IN DATA ONE BY ONE:",S(I)
940 NEXT I
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```
945 FOR I=1 TO Np
950 M(I)=Sp+(I-1)*Dp
955 PRINT USING 965;I,M(I),S(I)
960 NEXT I
965 IMAGE DDD,X,DDDDDDD,X,DDDDDDD
970 An$="N"
975 PRINT CHR$(7);\ INPUT "ANY MISTAKES? (N OR Y):",An$
980 IF An$="N" THEN GOTO 1005
985 PRINT CHR$(7);\ INPUT "WHICH ROW?",P
990 PRINT CHR$(7);\ INPUT "INPUT CORRECT VALUE:",S(P)
995 PRINT USING 965;P,M(P),S(P)
1000 GOTO 970
1005 Cor$="N"
1010 PRINT CHR$(7);\ INPUT "CHANGE THE BASE LEVEL? (N OR Y):",Cor$
1015 IF Cor$="N" THEN GOTO 1040
1020 PRINT CHR$(7);\ INPUT "HOW MUCH DO YOU WANT SUBTRACTED? ",Lv
1025 FOR I=1 TO Np
1030 S(I)=S(I)-Lv
1035 NEXT I
1040 IF Cor$="N" THEN Lv=0
1045 PRINT "**********PRINTING CORRECTED SP DATA TO TAPE **********"
1050 PRINT #1;Mth$;",";Dat$;",";Sp;",";Lp;",";Dp;",";Np;",";F;",";Cs
1055 FOR I=1 TO Np
1060 PRINT USING 965;I,M(I),S(I)
1065 PRINT #1;M(I),",",S(I)
1070 NEXT I
1075 GOTO 1760
1080 PRINT "****************** INPUT MAG DATA **************"
1085 PRINT CHR$(7);\ INPUT "DATE OF SURVEY?:",Dat$
1090 PRINT CHR$(7);\ INPUT "FIRST STATION LOCATION?:",Sm
1095 PRINT CHR$(7);\ INPUT "LAST STATION LOCATION?:",Lm
1100 PRINT CHR$(7);\ INPUT "STATION SPACING?(DIGITS ONLY):",Dm
1105 PRINT CHR$(7);\ INPUT "HOW MANY DATA POINTS?:",Nm
1110 PRINT "You may do a base to base linear adjustment of the magnetic"
1115 PRINT "values, in which case you must input the observed raw data,"
1120 PRINT "and time of observation:  MAG,Hr,Min or:36245,9,45"
1125 PRINT "If you wish to input previously adjusted mag data "
1130 PRINT "answer the next question Y, and input mag data only."
1135 PRINT CHR$(7);\ INPUT "DO YOU WANT TO FEED MAG DATA ONLY?(Y OR N):",Amg$
1140 FOR I=1 TO Nm
1145 IF Amg$="Y" THEN GOTO 1165
1150 PRINT CHR$(7);\ INPUT "NEXT INPUT MAG AND TIME DATA:",M(I),S(I),X(I)
1155 PRINT USING 1180;I,M(I),S(I),X(I)
1160 GOTO 1175
1165 PRINT CHR$(7);\ INPUT "NEXT MAG DATA?:",M(I)
1170 PRINT I;M(I)
1175 NEXT I
1180 IMAGE DDD,X,DDDDDDD.D,X,DDD,":",DDD
1185 An$="N"
1190 PRINT CHR$(7);\ INPUT "ANY MISTAKES?(N OR Y):",An$
1195 IF An$="N" THEN GOTO 1240
1200 PRINT CHR$(7);\ INPUT "WHICH ROW NO?",P
1205 IF Amg$="Y" THEN GOTO 1225
1210 PRINT CHR$(7);\ INPUT "INPUT NEW MAG,Hr,Mnt VALUE ",M(P),S(P),X(P)
1215 PRINT USING 1180;P,M(P),S(P),X(P)
1220 GOTO 1235
1225 PRINT CHR$(7);\ INPUT "INPUT CORRECT MAG VALUE:",M(P)
1230 PRINT P;M(P)
1235 GOTO 1185
1240 An$="N"
1245 J=1
1250 IF Amg$="Y" THEN GOTO 1345
1255 PRINT "First and last time of base should cover survey time."
```

```
1260 PRINT CHR$(7);\ INPUT "MAG AND TIME OF BASE? LOOP START ",Mgn,Hr,Mn
1265 INPUT "MAG AND TIME OF BASE? LOOP END ",Mag,Hrs,Mnt
1270 FOR I=J TO Nm
1275 J=I
1280 Ftm=Hr*60+Mn
1285 Ltm=Hrs*60+Mnt
1290 Mtm=S(I)*60+X(I)
1295 IF Ftm>Ltm THEN GOTO 1255
1300 IF Mtm=Ltm THEN GOTO 1330
1305 Dft=Ltm-Ftm
1310 Dfm=Mag-Mgn
1315 Rat=Dfm/Dft
1320 M(I)=M(I)-Rat*(S(I)*60+X(I)-Ftm)
1325 GOTO 1335
1330 M(I)=M(I)-Dfm
1335 PRINT USING 1180;I,M(I),S(I),X(I)
1340 NEXT I
1345 An$="N"
1350 PRINT CHR$(7);\ INPUT "SUBTRACT A BASE VALUE? (N OR Y):",An$
1355 IF An$="N" THEN GOTO 1365
1360 PRINT CHR$(7);\ INPUT "INPUT THE VALUE TO BE SUBTRACTED ",Lvm
1365 PRINT #1;Mth$;",";Dat$;",";Sm;",";Lm;",";Dm;",";Nm;",";F;",";Cs
1370 FOR I=1 TO Nm
1375 X(I)=Sm+(I-1)*Dm
1380 IF An$="N" THEN GOTO 1390
1385 M(I)=M(I)-Lvm
1390 PRINT USING 965;I,X(I),M(I)
1395 PRINT #1;X(I),",",M(I)
1400 NEXT I
1405 GOTO 1760
1410 PRINT "***************** INPUT TOPO DATA **************"
1415 An$="Y"
1420 PRINT CHR$(7);\ INPUT "Use SR slope data for TOPO profile?Y OR N",An$
1425 IF An$="Y" THEN GOTO 1575
1430 PRINT CHR$(7);\ INPUT "DATE OF SURVEY?:",Dat$
1435 PRINT "Input data in ascending order of station values, that is:"
1440 PRINT "with WEST and NORTH as the smallest station numbers."
1445 PRINT "Enter percent slope from station n to n+1."
1450 PRINT "  "
1455 PRINT CHR$(7);\ INPUT "HOW MANY STATIONS?:",Ntp
1460 PRINT CHR$(7);\ INPUT "FIRST STATION LOCATION?(ex.-400):",Ss
1465 PRINT CHR$(7);\ INPUT "LAST STATION LOCATION?(ex.650):",Ls
1470 PRINT CHR$(7);\ INPUT "STATION SPACING?:",Ds
1475 PRINT CHR$(7);\ INPUT "TOPO LEVEL OF THE FIRST STATION?:",Tlv
1480 FOR I=1 TO Ntp
1485 IF I=1 THEN GOTO 1505
1490 PRINT CHR$(7);\ INPUT "SLOPE VALUES?ONE BY ONE:",M(I)
1495 S(I)=Ss+(I-1)*Ds
1500 GOTO 1515
1505 S(I)=Ss
1510 M(I)=0
1515 PRINT USING 1525;I,S(I),M(I)
1520 NEXT I
1525 IMAGE DDD,5X," STATION:",DDDDDDDD,5X,"SLOPE:",DDDDDDDD
1530 Ns=Ntp
1535 An$="N"
1540 PRINT CHR$(7);\ INPUT "ANY MISTAKES?(N OR Y):",An$
1545 IF An$="N" THEN GOTO 1655
1550 PRINT CHR$(7);\ INPUT "WHICH ROW? ",P
1555 PRINT CHR$(7);\ INPUT "INPUT CORRECT SLOPE: ",M(P)
1560 PRINT USING 1525;P,S(P),M(P)
1565 GOTO 1535
1570 GOTO 1655
```

```
1575 PRINT CHR$(7);\ INPUT "ELEVATION OF THE FIRST POINT?:",Tlv
1580 Stp=Csh/Ds
1585 Ntp=Ns+2*Stp
1590 Ia=Stp+1
1595 FOR J=1 TO Stp
1600 Ja=J-1
1605 S(J)=Ss+Ja*Ds
1610 S(Ntp-Ja)=Ls-Ja*Ds
1615 M(J)=Re(1,1)
1620 M(Ntp-Ja)=Re(1,Ns)
1625 NEXT J
1630 FOR I=Ia TO Ns+Stp
1635 Ib=I-Stp
1640 M(I)=Re(1,Ib)
1645 S(I)=Ss+(I-1)*Ds
1650 NEXT I
1655 PRINT #1;Mth$;",";Dat$;",";Ss;",";Ls;",";Ds;",";Ns;",";F;",";Cs
1660 X(1)=Tlv
1665 M(1)=0
1670 An$="N"
1675 PRINT CHR$(7);\ INPUT "PRINT OUT INPUT DATA?(N OR Y):",An$
1680 IF An$="N" THEN GOTO 1700
1685 FOR I=1 TO Ntp
1690 PRINT USING 1525;I,S(I),M(I)
1695 NEXT I
1700 FOR I=1 TO Ntp
1705 IF I=1 THEN GOTO 1745
1710 Pi=4*ATN(1)
1715 A=ABS(M(I))*2*Pi/400
1720 L=Ds*TAN(A)
1725 Pr=X(I-1)
1730 IF M(I)>0 THEN X(I)=Pr+L
1735 IF M(I)<0 THEN X(I)=Pr-L
1740 IF M(I)=0 THEN X(I)=Pr
1745 PRINT USING 1765;I,S(I),X(I)
1750 PRINT #1;S(I),",",X(I)
1755 NEXT I
1760 NEXT K
1765 IMAGE DDD,5X,"STATION:",DDDDDDD,5X,"ELEVATION:",DDDDDDD
1770 An$="N"
1775 PRINT CHR$(7);\ INPUT "WANT TO DO ANOTHER LINE? (N OR Y):",An$
1780 PRINT " F H R"
1785 IF An$="Y" THEN GOTO 70
1790 FOR I=1 TO 10\ PRINT CHR$(7);\ NEXT I
1795 PRINT "****I'M FINISHED, TAKE A BREAK*****"
1800 END
```

Appendix II

Profile data plotting program

```
H#6
10 REM PROGRAM PROLILE PLOT OF COMPLEX GEOPHYSICAL METHODS
20 PRINT "*****PROFILE PLOTTING*****"
30 DIM X(100),Y(100),A(100),B(100),C(100),Im(100)
40 DIM Fr(5)
50 ASSIGN "RIGHT TAPE" TO #1
60 READ #1;Fnm$
70 PRINT "THE NEXT FILE NAME IS:";Fnm$
80 An1$="Y"
90 Ansr$="Y"
100 PRINT CHR$(7);\ INPUT "PLOT THIS FILE? (Y OR N):",Ansr$
110 PRINT CHR$(7);\ INPUT "PLOTTER OUTPUT? (Y OR N):",An1$
120 IF Ansr$="N" THEN GOTO 910
130 READ #1;Title$,Ln$,Nm,Ut$
140 IF Ut$="METERS" THEN Ui$="m."
150 IF Ut$="FEET" THEN Ui$="ft."
160 PRINT "PROJECT:";Title$,"LINE:";Ln$,"NO.OF METHODS:";Nm
170 Hi=0\F1=0
180 GOTO 960
190 FOR M=1 TO Nm
200 READ #1;Mth$,Dat$,Sx,Lx,Dx,Nx,Nf,Lv
210 PRINT "THE NEXT METHOD IS:";Mth$,"NO OF DATA POINTS:";Nx
220 Ans$="Y"
230 PRINT CHR$(7);\ INPUT "PLOT THIS METHOD?(Y OR N):",Ans$
240 IF Mth$<>"MAXMIN" THEN GOTO 620
250 IF Ans$="N" THEN GOTO 270
260 PRINT "RECORDED FREQUENCIES IS:";Nf
270 FOR I=1 TO Nx
280 READ #1;X(I),Y(I)
290 NEXT I
300 Jmb=0
310 FOR J=1 TO Nf
320 READ #1;Fr(J)
330 IF Ans$="N" THEN GOTO 400
340 PRINT "NEXT FREQUENCY IS:";Fr(J)
350 An$="Y"
360 PRINT CHR$(7);\ INPUT "PLOT THIS FREQUENCY?(Y OR N):",An$
370 IF An$="N" THEN GOTO 400
380 PRINT CHR$(7);
390 INPUT "REVERSE IMAGINARY?(Y OR N):",Rvs$
400 FOR I=1 TO Nx
410 READ #1;Y(I),Im(I)
420 IF Rvs$="Y" THEN Im(I)=-Im(I)
430 NEXT I
440 IF An$="N" THEN GOTO 590
450 IF Ans$="N" THEN GOTO 590
460 PRINT "STATION SPACING IS:";Dx\ PRINT CHR$(7);
470 INPUT "INPUT SMOOTHING SUB INTERVAL?:",Cx
480 CALL Mxmn(Nx,Y(),Mx,Mn)
490 CALL Mxmn(Nx,Im(),Mxi,Mni)
500 IF Mxi>Mx THEN Max=Mxi ELSE Max=Mx
510 IF Mni<Mn THEN Min=Mni ELSE Min=Mn
520 Hi=1
530 CALL Splin(Nx,X(),Y(),A(),B(),C())
540 GOTO 960
550 IF J>Nf THEN GOTO 810
560 Hi=2
570 CALL Splin(Nx,X(),Y(),A(),B(),C())
580 GOTO 2060
590 NEXT J
600 Jmb=0
610 GOTO 810
620 FOR I=1 TO Nx
```

```
630 READ #1;X(I),Y(I)
640 NEXT I
650 IF Mth$<>"TOPO  " THEN GOTO 740
660 IF Ans$="N" THEN GOTO 810
670 Ymx=2*Y(1)
680 Qtn$="N"\ PRINT Chr$(7)
690 INPUT "REVERSE TOPO SLOPES?(N OR Y):",Qtn$
700 IF Qtn$="N" THEN GOTO 740
710 FOR I=1 TO Nx
720 Y(I)=Ymx-Y(I)
730 NEXT I
740 IF Ans$="N" THEN GOTO 810
750 CALL Mxmn(Nx,Y(),Max,Min)
760 CALL Splin(Nx,X(),Y(),A(),B(),C())
770 PRINT "STATION SPACING IS:",Dx\ PRINT CHR$(7);
780 INPUT "SMOOTHING INTERVAL?:",Cx
790 Hi=3
800 GOTO 960
810 NEXT M
820 An$="N"\ PRINT CHR$(7);
830 INPUT "ANOTHER PROFILE?(N OR Y):",An$
840 IF An$="N" THEN GOTO 930
850 PRINT "CHANGE PAPER ON PLOTTER!!!!"
860 Ans$="N"\ PRINT CHR$(7);
870 INPUT "READY FOR NEW PLOT?(N OR Y):",Ans$
880 IF Ans$="N" THEN GOTO 850
890 PRINT " F +1 R"
900 GOTO 60
910 IF Ansr$="N" THEN PRINT " F +1 R"
920 IF Ansr$="N" THEN GOTO 60
930 PRINT "PLOT COMPLETED"
940 PEN (0)
950 GOTO 3480
960 IF An1$="Y" THEN GOTO 990
970 PLOTR
980 GOTO 1000
990 PLOTR (5,1)
1000 IF Hi>1 THEN GOTO 1280
1010 IF Jmb=1 THEN GOTO 1280
1020 LOCATE (0,170,0,120)
1030 FRAME
1040 IF Hi=1 THEN GOTO 1080
1050 Att$="Y"\ PRINT CHR$(7);
1060 INPUT "PLOT GENERAL TITLE FOR THE PAGE?(Y OR N):",Att$
1061 PRINT CHR$(7);\ INPUT "LABEL PROFILE DIRECTION?(Y OR N)",Pd$
1062 IF Pd$="N" THEN GOTO 1064
1063 PRINT CHR$(7);\ INPUT "INPUT RIGHT SIDE OF PROFILE DIRECTION ",Prod$
1064 PRINT CHR$(7);\ INPUT "TICK DATA LOCATION ON PROFILE? (Y OR N):",Z$
1070 IF Att$="N" THEN GOTO 1260
1080 SCALE (0,150,0,100)
1090 MOVE (8,81)
1100 CSIZE (2,1,0)
1110 IF Hi=0 THEN GOTO 1180
1120 Ain$="N"\ PRINT CHR$(7);
1130 INPUT "WRITE COIL AND STATION SPACING?(N OR Y):",Ain$
1140 IF Ain$="N" THEN GOTO 1280
1150 MOVE (99,81)
1160 PRINT #0;"L=";Lv;Ui$;" X=";Dx;Ui$;
1170 GOTO 1280
1180 PRINT CHR$(7);\ INPUT "LOCATION NAME?:",Fn$
1190 PRINT #0 USING 1200;"PROJECT:",Title$," AREA:",Fn$
1200 IMAGE 10A,10A,6A,15A
1210 Qes$="Y"\ PRINT CHR$(7);
```

```
1230 IF Qes$="N" THEN GOTO 1260
1240 MOVE (69,81)
1250 PRINT #0;" LINE:";Ln$
1260 IF Hi=1 THEN GOTO 1280
1270 GOTO 190
1280 Nc=Dx/Cx
1290 Xf=X(1)
1300 Xl=X(Nx)
1310 PRINT "NO. OF DATA POINTS IS:";Nx
1320 PRINT "FIRST STATION LOCATION IS:",X(1)
1330 PRINT "LAST STATION LOCATION IS:",X(Nx)
1340 IF Jmb=1 THEN GOTO 1510
1350 Awr$="Y"\ PRINT CHR$(7);
1360 INPUT "CHANGE THESE LOCATIONS (Y OR N):",Awr$
1370 IF Awr$="N" THEN GOTO 1420
1380 PRINT CHR$(7);\ INPUT "NEW START STATION?:",Xmn
1390 PRINT CHR$(7);\ INPUT "NEW LAST STATION?:",Xmx
1400 PRINT CHR$(7);\ INPUT "HOW MANY DATA POINTS TO PLOT?:",Ny
1410 GOTO 1460
1420 Ny=Nx
1430 Xmn=X(1)
1440 Xmx=X(Nx)
1450 Df=Dx/2
1460 PRINT "THE X-AXIS MINOR INTERVAL WILL BE:";Df
1470 Awr$="N"\ PRINT CHR$(7);
1480 INPUT "CHANGE THIS VALUE?(N OR Y):",Awr$
1490 IF Awr$="N" THEN GOTO 1510
1500 PRINT CHR$(7);\ INPUT "THE NEW SUBINTERVAL?:",Df
1510 Qn=Max-Min
1520 PRINT "Y-MAX. IS:",Max
1530 PRINT "Y-Min. IS:",Min
1540 PRINT "DIFFERENCE IS:";Qn\ PRINT CHR$(7);
1550 INPUT "SCALE Y-AXIS TO MAX-MIN ?(Y OR N):",Yan$
1560 IF Yan$="N" THEN GOTO 1600
1570 Ymx=Max
1580 Ymn=Min
1590 GOTO 1620
1600 PRINT CHR$(7);\ INPUT "NEW Y-AXIS MIN. VALUE?:",Ymn
1610 PRINT CHR$(7);\ INPUT "NEW Y-AXIS MAX. VALUE?:",Ymx
1620 PRINT CHR$(7);\ INPUT "Y-AXIS MINOR INTERVAL?:",Dv
1630 IF Hi=3 THEN GOTO 2420
1640 PRINT "******SELECT PLOTTING AREAS*******"
1650 PRINT "DEFAULT MODE:4 AREAS FOR MAXMIN IN % OF PAGE:"
1660 PRINT "AREA1:88-100%, 2:72-88%, 3:52-72%, 4:28-52%"
1670 Ara$="N"\ PRINT CHR$(7);
1680 INPUT "CHANGE THE STANDARD AREAS?(N OR Y):",Ara$
1690 IF Ara$="Y" THEN GOTO 1740
1700 PRINT CHR$(7);\ INPUT "PLOT THIS FREQ IN WHAT AREA?(1-4):",Z
1710 IF Z<5 THEN GOTO 1770
1720 PRINT "YOU BLEW IT TRY AGAIN!!!!"
1730 GOTO 1700
1740 PRINT CHR$(7);\ INPUT "LOWER BOUNDARY OF THE NEW AREA?:",H
1750 PRINT CHR$(7);\ INPUT "UPPER BOUNDARY OF THE NEW AREA?:",G
1760 GOTO 1810
1770 H=88-(Z-1)*16
1780 IF Z>1 THEN H=H-(Z-2)*4
1790 IF Z>2 THEN H=H-(Z-3)*4
1800 G=H+12+(Z-1)*4
1810 LOCATE (10,140,H,G)
1820 Hn=Ymn-5
1830 Hx=Ymx+5
1840 IF Yan$="N" THEN Hn=Ymn
```

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1850 IF Yan$="N" THEN Hx=Ymx
1860 SCALE (Xmn,Xmx,Hn,Hx)
1870 CSIZE (2,.7,0)\ PRINT CHR$(7);
1880 INPUT "PLOT THE X-AXIS?(Y OR N):",Rex$
1890 IF Rex$="N" THEN GOTO 1950
1900 PRINT CHR$(7);\ INPUT "LABEL X-AXIS?(Y OR N):",Rlb$
1910 IF Rlb$="Y" THEN GOTO 1940
1920 XAXIS (Df,Xmn,0,2,1)
1930 GOTO 1950
1940 LXAXIS (Df,Xmn,0,2,1,1)
1950 Wn=1
1960 Xax=Xmn
1970 LYAXIS (Dv,Xax,0,2,1,1)
1980 Gb=Ymx
1990 Gh=Xmn+5
2000 Gx=X(Ny)-2*Dx
2010 Ab=Fr(J)
2011 IF Pd$="N" THEN GOTO 2020
2012 IF Fl=1 THEN GOTO 2020
2013 CSIZE (1.5,.7,0)
2014 MOVE (Gx+720,Gy)
2015 PRINT #0;Prod$
2016 CSIZE (2,1,0)
2017 Fl=1
2020 MOVE (Gx,Gy)
2030 PRINT #0;Ab;"Hz";
2040 IF Hi=1 THEN MOVE (X(7),Y(7))
2050 IF Hi=1 THEN PRINT #0;"Re";
2060 IF Hi=2 THEN MOVE (X(9),Y(9))
2070 IF Hi=2 THEN PRINT #0;"Im";
2080 Gf=Max
2090 MOVE (Xf,Max)
2100 IF Hi=2 THEN LINE (6)
2110 FOR L=1 TO Nx
2120 FOR K=1 TO Nc
2130 T=X(L)+(K-1)*Cx
2140 IF T<Xf THEN GOTO 2190
2150 IF T>X1 THEN GOTO 2190
2160 U=T-X(L)
2170 V=Y(L)+U*(A(L)+U*(B(L)+U*C(L)))
2180 PLOT (T,V)
2190 NEXT K
2200 NEXT L
2210 FOR L=1 TO Nx
2220 IF Z$="N" THEN GOTO 2270
2230 MOVE (X(L),Y(L)-3)
2240 PORG (X(L),Y(L)-3)
2250 IF Hi=1 THEN PRINT #0;"x";
2260 IF Hi=2 THEN PRINT #0;"+";
2270 Y(L)=Im(L)
2280 NEXT L
2290 Jmb=1
2300 IF Hi=1 THEN GOTO 550
2310 IF Rvs$="N" THEN GOTO 2360
2320 Zn=-Hn
2330 Zx=-Hx
2340 SCALE (Xmn,Xmx,Zn,Zx)
2350 LYAXIS (Dv,Xmx,0,2,1,2)
2360 LOCATE (0,170,H,G)
2370 SCALE (0,100,0,40)
2380 MOVE (2,4)
2390 LDIR (0,8)
2400 PRINT #0;"PERCENT";
```

```
2410 IF Hi=2 THEN GOTO 590
2420 PRINT "*****************************************************"
2430 PRINT "SP,MAG AND TOPO ARE PLOTTED OVERLAPPED IN DEFULT MODE"
2440 PRINT "IN AREA 8-28%, YOU MAY CHANGE THIS IF YOU WISH."
2450 Ap1$="N"\ PRINT CHR$(7);
2460 INPUT "CHANGE DEFAULT AREAS?(N OR Y):",Ap1$
2470 IF Ap1$="N" THEN GOTO 2510
2480 PRINT CHR$(7);\ INPUT "LOWER BOUNDARY OF THE NEW AREA?:",H
2490 PRINT CHR$(7);\ INPUT "UPPER BOUNDARY OF THE NEW AREA?:",G
2500 GOTO 2540
2510 H=8
2520 G=H+20
2530 IF Mth$<>"TOPO  " THEN G=30
2540 LOCATE (10,140,H,G)
2550 CSIZE (2,.7,0)
2560 Hn=Ymn-10
2570 Hx=Ymx+10
2580 IF Mth$<>"SP    " THEN GOTO 2630
2590 PRINT CHR$(7);\ INPUT "SP NEGATIVE UPWARD?(Y OR N):",Qw$
2600 IF Qw$="N" THEN GOTO 2630
2610 Hn=Ymx+10
2620 Hx=Ymn-10
2630 SCALE (Xmn,Xmx,Hn,Hx)
2640 PRINT "*************( SETTING AXES )*************************"
2650 PRINT "STANDARD PLOT SETS XAXIS THEN PLOTS YAXIS ON RIGHT FOR TOPO,"
2660 PRINT "YAXIS FOR SP AND MAG ARE ON THE LEFT, YOU CAN CHANGE THIS"
2670 PRINT "CONFIGURATION."
2680 Stp1$="N"\ PRINT CHR$(7);
2690 INPUT "CHANGE THE STANDARD PLOT(Y OR N):",Stp1$
2700 IF Stp1$="Y" THEN GOTO 2740
2710 Wx=1
2720 Xya=Xmn
2730 W=1
2740 Aax$="N"\ PRINT CHR$(7);
2750 INPUT "PLOT THE X-AXIS?(N OR Y):",Aax$
2760 IF Aax$="N" THEN GOTO 2830
2770 IF Stp1$="N" THEN GOTO 2800
2780 PRINT CHR$(7);
2790 INPUT "LABEL XAXIS UP (2) OR DOWN (1)?:",Wx
2800 Yw=Ymn
2810 IF Qw$="Y" THEN Yw=Ymx
2820 LXAXIS (Df,Xya,Yw,2,1,Wx)
2830 PRINT "*****( SETTING Y-AXIS )*****"
2840 IF Stp1$="N" THEN GOTO 2920
2850 Rp1$="N"\ PRINT CHR$(7);
2860 INPUT "CHANGE Y-AXIS POSITION OR LABEL?(N OR Y):",Rp1$
2870 IF Rp1$="N" THEN GOTO 2920
2880 INPUT "AT WHICH X-STATION YOU WANT TO PUT THE Y-AXIS?:",Xya
2890 PRINT CHR$(7);
2900 INPUT "WHERE DO YOU WANT TO PUT ITS LABEL?(1-2;Left=1,Right=2):",W
2910 GOTO 2960
2920 IF Mth$="SP    " THEN W=2
2930 IF Mth$="MAG   " THEN W=1
2940 Xya=Xmx
2950 IF Mth$="TOPO  " THEN Xya=Xmn
2960 Mm1=Ymn
2970 IF Qw$="Y" THEN Mm1=Max
2980 LYAXIS (Dv,Xya,Mm1,2,1,W)
2990 PRINT CHR$(7);
3000 IF Xya<>Xmn AND Xya<>Xmx THEN GOTO 3090
3010 IF Mth$="TOPO  " THEN MOVE (X(Ny-8),Y(Ny-8)+2)
3020 IF Mth$="SP    " THEN MOVE (X(Ny-6),Y(Ny-6)+2)
3030 IF Mth$="MAG   " THEN MOVE (X(7),Y(7)+2)
```

```
3040 PRINT #0;Mth$;
3050 MOVE (10,Max)
3060 IF Mth$="SP     " THEN LINE (4)
3070 IF Mth$="MAG    " THEN LINE (6)
3080 GOTO 3150
3090 IF W=1 THEN MOVE (Xya-5,Ymx+5)
3100 IF W=2 THEN MOVE (Xya+5,Ymx+5)
3110 IF Mth$="TOPO   " THEN PRINT #0;Ut$;
3120 IF Mth$="SP     " THEN PRINT #0;"mV"
3130 IF Mth$="MAG    " THEN PRINT #0;"GAMMAS"
3140 GOTO 3010
3150 FOR L=1 TO Nx
3160 FOR K=1 TO Nc
3170 T=X(L)+(K-1)*Cx
3180 IF T<Xf THEN GOTO 3230
3190 IF T>X1 THEN GOTO 3230
3200 U=T-X(L)
3210 V=Y(L)+U*(A(L)+U*(B(L)+U*C(L)))
3220 PLOT (T,V)
3230 NEXT K
3240 NEXT L
3250 FOR L=1 TO Nx
3260 GOTO 3330
3270 MOVE (X(L),Y(L))
3280 IF X(L)<Xf THEN GOTO 3330
3290 IF X(L)>X1 THEN GOTO 3330
3300 IF Mth$="TOPO   " THEN PRINT #0;"o";
3310 IF Mth$="SP     " THEN PRINT #0;"*";
3320 IF Mth$="MAG    " THEN PRINT #0;"@";
3330 NEXT L
3340 LOCATE (0,170,H,G)
3350 SCALE (0,150,40,80)
3360 IF Xya<>Xmx THEN GOTO 3400
3370 IF W=2 THEN MOVE (132,60)
3380 IF W=1 THEN MOVE (117,75)
3390 IF Xya=Xmx THEN GOTO 3430
3400 IF Xya<>Xmn THEN GOTO 3470
3410 IF W=1 THEN MOVE (2,60)
3420 IF W=2 THEN MOVE (17,45)
3430 LDIR (0,8)
3440 IF Mth$="TOPO   " THEN PRINT #0;Ut$;
3450 IF Mth$="SP     " THEN PRINT #0;"mV";
3460 IF Mth$="MAG    " THEN PRINT #0;"GAMMAS";
3470 GOTO 810
3480 END
3490 SUB Mxmn(Nx,Y(),Max,Min)
3500 D(2)=Y(Nx)
3510 Max=Y(1)
3520 Min=Y(1)
3530 FOR I=1 TO Nx
3540 IF Y(I)>Max THEN Max=Y(I)
3550 IF Y(I)<Min THEN Min=Y(I)
3560 NEXT I
3570 SUBEND
3580 SUB Splin(Nx,X(),Y(),A(),B(),C())
3590 IF Nx<2 THEN GOTO 4040
3600 IF Nx<3 THEN GOTO 3980
3610 Ne=Nx-1
3620 C(1)=X(2)-X(1)
3630 B(2)=(Y(2)-Y(1))/C(1)
3640 FOR I=2 TO Ne
3650 C(I)=X(I+1)-X(I)
3660 A(I)=2*(C(I-1)+C(I))
```

```
3670 B(I-1)=(Y(I+1)-Y(I))/C(I)
3680 C(I)=B(I+1)-B(I)
3690 NEXT I
3700 A(1)=-C(1)
3710 A(Nx)=-C(Nx-1)
3720 B(1)=0
3730 B(Nx)=0
3740 IF Nx=3 THEN GOTO 3790
3750 B(1)=B(3)/(X(4)-X(2))-B(2)/(X(3)-X(1))
3760 B(Nx)=B(Nx-1)/(X(Nx)-X(Nx-2))-B(Nx-2)/(X(Nx-1)-X(Nx-3))
3770 B(1)=B(1)*C(1)^2/(X(4)-X(1))
3780 B(Nx)=-B(Nx)*C(Nx-1)^2/(X(Nx)-X(Nx-3))
3790 FOR I=2 TO Nx
3800 T1=C(I-1)/A(I-1)
3810 A(I)=A(I)-T1*C(I-1)
3820 B(I)=B(I)-T1*B(I-1)
3830 NEXT I
3840 B(Nx)=B(Nx)/A(Nx)
3850 FOR K=1 TO Ne
3860 I=Nx-K
3870 B(I)=(B(I)-C(I)*B(I+1))/A(I)
3880 NEXT K
3890 A(Nx)=(Y(Nx)-Y(Ne))/C(Ne)+C(Ne)*(B(Ne)+2*B(Nx))
3900 FOR I=1 TO Ne
3910 A(I)=(Y(I+1)-Y(I))/C(I)-C(I)*(B(I+1)+2*B(I))
3920 C(I)=(B(I+1)-B(I))/C(I)
3930 B(I)=3*B(I)
3940 NEXT I
3950 B(Nx)=3*B(Nx)
3960 C(Nx)=C(Nx-1)
3970 GOTO 4040
3980 A(1)=(Y(2)-Y(1))/(X(2)-X(1))
3990 B(1)=0
4000 C(1)=0
4010 A(2)=A(1)
4020 B(2)=0
4030 C(2)=0
4040 SUBEND
```

Appendix III

Stacked profile plotting program

```
H#6
 5 REM PROGRAM STACK PROFILES
 10 PRINT "THIS PROGRAM PLOTS THE STACK PROFILES FOR ANY METHOD"
 15 PRINT "ON THE INPUT DATA TAPE PROGRAM THESE PROFILES ARE"
 20 PRINT "SCALED OR NOT SCALED "
 25 DIM X(100),Y(100),A(100),B(100),C(100),Ig(100)
 30 INTEGER St
 35 ASSIGN "RIGHT TAPE" TO #1
 40 Hi=0
 45 Ans1$="N"
 50 INPUT "DO YOU WANT PLOTTER OUTPUT? (Y OR N):",Ans1$
 55 READ #1;Fnm$
 60 Hi=Hi+1
 65 PRINT "THE NEXT FILE NAME IS:";Fnm$
 70 Ansr$="Y"
 75 INPUT "DO YOU WANT TO PLOT THIS FILE? (Y OR N):",Ansr$
 80 IF Ansr$="N" THEN PRINT " F +1 R"
 85 IF Ansr$="N" THEN GOTO 55
 90 READ #1;Title$,Ln$,Nm,Ut$
 95 PRINT "PROJECT:";Title$,"LINE:";Ln$,"NO.OF METHODS:";Nm
 100 Jb=0
 105 IF Hi>1 THEN GOTO 115
 110 GOTO 485
 115 FOR M=1 TO Nm
 120 READ #1;Mth$,Dat$,Sx,Lx,Dx,Nx,Nf,Lv
 125 PRINT "THE NEXT METHOD IS:";Mth$,"NO OF DATA POINTS:";Nx
 130 Ans$="Y"
 135 INPUT "DO WANT TO PLOT THIS METHOD?(Y OR N):",Ans$
 140 IF Mth$<>"MAXMIN" THEN GOTO 330
 145 PRINT "NO. OF RECORDED FREQUENCIES=";Nf
 150 FOR I=1 TO Nx
 155 READ #1;X(I),Y(I)
 160 NEXT I
 165 FOR J=1 TO Nf
 170 READ #1;Fr
 175 IF Ans$="N" THEN GOTO 190
 180 PRINT "THE NEXT FREQUENCY IS:";Fr
 185 INPUT "DO YOU WANT TO PLOT THIS FREQUENCY?(Y OR N):",An$
 190 FOR I=1 TO Nx
 195 READ #1;Y(I),Ig(I)
 200 NEXT I
 205 IF Ans$="N" THEN GOTO 320
 210 IF An$="N" THEN GOTO 320
 215 IF Ar1$="N" THEN GOTO 260
 220 INPUT "DO YOU WANT TO PLOT REAL?(Y OR N):",Ar1$
 225 IF Ar1$="N" THEN GOTO 260
 230 Smth$="Re"
 235 CALL Mxmn(Nx,Y(),Max,Min)
 240 CALL Splin(Nx,X(),Y(),A(),B(),C())
 245 PRINT "THE STATION SPACING IS:",Dx
 250 INPUT "WHAT IS THE SMOOTHING INTERVAL?:",Cx
 255 GOTO 485
 260 IF Aim$="N" THEN GOTO 320
 265 INPUT "DO YOU WANT TO PLOT IMAGINARY?(Y OR N):",Aim$
 270 IF Aim$="N" THEN GOTO 320
 275 Smth$="Im"
 280 FOR I=1 TO Nx
 285 Y(I)=Ig(I)
 290 NEXT I
 295 CALL Mxmn(Nx,Y(),Max,Min)
 300 CALL Splin(Nx,X(),Y(),A(),B(),C())
 305 PRINT "THE STATION SPACING IS:",Dx
 310 INPUT "WHAT IS THE SMOOTHING INTERVAL?:",Cx
```

```
315 GOTO 485
320 NEXT J
325 GOTO 420
330 FOR I=1 TO Nx
335 READ #1;X(I),Y(I)
340 NEXT I
345 IF Mth$()"TOPO  " THEN GOTO 390
350 Ymx=2*Y(1)
355 IF Ans$="N" THEN GOTO 420
360 Qtn$="N"
365 INPUT "DO YOU WANT TO REVERSE SLOPES SIGN?(N OR Y):",Qtn$
370 IF Qtn$="N" THEN GOTO 390
375 FOR I=1 TO Nx
380 Y(I)=Ymx-Y(I)
385 NEXT I
390 IF Ans$="N" THEN GOTO 420
395 CALL Mxmn(Nx,Y(),Max,Min)
400 CALL Splin(Nx,X(),Y(),A(),B(),C())
405 PRINT "THE STATION SPACING IS:",Dx
410 INPUT "WHAT IS THE SMOOTHING INTERVAL?:",Cx
415 GOTO 485
420 NEXT M
425 An$="N"
430 INPUT "DO YOU WANT ANOTHER PROFILE?(N OR Y):",An$
435 IF An$="N" THEN GOTO 470
440 Ans$="N"
445 INPUT "ARE YOU READY FOR NEW PLOT?(N OR Y):",Ans$
450 IF Ans$="N" THEN GOTO 445
*455 PRINT " F +1 R
460 GOTO 55
465 IF Ansr$="N" THEN GOTO 55
470 PRINT "TAKE A BREAK, THANK YOU"
475 PEN (0)
480 GOTO 1130
485 IF Ans1$="N" THEN GOTO 500
490 PLOTR (5,1)
495 GOTO 505
500 PLOTR
505 IF Hi>1 THEN GOTO 640
510 IF Jb>1 THEN GOTO 640
515 LOCATE (0,170,0,120)
520 FRAME
525 IF Jb=0 THEN GOTO 535
530 IF Jb=1 THEN GOTO 585
535 Att$="Y"
540 INPUT "DO YOU WANT TO PLOT GENERAL TITLE FOR THE PAGE?(Y OR N):",Att$
545 IF Att$="N" THEN GOTO 625
550 SCALE (0,150,0,100)
555 CSIZE (2,1,0)
560 MOVE (15,81)
565 INPUT "WHAT IS THE LOCATION NAME?:",Fn$
570 PRINT #0;"AREA:";Title$;" LOCATION:";Fn$;
575 Jb=Jb+1
580 GOTO 625
585 Ain$="N"
590 INPUT "DO YOU WANT TO WRITE METHOD STATION SPACING?(N OR Y):",Ain$
595 IF Ain$="N" THEN GOTO 620
600 SCALE (0,150,0,100)
605 CSIZE (2,1,0)
610 MOVE (95,81)
615 PRINT #0;"METHOD=";Mth$;" X=";Dx;
620 Jb=Jb+1
625 IF Ans$="Y" THEN GOTO 640
```

```
630 IF Att$="N" THEN Jb=2
635 GOTO 115
640 PRINT "*************************************************************"
645 PRINT "THE STARTING STATION IS:",Sx
650 PRINT "THE LAST STATION IS:",Lx
655 PRINT "THE MIN. VALUE IS:",Min
660 PRINT "THE MAX. VALUE IS:",Max
665 IF Hi>1 THEN GOTO 710
670 INPUT "WHAT IS THE STARTING STATION?:",Xmn
675 INPUT "WHAT IS THE LAST STATION?:",Xmx
680 INPUT "WHAT IS THE MAXIMUM VALUE OF THE READINGS?:",Ymx
685 INPUT "WHAT IS THE MINIMUN VALUE OF READINGS?:",Ymn
690 INPUT "WHAT IS THE SIZE OF EVERY PLOT IN % OF PAGE?:",Sz
695 INPUT "DO YOU WANT TO UPWARD OR DOWNWARD?(UW OR DW):",Tb$
700 INPUT "WHAT IS THE UPPER BOUNDARY OF THE FIRST PLOT AREA?:",Up
705 Axm=Ymx
710 Un=140/(Xmx-Xmn)
715 IF Hi=1 THEN GOTO 970
720 INPUT "WHAT IS THE DISTANCE BET. THIS PROFILE AND THE START:",Vd
725 Shf=Vd*Un
730 CSIZE (2,.7,0)
735 IF Hi>1 THEN GOTO 755
740 G=Up
745 H=G-Sz
750 IF Hi=1 THEN GOTO 790
755 IF Tb$="DW" THEN G=Up-Shf
760 IF Tb$="UW" THEN G=Up+Shf
765 H=G-Sz
770 IF Ans1$="N" THEN GOTO 785
775 PLOTR (5,1)
780 GOTO 790
785 PLOTR
790 LOCATE (10,150,H,G)
795 SCALE (Xmn,Xmx,Ymn,Axm)
800 IF Hi>1 THEN GOTO 835
805 INPUT "DO YOU WANT TO PUT THE X-AXIS ON EACH PROFILE?(Y OR N):",Qax$
810 IF Qax$="N" THEN GOTO 850
815 INPUT "DO YOU WANT TO PUT TICS ON THE X-AXIS?(Y OR N):",Atc$
820 IF Atc$="N" THEN Df=0
825 IF Atc$="Y" THEN INPUT "WHAT IS THE X-MINOR INTERVAL?:",Df
830 INPUT "AT WHICH Y-VALUE DO YOU WANT TO PUT THE X-AXIS:",Yax
835 XAXIS (Df,Xmn,Yax,2,1)
840 MOVE (Xmn-16,Yax)
845 PRINT #0;Yax
850 CSIZE (2,.7,0)
855 Nc=Dx/Cx
860 IF Smth$="Im" THEN LINE (6)
865 FOR L=1 TO Nx
870 FOR K=1 TO Nc
875 T=X(L)+(K-1)*Cx
880 IF T<Xmn THEN GOTO 905
885 IF T>Xmx THEN GOTO 905
890 U=T-X(L)
895 V=Y(L)+U*(A(L)+U*(B(L)+U*C(L)))
900 PLOT (T,V)
905 NEXT K
910 NEXT L
915 MOVE (Xmx-100,Yax)
920 LDIR (1,0)
925 LINE (0)
930 PRINT #0;Ln$
935 IF Mth$<>"MAXMIN" THEN GOTO 1120
940 MOVE (Xmx-400,Yax)
```

```
945 PRINT #0;Fr;"Hz";
950 IF Smth$="Re" THEN MOVE (X(5),Y(5))
955 IF Smth$="Im" THEN MOVE (X(7),Y(7))
960 PRINT #0;Smth$;
965 GOTO 1120
970 INPUT "DO YOU WANT TO PLOT GENERAL LABELLED AXIS?(Y OR N):",Gax$
975 IF Gax$="N" THEN GOTO 1115
980 INPUT "AT WHICH Y% WILL BE THE LOWER BOUNDARY OF AXIS AREA?:",Ybn
985 Ysc=Ybn+Sz
990 INPUT "WHAT IS THE X-AXIS MINOR INTERVAL?:",Df
995 INPUT "WHAT IS THE Y-AXIS MINOR INTERVAL?:",Dv
1000 LOCATE (10,150,Ybn,Ysc)
1005 SCALE (Xmn,Xmx,Ymn,Ymx)
1010 CSIZE (2,.7,0)
1015 INPUT "DO YOU WANT X-AXIS AT Y-MIN OR AT Y=0?(MN OR ZR):",Yx$
1020 IF Yx$="MN" THEN Ynw=Ymn
1025 IF Yx$="ZR" THEN INPUT "WHAT IS YOUR ZERO LEVEL?:",Ynw
1030 LXAXIS (Df,Xmn,Ynw,2,1,1)
1035 LYAXIS (Dv,Xmn,Ynw,2,1,1)
1040 IF Ans1$="N" THEN GOTO 1055
1045 PLOTR (5,1)
1050 GOTO 1060
1055 PLOTR
1060 H=Ybn
1065 G=H+Sz
1070 LOCATE (0,170,H,G)
1075 SCALE (0,160,40,80)
1080 CSIZE (2,.7,0)
1085 LDIR (0,8)
1090 MOVE (2,50)
1095 IF Mth$="TOPO   " THEN PRINT #0;Ut$;
1100 IF Mth$="SP     " THEN PRINT #0;"mv";
1105 IF Mth$="MAG    " THEN PRINT #0;"GAMMAS";
1110 IF Mth$="MAXMIN" THEN PRINT #0;"PERCENT";
1115 GOTO 720
1120 IF Mth$="MAXMIN" THEN GOTO 215
1125 GOTO 420
1130 END
1135 SUB Mxmn(Nx,Y(),Max,Min)
1140 D(2)=Y(Nx)
1145 Max=Y(1)
1150 Min=Y(1)
1155 FOR I=1 TO Nx
1160 IF Y(I)>Max THEN Max=Y(I)
1165 IF Y(I)<Min THEN Min=Y(I)
1170 NEXT I
1175 SUBEND
1180 SUB Splin(Nx,X(),Y(),A(),B(),C())
1185 IF Nx<2 THEN GOTO 1410
1190 IF Nx<3 THEN GOTO 1380
1195 Ne=Nx-1
1200 C(1)=X(2)-X(1)
1205 B(2)=(Y(2)-Y(1))/C(1)
1210 FOR I=2 TO Ne
1215 C(I)=X(I+1)-X(I)
1220 A(I)=2*(C(I-1)+C(I))
1225 B(I+1)=(Y(I+1)-Y(I))/C(I)
1230 B(I)=B(I+1)-B(I)
1235 NEXT I
1240 A(1)=-C(1)
1245 A(Nx)=-C(Nx-1)
1250 B(1)=0
1255 B(Nx)=0
```

```
1260 IF Nx=3 THEN GOTO 1285
1265 B(1)=B(3)/(X(4)-X(2))-B(2)/(X(3)-X(1))
1270 B(Nx)=B(Nx-1)/(X(Nx)-X(Nx-2))-B(Nx-2)/(X(Nx-1)-X(Nx-3))
1275 B(1)=B(1)*C(1)^2/(X(4)-X(1))
1280 B(Nx)=-B(Nx)*C(Nx-1)^2/(X(Nx)-X(Nx-3))
1285 FOR I=2 TO Nx
1290 Ti=C(I-1)/A(I-1)
1295 A(I)=A(I)-Ti*C(I-1)
1300 B(I)=B(I)-Ti*B(I-1)
1305 NEXT I
1310 B(Nx)=B(Nx)/A(Nx)
1315 FOR K=1 TO Ne
1320 I=Nx-K
1325 B(I)=(B(I)-C(I)*B(I+1))/A(I)
1330 NEXT K
1335 A(Nx)=(Y(Nx)-Y(Ne))/C(Ne)+C(Ne)*(B(Ne)+2*B(Nx))
1340 FOR I=1 TO Ne
1345 A(I)=(Y(I+1)-Y(I))/C(I)-C(I)*(B(I+1)+2*B(I))
1350 C(I)=(B(I+1)-B(I))/C(I)
1355 D(I)=3*B(I)
1360 NEXT I
1365 B(Nx)=3*B(Nx)
1370 C(Nx)=C(Nx-1)
1375 GOTO 1410
1380 A(1)=(Y(2)-Y(1))/(X(2)-X(1))
1385 B(1)=0
1390 C(1)=0
1395 A(2)=A(1)
1400 B(2)=0
1405 C(2)=0
1410 SUBEND
```

Appendix IV

Tabular printout program

H#6

```
100 REM printdata
105 REM
110 REM set up
115 REM
120 DIM Stations(200),Sl(10,50),Sp(2,100),Tp(2,100),Mg(2,100),Frq(5),B$[80]
125 DIM Mt$(5),Fst(5),Lst(5),Stsp(5),Nst(5),Cs(5),Dt$,Nfrq(5),Dummy1(50)
130 REM
131 ASSIGN "RIGHT TAPE" TO #1
132 REM
133 ASSIGN "H#6" TO #2
134 REM
135 REM ZERO OUT ARRAYS
137 REM
138 FOR I=1 TO 5\ PRINT CHR$(7)\ NEXT I\ PRINT CHR$(213)
140 FOR I=1 TO 200\Stations(I)=0\ NEXT I
145 FOR I=1 TO 50\ FOR I=1 TO 10\Sl(I,I)=0\ NEXT I
150 FOR I=1 TO 100\ FOR I=1 TO 2\Mg(I,I)=1E+06\Tp(I,I)=1E+06
155 Sp(I,I)=1E+06\ NEXT I
160 FOR I=1 TO 5\Mt$(I)=" "\Fst(I)=0\Lst(I)=0\Stsp(I)=0
170 Nst(I)=0\Nfrq(I)=0\Cs(I)=0\ NEXT I
171 REM ************************************************************
172 REM MAIN LOGIC
173 REM
175 REM CALL SUBS
180 REM
185 REM READ SUB
190 REM
200 GOSUB 2000
210 REM
211 REM SUB TO GET STATIONS INTO ARRAY STATIONS
220 REM
300 GOSUB 3000
310 REM
315 REM MARK THE DUPLICATES
320 REM
400 GOSUB 4000
405 REM
410 REM SUB TO SORT
420 REM
500 GOSUB 5000
505 REM
510 REM SUB TO PRINT DATA
520 REM
600 GOSUB 6000
700 REM
702 PRINT CHR$(213)
703 PRINT Adders;"STATIONS PRINTED"
998 PRINT "I'M READY FOR ANOTHER FILE"\ FOR I=1 TO 10\ PRINT CHR$(7)\ NEXT I
999 END
2000 REM************************************************************
2005 REM READ ROUTINE
2010 REM
2025 READ #1;Fnm$
2033 C=0
2035 PRINT " >>FILE NAME IS >>";Fnm$;"<<  PRINT IT ? (Y OR N)"
2036 PRINT "   ------------"
2040 INPUT Ans$
2042 IF Ans$="N" THEN GOTO 2500
2050 IF Ans$<>"Y" THEN GOTO 2035
2052 C=5
2053 Cnt=0
2054 PRINT CHR$(7)\ PRINT "READING"
```

```
2056 READ #1;T$,Ln$,Nmt,Un$
2059 Cnt=Cnt+1\C=5
2060 IF Cnt>Nmt THEN RETURN
2061 READ #1;Mt$(C),Dt$(C),Fst(C),Lst(C),Stsp(C),Nst(C),Nfrq(C),Cs(C)
2065 REM NOW THAT WE READ A HEADER WHAT DATA DO WE HAVE ??
2070 IF Mt$(C)="MAXMIN" THEN GOTO 2100
2075 IF Mt$(C)="SP    " THEN GOTO 2200
2080 IF Mt$(C)="TOPO  " THEN GOTO 2300
2085 IF Mt$(C)="MAG   " THEN GOTO 2400
2090 PRINT ">> INVALID METHOD ";Mt$(C)\ STOP
2095 REM
2100 REM SLING READ
2102 C=1
2103 GOSUB 20000
2105 FOR I=1 TO Nst(C)
2110 READ #1;Dummy1(I),Dummy2
2111 NEXT I
2112 Cnt1=0
2113 Cnt2=1
2114 IF Cnt2>Nfrq(C) THEN GOTO 2059
2115 READ #1;Frq(Cnt2)
2120 FOR I=1 TO Nst(C)
2130 READ #1;SI(Cnt1+1,I),SI(Cnt1+2,I)
2135 NEXT I
2140 Cnt1=Cnt1+2
2145 Cnt2=Cnt2+1
2150 GOTO 2114
2155 REM
2200 REM SP READ
2201 C=2
2203 GOSUB 20000
2205 FOR I=1 TO Nst(C)
2210 READ #1;Sp(1,I),Sp(2,I)
2215 NEXT I
2220 GOTO 2059
2221 REM
2225 REM
2300 REM TOPO READ
2301 C=3
2302 GOSUB 20000
2305 FOR I=1 TO Nst(C)
2310 READ #1;Tp(1,I),Tp(2,I)
2311 Tp(2,I)=Tp(2,I)*10
2312 Tp(2,I)=INT(Tp(2,I))/10
2315 NEXT I
2316 GOTO 2059
2321 REM
2400 REM MAG READ
2401 C=4
2402 GOSUB 20000
2405 FOR I=1 TO Nst(C)
2410 READ #1;Mg(1,I),Mg(2,I)
2415 NEXT I
2425 GOTO 2059
2500 PRINT " F +1 R"
2505 GOTO 2025
3000 REM*****************************************************************
3005 REM GET ALL STATIONS INTO STATIONS
3016 REM
3017 PRINT CHR$(7)\ PRINT "GENERATING STATIONS ARRAY"
3020 Kount=0
3025 IF Nst(1)=0 THEN GOTO 3100
3030 FOR I=1 TO Nst(1)
```

```
3030 Kount=Kount+1
3040 Stations(Kount)=Dummy1(I)
3045 NEXT I
3050 REM
3100 IF Nst(2)=0 THEN GOTO 3125
3105 FOR I=1 TO Nst(2)
3106 Kount=Kount+1
3110 Stations(Kount)=Sp(1,I)
3120 NEXT I
3125 IF Nst(3)=0 THEN GOTO 3300
3130 FOR I=1 TO Nst(3)
3131 Kount=Kount+1
3135 Stations(Kount)=Tp(1,I)
3140 NEXT I
3300 IF Nst(4)=0 THEN GOTO 3321
3305 FOR I=1 TO Nst(4)
3310 Kount=Kount+1
3315 Stations(Kount)=Mg(1,I)
3320 NEXT I
3321 Adders=Kount
3999 RETURN
4000 REM ************************************************************************
4002 REM INDICATE DUPLICATES
4005 REM
4006 PRINT CHR$(7)\ PRINT "REMOVING DUPLICATE STATIONS"
4010 FOR I=1 TO Adders
4020 FOR J=I+1 TO Adders
4024 IF Stations(I)=1000000 THEN GOTO 4050
4025 IF Stations(J)=Stations(I) THEN GOTO 4030\ GOTO 4040
4026 GOTO 4040
4030 Stations(J)=1000000
4040 NEXT J
4050 NEXT I
4999 RETURN
5000 REM ************************************************************************
5005 REM SHELL-METZNER SORT
5010 REM
5011 PRINT CHR$(7)\ PRINT "SORTING"
5015 S=Adders
5790 S=INT(S/2)
5810 IF S=0 THEN GOTO 5999
5820 K=Adders-S
5830 J=1
5840 I=J
5850 L=I+S
5860 IF Stations(I)>Stations(L) THEN GOTO 5900
5870 J=J+1
5880 IF J>K THEN 5790
5881 GOTO 5840
5900 T=Stations(I)
5910 Stations(I)=Stations(L)
5920 Stations(L)=T
5930 I=I-S
5970 IF I<1 THEN GOTO 5870
5975 GOTO 5850
5999 RETURN
6000 REM ************************************************************************
6005 REM PRINT OUT DATA
6006 REM
6007 PRINT CHR$(7)\ PRINT "PRINTING"
6010 PRINT #2;"FILE>  ";Fnm$;" PROJECT>  ";T$;"  LINE>  ";Ln$;" UNITS>  ";Un$
6011 PRINT #2;" "
6020 PRINT #2;"STATION¦   SLINGRAM";TAB(51);"¦SP 35   ¦TOPO   ¦MAG"
```

```
6024 B$="----------------------------------------"
6025 PRINT #2;B$;B$
6026 C$="mv.    ¦       ¦nT."
6030 PRINT #2; USING 6035;Frq(1),Frq(2),Frq(3),Frq(4),Frq(5),C$
6035 IMAGE 7X,"¦Frq"   ,5(3X,4D,"¦"),19A
6036 B$="       ¦   re. im.¦re. im.¦re. im.¦re. im.¦re. im.¦       ¦       ¦"
6037 PRINT #2;B$
6045 IMAGE MDDDD.D,"¦",3X,5(AAA,1X,AAA,"¦"),AAAAAAA,"¦",AAAAAAA,"¦",AAAAAAA,"¦"
6047 REM
6050 FOR I=1 TO Adders
6053 IF Stations(I)=1E+06 THEN GOTO 6150
6054 01=1E+06\02=1E+06\03=1E+06\04=1E+06\05=1E+06\06=1E+06
6055 07=1E+06\08=1E+06\09=1E+06\00=1E+06\0a=1E+06\0b=1E+06
6056 0c=1E+06
6057 FOR J=1 TO Nst(1)
6060 IF Dummy1(J)=Stations(I) THEN GOTO 6070
6065 GOTO 6075
6070 01=S1(1,J)\02=S1(2,J)\03=S1(3,J)\04=S1(4,J)\05=S1(5,J)\06=S1(6,J)
6072 07=S1(7,J)\08=S1(7,J)\09=S1(9,J)\00=S1(10,J)
6075 NEXT J
6085 FOR J=1 TO Nst(2)
6090 IF Stations(I)=Sp(1,J) THEN 0a=Sp(2,J)
6100 NEXT J
6105 FOR J=1 TO Nst(3)
6110 IF Stations(I)=Tp(1,J) THEN 0b=Tp(2,J)
6115 NEXT J
6120 FOR J=1 TO Nst(4)
6121 IF Stations(I)=Mg(1,J) THEN 0c=Mg(2,J)
6122 NEXT J
6126 01$=VAL$(01)\02$=VAL$(02)\03$=VAL$(03)\04$=VAL$(04)\05$=VAL$(05)
6127 06$=VAL$(06)\07$=VAL$(07)\08$=VAL$(08)\09$=VAL$(09)\0a$=VAL$(0a)
6128 0b$=VAL$(0b)\0c$=VAL$(0c)\00$=VAL$(00)
6129 IF 0a$="1E+06" THEN 0a$=" "
6130 IF 0b$="1E+06" THEN 0b$=" "
6131 IF 0c$="1E+06" THEN 0c$=" "
6132 IF 01$="1E+06" THEN 01$=" "
6133 IF 02$="1E+06" THEN 02$=" "
6134 IF 03$="1E+06" THEN 03$=" "
6135 IF 04$="1E+06" THEN 04$=" "
6136 IF 05$="1E+06" THEN 05$=" "
6137 IF 06$="1E+06" THEN 06$=" "
6138 IF 07$="1E+06" THEN 07$=" "
6139 IF 08$="1E+06" THEN 08$=" "
6140 IF 09$="1E+06" THEN 09$=" "
6141 IF 00$="1E+06" THEN 00$=" "
6142 St=Stations(I)
6145 PRINT #2; USING 6045;St,01$,02$,03$,04$,05$,06$,07$,08$,09$,00$,0a$,0b$,0c$
6150 NEXT I
6999 RETURN
20000 REM ************************************************************
20005 REM SUB STANDARDIZES DATA ARRAYS
20010 REM
20015 Mth$(C)=Mth$(5)\Dt$(C)=Dt$(5)\Lst(C)=Lst(5)\Stst(C)=Stsp(5)
20020 Nfrq(C)=Nfrq(5)\Nst(C)=Nst(5)\Cs(C)=Cs(5)
29999 RETURN
```