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GM3D: INTERACTIVE THREE-DIMENSIONAL GRAVITY AND MAGNETIC MODELING PROGRAM

(GM3D.REV1 USER'S GUIDE)

J. Maurer

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October, 1980

Work performed under contract No. DOE/ID12079

EARTH SCIENCE LABORATORY
University of Utah Research Institute
Salt Lake City, Utah

Prepared for
U.S. Department of Energy
Division of Geothermal Energy

DISCLAIMER

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ABSTRACT

GM3D has been developed for computing the gravity or magnetic anomaly due to a three-dimensional body, and for plotting the resulting contour map. A complex body may be constructed from several right-rectilinear vertical-sided prisms. The program allows the input and editing of the prism data which are then used to calculate the anomaly map for plotting. Plotting is done on either a Tekronix 4014 graphics terminal, a Statos electrostatic plotter, or a CalComp pen plotter. A terminal plot is also available which can be printed on any terminal and on a line printer.

The program is written in FORTRAN IV code and operates on a PRIME 400 computer system. Adaptation of the program to other systems is relatively straightforward.

INTRODUCTION AND PURPOSE OF THE GM3D PROGRAM

This publication has been written to document, and as a user's guide to, GM3D. GM3D is an interactive program developed to compute and plot gravity or magnetic anomalies created by three-dimensional right-rectilinear prism models. The program can produce continuous contour anomaly maps on a Tektronix 4014 graphics terminal or a hard copy plot on a Statos electrostatic plotter. Discrete contour maps are also available on a line printer and on terminals without graphics capabilities.

The program was originally developed on the University of Utah's UNIVAC 1108 by D. T. Purvance. Jim Maurer converted the program to the University of Utah Research Institute's (UURI) Prime 400 computer. GM3D uses the methodology described by Goodacre (1973) to compute the vertical component of the gravity or magnetic fields.

PROGRAM DESCRIPTION

Introduction

The GM3D program uses a prism-modeling system to compute the anomalies, and then plots the computed anomaly map on the desired plot device. An option system allows the user to systematically input, edit, compute, and plot the computed models. The user can also save a model to a large merge file, or retrieve a desired model from the merge file, by using the proper option. The option system and file formats are described below.

The GM3D Option System

An option system permits easy use of the program and subroutines. At certain times in the program the user is asked for an option number which directs the program to the desired operation or function. The program assumes that the user is familiar with the option choices. If this is not the case, the user can produce an option list at the terminal for any specific option request simply by pressing the carriage return key. An invalid option number will also produce a listing of the available options.

The user performs the desired operation when appropriate by entering the correct option number when prompted by the program to do so. The options in the main program start execution of the major program operations. These options include input and editing of the model prisms, computation of the model, printing and/or plotting the model and computed map, and execution of the file maintenance routines. The various options may sometimes

lead to another option list; for example, the file maintenance routine (FMAIN option) allows the saving or reading of the merge file, the deletion of unwanted files, initialization of a new merge file, and production of a merge file directory listing. For a more complete description of the program options, see the User's Guide section.

Program File Structures

GM3D uses two files to store and manipulate data: a work file (GM3D-WORK), and a merge file (GM3D-MERGE). These files are direct-access files which can be read and written dynamically by the program. They are created and/or opened automatically when the program starts execution and are closed automatically when the program is exited through normal channels.

The work file contains one set of data at a time. The data consists of descriptive headers, model parameters, the computed models, and the prism parameters. There are two descriptive headers, one to describe the project and one to describe the particular model stored in the work file. The model parameters are the grid spacing, and, for the magnetic model, the Earth's total field intensity and angles of inclination and declination. Each work file can also store the most recent computed gravity and magnetic models as well as the prism parameters. If a model is to be kept, the user saves the work file by writing it to the merge file before changing the parameters for computing a new model. Once a change has been made to the work file, any computed model contained in the work file would have the wrong parameters associated with it.

The merge file is a collection of data sets which have been saved from the work file at various times. The data sets, or subfiles, are numbered in sequence as they are stored to facilitate access by the user. These numbers can be specified to restore a subfile from the merge file to the work file where it can be manipulated by the other portions of the program. A more detailed description of the work and merge files can be found in Appendix A.

Model Prism Format

The GM3D program uses a model consisting of up to 25 right-rectilinear prisms to compute the anomaly map. A prism is defined by the top corners (X1, X2, Y1, Y2), depth to the top (Z1), and depth to the bottom (Z2). These coordinates are given in relation to the origin (0,0) which is located at the center of the grid on the earth's surface. Each prism is also assigned a magnetic susceptibility contrast SC (for magnetic model) or a density contrast DC (for gravity model). The magnetic model also

associates three additional parameters with each prism in the model: the remanent magnetization angle of inclination, the remanent magnetization angle of declination, and the Koenigsberger ratio.

The units which are used in the model are feet (length), grams/cc (density), cgs x 10E-6 (magnetic suseptibility), degrees (angles), milligals (gravity), and gammas (magnetic intensity).

GM3D USER'S GUIDE

Introduction

Use of the GM3D program consists entirely of responding to questions and choices presented to the user by the program. The program tells the user what information it is seeking, and also the format of the data expected. There are three types of data that the program requests, and these are designated by the letters (I), (F), and (A) as printed by the request prompt. (I) tells the user that the data requested should be an integer, (F) that the data should be a floating point value, and (A) that the data should be alphanumeric.

Execution of the Program

Upon entering the GM3D program the user is asked to specify whether the model is to be a magnetic or gravity model. Switching model selection at any time can be done within the program simply by choosing the appropriate option within GM3D. The first set of options which the user encounters is the GM3D option list.

GM3D Options:

```
GM3D options are:
        1 - Stop
        2 - Input prisms
        3 - Edit
        4 - List prisms and model
        5 - Plan view of model
        6 - Compute model
        7 - Map output
        8 - Change model type
        9 - File maintenance
```

Option 1 causes termination of the program. The work and

merge files are automatically closed before the program returns control to the operating system.

Option 2 passes control to the data input routine where another option selection is made. (See Input Options)

Option 3 passes control to the data editing routine where there is also another option selection to be made.

Option 4 presents the user with a listing of the prism and model parameters at the terminal or line printer.

Option 5 produces a plan view of the prism model on the terminal for checking.

Option 6 computes the anomaly and stores it in the work file. This computation may take several minutes to complete if the model is large. Option 6 automatically passes control to Option 7.

Option 7 produces the contour maps. The user must specify if a discrete-valued contour map (terminal plot) is wanted. If the user wishes to continue, the program asks for the number of contour levels to plot. The user can then either specify the contour values or allow the program to calculate them. The user is also asked to specify a contour interval. If a negative interval is given, the program will compute one. The user is then asked for a map title.

The program then produces a prism and model list followed by the contour map. The user is then asked if a continuous contour map is wanted. If the answer is yes, the program asks if the contour values are whole numbers. Control is then passed to the section of the program which asks for a scaling option.

Option 8 allows the user to switch between the gravity and magnetic modeling routines.

Option 9 passes control to the file maintenance routines.

Input Options:

```
Input options are:
        1 - Return to master level
        2 - Initial input
        3 - Add prisms
```

Option 1 returns control to the main program.

Option 2 prompts the user for the information necessary for describing the model.

Option 3 allows the user to add prisms to an existing model.

Edit Options:

Edit options are:

1 - Return to master program
2 - Edit project name
3 - Edit model description
4 - Change grid spacing
5 - Edit Earth"s field
6 - Change angle of inclination
7 - Change angle of declination
8 - Change prism parameters
9 - Delete and pack prisms

Option 1 returns control to the main program.

Options 2 through 7 allow the user to change the specified value.

Option 8 passes control to another option list for changing the prism parameters.

Option 9 allows the user to delete unwanted prisms from the model.

Prism Editing Options:

The prism parameters are:

1 - X1
2 - X2
3 - Y1
4 - Y2
5 - Z1
6 - Z2
7 - Remanent magnetization inclination
8 - Remanent magnetization declination
9 - Koenigsberger ratio
10 - Magnetic susceptibility
11 - Density contrast

Options 1 through 11 allow the user to change the indicated prism parameter.

Scaling Options:

```
SCALE   OPTION # (I)=
      1  1:12,000
      2  1:24,000
      3  1:62,500
      4  1:125,000
      5  1:250,000
```

Options 1 through 5 are the scaling options for the map. After giving the desired scale option the user is asked if a grid is wanted. If the answer is yes, the user is asked to supply a grid interval. This interval must be an integral divisor of the floating point number given in the inquiry. For example, if the number given by the program inquiry were 28000.0, the user could obtain a grid of 4 sectors (2 x 2) by entering a 14000.0, a grid of 16 sectors by entering a 7000.0, or a grid of 49 sectors by entering a 4000.0, etc.

The user also is given the option of having the prisms drawn on the map. The user is asked to give the user's name and the date, and control is passed to the plotting portion of the program which asks for the plot device option.

Plot Device Options:

```
Enter device number:
        1 - Tektronix 4014
        2 - Statos plotter
        3 - Calcomp plotter
```

Option 1 produces a plot on the Tektronix graphics terminal. This option should not be used with any other terminal.

Option 2 produces a plot on a file which is then used to plot on the Statos electrostatic plotter.

Option 3 produces a plot on a file which can then be used to create a plot on the Calcomp plotter.

File Maintenance Options:

```
FMAIN---OPTION # (I)=
      1  Return to master program
      2  List merge file directory
      3  Save work file on merge file
      4  Restore work file from merge file
```

5 Delete and pack merge file
6 Initialize merge file

Option 1 returns control to the main program.

Option 2 produces a directory of the merge file contents. This is sent to either the terminal or line printer.

Option 3 writes the contents of the work file to a new subfile within the merge file.

Option 4 reads a specified subfile from the merge file into the work file.

Option 5 allows the user to delete unwanted subfiles from the merge file by placing a "Y" directly beneath the subfile number as printed by the computer. For example if there were 16 subfiles in the merge file:

```
The computer would print: 123456789*123456
User response           :  Y Y     Y  YY
```

The above reponse would delete subfiles 2, 4, 10, 13, and 14.

Option 6 initializes the merge file. The merge file needs to be (and should be) initialized only once prior to saving the first work file. Any furthur initialization will result in the destruction of any previously saved data.

PROGRAM CONVERSION

GM3D was originally designed to run on a UNIVAC 1108 computer and has been converted and expanded by the Earth Science Laboratory to run on a PRIME 400 computer. Conversion of the program to another system should be fairly straightforward. The program requires approximately 32K four-byte words of storage; a byte consists of 8 bits. The program requires no special software capabilities with the exception of direct-access file handlers. Some bit manipulation functions are desirable for use in the continuous contour map routine.

GM3D utilizes an "industry standard" plotting library which must be supplied by the user.

REFERENCES

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APPENDIX A

GM3D File Formats

GM3D Work File Format

Record length is 17 words of 4 bytes each.

Record 1 -

NR = (Integer) Number of records (32 + NP). (1 word)

NAME1 = (Alphanumeric) (8 words)

NAME2 = (Alphanumeric) (8 words)

Record 2 -

NP = (Integer) Number of prisms. (1 word)

GMESH = (Real) (1 word)

RTHFLD = (Real) (1 word)

ANGINC = (Real) (1 word)

ANGDEC = (Real) (1 word)

MODEL = (Alphanumeric) (12 words)

Records 3 through 17 - (I = 1 through 15)

IMAG = (Integer) (1 word)

M = (Integer) (1 word)

F(I,J) = (Real) J = 1 through 15 (15 words)

Records 18 through 32 - (I = 1 through 15)

IGRAV = (Integer) (1 word)

M = (Integer) (1 word)

F(I,J) = (Real) J = 1 through 15 (15 words)

Records 34 through (32 + NP) - (I = 1 through NP)

XP(1,I) = (Real) (1 word)

XP(2,I) = (Real) (1 word)

YP(1,I) = (Real) (1 word)

YP(2,I) = (Real) (1 word)

ZP(1,I) = (Real) (1 word)

ZP(2,I) = (Real) (1 word)

REMINC = (Real) (1 word)

REMDEC = (Real) (1 word)

QF = (Real) (1 word)

SC = (Real) (1 word)

DC = (Real) (1 word)

GM3D Merge File Format

Record length is 17 words of 4 bytes each.

Record 1 -

LR = (Integer) Record length (= 17). (1 word)

NSF = (Integer) Number of subfiles. (1 word)

TITLE = (Alphanumeric) Merge file title. (15 words)

Record 2 -

NR(1) = (Integer) Number of records in subfile 1.

(1 word)

NAME1 = (Alphanumeric) (8 words)

NAME2 = (Alphanumeric) (8 words)

Record 3 through (NR(1) + 1) - Subfile records

Record (NR(1) + 2) -

NR(2) = (Integer) Number of records in subfile 2.

(1 word)

NAME1 = (Alphanumeric) (8 words)

NAME2 = (Alphanumeric) (8 words)

Record (NR(1) + 3) through (NR(1) + NR(2) + 1) - Subfile records.

ETC.

APPENDIX B

Sample Sessions

```
OK, GM3D
GO

          ***** GM3D MODELING PROGRAM *****

 Please enter the model type (I):
          1 - Magnetic model
          2 - Gravity model
1

 Enter GM3D option (I):


 GM3D options are:
          1 - Stop
          2 - Input prisms
          3 - Edit
          4 - List prisms and model
          5 - Plan view of model
          6 - Compute model
          7 - Map output
          8 - Change model type
          9 - File maintenance

 Enter GM3D option (I):
9
*FILE MAINTENENCE*


     FMAIN---OPTION # (I)=
           1  Return to master program
           2  List merge file directory
           3  Save work file on merge file
           4  Restore work file from merge file
           5  Delete and pack merge file
           6  Initialize merge file

     FMAIN---OPTION # (I)=   2
TEST MERGE FILE FOR GM3D.

There are  3 subfiles in the merge file.

Project: SAMPLE MERGE FILE                FOR THE USER'S GUIDE.
    Model: THIS IS THE FIRST MODEL.                                4 prisms.

Project: SAMPLE MERGE FILE                FOR THE USER'S GUIDE.
    Model: THIS IS THE SECOND MODEL.                               6 prisms.

Project: SAMPLE MERGE FILE                FOR THE USER'S GUIDE.
    Model: THIS IS THE THIRD MODEL.                                3 prisms.
```

```
     FMAIN---OPTION # (I)=    1

 Enter GM3D option (I):
2

 Enter input option (I):


 Input options are:
         1 - Return to master level
         2 - Initial input
         3 - Add prisms

 Enter input option (I):
2

 Enter the project name on two lines, max. 32 chars. each (A):
SAMPLE MERGE FILE
FOR THE USER'S GUIDE.

 Enter the model description, max. 48 chars. (A):
THIS IS THE FOURTH MODEL.

 Enter the number of prisms in the model (25 max.) (I):
3

 Enter the grid spacing in feet (F):
500.

 Enter the Earth"s field in gammas (F):
50000.

 Enter the angles of inclination and declination in degrees (F):
12.,35.

 Enter X1 and X2 for prism #  1 (F,F):
250.,1250.

 Enter Y1 and Y2 for prism #  1 (F,F):
-1250.,250.

 Enter Z1 and Z2 for prism #  1 (F,F):
300.,600.

 Enter the remanent inclination and declination for prism #  1 (F,F):
0.0,0.0
```

```
 Enter the Koenigsberger ratio and the magnetic susceptibility
 for prism #  1 (F,F):
0.0,-100.

 Enter X1 and X2 for prism #  2 (F,F):
-1500.,-750.

 Enter Y1 and Y2 for prism #  2 (F,F):
-750.,0.

 Enter Z1 and Z2 for prism #  2 (F,F):
300.,1300.

 Enter the remanent inclination and declination for prism #  2 (F,F):
0.0,2.0

 Enter the Koenigsberger ratio and the magnetic susceptibility
 for prism #  2 (F,F):
0.0,-1000.

 Enter X1 and X2 for prism #  3 (F,F):
-1250.,-250.

 Enter Y1 and Y2 for prism #  3 (F,F):
1000.,1500.

 Enter Z1 and Z2 for prism #  3 (F,F):
300.,600.

 Enter the remanent inclination and declination for prism #  3 (F,F):
0.0,0.0

 Enter the Koenigsberger ratio and the magnetic susceptibility
 for prism #  3 (F,F):
0.0,-1000.

 Data stored.

 Enter input option (I):
1

 Enter GM3D option (I):
5
```

PLAN VIEW OF PRISM MODEL + Y ACROSS PAGE, + X UP PAGE

```
      1   2   3   4   5   6   7   8   9  10  11  12  13  14
15    .   .   .   .   .   .   .   .   .   .   .   .   .   .
14    .   .   .   .   .   .   .   .   .   .   .   .   .   .
13    .   .   .   .   .   .   .   .   .   .   .   .   .   .
12    .   .   .   .   .   .   .   .   .   .   .   .   .   .
11    .   .   .   .   .   .   .   .   .   .   .   .   .   .
                      1               1
10    .   .   .   .   .   .   .   .   .   .   .   .   .   .
 9    .   .   .   .   .   .   .   .   .   .   .   .   .   .
                      1               1
 8    .   .   .   .   .   .   .   .   .   .   .   .   .   .
                                          3   3
 7    .   .   .   .   .   .   .   .   .   .   .   .   .   .
                          2       2
 6    .   .   .   .   .   .   .   .   .   .   .   .   .   .
                                          3   3
 5    .   .   .   .   .   .   2   .   2   .   .   .   .   .
 4    .   .   .   .   .   .   .   .   .   .   .   .   .   .
 3    .   .   .   .   .   .   .   .   .   .   .   .   .   .
 2    .   .   .   .   .   .   .   .   .   .   .   .   .   .
 1    .   .   .   .   .   .   .   .   .   .   .   .   .   .
```

Enter GM3D option (I):
6

DATA RANGE = -20.56 50.20

```
 Would you like a contour map? (Y,N) - (A)
Y

 Do you want a line printer listing? (Y/N) - (A)
N

 How many contour levels would you like? (I)
10

 Do you want to specify the 10 contour levels? (Y - N) (A)
N

 Contour interval? (neg. for prog. comp.) - (F)
7.0

 Area name? (max 35 char) - (A)
FOR THE USER'S GUIDE.
```

Project name: SAMPLE MERGE FILE
FOR THE USER'S GUIDE.
Model: THIS IS THE FOURTH MODEL.

MAGNETIC PRISM MODEL
Earth"s field: 50000. gammas.
Inclination = 12. degrees Declination = 35. degrees.

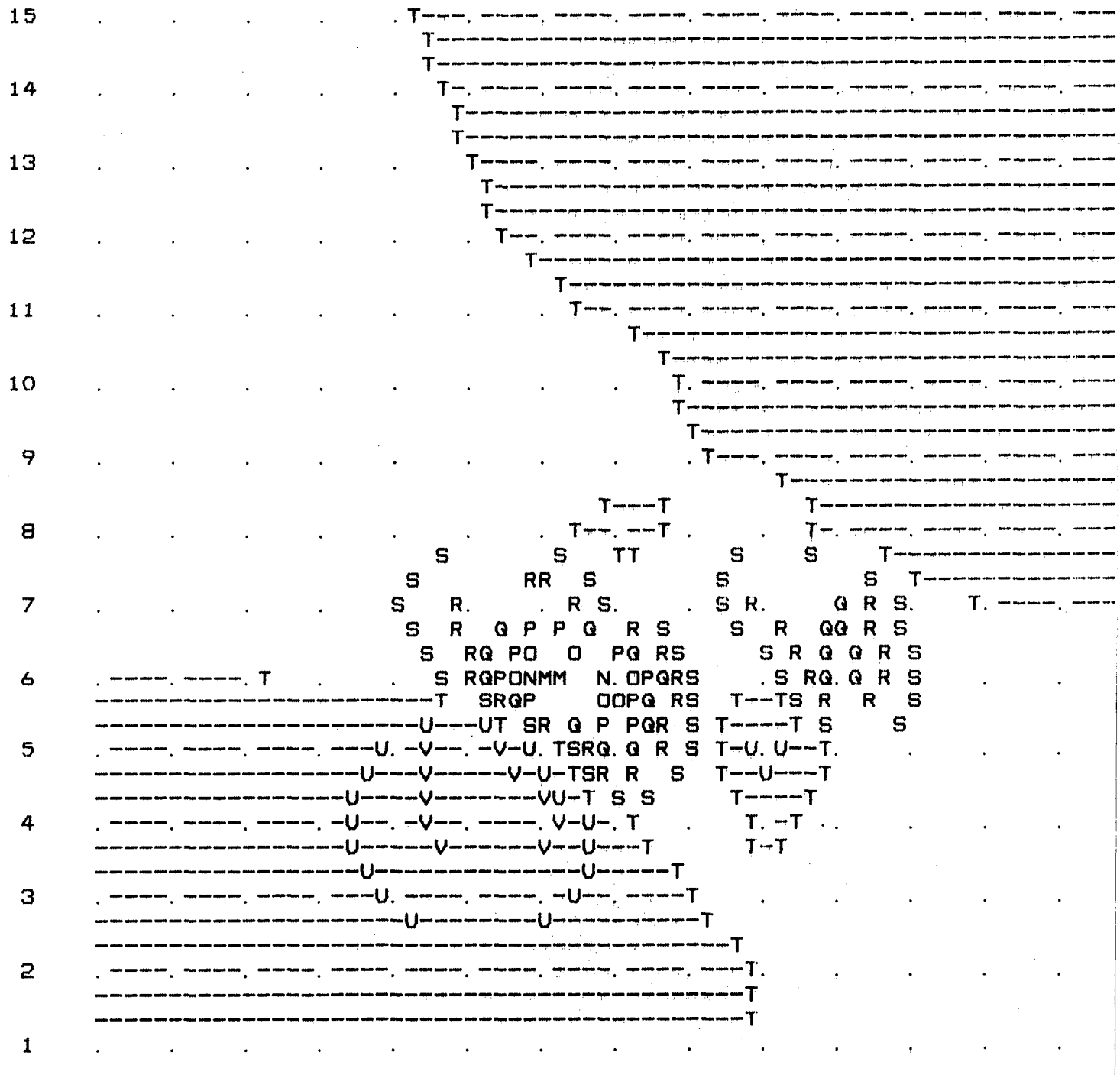
Grid spacing = 500.00 feet.

PRISM	X1	X2	Y1	Y2	Z1	Z2	SC
1	250.	1250.	-1250.	250.	300.	600.	-100.
2	-1500.	-750.	-750.	0.	300.	1300.	-1000.
	Rem. incl. = 0.			Rem. decl. = 2.		Q =	0.00
3	-1250.	-250.	1000.	1500.	300.	600.	-1000.

FOR THE USER'S GUIDE.

TRUE VALUES FOR ISOLINES

(L) =	0.560E 02	(M) =	0.490E 02	(N) =	0.420E 02	(O) =	0.350						
(P) =	0.280E 02	(Q) =	0.210E 02	(R) =	0.140E 02	(S) =	0.700E						
(T) =	0.000E 00	(U) =	-0.700E 01	(V) =	-0.140E 02	(W) =	-0.210E						



```
FOR THE USER'S GUIDE.
GRID VALUE SCALE FACTOR    1.E 01

     2     2     2     1     0    -1    -2    -4    -4    -5    -5    -5    -5    -4
     2     2     2     2     1    -1    -3    -5    -6    -7    -7    -7    -6    -5
     3     4     4     4     3     0    -4    -8   -10   -10   -10    -9    -8    -6
     4     5     6     7     7     3    -5   -12   -15   -14   -13   -12   -10    -8
     5     6     9    12    18    19     6   -10   -20   -19   -19   -17   -13   -10
     5     8    11    15    22    47    43    26    -9   -21   -27   -25   -18   -12
     6     8    12    16    14    29    27    20     3   -16   -42   -38   -23   -12
     5     8    13    22    31    40    15   -22    10    66   -33   -46   -21   -10
     3     5    10    24    63   168   209    34     6   174   212    12    -2    -2
    -1    -1    -1     2    18   119   502   400    39     8   255    75    21     8
    -4    -8   -15   -33   -82  -206   -49   268    67  -105    41    58    26    12
    -7   -13   -24   -49  -105  -195  -177    -6    28    -8    10    25    19    12
    -9   -15   -26   -45   -74  -102   -88   -32     1     6    10    14    13     9
    -9   -14   -22   -33   -46   -53   -45   -24    -6     3     7     8     8     7
    -8   -12   -17   -23   -28   -30   -25   -16    -6     0     4     5     5     5

 MAP VALUES IN GAMMAS
    POINT (8,8) ON MAP CORRESPONDS TO COORDINATE (0,0)
    GRID SPACING  =      500.0 FT


 Would you like a continuous contour map? (Y,N) - (A)
N
```

```
 Enter GM3D option (I):
3

 Enter edit option (I):


 Edit options are:
         1 - Return to master program
         2 - Edit project name
         3 - Edit model description
         4 - Change grid spacing
         5 - Edit Earth"s field
         6 - Change angle of inclination
         7 - Change angle of declination
         8 - Change prism parameters
         9 - Delete and pack prisms

 Enter edit option (I):
8

 There are currently  3 prisms in the model.
 Which prism do you wish to edit (I)?
1

 Enter the parameter of prism #  1 to be edited (I):


 The prism parameters are:
         1 - X1
         2 - X2
         3 - Y1
         4 - Y2
         5 - Z1
         6 - Z2
         7 - Remanent magnetization inclination
         8 - Remanent magnetization declination
         9 - Koenigsberger ratio
        10 - Magnetic susceptibility
        11 - Density contrast

 Enter the parameter of prism #  1 to be edited (I):
10

 The current magnetic susceptibility is    -100.00 .
 Enter the new value (F):
-1000.

 Do you want to make another parameter change (Y/N)?
N

 Changes saved.

 Enter edit option (I):
1
```

```
 Enter GM3D option (I):
7

 The stored model is obsolete. Please use option 6 to re-compute the model.

 Enter GM3D option (I):
6

    DATA RANGE  =        -22.94        46.67

 Would you like a contour map? (Y,N) - (A)
Y

 Do you want a line printer listing? (Y/N) - (A)
Y

 How many contour levels would you like? (I)
10

 Do you want to specify the 10 contour levels? (Y - N) (A)
N

 Contour interval? (neg. for prog. comp.) - (F)
6.6

 Area name? (max 35 char) - (A)
USER'S GUIDE AGAIN.
```

Project name: SAMPLE MERGE FILE
FOR THE USER'S GUIDE.
Model: THIS IS THE FOURTH MODEL.

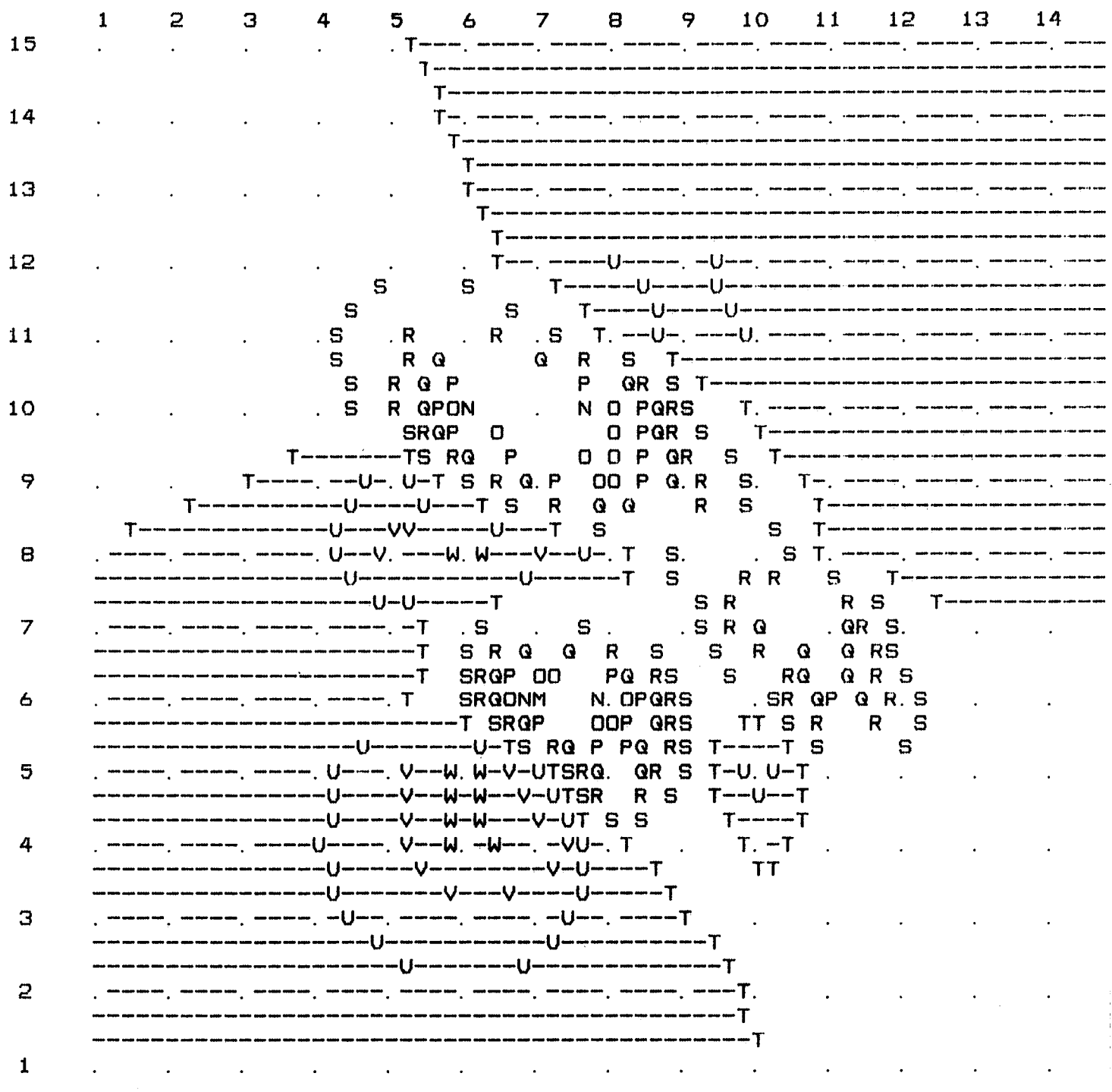
MAGNETIC PRISM MODEL
Earth"s field: 50000. gammas.
Inclination = 12. degrees Declination = 35. degrees.

Grid spacing = 500.00 feet.

PRISM	X1	X2	Y1	Y2	Z1	Z2	SC
1	250.	1250.	-1250.	250.	300.	600.	-1000.
2	-1500.	-750.	-750.	0.	300.	1300.	-1000.
	Rem. incl. = 0.		Rem. decl. = 2.		Q = 0.00		
3	-1250.	-250.	1000.	1500.	300.	600.	-1000.

USER'S GUIDE AGAIN.
TRUE VALUES FOR ISOLINES

(L) =	0.528E 02	(M) =	0.462E 02	(N) =	0.396E 02	(O) =	0.330
(P) =	0.264E 02	(Q) =	0.198E 02	(R) =	0.132E 02	(S) =	0.660E
(T) =	0.000E 00	(U) =	-0.660E 01	(V) =	-0.132E 02	(W) =	-0.198E
(X) =	-0.264E 02	(					



```
USER'S GUIDE AGAIN.
GRID VALUE SCALE FACTOR    1.E 01

    5    5    5    4    1   -3   -9  -13  -15  -15  -14  -11   -9   -7
    6    8    9    9    5   -3  -14  -22  -25  -23  -19  -15  -11   -9
    8   11   14   17   15    0  -22  -39  -42  -35  -26  -19  -14  -10
    9   14   22   34   43   21  -29  -70  -73  -50  -32  -22  -15  -11
    9   14   26   54  125  161   81  -27  -92  -55  -34  -24  -17  -12
    7   11   18   36  109  395  440  358   56  -21  -28  -25  -18  -12
    3    3    0  -22  -99   83  240  341  174   28  -27  -32  -20  -11
   -1   -3  -13  -46 -153 -210 -140  -26  100  112  -13  -36  -16   -7
   -5   -8  -16  -29  -32   53  127   14   28  199  228   21    3    2
   -8  -13  -21  -31  -28   70  467  387   45   19  265   82   26   11
  -11  -18  -30  -53 -106 -229  -67  260   68 -100   46   63   30   15
  -13  -21  -35  -62 -119 -208 -186  -11   27   -6   13   29   22   14
  -14  -21  -33  -53  -83 -110  -94  -36    0    6   12   16   15   11
  -13  -18  -27  -39  -52  -58  -49  -26   -7    3    7   10   10    8
  -11  -15  -21  -27  -32  -33  -28  -18   -7    0    4    6    6    6

MAP VALUES IN GAMMAS
   POINT (8,8) ON MAP CORRESPONDS TO COORDINATE (0,0)
   GRID SPACING  =      500.0 FT

PRINT FILE PRT001

  The contour map has been listed as GM3D-LIST.
```

```
 Would you like a continuous contour map? (Y,N) - (A)
Y

 Did you enter contour values as whole numbers? (Y,N) - (A)
Y

 Do you want high/low centers printed? (Y,N) - (A)
N
SCALE   OPTION # (I)=
       1   1:12,000
       2   1:24,000
       3   1:62,500
       4   1:125,000
       5   1:250,000

SCALE   OPTION # (I)=    1

 Would you like a grid overlay? (Y,N) - (A)
Y

 Grid interval in ft.? (must be an integral divisor of    7000.0) - (F)
1000.

 Draw prisms on map? (Y,N) - (A)
Y

 Your name? (max 15 char) - (A)
JIM

 Todays date? (max 8 char) - (A)
TODAY

 Enter device number:
              1 - Tektronix 4014
              2 - Statos plotter
              3 - Calcomp plotter
2
# OF VECTORS=       1363

 Plot completed.

 Enter GM3D option (I):
9
*FILE MAINTENENCE*



     FMAIN---OPTION # (I)=    3
*SAVE WORK FILE*
WORK FILE SAVED AS SUBFILE#  4
```

```
     FMAIN---OPTION # (I)=    2
TEST MERGE FILE FOR GM3D.

There are  4 subfiles in the merge file.

Project: SAMPLE MERGE FILE                    FOR THE USER'S GUIDE.
    Model: THIS IS THE FIRST MODEL.                                  4 prisms.

Project: SAMPLE MERGE FILE                    FOR THE USER'S GUIDE.
    Model: THIS IS THE SECOND MODEL.                                 6 prisms.

Project: SAMPLE MERGE FILE                    FOR THE USER'S GUIDE.
    Model: THIS IS THE THIRD MODEL.                                  3 prisms.

Project: SAMPLE MERGE FILE                    FOR THE USER'S GUIDE.
    Model: THIS IS THE FOURTH MODEL.                                 3 prisms.


     FMAIN---OPTION # (I)=    1

 Enter GM3D option (I):
1

 Program stopped.

OK,
```