

Dr. Tanner for his info-

JST *My3*

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Program Package of Seismic Risk Analysis

Using the EMR CYBER System

Division of Seismology and Geothermal Studies

Earth Physics Branch

Energy, Mines and Resources Canada

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F. Anglin

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SEISMIC RISK ANALYSIS

R.K. McGuire's Fortran computer program for seismic risk analysis has been modified to obtain a version suitable for routine calculations of the accelerations, velocities and ratios at fixed risk values. To reduce the possibility of error while using this program, card input has been minimized without sacrificing flexibility. The source zone data, which comprises the bulk of the input data, are now read from a disc file, the eight areas of the country each having a different file (see section 'SOURCE ZONE DATA' for definition of areas). For part of the Western Arctic, there is a separate version of the program that allows a combination of eastern and western attenuation functions to be used. A list of required input data and their formats will be found in the section 'Seismic Risk Calculations'. The rest of these introductory notes describe the changes to McGuire's original program.

In the set of subroutine that make up the risk program the only fundamental change in the calculations is found in RISK1 where D.H. Weichert has introduced a 'spike' function and limited the upper magnitude value. Changes have also been made in the main program and routines INSIDE and OUTSID to deal with the errors in calculating areas. The value to NSTEP is increased to try to reduce these area errors when they occur. If an area error exceeds a designated amount (ERRBND) NSTEP is doubled and the area recalculated. This is repeated until the error is less than ERBND percent or NSTEP exceeds NSTEPMX in value. If the error for this site-source calculation is still greater than ERBND, the data are flagged. For each of these site-zone calculations, if the ratio of the total flagged risk values to the total unflagged risk values is greater than RKRATO, the calculated data for that site are rejected unless the logical variable INCLUD has been set .TRUE.. Thus if an area error occurs for calculations using zones that contribute

little to the final value, the resulting error on the total will be small and probably insignificant.

In subroutine INSIDE and OUTSID, site-source zone combinations can result in other types of errors where no acceleration or velocity values are calculated. Data for these sites are rejected unless logical variable INCLD2 has been set .TRUE.. Where data are rejected, an error message is printed giving the geographical location of the site and reason for the rejection.

Another change that has been made to subroutine OUTSID is having RZ2 a function of the zone being used for the calculation. RZ2 is the closest distance from the site to the zone for which the calculation is still treated as a lump risk at the centre of the zone. For long or larger zones, having RZ2 fixed at a value that would be smaller than the major dimensions of the zone could result in a discontinuity in the risk calculation when the calculation changes from an integration of the risk over the zone to that where the centre of the zone is treated as the centre for a lump risk.

The original seismic risk analysis program required two runs in order to calculate values of acceleration and velocity. In this present version, both calculations are done in one run, and as well, the ratio of the velocity to acceleration is calculated for each risk value. This change makes the calculations more efficient in that the input data need only be read once, and as well, the projected areas of the sources need only be calculated once. The output data are also concisely written out onto a disc file to allow for convenient contouring of the data when required.

References:

- Cornell, C.A. (1968) Engineering seismic risk analysis. Bull. Seism. Soc. Am. 58, 1583-1606
- McGuire, R.K. (1976) Fortran computer program for seismic risk analysis. U.S. Geological Survey Open File Report 26-67, 90 pp.

Seismic Risk Calculations

R.K. McGuire's program for seismic risk analysis as modified at the Seismology Division, EPB, is now residing on a file of the CYBER system at EMR. Its use is illustrated in the following example and notes that follow. Card deck required.

- (1) GB1234,CM100000,T50,P2. NAME
- (2) ACCOUNT,*****.NAME
- (3) FTN,L=0.
- (4) MOUNT,VSN=EMR130,SN=GMSM.
- (5) ATTACH,TAPE2,-----,ID=RISKS,SN=GMSM.
- (6) ATTACH,LIB1,SEISRISK,ID=RISKS,SN=GMSM.
- (7) LIBRARY,LIB1.
- (8) LGO.
EXIT.
7/8/9
- (9) PROGRAM RISK (INPUT,OUTPUT,TAPE1=INPUT,TAPE2,TAPE3,
TAPE4,TAPE6=OUTPUT,TAPE11,TAPE12)
- (10) CALL MCGUIRE
STOP
END
7/8/9
- (11) CONTROL CARDS
7/8/9
6/7/8/9
6/7/8/9

Notes

- (1) Standard CYBER job card.
- (2) Standard account card
- (3) Compile
- (4) Device on which routines and data reside has to be mounted.
- (5) Zone data has to be attached. See notes on "Source Zone Data" as to which file should be attached. It is a function of the area in which the site(s) reside.
- (6),(7),(8), Attach, load and start program.
- (10) CALL MCGUIRE if only one set of zones and either eastern or western attenuation functions used. If the site(s) is (are) in the north west where a combination of zones in the east and west are used with attenuation functions for the east and west, CALL MCGUIRC instead and add TAPE7, TAPE8, TAPE9, TAPE10 to the Program card (9). Zone data must be NWNERISKSOURCEDATA.
- (11) See notes that follow on "Control Cards".

Control Cards

Card #1 Col 1 (A1) E or W depending on attenuation to be used. E for eastern, W for western attenuation relations. For program that uses a combination of eastern and western data, this parameter is ignored.

Cols 2-10 (F9.0) Central meridian value to be used in projecting the geographic coordinates into eastings and northings. Absolute value must lie between 0 and 180. Note west is negative.

For routine site calculations, the following data need not be defined on card #1.

Cols 11-13 (I3) NSTEP Number of steps used in integration of area
Default = 10

Cols 14-16 (I3) NSTEPMX Maximum value that NSTEP can be increased to try to decrease error in area calculation. Default = 40

Col 17 (I1) JPRNT = 0 is used to print only total expected numbers and risks at a site (use if a grid is being calculated).
= 1 is used to print expected numbers from each site-source combination (Default)

Col 18 (I1) JPRNT2 = 0 Print detailed output of site-source (Default)
= 1 Print abbreviated output
= 2 No output of site+source data (use if grid is being calculated).

Col 19 (I1) JPRNT3 = 0 No ratio of velocity to acceleration printed or calculated and no data stored for contouring
= 1 Ratio calculated and printed (Default)
and data stored for contouring.

Cols 20-24 (F5.0) ERRBND Maximum percentage error allowed in area calculation before message printed and data flagged (Default = 20.)

Cols 25-29 (F5.0) RKRATO Maximum value of ratio of output values with area errors before error message and rejection of data. (Default = 0.05)

Col 30 (L1) INCLUD If T, include output data irrespective of value of area errors or value of ratio mentioned above (Default F)

Col 31 (L1) INCLUD2 If T, include risk data where other types of errors occurred in calculations in INSIDE or OUTSID. (Default F)

Col 32 (L1) LNLEI If T read in number and list of examined intensities. (see below). (Default F)

Col 33 (L1) LRISKS If T, read risks desired (Default F)

Col 34 (L1) LEATT If T, read eastern attenuation coefficients (Default F)

Col 35 (L1) LWATT If T, read western attenuation coefficients (Default F)

Cols 36-80 (4A10) Read in title of run.

Card #2

Cols 1-5 (I5) NX number of latitude values if grid is to be calculated
6-10 (I5) NY " " longitude " " " " " " "
11-20 (F10.1) XZERO Latitude value or starting latitude value if
grid is to be calculated.
21-30 (F10.2) YZERO Longitude value or starting longitude value if
grid is to be calculated.
31-40 (F10.2) XDELTA Latitude increments if grid is to be
calculated.
41-50 (F10.2) YDELTA Longitude " " " " " " "calculated.
51-70 (2A10) NAMES Name of site

There can be as many of these cards as is required. End either with a
blank card or end of file (7/8/9) card.

The following card(s) are only required if one or more of columns 32-35
of card #1 contain a T.

If LNLEI was TRUE, read a card containing a new list of intensities.

Cols 1-5 (I5) NLEI Number of examined intensities.

6-65 (12F5.3) TI Values of examined intensities

If LRISKS was True, read a card containing a new list of risks

Cols 1-80 (8F10.2) RISKS.

If LEATT was True, read two cards containing eastern attenuation coefficients
for accelerations and then velocities

Cols 1-10 (F10.2) C1

11-20 (F10.2) C2

21-30 (F10.2) C3

31-40 (F10.2) SIG

41-50 (F10.2) RZERO

51-60 (F10.2) RONE

61-70 (F10.2) AAA

71-80 (F10.2) BBB

The second card is identical in format.

If LWATT was true read two cards containing western attenuation coefficients
for accelerations and then velocities. Formats are the same as for the
eastern input.

Source Zone Data

Input source zone data required on TAPE11

These eight source zone data files have been set up with combinations of source zones depending on the region of Canada for which data are required.

East between 41° and 49.5°N, 49 to 86°W

use file EASTRISKSOURCEDATA, ID = RISKS, SN = GSM

and contains the following zones

CHV, WQU, LSL, NAP, ATT, GBK, EBG, EAST + DUMMY

East-North between 50° and 59.5°N, 50° to 90°W

use file EASTNORTHRISKSOURCEDATA, ID = RISKS, SN = GSM

and contains the following zones.

CHV, WQU, LSL, NAP, GBK, EBG, LAB, GLA, SVD, BOU, BAI,

BAB, EAB, EAST + DUMMY.

North-East between 60° and 85°N, 50° to 105°W

use file NORTHEASTRISKSOURCEDATA, ID = RISKS, SN = GSM

and contains the following zones.

GLA, SVD, BOU, BAI, BAB, LAB, EAB, EAST + DUMMY.

Central between 46° and 51°N, 100° to 110°W

use file CENTRALRISKSOURCEDATA, ID = RISKS, SN = GSM

and contains the following zones

SAS, SBC, FHL, EAST + DUMMY.

West between 47° and 52.5°N, 109° to 142°W

use file WESTRISKSOURCEDATA, ID = RISKS, SN = GSM

and contains the following zones

CAS, PGT, CSM, NVI, JFE, QCF, SPT, SBC, NBC, FHL, Zero Back.

West north between 53° and 59.5°N, 110 to 145°W

use file WESTNORTHRISKSOURCEDATA, ID = RISKS, SN = GSM

and contains the following zones.

CAS, PGT, CSM, NVI, JFE, SBC, FHL, QCF, SPT, NBC, FWY, DSK, RIC, MKZ, BFT, ALC, ALI, ZERO Back.

North-west between 60° and 67.5°N, 110° to 145°W

use file NORTHWESTRISKSOURCEDATA, ID = RISKS, SN = GSM
and contains the following zones.

FWY, DSK, RIC, MKZ, BFT, QCF, SPT, NBC, ALC, ALI, Zero Back.

North-west-north-east between 68° and 82°N, 91° to 145°W

use file NWNERISKSOURCEDATA, ID = RISKS, SN = GSM
and contains the following zones in two groups.

FWY, DSK, RIC, MKZ, BFT, QCF, SPT, NBC, ALC, ALI, Zero Back
and GLA, SVD, BOU, BAI, BAB, LAB, EAB, EAST + DUMMY.

This last file is used in the version of the program where a combination of eastern and western attenuations are used.

Should other areas be required or changes made, the following data will be required to generate a file.

Card #1 (Format 24I3): NGS, NRS(1), NRS(2),....NRS(NGS).

NGS is the number of gross sources to be specified.

NRS(1), NRS(2), and so on are the number of subsources in gross source 1, 2, etc.

Card (Set)#2 (Format F5.0,I5,6F10.2,A10): RZ2(I) LORS(I), COEF(I),

AMO(I), AM1(I), BETA(I), RATE(I), FDEPTH(I), NAME

There must be NGS + 1 of these cards, one for each gross source and one for background seismicity.

RZ2(I) Closest distance in km for which source is considered as a lump risk.

LORS(I) is a flag indicating whether the source area has a loose or
strict lower bound;

(=0 implies a loose lower bound.)

(=1 implies a strict lower bound.)

COEF(I) is a coefficient modifying the expected number of exceedances
from gross-source I. Its most common value is +1.0.

AMO(I) is the loose or strict lower-bound magnitude or intensity
for gross-source I.

AM1(I) is the upper-bound magnitude or intensity for gross-source I.

BETA(I) is the value of Beta for gross-source I. It is equal to the
natural

logarithm of 10, times the Richter b value for the source.

RATE(I) is the rate of occurrence of events having magnitudes of
intensities greater than AMO(I). If a discrete distribution on
intensities has been used to calculate the rate, the user may
wish to specify AMO(I) as one-half intensity unit lower than the
lowest intensity used to establish the rate. Note that the gross
sources RATE(I) is in units of number per year; for background
seismicity it is in units of number per year per 10,000 km.

FDEPTH(I) is the focal depth of events in gross-source I, in Kilometres.
If epicentral distances are required for all sources and for
background seismicity for the attenuation function, insert zero
for FDEPTH(I).

If no background seismicity is desired, leave the last card in this set
completely blank.

Card (Set) #3 (Format 4F10.2,2A10): X1, Y1, X2, Y2, NAMES

There must be $NRS(1) + NRS(2) + \dots + NRS(NGS) + NGS$ of these cards. The first $NRS(1) + 1$ cards specify coordinates of subsources for gross-source 1, the next $NRS(2) + 1$ cards specify coordinates of subsources for gross-source 2, and so on. Internally, the point X1, Y1 is connected to point X2, Y2, as well as to both the previous and subsequent points designated as X1, Y1, as long as these are both in the same gross source. Point X2, Y2 is connected similarly. NAMES contains the name of the subsurface.

Contouring of Acceleration or Velocity Data from the Seismic Risk Program.

If the site data used in the Risk program consists of a grid of sites, the acceleration or velocity values associated with each grid point can be easily contoured and plotted on the CALCOMP plotter. If the grid covers the map area that is to be contoured, call Bmprsk after the call MCGUIRE OR MCGUIRC. However, if the grid covers only part of the map area, see notes that follow re merging of data.

In the seismic risk calculation program, make the following changes and additions;

Change on 1) CM115000

After (4) Add REQUEST,TAPE3,*PF,SN=GMSM.

After (6) Add ATTACH,LIB2,PLOTSUBR,ID=SAGS,SN=GMSM.

Change (7) to LIBRARY,LIB1,LIB2.

Change (8) to BEGIN,CCR,,CALCOMP,D=SCRATCH.

After (8) Add CATALOG,TAPE3,CONTOURDATA,ID=RISKS,RP=999.

Add to (9) TAPE5

After (10) Add CALL Bmprsk(1,X,Y) (see note below)

After (11) Add the following cards

Card A (11) Col 1, 0

Card B (F10.0,9F5.0) Col 1-10 SCALE (of map)

11-15	Latitude of western edge of map area				
10-20	Longitude "	"	"	"	"
21-25	Latitude of eastern	"	"	"	"
26-30	Longitude "	"	"	"	"
31-35	Latitude of northern	"	"	"	"
36-40	Longitude "	"	"	"	"
41-45	Latitude " southern	"	"	"	"
51-55	Central meridian	"	"	"	"

Card C (F10.0,3A10) Col. 1-10 Risk values for which acceleration
or velocity is to be contoured

11-40 Title of data

The parameters on card B should agree exactly with those used to set up the base map. If this is not the case, the data will not be projected to their correct positions on the map.

After this program is run, the data cataloged on TAPE3 will be used as input to the contouring program GPCP which is described in a later section.

The program prints out "MAP X DIMENSIONS = XXX INCHES Y DIMENSION YYYY INCHES TO BE USED ON SIZX CARD". These XXXX, YYYY data will be required as input data to GPCP.

The X,Y arguments in CALL Bmprsk (1,Y,Y), are the values in cms. used to increase the map dimensions for the purpose of including data points outside the defined map area. These data points (if they exist in the data set as defined by the data on card #2 in the seismic risk calculation) will be used by GPCP to define the contours. By using these data, contours will agree between adjacent map areas. Select values of X and Y so as to include at least 2* DELTAX in the X direction and 2* DELTAY in the Y direction. (See notes on GPCP for definition of DELTAX, DELTAY and note that in GPCP all parameters are in inches).

GPCP

GPCP (Calcomp's General Purpose Contouring Program) is used to contour the data. A users' guide is available from the EMR Computer Science Centre which describes the theory of operation of the contouring process. This information will not be repeated here. Only an outline of the requirements needed to produce the basic contour plots from the risk data will be found below.

Card deck:

- (1) GB1234, CM-----,T100,P2.NAME
ACCOUNT, *****.NAME
MOUNT, VSN=EMR130,SN=GMSM.
ATTACH,TAPE99,CONTOURDATA,ID=RISKS,SN=GMSM.
- (2) BEGIN,GPCP,,CAL960,NAME=\$NAME,ADDRESS\$,XSIZE=XX,YSIZE=YY.
7/8/9
CONTROL CARDS FOR GPCP
7/8/9
6/7/8/9
6/7/8/9

Notes

(1) The CM requirement is a function of the number of grid and data points. See page 4-3 of GPCP users guide. In brief $CM(\text{decimal}) = A + 2B + 6NC + 25000$ where $B = XSIZE/DELTA X + 4, A = B * (YSIZE/DELTA Y + 5) + 1, NC = \text{NUMBER OF DATA POINTS READ IN}$ where XSIZE and YSIZE are the values in inches as mentioned previously and are the map dimension.

DELTA X AND DELTA Y are the minimum distances in inches between the grid points and are the same data as used below. The decimal value of CM must be converted to octal for card (1)

(2) Different size pens could be used for the border and contours.

If this is required define the pens to be used on this card (see Data display CCC PROC Users' Guide) and then insert where required the control card.

Col 1-4 'NWPN' 3-35.1

Col 10 Pen number (I1)

Thus these cards could be interspersed between the LEV cards to produce heavier lines for certain contour levels.

XX and YY are the dimensions in inches required for the plot.

Note that GPCP requires space for a second plot and so XX should be at least twice the X dimension of the plot.

Control Cards for GPCP		Page in users manual
Card 1	Cols 1-3 'JOB'	3-30
	Cols 6-80 Title to be written on plot	
Card 2	Cols 1-4 'FLEX'	3-29
Card 3	Cols 1-4 'SIZX'	3-55
	6-10 XSCALE use 1.0	
	11-15 YSCALE use 1.0	
	16-20 X00 use 1.0	
	21-25 Y00 use 1.0	
	26-35 XMIN use 0.	
	36-40 DELTAX see note above (minimum X distance)	
	41-50 XSIZE see note above	
	51-60 YMIN use 0.	
	61-65 DELTAY see note above (minimum Y distance)	
	66-75 YSIZE see note above	

Card 4 Cols 1-4 'EDIT' 3-21
Cols 9-10 '99'

Card 5 Cols 1-4 'CNTL' 3-15
Col 25 '6' grid points will not be marked
Col 35 '1' data values at grid points
will not be printed

Card 6 Cols 1-4 'CNTL' 3-19
Cols 6-24 '(2F10.7,6E 11.4,8A1)'

Card 7 Cols 1-4 'CNTL' 3-20
Col 10 '1'
Col 15 '2'
Col 20 The number in this column determines which
parameter is to be plotted
3 Acceleration
4 Velocity
5 Ratio

Card 8 Cols 1-4 'BEND' 3-8

Card 9 Cols 1-4 'PHS4' 3-42

Card set 10 for each card Cols 1-3 'LEV' 3-31

These cards determine which contour levels will be drawn
and whether the contour values will be plotted

Cols 6-10 (F5.0) Contour level

11-15 (F5.0) Numerical label for contour line

16-20 (F5.0) Distance in inches along contour line from
line start to label = 1.

21-25 (F5.0) Height of numerals in label = 0.15

26-30 (F5.0) Distance in inches between tic marks or
centres of gaps = 0.

31-35 (F5.0) Width of gap in inches

50 (I1) = 1 plot solid line, = 4 plots gapped line

55 (I1) = Number of characters in label

60 (I1) = Number of digits after decimal point

Card 11	Cols 1-4 'BRDR' Draws border	3-14
Card 12	Cols 1-4 'PLOT'	3-43
Card 13	Cols 1-3 'END'	3-24
Card 14	Cols 1-4 'STOP'	3-57

7/8/9

6/7/8/9

6/7/8/9

There are many other options in GPCP such as blanking out contours where no data exist or where no contours are desired. They are not mentioned here. The user should refer to the GPCP manual if more sophisticated plots are required.

Contouring of Acceleration or Velocity Data from the Seismic Risk Program
where more than one run is required to produce data to cover the desired map
area.

In this case, the seismic risk program will probably be run using different source zone data for each run, the output to be merged for contouring. In the card deck for the basic Seismic risk calculations, make the following changes.

After (4) add REQUEST,TAPE4,*PF,SN=GMSM.

After (8) add CATALOG,TAPE4,RISKDATA,ID=RISKS,RP=999.

Run this program as many times as required using different site data (and possibly zone data) for each run. Make sure there are no overlaps in the geographical grid positions as the data are merged after all the risk calculations are done.

To merge the outputs from above, the following program package is used.

GB1234,CM100000,T100,P2.NAME

ACCOUNT,*****.NAME

MOUNT,VSN=EMR130,SN=GMSM.

REQUEST,TAPE3,*PF,SN=GMSM.

FTN,L=0.

ATTACH,TAPE10,RISKDATA,ID=RISKS,SN=GMSM,CY=1.

ATTACH,TAPE11,RISKDATA,ID=RISKS,SN=GMSM,CY=2.

(1)

ATTACH,LIB1,SEISRISK,ID=RISKS,SN=GMSM.

ATTACH,LIB2,PLOTSUBR,ID=SAGS,SN=GMSM.

LIBRARY,LIB1,LIB2.

BEGIN,CCR,,CALCOMP,D=SCRATCH.

(2) CATALOG,TAPE3,CONTOURDATA, ID=RISKS,RP=999.

EXIT.

7/8/9

PROGRAM MERGE(INPUT,OUTPUT,TAPE1=INPUT,TAPE3,

(3) TAPE5,TAPE10,TAPE11)

(4) CALL BMPRSK (2,X,Y)

STOP

END

7/8/9

Cards A, B and C as in section "Contouring of Acceleration or Velocity Data from Seismic Risk Program".

7/8/9

6/7/8/9

6/7/8/9

Notes (1) If more than two files of data are to be input add here using

TAPE12, TAPE13,.....

(2) These are the data which will be used as input to the contouring program GPCP which is described in a earlier section.

(3) Add TAPE12, TAPE13,.....as required.

(4) The argument of BMPRSK should reflect the number of input files that are to be used. X and Y values are as noted in section on "contouring of acceleration or velocity data from the seismic

risk program".

Recurrence calculations and plots

D.H. Weichert's recurrence program has been adapted to the CYBER system and has had a plotted output added as an option. The theory behind the method of calculation used in this program is found in his paper "Estimation of the Earthquake Recurrence Parameters for Unequal Observation Periods for Different Magnitudes", Bulletin of the Seismological Society of America, Volume 70, Number 4, pages 1337-1346, August 1980.

This program resides as a subroutine BETAPL on a file in the CYBER system. Its use is illustrated in the following example.

```
(1)  GB1234,CM70000,T50,P2.NAME
(2)  ACCOUNT,XXXXX.NAME
(3)  MOUNT,VSN=EMR130,SN=GMSM.
(4)  ATTACH,LIB1,PLOTSUBR,ID=SAGS,SN=GMSM.
(5)  ATTACH,LIB2,SEISRISK,ID=RISKS,SN=GMSM.
(6)  FTN,L=0.
(7)  LIBRARY,LIB1,LIB2.
(8)  BEGIN,CCR,,CAL960,NAME=$NAME ADDRESS$.

EXIT.
```

7/8/9

```
PROGRAM B(INPUT,OUTPUT,TAPE1=INPUT)

CALL BETAPL

STOP

END
```

7/8/9

The following data cards are required next.

Card #1 (L1,2I1) Col 1 T or F; T if plotted output is desired, F otherwise

Col 2 NIB1 Pen number used to draw labels and log scales
(Default = 1)

Col 3 NIB2 If defined, this sets the pen number used to draw
the recurrence curve.

For each zone being processed, include the following sets of cards.

Card #2(4A10,F3.1,2X, F3.1,2X,F3.1,F6.3,F7.0)

Cols 1-40 Title of zone
41-43 FMIN, Minimum magnitude
46-48 FMX, Maximum magnitude
51-53 FINCR, Magnitude increment.

The next two variables are only required if a recurrence curve is to be
imposed. See note (9)

54-59 BETA
60-66 FNO

Card set #3 (four cards) (16I5) IT, Starting years for completeness of
magnitude data for each magnitude. Start with
year corresponding to FMIN and proceed back to
year corresponding to maximum (FMX) magnitude.
The last year of data in the next card set
(#4) is placed in IT(51) which is columns 11 to
15 on card 4 of this set.

Card set #4 (A1,I4,32X,F3.1) ID, IY, FMG

ID is a control parameter. If ID = blank use
the value of IY and FMG, if ID = * omit the
data and if ID = E terminate the input of the
data for the zone.

If another zone is to be processed follow with another set of cards from #2 to
#4. Otherwise use and end-of-file 7/8/9 card followed by two end of job cards
6/7/8/9.

NOTES:

- (1) Standard CYBER job card. T may have to be increased if several zones are being processed.
- (2) Standard CYBER account card.
- (3) Device on which routines reside has to be mounted.
- (4) and (5) Libraries have to be attached from device.
- (6) Fortran compiler
- (7) Routines will have to be loaded.
- (8) Set up for Calcomp plot, loads program and starts execution.
- (9) If BETA is not equal to zero, a dashed line will be drawn using the value of BETA, FNO AND FMX to define the line. If FINCR equals zero, cards sets 3 and 4 must be omitted and thus no data points will be drawn.