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PC-QPLOT, an IBM-PC compatible version of the  
earthquake plotting program QPLOT

by

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## INTRODUCTION

QPLOT is an interactive, command driven plotting package tailored specifically for plotting data from seismographic networks (Klein, 1983). QPLOT, using the output from the commonly used USGS earthquake location programs HYPO71 (Lee and Lahr, 1975), HYPOINVERSE (Klein, 1978), and HYPOELLIPSE (Lahr, 1989), produces maps, cross sections, histograms, and time-series plots; the wide variety of plot types generated by QPLOT can be found in Klein and others, 1987. For the past decade, QPLOT has been running under the VAX VMS operating system and more recently on UNIX-based work stations (J. Lahr, oral commun., 1992). Here we describe the version of QPLOT that we developed to run on an IBM-compatible PC.

QPLOT is driven by 4-letter commands that can be entered either interactively or are read from a file. Typically QPLOT users will produce new plots interactively, adjusting the plot parameters to produce the desired plot, and then save the commands in a so-called "jump" file. Updating or modifying the plot is accomplished by editing the jump file, not by re-entering the commands in interactive mode. Several jump files can be combined to superimpose various plots or make a series of plots. Experienced QPLOT users rarely use the interactive mode but instead producing new plots by modifying one or more of their existing suite of jump files. Figures 1-4 show the output from example jump files that have been included on the distribution diskette.

The file QHELPPRT, located in the HELP subdirectory, describes the workings of QPLOT and the individual commands. To obtain a hardcopy of this file, simply print it.

We have attempted to keep PC-QPLOT's operation similar to the VAX version so that VAX users will require little time to become proficient with it. With the large number of options and applications that QPLOT has incorporated over the years we have not fully tested all of them in the PC version. If you discover commands that do not work on the PC version but do on the VAX, please let us know.

## REQUIRED SOFTWARE AND HARDWARE

PC-QPLOT runs on an IBM-compatible PC with a minimum of 640 kbytes memory, minimum 10 mbytes hard disk drive, and math coprocessor. PC\_QPLOT is distributed on a 1.2 mbyte, 5.25" floppy diskette.

PC-QPLOT uses the GEOGRAF graphics drivers by GEOCOMP Corp, 66 Commonwealth Ave., Concord, MA, 01742, (508) 369-8304. The drivers support a wide variety of screen, printers, and plotters. They are the same drivers as used by the time-series plotting package BOB (Murray, 1990). They are available for about \$75.

## INSTALLATION

QPLOT is installed in two steps. The first uses the distribution diskette. It contains QPLOT, source code, help files, and examples. The second step involves installing the GEOGRAF fonts and graphics drivers supplied from GEOCOMP. You will need 2 mbytes of available space on your hard disk drive to install QPLOT.

To install QPLOT, place the installation diskette into the floppy drive. Change your local drive to the floppy by typing **A:** (if the floppy was inserted into the A-drive) or **B:** (if it was inserted into the B-drive).

Now run the installation program by typing **INSTALL**. The install program will ask you where you want QPLOT installed. If you do not want it installed in C:\QPLOT you can enter another location.

INSTALL will create the QPLOT directory and subdirectories, and copy and explode the various files to the directories. It will also create the file QPLOT.BAT in your root directory C:\. Most user have this directory in their PATH statement. This batch file allows you to run QPLOT from anywhere on your system.

The directory tree created by the installation program will look as follows.

```
QPLOT  +-----+-----EXAMPLES-----+-----FIGURE_1
        |
        +-----FONTS
        |
        +-----HELP
        |
        +-----QPL
        |
        +-----SOURCE
```

QPLOT holds the program QPLOT.EXE and the file INITIAL.QPL. INITIAL.QPL contains the information used by QPLOT to (1) find its subdirectories and (2) the names of the graphics drivers (must be followed by a "\$") and the ports they are attached to.

FONTS has all the fonts accessible by QPLOT. The fonts are installed as described below.

HELP has the help files and QPLOT documentation.

QPL has the jump file accessed by the QPLOT '\$' command. QPLOT uses these jump files to help develop plots from scratch.

SOURCE contains the QPLOT source code.

EXAMPLES has example QPLOT jump files in its subdirectories.

## Installing the Fonts

To install the fonts, insert the GEOGRAF utilities diskette into your A: or B: drive. Copy all the fonts (those files with the suffix .FNT) from the GEOGRAF diskette to the QPLOT\FONTS subdirectory with the command (making changes if you are using other drives or directories):

```
COPY A:\*.FNT C:\QPLOT\FONTS\*.*
```

Also copy the program PFONT.EXE into the FONTS directory. It is used to create uniformly spaced fonts from the supplied proportionally spaced fonts (though the manual incorrectly states that it performs the opposite task).

```
COPY A:\PFONT.EXE C:\QPLOT\FONTS\*.*
```

Next, create the uniformly spaced fonts from the supplied proportionally spaced ones by getting into the font directory and running the batch file UNIFORM.BAT.

```
C:  
CD C:\QPLOT\FONTS  
UNIFORM
```

## Installing the Graphics Drivers

QPLOT is configured to send plots to 3 different devices. They are the screen, the printer, and to a file. The latter option is used if a high-quality output device such as a pen-plotter or 300-dpi laser printer is available, but not attached to your system. By saving plots to a file, you can later plot them on another machine using the GEOGRAF program FPLOT.EXE.

The program DRIVERS.EXE supplied on the GEOGRAF Utilities allows you to choose graphics drivers compatible for your system. To run drivers, get onto the floppy and execute DRIVERS.EXE.

```
A:  
DRIVERS
```

The instructions supplied by GEOCOMP can be confusing. In particular:

- a) Though they give you numerous options under Graphics Cards for specific cards, we've found it easiest to simply choose IBM and then choose the highest resolution applicable to your graphics card (CGA, EGA, or VGA).
- b) When the color table is displayed, do NOT make any changes. Do NOT press <F4> (ignore any changes). Accept the color table as displayed by pressing <F1>.

- c) If you have an Epson printer that is not listed, choose the FX-80 72x240 option. In our experience, this will give you the highest resolution possible with your printer and GEOGRAF. Note that this may not give the highest resolution available with your printer, but will give you the highest possible with GEOGRAF.

When you are prompted for the file name for the driver, give the full path to the qplot directory and the file name SCREEN.DRV for the screen driver and PRINTER.DRV for the printer driver. For the optional driver choose something descriptive such as PLOTTER.DRV or LZR 150.DRV (if it were for a laser printer with a resolution of 150 dpi). For example:

```
C:\QPLOT\SCREEN.DRV
C:\QPLOT\PRINTER.DRV
C:\QPLOT\PLOTTER.DRV
```

#### Other Files Required to Run QPLOT

In normal operation, you would run QPLOT from directories that contained related jump and data files. For proper operation you will also need the following files in ANY directory you launch QPLOT from. These files are small so having multiple copies is not a problem.

The GEOGRAF drivers are installed by following the directions accompanying them.

INITIAL.QPL	Contains the information QPLOT needs to locate the directory QPLOT and, therefore, where subdirectories HELP, QPL, and FONTS are. Also in this file are the output devices and graphics drivers for the screen, printer, and optional plotfile. This file is read by strict FORMAT statements. Do not tinker with extra spaces. Note that the drivers cannot be located outside the directory. An example of this file is in the QPLOT directory and the subdirectories of EXAMPLES.
SCREEN.DRV	The GEOGRAF graphics driver for the screen. It can have any name so long as it matches that listed in INITIAL.QPL. You will not need this file if you will not be plotting on the screen.
PRINTER.DRV	The GEOGRAF graphics driver for the printer. It can have any name so long as it matches that listed in INITIAL.QPL. You will not need this file if you will not be sending any plots to the printer.

OPT\_FILE.DRV     The GEOGRAF graphics driver for the plotfile. It can have any name so long as it matches that listed in INITIAL.QPL. You will not need this file if will not be storing any plots on the disk.

QINST.JMP        (Optional) A jump file that QPLOT jumps to when first started.

The following files are produced by QPLOT during a normal session. They are NOT needed at startup and can be considered "scratch files". They are listed here so you will not wonder why they keep appearing.

QCOMMS.DAT       Contains the list of QPLOT commands entered during the latest session to produce the last plot. By jumping to this file (via the PRNT or PFILE command), the exact image displayed on the screen is reproduced for either printer output or the optional plotfile.

PLOTFILE.GEO     The current plot image for screen output.

PRNTFILE.GEO     The last plot image sent to the printer.

## OPERATION OF PC-QPLOT

PC-QPLOT works the same as the VAX version except that the plot images, instead of going directly to the screen are stored in the file PLOTFILE.GEO. To view the plot, you enter the command DISP. To get back to command mode you press <enter>. To erase the screen, use the command ERAS. This command erases the "screen" by deleting the old PLOTFILE.GEO and starting a new one.

Sending the plot to the printer is more difficult. With GEOGRAF, you cannot have more than one graphics device open at any one time. This means you cannot be creating a plot in both screen mode and printer mode in parallel. To get around this, PC-QPLOT keeps a history of the commands entered to create the plot. This history is kept in the file QCOMMS.DAT. When you want to print a plot (command PRNT), PC-QPLOT closes PLOTFILE.GEO and opens a new file for printer graphics, PRNTFILE.GEO. It then jumps to QCOMMS.DAT and executes the same commands that produced the screen display except now it is going out to the printer. The only drawback to this scheme is that if it took a long time to produce the screen plot (plotting 7000 earthquakes for instance), it will take equally long to produce the print file.

The normal method of viewing and printing a plot is as follows:

```
JUMP xxxx           ! jump to a setup file
MTIT                ! make some modifications
```

[make any modifications to the plot]

```
PLOT                ! create the plot image
DISP                ! display the image on the screen
<enter>            ! get back to text mode
PRNT                ! send the plot to the printer
```

You can also create an optional plot file to be stored for later use such as importing it into a word-processor or desktop-publisher program. It works the same as sending a file to the printer except that it stays in a file that can be later converted to postscript format.

Two other commands have been added. LAND produces plots in landscape mode, i.e. the bottom of the plot is the left-hand edge of the screen. The other is PORT. It returns the plot from landscape mode to the normal portrait mode.

In summary, the new QPLOT commands are:

```
DISP                Displays the current plot on the screen. Press
                   <enter> to return to command mode.
```

PRNT Send the current plot to the printer. The old QPLOT command HARD is no longer supported.

PFILE Create a plot file of the current plot for later use. The file can be later printed through the GEOGRAF FPLOTT utility or converted to Postscript format so it can be imported into a word processor or desktop publisher.

ERAS Erases the current plot files and QCOMMS.DAT.

LAND Puts QPLOT into landscape mode where the bottom of the plot is the left-hand edge of the screen. Though it's hard to view the screen, it will print nicely.

PORT Returns QPLOT from landscape mode to its normal portrait mode where the bottom of the plot is the bottom of the screen.

RSET Resets QPLOT back to its startup state.

## CONVERTING VAX JUMP AND DATA FILES FOR USE WITH PC-QPLOT

Jump files and data files can be moved from the VAX to the PC and, with the changes listed below, used with PC-QPLOT.

- (1) You must change the file name paths from the VAX location to the PC location.
- (2) Microsoft FORTRAN does not read the null descriptors used in the VAX jump files. These descriptors are of the format `x*` meaning that the next `x` values asked for are not to be changed in value. These descriptors are typically used in the `LINE` and `TICK` commands. For PC-QPLOT, commas must be substituted to indicate null values. If the `x*` is at the beginning of the list of values, substitute `x` commas in its place. For example:

```
VAX
    TICK 9*  0.06  0.20  0.15
PC
    TICK , , , , , , , , , 0.06  0.20  0.15
```

If the `x*` is in the middle of the list of values, substitute `x+1` commas. For example:

```
VAX
    LINE 2 2* '9000FT.SPU'  2  0
PC
    LINE 2 , , , '9000FT.SPU'  2  0
```

- (3) Some of the `FORMAT` descriptors used by the VAX are not supported by the PC, most importantly the `T` descriptor. There is no simple fix for this: you will have to re-format your file.

## EXAMPLES

Four examples (fig. 1-4) have been included on the distribution diskette. The files used to produce the plots have the suffix JMP and are in the four subdirectories under EXAMPLES. These have been included to enable you to test if QPLOT has been correctly installed and to also demonstrate how to use QPLOT to produce different plots. These plots are by no means all that QPLOT is capable of. They have been included to give novice QPLOT users a starting point in producing their own custom plots. We recommend you take the time to glance through the QPLOT manual (QHELPPRT in the HELP directory) to get a feel for the number and variety of commands available.

To produce the example plots on your computer:

- 1) Install QPLOT as described above.
- 2) Copy the graphics drivers SCREEN.DRV, PRINTER.DRV, and the optional driver from the QPLOT directory where you initially placed them to each of the figure subdirectories.
- 3) Copy INITIAL.QPL from the QPLOT directory to each of the figure subdirectories.
- 4) Get in the sub-directory of the figure you want displayed.
- 5) Execute QPLOT by typing QPLOT.
- 6) A QPLOT startup file, QINST.JMP, is in each of the subdirectories. QPLOT will jump to it upon startup and produce the plot. A <enter> will return you to command mode and the command EXIT will return you to DOS.

#### KNOWN BUGS

- 1) In one instance, a horizontal cross-section line would not be printed, though it would appear on the screen. It would be printed if it was moved up or down slightly. This may be a GEOGRAF/laserprinter flaw beyond our control. We hope that it is an oddball bug that we just happened to hit.
- 2) Some initial 10-day tick marks were not drawn until a month tick mark was hit in a time-series plot. We suspect that there is an undeclared logical or something in the passing routine that caused it. The VAX compiler is much more forgiving about such things than is the PC.
- 3) If you do multiple PRiNTs and PFILES without any ERASes, you will have multiple-1 DISPlays after the image is sent to the printer. This is harmless and we don't think it will crop up very often.

#### ACKNOWLEDGEMENTS

We thank our reviewers, Cynthia Gardner and Robert Hammond, for their suggestions and persistence in installing QPLOT correctly despite the rough instructions contained in the first drafts of this report.

## REFERENCES

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REDOUBT HYPOCENTERS DECEMBER 10 - 19, 1989

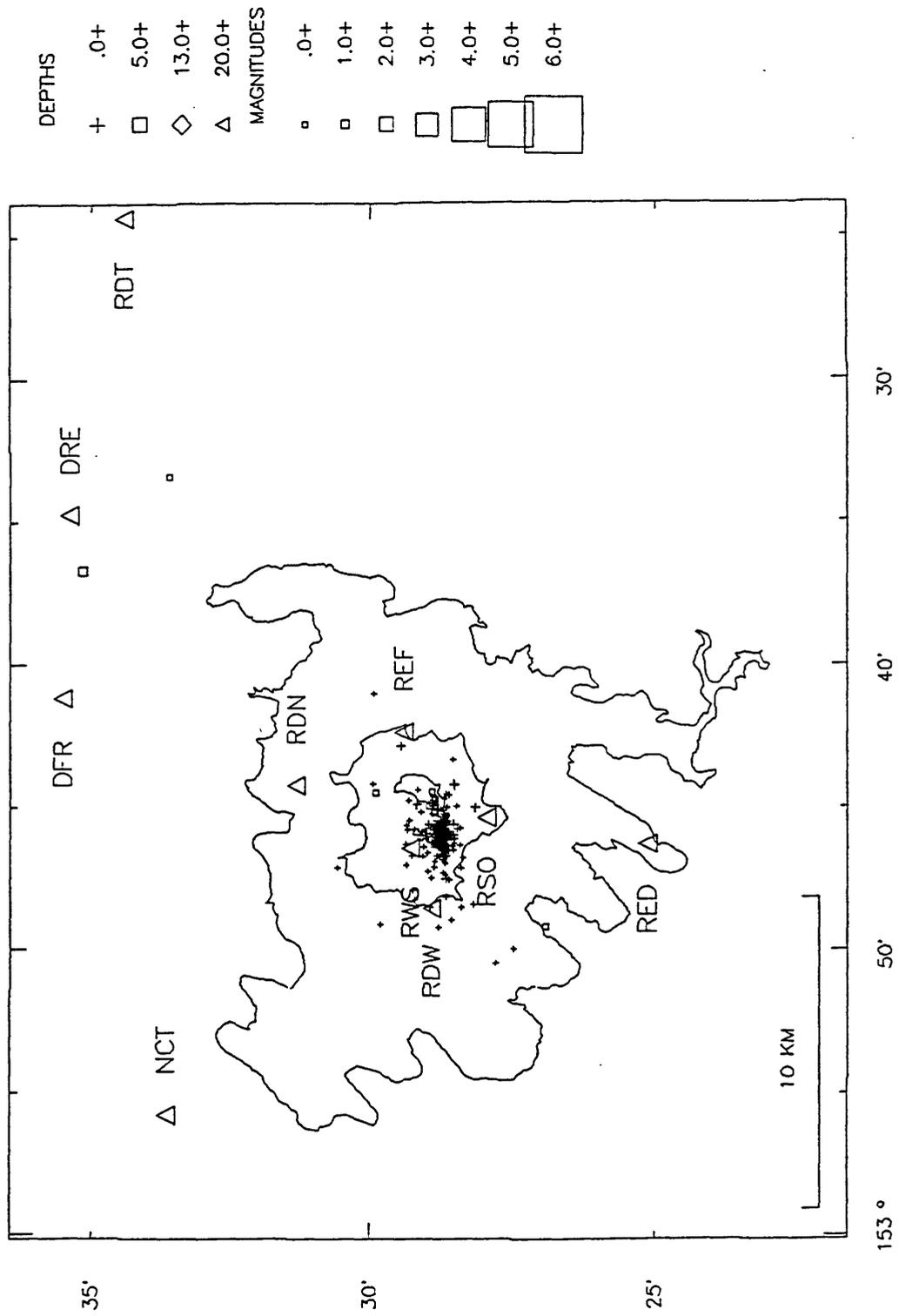


Figure 1. Example plot from the QPLOT jump file QPLOT\EXAMPLES\FIGURE\_1\REDHYPO.JMP.

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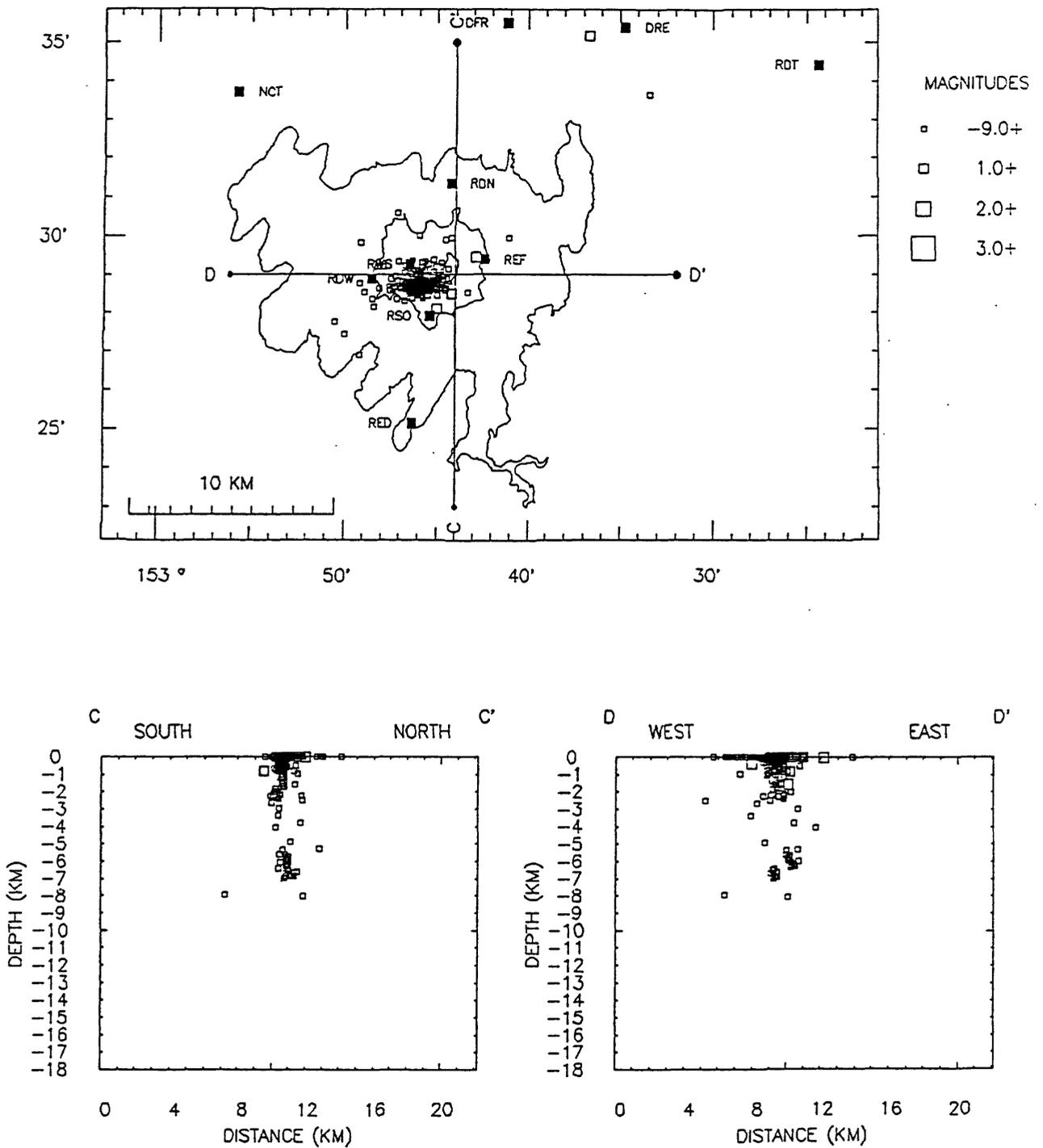


Figure 2. Example plot from the QPLOT jump file QPLOT\EXAMPLES\FIGURE 2\REDTRI.JMP. The plot will appear on the screen in landscape mode.

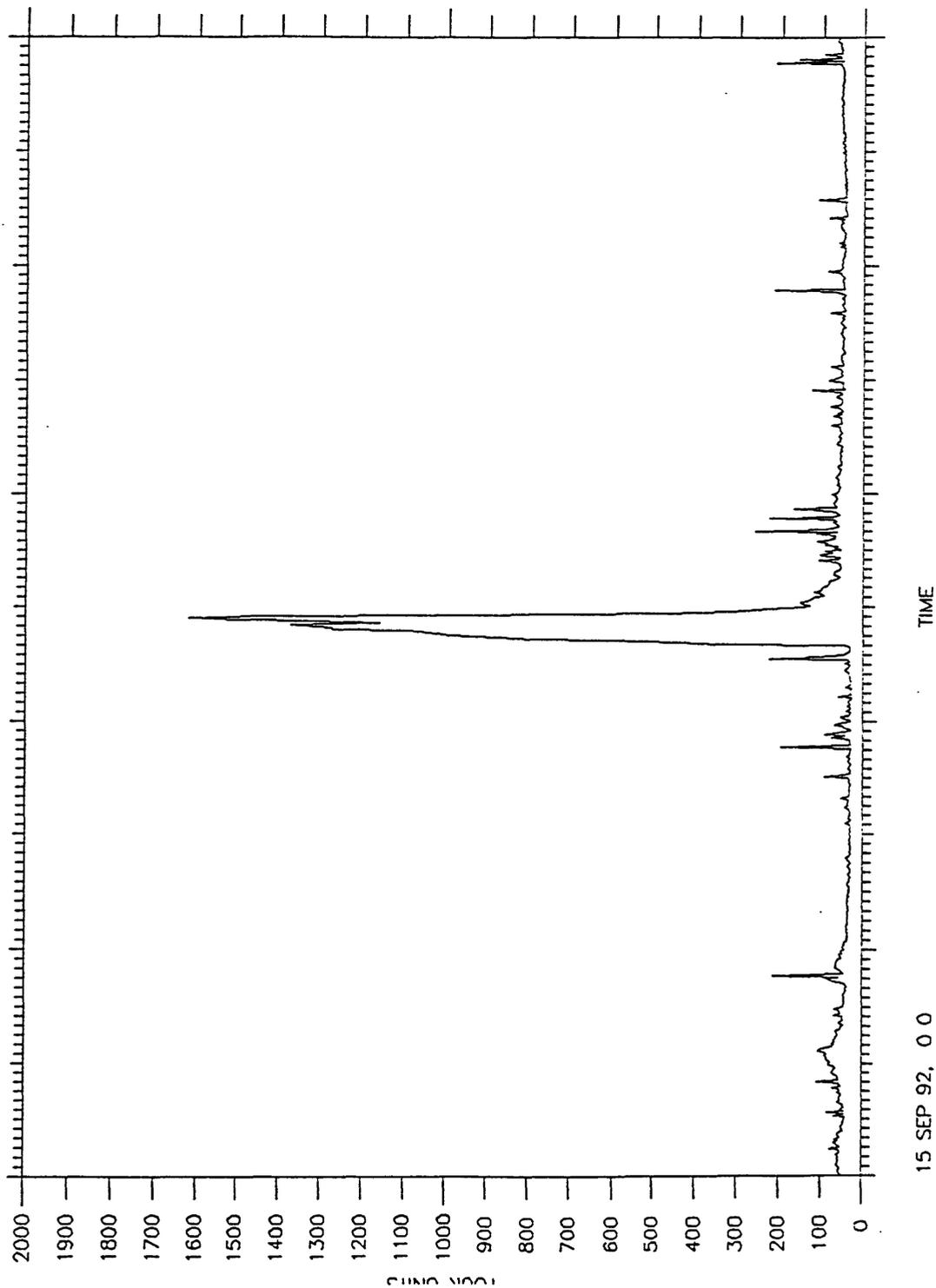


Figure 3.

Example time-series plot from the QPLOT jump file QPLOT\EXAMPLES\FIGURE\_3\RSAM.JMP. This plot will be slightly clipped on the left border. That also occurs when plotting it using the VAX version of QPLOT.

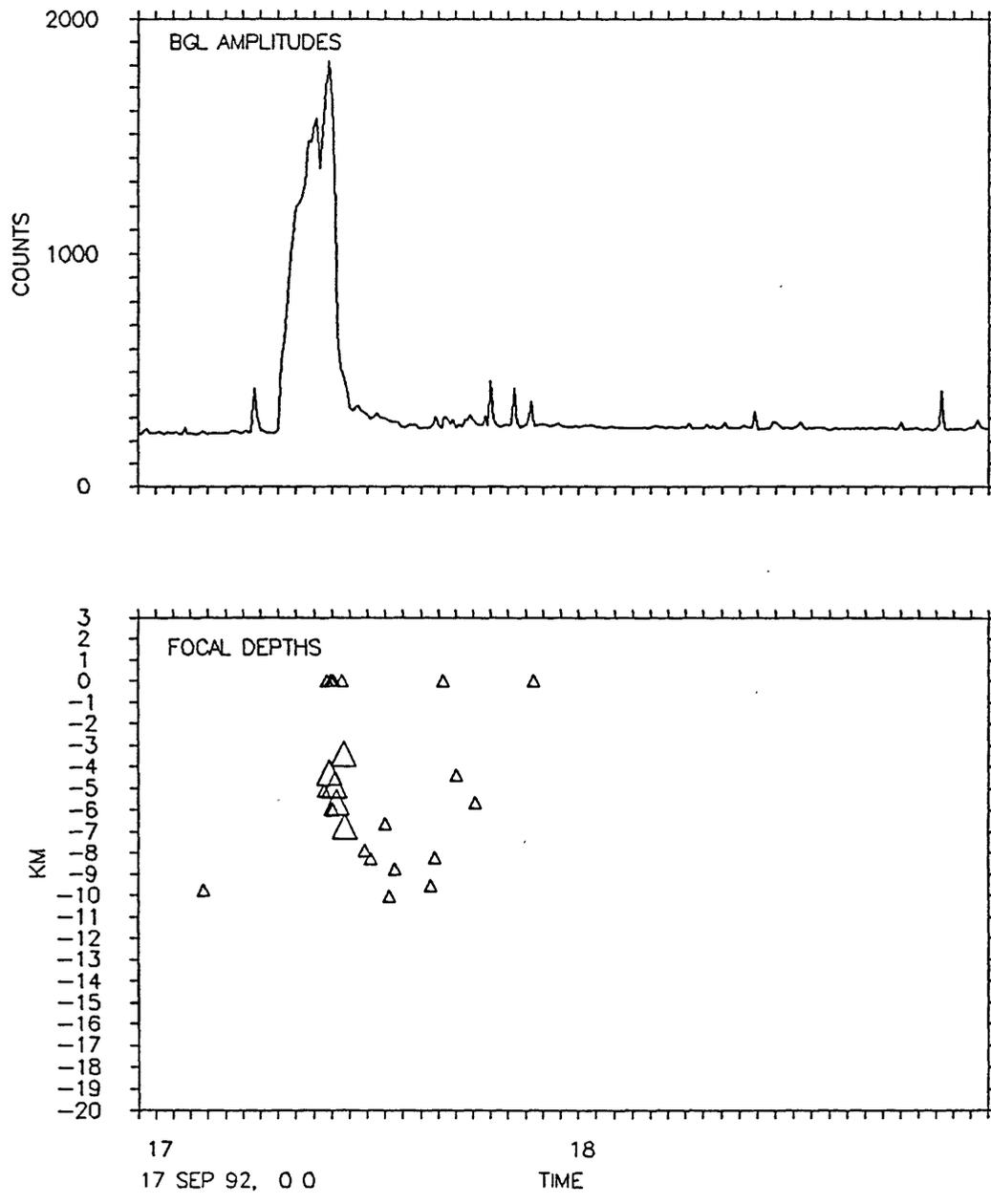


Figure 4. Example plot from the QPLOT jump file QPLOT\EXAMPLES\FIGURE\_4\TIMES.JMP.