12 The ZXPLOT Graphics Package

12.1. What is ZXPLOT

ZXPLOT is an independent graphics package developed by Ming Xue and Zuojun Zhang. ZXPLOT performs tasks ranging from the definition of plotting space, axis annotation, character string writing, curve plotting to the 2-D wind vector and scalar contour field plotting as well as color fill in between contours. Most of these features are available with NCAR Graphics, but ZXPLOT offers an additional degree of flexibility and ease of use. Here is an incomplete list of ZXPLOT capabilities:

- 2-D X-Y curve plotting, with axis labeling,
- Contouring on an irregular grid (such as the vertical cross section of a terrain-following model grid) with user controls over the labeling,
- Vector field plotting,
- 3-D surface plotting,
- Text plotting with choices of fonts, picture coordinate transformations, masking, and window clipping.

The contouring subroutines in ZXPLOT allow a user to

- set the limits on the maximum and minimum number of contours to be plotted,
- allow the contour interval to be internally adjusted or kept at a prespecified value,
- define the intensity of labeling,
- adjust the way contours are highlighted,
- choose the line pattern,
- specify the line pattern of zero contours or suppress zero contours,

- redefine the reference contour,
- plot contours at irregular intervals,
- hatch between contours,
- perform gray-scale shading or color fill in between contours.

ARPS graphics analysis program ARPSPLT is based exclusively on ZXPLOT (see Section 10.2).

Two low-level interfaces for ZXPLOT are currently available - one calls a few low-level NCAR Graphics routines and produces CGM (computer graphics metafile) output compatible with the NCAR graphics output and the related tools (*e.g.*, **ctrans**). This interface requires that NCAR graphics library be available. The interface routines are included in file *xncar.f* and the source code is freely available with the ZXPLOT object library distribution.

The other interface produces, independent of any other software package, PostScript (trademark of Adobe Systems, Inc.) files that can be viewed using PostScript viewers such as **ghostview** (X-window based software from GNU Free Software Foundation, available from the network) or printed on a PostScript printer. In this case, no other graphic library is required for ZXPLOT to work. The PostScript interface routines are included in *xpost.f* and are freely available for users who may be interested modifying the code. The PostScript output has a few advantages: it is an ASCII file, therefore is device independent, it can be printed on any PostScript printer with high quality output, and the laser printer fonts are used for the text.

Another low-level interface is being developed that calls Xlib routines, so that the graphic output is directly sent to the X-window display. This will provide an interactive capability for ZXPLOT.

12.2. How to Access ZXPLOT Library ———————————————

To use ZXPLOT, one has to install the ZXPLOT object library on their local computer system. The source code of ZXPLOT is not freely distributed, but the object library for most popular platforms can be obtained from its author Ming Xue, CAPS, University of Oklahoma (*mxue@uoknor.edu*). The object library can be obtained from the CAPS anonymous FTP server (*ftpcaps.uoknor.edu)* and the tar files for various systems are located inside *pub/ZXPLOT*. The ZXPLOT documentation is PostScript format is in *zxplot.docs.tar* and the example programs given in the documentation are provided in *zxplot.examples.tar.Z*. One should first consult the documentation inside *zxplot.docs.tar* for installation information.

The compilation and linking of a user's program with ZXPLOT library is handled by two UNIX shell scripts that come with the ZXPLOT library distributions. These two scripts are *zxncarf77* and *zxpostf77*, which link the ZXPLOT main library with the NCAR graphics interface and PostScript interface, respectively. Typically, *zxncarf77* and *zxpostf77* are placed in a directory, whose name is listed in the command search path. *zxncarf77* and *zxpostf77* should be edited during installation to specify the correct name for the directory where the ZXPLOT library codes reside.

The executable lines in *zxncarf77* look like this:

```
set zxdir = zxplot_library_directory
ncargf77 $* $zxdir/xncar.o $zxdir/zxplot2.o
```

and the executable lines in *zxpostf77* look like:

```
set zxdir = zxplot_library_directory
f77 $* $zxdir/xpost.o $zxdir/zxplot2ps.o
```

where *ncargf77* is the linker for NCAR Graphics, and *zxplot_library_directory* is the name of the directory that contains the ZXPLOT object library.

After the ZXPLOT object library (including *xncar.o, zxplot2.o, xpost.o* and *zxplot2ps.o)* and shell scripts *zxncarf77* and *zxpostf77* have been properly installed, the commands to compile and execute a user's plotting program *prog.f* are:

zxncarf77 *prog.f*
a.out

for metafile output, and

zxpostf77 *prog.f*
a.out

for PostScript (trademark of Adobe Systems, Inc.) output.

The NCAR graphics metafile output can be handled by tools (*e.g.* **ctrans**) that come with the NCAR Graphics package. The PostScript output (named *ps.outnnn*) can be sent to a PostScript printer or viewed using PostScript viewers such as **ghostview**(GNU software available on the internet).