CONPLT - A PROGRAM TO GENERATE CONTOURS FROM HARPO/HARPA ENVIRONMENTAL MODELS

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NOTICE

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CONPLT - A Program to Generate Contours from HARPO/HARPA Environmental Models

J.A. Harlan, T.M. Georges, and R. Michael Jones

Abstract. We describe a FORTRAN computer program, CONPLT, that will generate plotting-command files for contour plots of the environmental models (e.g., sound speed, current or wind velocity, temperature) used with the acoustic ray tracing programs HARPO (underwater acoustics) and HARPA (atmospheric acoustics). Contours of environmental model parameters can be obtained in any vertical or horizontal slice through three-dimensional models. A companion report, PSGRAPH -- A Plotting Program for PC-HARPO, PROFILE, CONPLT and EIGEN, describes an associated computer program that produces PostScript files as well as screen graphics for PC-compatible computers. We include a floppy disk with computer programs and a sample case. Also included are instructions for obtaining the programs (with updates) via Internet.

1. INTRODUCTION

The ray tracing programs HARPA (Jones et al., 1986a) and HARPO (Jones et al., 1986b; Georges et al., 1990) use a variety of subroutines to specify sound speed, current/wind velocity, temperature, etc., as functions of the three spatial coordinates (longitude, latitude, and depth/height). When adjusting the parameters of such models to approximate measurements, it is helpful to plot contours that compare the models to be used for ray tracing with measurements. It is also helpful to superimpose ray-path plots onto environmental contours to diagnose refractive effects. We describe here a program, CONPLT, that produces such contour plots specifically for the model subroutines used by the HARPA/HARPO ray tracing programs.

The user can specify the longitude and latitude of the left and right edges of the contour plot and also the desired height/depth interval. The contours can be in either a horizontal or a vertical slice. See the HARPO report (Jones et al., 1986) for more information about the four available types of slices. It is also possible to plot the contours of multiple environmental parameters on the same graph as long as the same set of models is used (e.g., current speed contours over sound speed contours). It is not possible to plot contours from different models on the same graph.

CONPLT creates a text output file, TXTOUT, which is read by the PSGRAPH program (Harlan et al., 1991a). PSGRAPH creates plots of publication quality that can be used in journal papers,presentations, and reports to display the models used in raytracing. Besides producing PostScript files, PSGRAPH also produces PC-compatible screen graphics.

The body of this report has been written for the user with an IBM PC-compatible computer. Because the CONPLT program was written in machine-independent FORTRAN, it can be used on any machine. However, PC-specific peripheral programs and operating system commands are necessary also (see Section 5).

1.1. Note for Non-PC Computer Users

Be sure to read Appendix A, which explains the system-dependent functions of the software provided on the distribution disk. This appendix is divided into sections for several operating systems.

2. INSTALLATION

2.1. Installing CONPLT from the Distribution Disk

The distribution floppy disk (1.2 MB, 5-1/4" IBM-PC/AT format) contains ASCII files, object files for the models, object files for the CONPLT program, three executable files, and a copy of the report you are now reading. See Appendix B for a complete description of the files on the disk.

There are over 100 files on the diskette. Most of these files (about 80) are source code and object files for the environmental models. Because the models are used by programs besides CONPLT, e.g., PROFILE and PC-HARPO, the user may want to locate the models in a directory that would be available to all programs. The INSTALL procedure described below allows the user to put the models in either 1) a subdirectory (called "MODELS") to the CONPLT working directory or 2) any existing directory (including the CONPLT working directory). If option 1 is chosen, the MODELS subdirectory will be created by the INSTALL program.

First, move to the directory in which you want to store (and run) the CONPLT program and its peripheral files. The main directory of the distribution diskette will always be copied into the directory from which INSTALL is invoked.

Second, insert the diskette into drive A and invoke the INSTALL procedure. Type:
A:INSTALL

NOTE: DO NOT SET YOUR WORKING DIRECTORY TO "A:" AND THEN TYPE "INSTALL".

The user is prompted for answers and can restart the INSTALL program if a change is desired.

The location of the models files is written to the MODELDIR.DAT file. This file is used by the FINDMODL program to determine where the object files for the models are located when linking.

If the user later decides to put the models files in a different directory, the MODELDIR.DAT file could be edited to reflect the new location of the models object files. This would avoid the need to reinstall the CONPLT program from the diskette.

2.2. Installing CONPLT via Internet

The CONPLT program and its peripheral programs (i.e., the contents of the distribution disk) can be obtained via Internet and an anonymous FTP (File Transfer Program) account. The anonymous account contains a directory, "raytracing", which is divided into several subdirectories. The subdirectories "conplt" and "models" contain the files that you will need. To access these files via anonymous FTP through the Internet, proceed as follows:

1. Log on to a host at your site that has an Internet connection and also supports FTP.

2. Invoke FTP by entering the Internet address of the server at the NOAA Wave Propagation Laboratory site:

   ftp pooh.wpl.erl.gov

   or

   ftp 140.172.32.11

3. Log in as "anonymous"

4. For the password, enter your complete Internet address, e.g., jah@node.her.thr.gov

5. General instructions and information about the anonymous FTP account at our site is available in a file named "README." To transfer this file to your local host, first set your current directory to the "pub" subdirectory:

```
cd pub
```

and then enter:

```
get README
```

6. Change your current directory to the "raytracing/conplt" subdirectory by entering:

```
cd raytracing/conplt
```

7. To transfer information about the "conplt" subdirectory to your local host, enter:

```
get readme.cnp
```

8. To transfer those files in the "conplt" subdirectory that you are interested in, enter:

```
get filename
```

where "filename" is the name of the file that you want. It is also possible to get multiple files using "mget".

9. Change your current directory to the "raytracing/models" subdirectory by entering:

```
cd ../models
```

10. To transfer those files in the "models" subdirectory that you are interested in, enter:

```
get filename
```

where "filename" is the name of the file that you want.

11. To return to your local host, enter:

```
quit
```

The files in the anonymous FTP account are not compressed as of this writing. If the files are ever compressed in the future, the "README" file in the "pub" directory will contain information as to how to decompress them.

3. SAMPLE CASE

The sample case illustrates many of the features of CONPLT and allows the user to verify that the program is working correctly.

Some of the features illustrated by the sample case are sound speed contours, current/wind speed (magnitude and component) contours, and bottom topography contours.

3.1. Description of the Sample Case Input and Output

Figures 1 through 7 show completed input data forms indicating the contours desired and the models to be used. (Appendixes C1 and C2 contain blank forms for general use.)

Because of the large number of models available, many possible combinations of models can determine a contour plot. Figure 8 shows the input data file corresponding to the completed input data forms for the sample case (DINP.SAM). Appendix G contains a list of the plotting commands written to the output file, TXTOUT. Figures 9 through 15 show the plots produced by the program, PSGRAPH, for the sample case. Note that all vertical slice plots contain a cross section of the topography (if any). This can be seen in Figs. 9, 10, 11, 13, and 15.

3.2. How to Run the Sample Case

In this section, boldface upper case letters indicate user input.

Type: RUNCON

You will then see the following:

```
*******************************************************
******************* CONTOUR PROGRAM *******************
*******************************************************

         No DINP file exists for CONPLT program.
         Enter filename on the next line >>>>>
```

Using file: DINP.SAM

The program is now executing, using the sample input datafile, DINP.SAM, and when it is finished, the last lines should be:

CONPLT completed normally
Output File: TXTOUT

The output file, TXTOUT, which contains the data to be plotted as well as the plotting commands, can be compared with the sample case output, TXTOUT.SAM, on the diskette.

If the user has the companion PSGRAPH report (Harlan et al., 1991a), and the PSGRAPH program is in the current directory, the plots can be printed and viewed on the screen.

Type: RUNPS and type a carriage return for all the choices(i.e., use defaults).

4. HOW TO USE CONPLT

4.1. Create an Input Data File

The input data file, usually called DINP, has the same form as input files for the HARPO program. An input data file can contain an unlimited number of "runsets," each of which creates a set of contours. The file can have any name, up to 80 characters (including the path), but both the FINDMODL program and CONPLT are expecting a file called DINP. If the file DINP is not found in the local directory, the user will be prompted for a file name.

Use the blank order forms for the input data in Appendixes C1 and C2 when creating an input DINP file to be sure that the necessary input data are complete and accurate.

Note that the input data forms contain only those W-array elements necessary for the particular contour type (indicated on the forms) except for W(29), which should always be 1.0.

See Appendix C3 for a table of currently available contour types.

As in HARPO, W-array values that do not change need not be repeated after the first run

set. For example, you do not have to enter the latitude for every run set if all contours in the
file have the same latitude. You can enter only the first plot's latitude.

See the HARPO/HARPA report (Sec. 2.4) for more format specifications for the input
files.

4.2. The Two Modes for Running CONPLT with RUNCON.BAT

A DOS batch file, RUNCON.BAT, controls the linking and running of the CONPLT
program.

MODE 1. Linking before running.
Used whenever a model is changed in the DINP file since last invoking RUNCON. Not necessary when only data used by a model is changed.

Type: RUNCON L

Several lines of linker commands will appear on the screen.

MODE 2. Running without linking.
Used when no changes (or nonmodel changes) have been made to the DINP file since last invoking RUNCON.

Type: RUNCON

IMPORTANT:
The CONPLT program will look for and use a file called "DINP" or, if not found, the last input data file that was linked. The program will place a message on the screen when it is using a file other than "DINP". See Section 4.2.1.

FOR BOTH MODES:

When the CONPLT program begins, the following lines will appear:

```
*******************************************************
******************** CONTOUR PROGRAM ******************
*******************************************************
```

The program is now executing and when finished, the last lines should be:

```
CONPLT Completed Normally.
Output File:  TXTOUT.
```

Assuming the user has the companion report (Harlan et al., 1991a), and that the program, PSGRAPH, from that report has been loaded, the plots can be viewed.

Type: RUNPS and type a carriage return for all the choices (i.e., use defaults).

4.2.1 Using Input Data File Other than DINP with RUNCON.BAT

For mode 1 (linking before running) if there is no file named DINP in the local directory, the user is prompted by FINDMODL for a file name as follows: (Note that bold lowercase indicates user-selected input, bold uppercase indicates nonselectable input.)

```
No DINP file exists for FINDMODL program.
Enter file name on the next line >>>>>
Type:  filename
```

When using a file with a name other than DINP, the user may avoid being prompted by FINDMODL by typing:

```
RUNCON L filename.
```

Then, when the CONPLT program begins, the following will appear. (The user does not have to reenter the file name, since the file name entered in response to the previous prompt is used.)

```
No DINP file exists for CONPLT program.
Enter file name on the next line >>>>>
Using file:  filename
```

The RUNCON.BAT file redirects standard input from a file called FNAME.OUT. This file contains the name of the input data file when it is something other than "DINP". It was created by FINDMODL and serves as a communications channel between the two programs for the input file name. Therefore, be sure not to delete this file when using RUNCON.BAT.

4.3. Compiling

It is not necessary to compile any of the source code provided in the distribution disk unless you modify it.

The object modules and the source code for the model subroutines are provided in the distribution disk subdirectory, MODELS.

If modifications to CONPLT are desired, the COMCON.BAT batch file contains the compiler instructions to compile all the CONPLT source code.

5. HOW CONPLT WORKS

5.1. Basic Overview

The operation of CONPLT is complicated by the fact that the input data file, DINP, indicates which model subroutines must be linked with the main body of the CONPLT program. The FINDMODL program reads DINP to determine which models will be linked to produce the executable file, CONPLT.EXE.

Creating contours from an input file (DINP) is actually a three-step process:

1. Run FINDMODL
2. Invoke the MicroSoft Linker
3. Run CONPLT.

The DOS batch file, RUNCON.BAT, performs all three steps when you type "RUNCON L". When you type "RUNCON" with no parameter, it will bypass the FINDMODL program and the linking process. This is desirable if no changes have been made to the model selections in the DINP file.

The first program, FINDMODL, reads the DINP file to determine which models are to be used to construct the CONPLT. If there is no file named DINP in the local directory, the user is prompted for a file name. That file name is then written to a file named FNAME.OUT (which is later used by the CONPLT program, see below).

The primary function of FINDMODL is to create an output file, called LINKMODL.DAT, which is used as input to the MicroSoft Linker. This file, called a "response file" by MicroSoft, contains a list of the names (and locations) of all object modules for the models to be linked.

Appendixes D and E show the linker response file for the sample case and the linker commands that result from the response file.

Then the linker is invoked, producing the executable file, CONPLT.EXE, which is the CONPLT program linked with the models selected by the user's DINP file.

The RUNCON batch file redirects standard input to the CONPLT program from FNAME.OUT. Thus, when a file named DINP is not available, the user is prompted for a file name but the FNAME.OUT file provides the response to the prompt.

Then CONPLT executes, producing the output text file, TXTOUT. TXTOUT contains plotting commands that can be used as input to the IBM PC-compatible program PSGRAPH. Unlike the PROFILE program, the TXTOUT file produced by CONPLT cannot be input to the commercial plotting package, DISSPLA. The reason for this is the "meta-command" code ("4") that was created for CONPLT. This command indicates that a sequence of "moveto-lineto" operations are to be carried out. If the TXTOUT file is to be used as input to DISSPLA, meta-command 4 will have to be translated to DISSPLA moveto and lineto commands.

5.2. The DINP File and Linking the CONPLT Program

The CONPLT program and the models that are linked with it are all written in machine-independent FORTRAN.

Because all the models for a particular parameter (e.g., background ocean current) have the same entry point names, it is not possible to link all models when creating the executable program. Most linkers generate "re-definition" errors when faced with this situation. Therefore, it is necessary to link only those models that have been selected via the input (DINP) data file.

5.3. How FINDMODL Works

FINDMODL simply reads the input DINP file to determine which models are to be linked with the main CONPLT program. It requires up to three input files:

1. A DINP-type input data file
2. MODELDIR.DAT (optional, if the object files for the models are in the same location as FINDMODL.EXE)
3. MODLTABL.DAT which contains a table of model numbers and names.

If you installed CONPLT from a floppy disk by using the INSTALL.BAT file, a MODELDIR.DAT file was created at that time. This file contains the directory location of the object files for the environmental models. If you downloaded CONPLT from the anonymous FTP account, a MODELDIR.DAT file was included. It contains the default location which is "models\". This syntax is of course only valid for MS-DOS systems. Be sure to edit this file if you want to run CONPLT from a directory that does not have a "models" subdirectory or if you want to run CONPLT on some other operating system.

Before reading the DINP file, FINDMODL reads the "locations" file, MODELDIR.DAT. The single line of text in MODELDIR.DAT is written to LINKMODL.DAT in the appropriate places. If there is no MODELDIR.DAT file, the program assumes that the object files for the models are in the current directory.

A character string table containing all the model names and their associated check numbers is in the INCLUDE file, MODLTABL.DAT.

The FINDMODL program simply compares the numbers found in DINP with those in MODLTABL.DAT and extracts the appropriate character string from the table; e.g., if W(150) in DINP is 6, it indicates the CSMUNK2 sound speed model.

To satisfy all external references for the CONPLT program, several "stub" subroutines have been created (e.g., NOSURF, NOCURR). These are included in the LINKMODL.DAT file when the DINP file does not have a selection for a particular type of model (e.g., surface model, current model).

The user can modify MODLTABL.DAT to include any new models created. Of course, it would then be necessary to recompile and relink FINDMODL.

REFERENCES

Georges, T.M., R. Michael Jones, and R.S. Lawrence, 1990, A PC version of the HARPO ocean acoustic ray-tracing program. NOAA Tech. Memo. ERL WPL-780, NOAA Environmental Research Laboratories, Boulder, Colorado, 18 pp. + disk.

Jones, R.M., J.P. Riley, and T.M. Georges, 1986a, HARPA--A versatile three-dimensional Hamiltonian ray-tracing program for acoustic waves in an atmosphere above irregular terrain. NOAA Report, Environmental Research Laboratories, Boulder, CO, 410 pp.

Jones, R.M., J.P. Riley, and T.M. Georges, 1986b, HARPO--A versatile three-dimensional
Hamiltonian ray-tracing program for acoustic waves in an ocean with irregular bottom.
NOAA Report, Environmental Research Laboratories, Boulder, Colorado, 455 pp.

Harlan, J.A., R.M. Jones, and T.M. Georges, 1991a, PSGRAPH--A plotting program for
PC-HARPO, PROFILE, CONPLT and EIGEN. NOAA Tech. Memo. ERL WPL-203,
NOAA Environmental Research Laboratories, Boulder, Colorado, 65 pp. + disk.

Harlan, J.A., T.M. Georges, and R.M. Jones, 1991b, PROFILE--A program to generate
profiles from HARPO/HARPA environmental models. NOAA Tech. Memo. ERL WPL
-198, NOAA Environmental Research Laboratories, Boulder, Colorado, 46 pp. + disk.

Appendix A. Instructions for Non-PC Users

A.1. General Guidelines

The CONPLT program is made up of scores of subroutines extracted intact from HARPA/HARPO and contains approximately 2750 lines of code, not including the models. Even though it is often desirable to allocate a single module of a program to a unique file, the large number of subroutines makes this impractical.

In addition, the use of multiple entry points within subroutines inherently precludes the "one module-one file" philosophy.

It is left to the user to decide whether or not to combine CONPLT.FOR and CONTOURx.FOR into one larger file.

Obviously, object modules must be created for each of the model subroutines using your own compiler.

Also, the batch files (*.BAT) provided in the distribution disk have no direct use for non-MicroSoft systems. However, they may provide some guidance in designing equivalent functions, whether via files or operating system commands.

The correct object modules for the models selected in the DINP file must be linked with the main portion of CONPLT before running. Therefore, the FINDMODL program MUST BE MODIFIED in order to create output equivalent to LINKMODL.DAT for your own operating system. See Section 5.3, the FINDMODL source code and the appropriate section below corresponding to your operating system for more information.

A.2. Running the Sample Case

After FINDMODL has been modified and the correct model object modules have been linked with the main program, CONPLT can be run. The output file, TXTOUT, can then be compared with the sample case, TXTOUT.SAM, on the diskette.

A.3. Instructions for CYBER NOS Users

A.3.1 Compilation Considerations for CONPLT

The following changes need to be made to the source code furnished by the distribution disk. See the Historical Note, Appendix F.

1. Throughout all files, replace "DOUBLE PRECISION" with "REAL".

2. Throughout all files, replace double precision intrinsic functions with their single precision equivalents:

DMAX1 with AMAX1
DINT with AINT
DLOG10 with ALOG10
DABS with ABS

A.3.2 Source Code Changes Necessary to FINDMODL

Section 5.3 contains a description of FINDMODL's functions. The FINDMODL output file, LINKMODL.DAT, will have to have a different form. The likely candidate is a NOS procedure file. The file will need to specify the object modules of those models that need to be linked with the main CONPLT program.

This can be done by explicitly specifying each object module or by putting all the object modules in a library, which is then linked with the main program.

The reference to GETARG must also be removed. Compile FINDMODL after appropriate changes have been made. The INCLUDE file, MODLTABL.DAT, must be present during compilation.

A.4. Instructions for VAX VMS Users

A.4.1 Compilation Considerations for CONPLT

In subroutine CONBLK, replace "1H" with "1H ". That is, make sure that there is a space after the H. This is an oddity of VAX and VAX editors.

A.4.2 Source Code Changes Necessary to FINDMODL

Section 5.3 contains a description of FINDMODL's functions. The FINDMODL output file, LINKMODL.DAT, will have to have a different form. The likely candidate is a DCL command file. The file will need to specify the object modules of those models which need to be linked with the main CONPLT program.

This may be done by explicitly specifying each object module or by putting all the object modules in a library which is then linked with the main program, probably using a VMS Linker options file.

The reference to GETARG must also be removed. Compile FINDMODL after the appropriate changes have been made. The INCLUDE file, MODLTABL.DAT, must be present during compilation.

A.5. Instructions for UNIX Users

A.5.1 Compilation Considerations for CONPLT

Use the option, "-Nx250", to "f77" which increases the maximum number of external names (e.g. COMMON blocks, function names, entry points etc.) from 200 (default) to 250.

A.5.2 Source Code Changes Necessary to FINDMODL

Section 5.3 contains a description of FINDMODL's functions. The FINDMODL output file, LINKMODL.DAT, will have to have a different form. The likely candidate is a "makefile." The file will need to specify the object modules of those models that need to be linked with the main CONPLT program. This can be done by explicitly specifying each object module or by putting all the object modules in a library, which is then linked with the main program.

With UNIX, much of this could be done when invoking the "f77" command.

The reference to GETARG must also be removed. Compile FINDMODL after the appropriate changes have been made. The INCLUDE file, MODLTABL.DAT, must be present during compilation.

Appendix B. Description of the Distribution Disk Contents

B.1 Main Directory of the Distribution Disk

CONPLT.FOR
CONTOURx.FOR (x = 1,2)

All source code for CONPLT and its subroutines. CONPLT was separated into 3 files due to its large size. This separation was somewhat arbitrary although the intent was to have files that could be compiled without exceeding the 64 Kbyte limit of the MicroSoft compiler.

FINDMODL.FOR — Source code for FINDMODL, which reads the input data file (usually DINP) to determine which models will be linked with the main CONPLT program.

MODLTABL.DAT — An INCLUDE file for FINDMODL.

COMCON.BAT — Use for compiling all source code in the main directory of the distribution diskette.

RUNCON.BAT — Use for linking and running CONPLT.

FINDMODL.EXE — Executable version of FINDMODL.

CONPLT.EXE — Executable version of CONPLT for the sample case.

FNAME.OUT — Data File for communicating the input data filename from FINDMODL to CONPLT program. On distribution diskette, contains the string "DINP.SAM".

DINP.SAM — Input data file for the sample case.

LINKMODL.SAM — Output from FINDMODL for the sample case.

TXTOUT.SAM — Output from CONPLT for the sample case.

INSTALL.BAT — Batch file that creates models subdirectory and copies diskette contents to user's machine.

INSTALIT.EXE — Executable file called by INSTALL.BAT.

CONPLT.DOC — The report you are reading.

B.2 Subdirectories of the Distribution Disk.

1. MODELS Subdirectory.
   Contains source code and object modules for all the models. The object modules are provided for MS-Utilities users. There is no need to compile the model source code if you are using MS-Utilities.

Note that older versions of PC-HARPO models (specifically Version 7-1-90) are not compatible with CONPLT due to the following two changes:

a. New error handling has eliminated the use of the RERROR routine.

b. Changes to the WW common block.

Appendix C. Blank Input Data Forms

There are currently two different types of contours that can be generated by the CONPLT program:

1. Sound Speed/Current Speed/Wind Speed
2. Topography

The forms to specify the input data are given in Appendixes C1 and C2. Appendix C3 describes the W90 values needed for each contour type.

Appendix C1. Form to Specify Input Data for Contours of Sound Speed/Current Speed/Wind Speed

Model ID:__________

Contour type: sound speed __________(W90=1.0)

current/wind speed __________(W90=2.0)

vertical component of current/wind velocity __________(W90=3.0)

southward component of current/wind velocity __________(W90=4.0)

eastward component of current/wind velocity __________(W90=5.0)

Superimpose this contour plot on the plot of the previous runset:

Yes __ (W90 negative; suppresses frame advance before plotting.)

No __ (W90 positive.)

Contour section plane:

Vertical plane, polar plot, rectangular expansion______(W81=1.0)
Horizontal plane, lateral expansion ________(W81=2.0)
Vertical plane, polar plot, radial expansion ________(W81=3.0)
Vertical plane, rectangular plot ________(W81=4.0)

Vertical or lateral expansion factor ________(W82)
Coordinates of the left edge of the graph:
Latitude = ________ (rad, deg, km) north (W83)
Longitude = _______ (rad, deg, km) east (W84)

Coordinates of the right edge of the graph:
Latitude = _______ (rad, deg, km) north (W85)
Longitude = ______ (rad, deg, km) east (W86)

Distance between horizontal tick marks = _______ rad, deg, km (W87)

Height above sea level of bottom of graph = _______ km (W88)
or height of horizontal section = _______ km (W88)

Height above sea level of top of graph = _______ km (W89)
Initial contour = _______ km/s, m/s; km, m (W92)
Final contour = _______ km/s, m/s; km, m (W93)
Step in contour = _______ km/s, m/s; km, m (W94)

Distance between vertical tick marks = _______ km (W96)

Appendix C2. Form to Specify Input Data for Contours of Topography

Model ID:__________
Contour type: topography __________(W90=6.0)

Superimpose this plot on the graph of the previous runset?

Yes __ (W90 negative; suppresses frame advance before plotting.)

No __ (W90 positive.)

Contour section plane (must be 2.0):

Horizontal plane, lateral expansion ________(W81=2.0)

Vertical or lateral expansion factor ________(W82)

Coordinates of the left edge of the graph:
Latitude = ________ (rad, deg, km) north (W83)
Longitude = _______ (rad, deg, km) east (W84)

Coordinates of the right edge of the graph:
Latitude = _______ (rad, deg, km) north (W85)
Longitude = ______ (rad, deg, km) east (W86)

Appendix C3. Table of W(90) Values to Specify Contour Type

W(90) Value	Common Block	Contour Type
1	CC	Sound Speed
2	UU	Current/Wind Speed
3	UU	Vertical Component
4	UU	Southward Component
5	UU	Eastward Component
6	GG	Topography

Using the negative of any of the above will cause the plot to be superimposed on the previous plot.

Appendix D. The Linker Response File for the Sample Case

LINKMODL.DAT

```
models\VVORTX3+
models\NPCURR +
models\CSMUNK1+
models\NPSPEED +
models\TLINEAR +
models\NPTEMP +
models\RHORIZ +
models\GLORENZ +
models\NPBOTM +
models\NOLOSS +
models\NOSURF
```

This file provides input to the LINK command. See the MicroSoft Linker manual for explanations of the syntax.

Appendix E. Linker Instructions Generated for the Sample Case

```
MicroSoft (R) Segmented-Executable Linker  Version 5.03
Copyright (C) Microsoft Corp 1984-1989.  All rights reserved.

Object Modules [.OBJ]: /STACK:4096 /SEGMENT:130 /NOE  MODELS\VVORTX3+
Object Modules [.OBJ]:  MODELS\NPCURR +
Object Modules [.OBJ]:  MODELS\CSMUNK1+
Object Modules [.OBJ]:  MODELS\NPSPEED +
Object Modules [.OBJ]:  MODELS\TLINEAR+
Object Modules [.OBJ]:  MODELS\NPTEMP +
Object Modules [.OBJ]:  MODELS\RHORIZ +
Object Modules [.OBJ]:  MODELS\GLORENZ+
Object Modules [.OBJ]:  MODELS\NPBOTM +
Object Modules [.OBJ]:  MODELS\NOSURF +
Object Modules [.OBJ]:  MODELS\NOLOSS
Run File [CONPLT.EXE]:
```

Appendix F. Historical Note on the Use of Double Precision

The CONPLT program was originally written on a CYBER machine using numerous common blocks and Hollerith data instead of character data. HARPO and CONPLT use the same common blocks and any of the same routines. While updating the CONPLT program for ASCII text output, a principal design goal was to maintain as much compatibility with HARPO as possible. Because of the unusual (60-bit) word length of the CYBER and the CYBER's 6-bit characters, 10 characters could be put in a single word. This fact, coupled with our design goal, caused us to use double precision variables to accommodate more characters per word.

Appendix G. CONPLT Plotting Commands

G.1 Plotting Commands in TXTOUT Used by PSGRAPH

0	Frame start
1	Moveto with linetos
3	Text location and text
4	Alternating moveto,linetos
-2	Frame advance
-1	End of plotting

G.2 Plotting Commands in TXTOUT Ignored by PSGRAPH

10	Font indicator
11	Case indicator
12	Case indicator
13	Text Height

G.3 FORTRAN Format Specification for Plotting Commands

Command

```
0  -   User Identifier
       Number of Lines:    2

       Contents of Line 1: "0"
       Contents of Line 2: Text

       Format of Line 1:   I2
       Format of Line 2:   A

1  -   Moveto with "pen up" to IX, IY

       Number of Lines:    Variable (up to 377)

       Contents of Line 1:  "1" IX  IY
       Contents of Line 2:  Number of pairs of points to follow
       Contents of Lines 3 to 377:  8 pairs of plot coordinates

       Format of Line 1:   I2 2I5
       Format of Line 2:   I5
       Format of Lines 3 to 377:  8(2I5)

       NOTE:  If number of points on line 2 is not evenly
              divisible by 8, then the remaining pairs of points
              are each written to a separate line (1 pair per line)


3  -   Text for Ray Plots, Contour Plots and Profile Subtitles

       Number of Lines:    3

       Contents of Line 1:  "3" IX  IY location for characters
       Contents of Line 2:  Orientation, number of characters
       Contents of Line 3:  Text

       Format of Line 1:   I2 2I4
       Format of Line 2:   2I3
       Format of Line 3:   A
```

4 Sequence of Moveto and Lineto Commands

Number of Lines: Variable

Contents of Line 1: "4"
Contents of Line 2: Number of Pairs of Points to be Plotted (there are actually twice this number of pairs of points since there is one pair for the moveto and one pair for the lineto)
Contents of Line 3-N: 8 pairs of X,Y plot coordinates

Format of Line 1: I2
Format of Line 2: I4
Format of Line 3: 8(2I5)

NOTE: If number of points on line 2 is not evenly divisible by 8, then the remaining pairs of points are each written to a separate line (2 pairs per line, one moveto pair and one lineto pair).

-2 Frame Advance for Ray Plots

Number of Lines: 1

Contents of Line 1: "-2"

Format of Line 1: I2

-1 End of Plotting for Ray Plots

Number of Lines: 1

Contents of Line 1: "-1"

Format of Line 1: I2

10 Font indicator

Number of Lines: 1

Contents of Line 1: "10"

Format of Line 1: I2

G.3 FORTRAN Format Specification for Plotting Commands (cont.)

11 Case indicator

Number of Lines: 1

Contents of Line 1: "11 STAND   !"

Format of Line 1: I2,trl,a,lx,al

12 Case indicator

Number of Lines: 1
Contents of Line 1: "12 L/CSTD   #"

Format of Line 1: I2,trl,a,lx,al

13 Text Height

Number of Lines: 1

Contents of Line 1: "13" number

Format of Line 1: I2,F4.2

Model ID:__________

Contour type: sound speed __________(W90=1.0)

current/wind speed __________(W90=2.0)

vertical component of current/wind velocity __________(W90=3.0)

southward component of current/wind velocity __________(W90=4.0)

eastward component of current/wind velocity __________(W90=5.0)

Superimpose this contour plot on the plot of the previous runset:

Yes __ (W90 negative; suppresses frame advance before plotting.)

No __ (W90 positive.)

Contour section plane:

Vertical plane, polar plot, rectangular expansion______(W81=1.0)
Horizontal plane, lateral expansion ________(W81=2.0)
Vertical plane, polar plot, radial expansion ________(W81=3.0)
Vertical plane, rectangular plot ________(W81=4.0)

Vertical or lateral expansion factor ________(W82)
Coordinates of the left edge of the graph:
Latitude = ________ (rad, deg, km) north (W83)
Longitude = _______ (rad, deg, km) east (W84)

Coordinates of the right edge of the graph:
Latitude = _______ (rad, deg, km) north (W85)
Longitude = ______ (rad, deg, km) east (W86)

Distance between horizontal tick marks = _______ rad, deg, km (W87)

Height above sea level of bottom of graph = _______ km (W88)
or height of horizontal section = _______ km (W88)

Height above sea level of top of graph = _______ km (W89)
Initial contour = _______ km/s, m/s; km, m (W92)
Final contour = _______ km/s, m/s; km, m (W93)
Step in contour = _______ km/s, m/s; km, m (W94)

Distance between vertical tick marks = _______ km (W96)

Figure 1. Input data form for sample case, plot 1, sound speed, vertical slice, rectangular plot

Model ID:__________

Contour type: sound speed __________(W90=1.0)

current/wind speed __________(W90=2.0)

vertical component of current/wind velocity __________(W90=3.0)

southward component of current/wind velocity __________(W90=4.0)

eastward component of current/wind velocity __________(W90=5.0)

Superimpose this contour plot on the plot of the previous runset:

Yes __ (W90 negative; suppresses frame advance before plotting.)

No __ (W90 positive.)

Contour section plane:

Vertical plane, polar plot, rectangular expansion______(W81=1.0)
Horizontal plane, lateral expansion ________(W81=2.0)
Vertical plane, polar plot, radial expansion ________(W81=3.0)
Vertical plane, rectangular plot ________(W81=4.0)

Vertical or lateral expansion factor ________(W82)
Coordinates of the left edge of the graph:
Latitude = ________ (rad, deg, km) north (W83)
Longitude = _______ (rad, deg, km) east (W84)

Coordinates of the right edge of the graph:
Latitude = _______ (rad, deg, km) north (W85)
Longitude = ______ (rad, deg, km) east (W86)

Distance between horizontal tick marks = _______ rad, deg, km (W87)

Height above sea level of bottom of graph = _______ km (W88)
or height of horizontal section = _______ km (W88)

Height above sea level of top of graph = _______ km (W89)
Initial contour = _______ km/s, m/s; km, m (W92)
Final contour = _______ km/s, m/s; km, m (W93)
Step in contour = _______ km/s, m/s; km, m (W94)

Distance between vertical tick marks = _______ km (W96)

Figure 2. Input data form for sample case, plot 2, current speed, vertical slice, rectangular plot

Model ID:__________

Contour type: sound speed __________(W90=1.0)

current/wind speed __________(W90=2.0)

vertical component of current/wind velocity __________(W90=3.0)

southward component of current/wind velocity __________(W90=4.0)

eastward component of current/wind velocity __________(W90=5.0)

Superimpose this contour plot on the plot of the previous runset:

Yes __ (W90 negative; suppresses frame advance before plotting.)

No __ (W90 positive.)

Contour section plane:

Vertical plane, polar plot, rectangular expansion______(W81=1.0)
Horizontal plane, lateral expansion ________(W81=2.0)
Vertical plane, polar plot, radial expansion ________(W81=3.0)
Vertical plane, rectangular plot ________(W81=4.0)

Vertical or lateral expansion factor ________(W82)
Coordinates of the left edge of the graph:
Latitude = ________ (rad, deg, km) north (W83)
Longitude = _______ (rad, deg, km) east (W84)

Coordinates of the right edge of the graph:
Latitude = _______ (rad, deg, km) north (W85)
Longitude = ______ (rad, deg, km) east (W86)

Distance between horizontal tick marks = _______ rad, deg, km (W87)

Height above sea level of bottom of graph = _______ km (W88)
or height of horizontal section = _______ km (W88)

Height above sea level of top of graph = _______ km (W89)
Initial contour = _______ km/s, m/s; km, m (W92)
Final contour = _______ km/s, m/s; km, m (W93)
Step in contour = _______ km/s, m/s; km, m (W94)

Distance between vertical tick marks = _______ km (W96)

Figure 3. Input data form for sample case, plot 3, sound speed, polar plot, radial expansion

Model ID:__________

Contour type: sound speed __________(W90=1.0) current/wind speed __________(W90=2.0)

vertical component of current/wind velocity __________(W90=3.0)

southward component of current/wind velocity __________(W90=4.0)

eastward component of current/wind velocity __________(W90=5.0)

Superimpose this contour plot on the plot of the previous runset:

Yes __ (W90 negative; suppresses frame advance before plotting.)

No __ (W90 positive.)

Contour section plane:

Vertical plane, polar plot, rectangular expansion______(W81=1.0)
Horizontal plane, lateral expansion ________(W81=2.0)
Vertical plane, polar plot, radial expansion ________(W81=3.0)
Vertical plane, rectangular plot ________(W81=4.0)

Vertical or lateral expansion factor ________(W82)
Coordinates of the left edge of the graph:
Latitude = ________ (rad, deg, km) north (W83)
Longitude = _______ (rad, deg, km) east (W84)

Coordinates of the right edge of the graph:
Latitude = _______ (rad, deg, km) north (W85)
Longitude = ______ (rad, deg, km) east (W86)

Distance between horizontal tick marks = _______ rad, deg, km (W87)

Height above sea level of bottom of graph = _______ km (W88)
or height of horizontal section = _______ km (W88)

Height above sea level of top of graph = _______ km (W89)
Initial contour = _______ km/s, m/s; km, m (W92)
Final contour = _______ km/s, m/s; km, m (W93)
Step in contour = _______ km/s, m/s; km, m (W94)

Distance between vertical tick marks = _______ km (W96)

Figure 4. Input data form for sample case, plot 4, current speed, horizontal slice

Model ID:__________

Contour type: sound speed __________(W90=1.0)

current/wind speed __________(W90=2.0)

vertical component of current/wind velocity __________(W90=3.0)

southward component of current/wind velocity __________(W90=4.0)

eastward component of current/wind velocity __________(W90=5.0)

Superimpose this contour plot on the plot of the previous runset:

Yes __ (W90 negative; suppresses frame advance before plotting.)

No __ (W90 positive.)

Contour section plane:

Vertical plane, polar plot, rectangular expansion______(W81=1.0)
Horizontal plane, lateral expansion ________(W81=2.0)
Vertical plane, polar plot, radial expansion ________(W81=3.0)
Vertical plane, rectangular plot ________(W81=4.0)

Vertical or lateral expansion factor ________(W82)
Coordinates of the left edge of the graph:
Latitude = ________ (rad, deg, km) north (W83)
Longitude = _______ (rad, deg, km) east (W84)

Coordinates of the right edge of the graph:
Latitude = _______ (rad, deg, km) north (W85)
Longitude = ______ (rad, deg, km) east (W86)

Distance between horizontal tick marks = _______ rad, deg, km (W87)

Height above sea level of bottom of graph = _______ km (W88)
or height of horizontal section = _______ km (W88)

Height above sea level of top of graph = _______ km (W89)
Initial contour = _______ km/s, m/s; km, m (W92)
Final contour = _______ km/s, m/s; km, m (W93)
Step in contour = _______ km/s, m/s; km, m (W94)

Distance between vertical tick marks = _______ km (W96)

Figure 5. Input data form for sample case, plot 5, southward current component, vertical slice, rectangular plot

Model ID:__________

Contour type: topography __________(W90=6.0)

Superimpose this plot on the graph of the previous runset?

Yes __ (W90 negative; suppresses frame advance before plotting.)

No __ (W90 positive.)

Contour section plane (must be 2.0):

Horizontal plane, lateral expansion ________(W81=2.0)

Vertical or lateral expansion factor ________(W82)

Coordinates of the left edge of the graph:
Latitude = ________ (rad, deg, km) north (W83)
Longitude = _______ (rad, deg, km) east (W84)

Coordinates of the right edge of the graph:
Latitude = _______ (rad, deg, km) north (W85)
Longitude = ______ (rad, deg, km) east (W86)

Figure 6. Input data form for sample case, plot 6, topography, vertical slice

```
Model ID:__________

Contour type:  sound speed __________(W90=1.0)

current/wind speed __________(W90=2.0)

vertical component of current/wind velocity __________(W90=3.0)

southward component of current/wind velocity __________(W90=4.0)

eastward component of current/wind velocity __________(W90=5.0)

Superimpose this contour plot on the plot of the previous runset:

Yes __ (W90 negative; suppresses frame advance before plotting.)

No  __ (W90 positive.)

Contour section plane:

Vertical plane, polar plot, rectangular expansion______(W81=1.0)
Horizontal plane, lateral expansion              ________(W81=2.0)
Vertical plane, polar plot, radial expansion     ________(W81=3.0)
Vertical plane, rectangular plot                 ________(W81=4.0)

Vertical or lateral expansion factor             ________(W82)
Coordinates of the left edge of the graph:
     Latitude = ________ (rad, deg, km) north (W83)
     Longitude = _______ (rad, deg, km) east (W84)

Coordinates of the right edge of the graph:
     Latitude = _______ (rad, deg, km) north (W85)
     Longitude = ______ (rad, deg, km) east (W86)

Distance between horizontal tick marks = _______ rad, deg, km (W87)

Height above sea level of bottom of graph = _______ km (W88)
          or height of horizontal section = _______ km (W88)

Height above sea level of top of graph = _______ km (W89)
Initial contour = _______ km/s, m/s; km, m (W92)
Final contour = _______ km/s, m/s; km, m (W93)
Step in contour =  _______ km/s, m/s; km, m (W94)

Distance between vertical tick marks = _______ km (W96)
```

Figure 7. Input data form for sample case, plot 7, eastward current component, vertical slice, rectangular plot

```
MIKE JONES RL3 X6464
N01-1     Sample Case for CONPLT Documentation
  1 6370.00000000       EARTH RADIUS TO MSL, KM (6370.)
```

```
  3 2.00000000000      TTRANSMITTER HEIGHT ABOVE MSL (T=ABOVE BOTTOM), KM
  4 0.            AN KM  N. TRANSMITTER LATITUDE, KM
  5 0.            AN KM  E. TRANSMITTER LONGITUDE, KM
  7 400.000000000FQ HZ  INITIAL FREQUENCY, HZ
 11 80.0000000000AN DG  INITIAL AZIMUTH ANGLE, DEG
 15 2.00000000000AN DG  INITIAL ELEVATION ANGLE, DEG
 16 16.0000000000AN DG  FINAL   ELEVATION ANGLE, DEG
 17 2.00000000000AN DG  STEP IN ELEVATION ANGLE, DEG
 19 0.                  STOP RAYS THAT STRIKE BOTTOM (1=YES; 0=NO)
 20-1.00000000000       RECEIVER HEIGHT ABOVE MSL, KM
 22 50.0000000000       MAXIMUM NUMBER OF HOPS (1.)
 23 1000.00000000       MAXIMUM NUMBER OF STEPS PER HOP (1000.)
 26 5.00000000000       MAXIMUM RAY HEIGHT ABOVE MSL, KM
 27-5.00000000000       MINIMUM RAY HEIGHT ABOVE MSL, KM
 28 210.000000000       MAXIMUM RANGE AT MSL, KM
 29 1.                  1=PROCESS RUNSET, 0=SKIP RUNSET
 33 20.0000000000       MAXIMUM ABSORPTION, DB (999.999)
 42  .1000000E-05       MAXIMUM SINGLE-STEP INTEGRATION ERROR (1.0E-4)
 44 .100000000000       INITIAL INTEGRATION STEP SIZE, KM (1.0)
 57 2.00000000000       PHASE PATH  (0=NO; 1=INTEGRATE; 2=INTEGRATE/PRINT)
 58 2.00000000000       ABSORPTION  (0=NO; 1=INTEGRATE; 2=INTEGRATE/PRINT)
 60 2.00000000000       PATH LENGTH (0=NO; 1=INTEGRATE; 2=INTEGRATE/PRINT)
 71 50.0000000000       NUMBER OF INTEGRATION STEPS PER PRINT [1.E9]
 72 1.00000000000       OUTPUT RAYSETS (1=YES; 0=NO)
 73 0.                  DIAGNOSTIC PRINTOUT (1=YES; 0=NO)
 74 0.                  PRINT EVERY W(71) RAY STEPS (0=YES; 1=N0)
 76 0.                  BINARY RAY OUTPUT (1=YES; 0=NO)
 77 76.0000000000       LINES PER PAGE OF PRINTOUT = 76. FOR HPLJ (57.)
 81 4.00000000000       RAYPLOT PROJECTION PLANE (4 = VERT. RECTANGULAR)
 82 40.00000000000      PLOT-ORDINATE EXPANSION FACTOR [1.]
 83 0.            AN KM  N. LATITUDE OF LEFT PLOT EDGE, KM
 84 0.            AN KM  E. LONGITUDE OF LEFT PLOT EDGE, KM
 85  35.265396   AN KM  N. LATITUDE OF RIGHT PLOT EDGE, KM
 86 200.000000000AN KM  E. LONGITUDE OF RIGHT PLOT EDGE, KM
 87 50.0000000000AN KM  DISTANCE BETWEEN RANGE TICKS, KM
 88-3.00000000000       HEIGHT ABOVE MSL OF BOTTOM OF GRAPH, KM
 89 0.00                HEIGHT ABOVE MSL OF TOP OF GRAPH, KM
 90 1.00000000000       SOUND SPEED CONTOURS
 92 1486.00000000LN  M  MINIMUM CONTOUR LEVEL
 93 1540.00000000LN  M  MAXIMUM CONTOUR LEVEL
 94 4.00000000000LN  M  CONTOUR INTERVAL
 96 1.00000000000       DISTANCE BETWEEN DEPTH TICKS, KM
100 9.00000000000       VVORTX3 MODEL CHECK NUMBER
102 3.00000000000       VVORTX3 BACKGROUND CURRENT DATA SET ID
103 1.02000000000LN  M  MAXIMUM TANGENTIAL CURRENT, M/S
```

Figure 8. Input data file for the sample case (page 1 of 5)

```
104 50.0000000000       RADIUS OF VORTEX CORE, KM
105 0.           AN KM  LATITUDE OF VORTEX CENTER, KM
106 150.000000000AN KM  LONGITUDE OF VORTEX CENTER, KM
107 1.00000000000       VERTICAL HALF-WIDTH OF VORTEX, KM
108-1.00000000000       HEIGHT OF VORTEX CENTER ABOVE MSL, KM
125 0.                  NPCURR MODEL CHECK NUMBER
150 7.00000000000       CTANH SOUND SPEED MODEL CHECK NUMBER
152 1.00000000000       CTANH BACKGROUND SOUND SPEED DATA SET ID
175 2.00000000000       CBLOB2 SOUND SPEED PERTURBATION MODEL CHECK NUMBER
177 7.00000000000       CBLOB2 PERTURBATION SOUND SPEED DATA SET ID
178 .020000000000       MAXIMUM FRACTIONAL INCREASE IN C SQUARED
179-1.00000000000       HEIGHT OF MAX EFFECT ABOVE MSL, KM
180 0.           AN KM  LATITUDE OF MAX EFFECT, KM
181 150.000000000AN KM  LONGITUDE OF MAX EFFECT, KM
182 1.00000000000       VERTICAL HALF-WIDTH, KM
183 50.0000000000AN KM  N-S  HALF-WIDTH, KM
184 50.0000000000AN KM  E-W  HALF-WIDTH, KM
275 1.00000000000       RHORIZ RECEIVER MODEL CHECK NUMBER
300 4.0                 GLORENZ BOTTOM MODEL CHECK NUMBER
301 0.                  DATA INPUT FORMAT CODE NUMBER
302 0.                  DATA SET IDENTIFICATION NUMBER
303 1.00                HEIGHT OF RIDGE (KM)
304 10.0         AN KM  LATITUDE OF THE RIDGE CENTER, RAD,DEG,KM
305 2.0          AN KM  HALF-WIDTH OF RIDGE, RAD,DEG,KM
306-3.0                 BASE OF RIDGE (KM ABOVE MSL)
325 0.0                 NPBOTM
350 1.00000000000       SHORIZ MODEL CHECK NUMBER
352 1.00000000000       SHORIZ OCEAN SURFACE DATA SET ID
353 0.                  HEIGHT OF OCEAN SURFACE ABOVE MSL, KM
375 0.                  NPSURF MODEL CHECK NUMBER
500 1.00000000000       SLLOSS ABSORPTION MODEL CHECK NUMBER
502 1.00000000000       SLLOSS ABSORPTION DATA SET ID
503 .006000000000AM DB  A COEFFICIENT, DB
504 .263500000000AM DB  B COEFFICIENT, DB
505 1000.00000000FQ HZ  OMEGA1, HZ
506 1700.00000000FQ HZ  OMEGA2, HZ
525 0.                  NPABSRP MODEL CHECK NUMBER
 -1                     DATA SUBSET FOR BACKGROUND CURRENT MODEL
  A  VORTEX AT LONGITUDE 150 KM E, UMAX= 1.02 M/S, R= 50 KM
  0        RETURN TO W-ARRAY DATA SET
 -2                     DATA SUBSET FOR PERTURBATION CURRENT MODEL
  A  NO CURRENT PERTURBATION
  0        RETURN TO W-ARRAY DATA SET
 -3                     DATA SUBSET FOR BACKGROUND SOUND-SPEED MODEL
  A  EL NINO BACKGROUND SOUND-SPEED PROFILE
```

Figure 8. Input data file for the sample case (page 2 of 5)

```
  3      999.0
    LN  M        LN  M       LN  M
 0.             1532.00     0.
 -20.0000       1531.50     -7.00000
 -50.0000       1509.00     -20.0000
 -250.000       1503.00     -40.0000
 -450.000       1485.00     -300.000
 -1500.00       1485.00     -400.000
 -3000.00       1508.00     0.
  999.000
  0       RETURN TO W-ARRAY DATA SET
 -4                     DATA SUBSET FOR SOUND-SPEED PERTURBATION MODEL
  A  2% INCREASE IN C-SQUARED AT 150 KM LON., 1 KM DEPTH, 50 KM WIDE
  0       RETURN TO W-ARRAY DATA SET
 -8                     DATA SUBSET FOR RECEIVER-SURFACE MODEL
  A  RECEIVER SURFACE = SPHERE 1 KM BELOW MSL
  0       RETURN TO W-ARRAY DATA SET
 -9                     DATA SUBSET FOR BACKGROUND BOTTOM MODEL
  A  RIDGE .5 KM HIGH, 2 KM WIDE AT 10 KM N LATITUDE; BASE= -3 KM
  0       RETURN TO W-ARRAY DATA SET
-10                     DATA SUBSET FOR BOTTOM PERTURBATION MODEL
  A  NO BOTTOM PERTURBATION
  0       RETURN TO W-ARRAY DATA SET
-11                     DATA SUBSET FOR OCEAN SURFACE MODEL
  A  OCEAN SURFACE = SPHERE AT MSL
  0       RETURN TO W-ARRAY DATA SET
-12                     DATA SUBSET FOR OCEAN SURFACE PERTURBATION MODEL
  A  NO OCEAN SURFACE PERTURBATION
  0       RETURN TO W-ARRAY DATA SET
-17                     DATA SUBSET FOR OCEAN ABSORPTION MODEL
  A  SKRETTING-LEROY ABSORPTION FORMULA
  0       RETURN TO W-ARRAY DATA SET
-18                     DATA SUBSET FOR PERTURBATION ABSORPTION MODEL
  A  NO ABSORPTION PERTURBATION
  0       RETURN TO W-ARRAY DATA SET
  0                     **********  END OF RUN SET NUMBER 1  *********
N01-2     Sample Case for CONPLT Documentation
 29 1.                  1=PROCESS RUNSET, 0=SKIP RUNSET
 81 4.00000000000       RAYPLOT PROJECTION PLANE (2 = HORIZONTAL)
 82 40.0000000000       PLOT-ORDINATE EXPANSION FACTOR [1.]
 85  35.265396   AN KM  N. LATITUDE OF RIGHT PLOT EDGE, KM
 86 200.000000000AN KM  E. LONGITUDE OF RIGHT PLOT EDGE, KM
 87 50.0000000000AN KM  DISTANCE BETWEEN RANGE TICKS, KM
 88-3.00000000000       HEIGHT ABOVE MSL OF BOTTOM OF GRAPH, KM
 89 0.0                 HEIGHT ABOVE MSL OF TOP OF GRAPH, KM
 90 2.00000000000       CURRENT SPEED CONTOURS
 92 0.10000000000LN  M  MINIMUM CONTOUR LEVEL
 93 1.00000000000LN  M  MAXIMUM CONTOUR LEVEL
```

Figure 8. Input data file for the sample case (page 3 of 5)

```
 94 0.10000000000LN  M  CONTOUR INTERVAL
 96 1.00000000000       DISTANCE BETWEEN DEPTH TICKS, KM
  0                     **********  END OF RUN SET NUMBER 2  *********
N01-3     Sample Case for CONPLT Documentation
 29 1.                  1=PROCESS RUNSET, 0=SKIP RUNSET
 81 3.00000000000       RAYPLOT PROJECTION PLANE (2 = HORIZONTAL)
 82 200.00000000        PLOT-ORDINATE EXPANSION FACTOR [1.]
 85 141.0615846  AN KM  N. LATITUDE OF RIGHT PLOT EDGE, KM
 86 800.000000000AN KM  E. LONGITUDE OF RIGHT PLOT EDGE, KM
 87 100.000000000AN KM  DISTANCE BETWEEN RANGE TICKS, KM
 88-3.00000000000       HEIGHT ABOVE MSL OF BOTTOM OF GRAPH, KM
 90 1.0                 SOUND SPEED CONTOURS
 92 1486.00000000LN  M  MINIMUM CONTOUR LEVEL
 93 1540.00000000LN  M  MAXIMUM CONTOUR LEVEL
 94 6.00000000000LN  M  CONTOUR INTERVAL
 96 1.00000000000       DISTANCE BETWEEN DEPTH TICKS, KM
  0                     **********  END OF RUN SET NUMBER 3  *********
N01-4     Sample Case for CONPLT Documentation
 29 1.                  1=PROCESS RUNSET, 0=SKIP RUNSET
 81 2.00000000000       RAYPLOT PROJECTION PLANE (2 = HORIZONTAL)
 82 1.00000000000       PLOT-ORDINATE EXPANSION FACTOR [1.]
 85  35.265396   AN KM  N. LATITUDE OF RIGHT PLOT EDGE, KM
 86 200.000000000AN KM  E. LONGITUDE OF RIGHT PLOT EDGE, KM
 87 50.0000000000AN KM  DISTANCE BETWEEN RANGE TICKS, KM
 88-1.00000000000       HEIGHT OF HORIZONTAL PLOT SECTION ABOVE MSL, KM
 90 2.0                 CURRENT SPEED CONTOURS
 92 0.10000000000LN  M  MINIMUM CONTOUR LEVEL
 93 1.00000000000LN  M  MAXIMUM CONTOUR LEVEL
 94 0.10000000000LN  M  CONTOUR INTERVAL
 96 100.000000000       DISTANCE BETWEEN DEPTH TICKS, KM
  0                     **********  END OF RUN SET NUMBER 4  *********
N01-5     Sample Case for CONPLT Documentation
 29 1.                  1=PROCESS RUNSET, 0=SKIP RUNSET
 81 4.00000000000       RAYPLOT PROJECTION PLANE (2 = HORIZONTAL)
 82 40.0000000000       PLOT-ORDINATE EXPANSION FACTOR [1.]
 85  35.265396   AN KM  N. LATITUDE OF RIGHT PLOT EDGE, KM
 86 200.000000000AN KM  E. LONGITUDE OF RIGHT PLOT EDGE, KM
 87 50.0000000000AN KM  DISTANCE BETWEEN RANGE TICKS, KM
 88-3.00000000000       HEIGHT ABOVE MSL OF BOTTOM OF GRAPH, KM
 89 0.0                 HEIGHT ABOVE MSL OF TOP OF GRAPH, KM
 90 4.00000000000       CURRENT SPEED CONTOURS
 92-1.00000000000LN  M  MINIMUM CONTOUR LEVEL
 93 1.00000000000LN  M  MAXIMUM CONTOUR LEVEL
 94 0.10000000000LN  M  CONTOUR INTERVAL
 96 1.00000000000       DISTANCE BETWEEN DEPTH TICKS, KM
  0                     **********  END OF RUN SET NUMBER 5  *********
```

Figure 8. Input data file for the sample case (page 4 of 5)

```
N01-6     Sample Case for CONPLT Documentation
 29 1.                   1=PROCESS RUNSET, 0=SKIP RUNSET
 81 2.00000000000        RAYPLOT PROJECTION PLANE (2 = HORIZONTAL)
 82 5.00000000000        PLOT-ORDINATE EXPANSION FACTOR [1.]
 85  35.265396   AN KM  N. LATITUDE OF RIGHT PLOT EDGE, KM
 86 200.000000000AN KM  E. LONGITUDE OF RIGHT PLOT EDGE, KM
 87 50.0000000000AN KM  DISTANCE BETWEEN RANGE TICKS, KM
 88-2.50000000000        HEIGHT OF HORIZONTAL PLOT SECTION ABOVE MSL, KM
 90 6.00000000000        TOPOGRAPHY CONTOURS
 92 -3.0000000000LN KM  INITIAL CONTOUR VALUE
 93 -1.5000000000LN KM  FINAL CONTOUR VALUE
 94 0.10000000000LN KM  STEP IN CONTOUR VALUE
 96 10.0000000000        DISTANCE BETWEEN CROSS-RANGE TICKS, KM
  0                      **********  END OF RUN SET NUMBER 6  *********
N01-7     Sample Case for CONPLT Documentation
 29 1.                   1=PROCESS RUNSET, 0=SKIP RUNSET
 81 4.00000000000        RAYPLOT PROJECTION PLANE (2 = HORIZONTAL)
 82 40.0000000000        PLOT-ORDINATE EXPANSION FACTOR [1.]
 85  35.265396   AN KM  N. LATITUDE OF RIGHT PLOT EDGE, KM
 86 200.000000000AN KM  E. LONGITUDE OF RIGHT PLOT EDGE, KM
 87 50.0000000000AN KM  DISTANCE BETWEEN RANGE TICKS, KM
 88-3.00000000000        HEIGHT ABOVE MSL OF BOTTOM OF GRAPH, KM
 89 0.0                  HEIGHT ABOVE MSL OF TOP OF GRAPH, KM
 90 5.00000000000        CURRENT SPEED CONTOURS
 92-1.00000000000LN  M  MINIMUM CONTOUR LEVEL
 93 1.00000000000LN  M  MAXIMUM CONTOUR LEVEL
 94 0.10000000000LN  M  CONTOUR INTERVAL
 96 1.00000000000        DISTANCE BETWEEN DEPTH TICKS, KM
  0                      **********  END OF RUN SET NUMBER 7  *********
```

Figure 8. Input data file for the sample case (page 5 of 5)

Figure 9.--Sound speed contours for sample case, plot 1

Figure 10.--Current speed contours for sample case, plot 2

Figure 11.--Sound speed contours for sample case, plot 3

Figure 12.--Current speed contours for sample case, plot 4

Figure 13.--Southward component current speed contours for sample case, plot 5

Figure 14.--Topography contours for sample case, plot 6

Figure 15.--Eastward component current speed contours for sample case, plot 7