Computer Programs in Seismology

Version 3.30

Installation Guide

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Installation of Computer Programs in Seismology Version 3.30

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1 Introduction

This document describes the installation of Version 3.30 of the Computer Programs in Seismology package created by R.B. Herrmann of Saint Louis University. This installation has been tested for the Solaris operating system running on a Sun Sparc, on Linux and Windows on PC platforms and on Apple’s MacOS-X system.

Installation Files
There are two ways of distributing this software – a special CDROM or Internet download using ftp.

1.1 CDROM distribution

The CDROM contains the source code documentation for the software, the complete CYGWIN package for use with Windows and precompiled binaries for some architectures. The installation of the software under UNIX/LINUX and MacOS-X is described in Section 3 of this document. The installation of CYGWIN and the compilation of Computer Programs in Seismology for Windows is discussed in detail in Section 4.

In addition, the CDROM distribution has precompiled binaries for several operating systems. If the CDROM drive is “D:”, these binaries are

D:/usr/cps330lnx.tgz – for LINUX
D:/usr/cps330osx.tgz – for MacOS-X
D:/usr/cps330cyg.tgz – for CYGWIN
D:/usr/cps330sol.tgz – for Solaris

To install any of these, use the command

    gunzip –c cps330lnx.tgz | tar xf –

This will unpack the binaries and documentation into the directories

    PROGRAMS.330/bin
    PROGRAMS.330/DOC

The bin folder contains the executable binaries and shell scripts. The DOC folder is split into sub-folders that contain tutorials in PDF format.

The binaries should work on the various systems. If they do not, unpack the file NP330.tgz and compile everything following the instructions of Sections 3 or 4.

1.2 FTP install

The distribution is available for download after completing a registration form
http://www.eas.slu.edu/People/RBHerrmann/ComputerPrograms.html

This will lead you to the ftp area for download. You will be able to get the following:

- CPSInstall.doc - this document
- CPSInstall.pdf - PDF form of this document
- NP330.tgz - Computer Programs in Seismology distribution

Send email to me if you try the binary distribution.
2 Installation on UNIX/Linux/MacOS–X

2.1 Compilers

Solaris
Either the Sun cc/f77 suite is required or the freely available gcc/g77 compilers. Precompiled gcc/g77 binary executables of these compilers are available for free at the site:

http://sunfreeware.com

Just select the version corresponding to your operating system and architecture. There are also other interesting software packages there too.

Linux
You will need the gcc/g77 compilers and the X11 programming support files.

MacOS–X
You will require the gcc/g77 compilers. You will have to search the web for them. You may have to do a Web search for the pattern ‘g77 Mac OSX’. One such link is

http://hpc.sourceforge.net

for high performance computing using Mac OS–X.

2.2 Getting the Programs

FTP
The most recent version of the Computer Programs in Seismology package will always be available for ftp download from the site:


In this directory you will find files ending in “.Z” or “.tgz” which are compressed “tar” files in either “compress” or “gzip” formats. The gzip’d files are smaller. You only require one of the two formats.

CDROM
This is the distribution on this CDROM. The are stored in the directory/folder “/usr” in the file “NP330.tgz”
2.3 Installation of the Programs

The programs will be installed in a directory of your choosing. For example, if I place the downloaded “.Z” or “.tgz” files in “/home/rbh”, then I would do the following:

“.Z” compressed files: Using sh, bash or csh shells:

<table>
<thead>
<tr>
<th>sh or bash</th>
<th>csh</th>
</tr>
</thead>
<tbody>
<tr>
<td>for i in *.Z</td>
<td>foreach i ( *.Z)</td>
</tr>
<tr>
<td>do</td>
<td>zcat $i</td>
</tr>
<tr>
<td>zcat $i</td>
<td>tar xf -</td>
</tr>
<tr>
<td>done</td>
<td></td>
</tr>
</tbody>
</table>

“.tgz” gzipped files: Using sh, bash or csh shells:

<table>
<thead>
<tr>
<th>sh or bash</th>
<th>csh</th>
</tr>
</thead>
<tbody>
<tr>
<td>for i in *.tgz</td>
<td>foreach i ( *.tgz)</td>
</tr>
<tr>
<td>do</td>
<td>gunzip -c $i</td>
</tr>
<tr>
<td>gunzip -c $i</td>
<td>tar xf -</td>
</tr>
<tr>
<td>done</td>
<td></td>
</tr>
</tbody>
</table>

Eventually you may remove the “.Z” or “.tgz” files to save space. You will not require these any more.

2.4 Compiling

Note that in the example below “rbh>” is the shell prompt indicating that you are in the “rbh” directory. If your directory name is different, the prompt will be different. Commands for you to type are indicated in bold, such as “cd”.

First, go to the PROGRAMS.330 directory.

rbh> cd PROGRAMS.330  (go to the Programs directory)
Then run the Setup program:

rbh> ./Setup  (get correct syntax)
Checking for existence of bin and lib directories
Directory bin exists
Directory lib exists
Usage: Setup SOL WIN32 SOL-EGCS LINUX CYGWIN OSX
SOL  SUN Solaris Compilers
SOL-EGCS SUN Solaris with gcc/g77 compilers
WIN32 WIN 95/98/NT/2K/XP gcc/g77 Compilers
CYGWIN CYGWIN 95/98/NT/2K/XP gcc/g77 Compilers
LINUX Linux with gcc/g77 compilers
OSX Apple Mac with gcc/g77 compilers
OSF DEC/Compaq ALPHA with f77/cc compilers
rbh> ./Setup LINUX  (for my LINUX system – you will use your system type. This command will define the Makefile to use for the system)
Checking for existence of bin and lib directories
Directory bin exists
Directory lib exists
Linux
Copying VOLI/src/Makefile.LNX VOLI/src/Makefile
Copying VOLII/src/Makefile.LNX VOLII/src/Makefile
Copying VOLIII/src/Makefile.LNX VOLIII/src/Makefile
Copying VOLIV/src/Makefile.LNX VOLIV/src/Makefile
Copying VOLV/src/Makefile.LNX VOLV/src/Makefile
Copying VOLVI/src/Makefile.LNX VOLVI/src/Makefile
Copying VOLVII/src/Makefile.LNX VOLVII/src/Makefile
Copying VOLVIII/src/Makefile.LNX VOLVIII/src/Makefile
Copying VOLIX/src/Makefile.LNX VOLIX/src/Makefile
Copying IRIS/rdseed4.5/Makefile.LNX IRIS/rdseed4.5/Makefile
Copying IRIS/DOCOMPILE.LNX IRIS/DOCOMPILE
Copying CALPLOT/src/cmd.unx/Makefile.LNX CALPLOT/src/cmd.unx/Makefile
Copying CALPLOT/src/clib.unx/Makefile.LNX CALPLOT/src/clib.unx/Makefile
Copying CALPLOT/src/flib.unx/Makefile.LNX CALPLOT/src/flib.unx/Makefile
Copying CALPLOT/src/Util/Makefile.LNX CALPLOT/src/Util/Makefile
Copying CALPLOT/testf/Makefile.LNX CALPLOT/testf/Makefile
Copying CALPLOT/testc/Makefile.LNX CALPLOT/testc/Makefile
The proper Makefiles have been installed for your Operating System
Verify that these are correct with respect to compilers, flags and libraries
If everything is correct, enter the command

  ./C             (for the complete distribution or)
  ./Ccal          (for just CALPLOT)

to “make” everything.

When the compilation is done, the executables will be in the “/bin” directory and the libraries in “/lib”.

Changing PATH

In order to use the programs you must change the PATH environment parameter. First determine the name of the SHELL that you are using.

rbh> echo $SHELL
You will see something like “/bin/sh”, “/bin/bash” or “/bin/csh”. To change the PATH we must edit a file in your login directory. For discussion, let the login directory be “/home/rbh”. In the bash or c-shell, the tilde, “~”, is an alias to indicate this login directory. Do the following for the appropriate shell. Recall that the Programs are
installed in “/home/rbh/PROGRAMS.330” (where “/home/rbh” will be different for your computer).

/bin/sh

Edit “/home/rbh/.profile” to add the following lines after the last reference to PATH.

    PATH=$PATH:/home/rbh/PROGRAMS.330/bin
    export PATH

/bin/bash

Edit “/home/rbh/.bash_profile” or equivalently “~/.bash_profile” to add the following lines after the last reference to PATH.

    PATH=$PATH:/home/rbh/PROGRAMS.330/bin
    export PATH

/bin/csh

Edit “/home/rbh/.cshrc” or equivalently “~/.cshrc” to add the following lines after the last reference to PATH.

    set path = ( ~/PROGRAMS.330/bin $path)
When you log onto the computer the next time, the PATH will be reset. You can see the new PATH with the command

    rbh> echo $PATH
You should now see “PROGRAMS.330/bin” in the PATH listing. As an added check, you can ask the system to find a program, as in

    rbh> which calxvig plotxvig surf96
    ~/PROGRAMS.330/bin/calxvig
    ~/PROGRAMS.330/bin/plotxvig
    ~/PROGRAMS.330/bin/surf96

2.5 Documentation

Documentation is in the directory DOC in both PDF and PS formats.

You are now ready to use Computer Programs in Seismology! Have Fun
3 Installation on Windows using Cygwin

The Windows distribution can be made directly from the CDROM. There are three steps for a successful installation:

1. Installation of the Cygwin package
2. Modification of the Cygwin environment for the user
3. Installation of Computer Programs in Seismology

3.1 Getting Cygwin

**WEB**

Use the browser to go to the Cygwin website at [http://www.cygwin.com](http://www.cygwin.com).

Get the current version of setup.exe.

Start setup.exe from the control panel or from the run option of windows.

**CDROM**

Cygwin is on the CDROM in the “usr” folder. For example if the CDROM drive is “D:”, then you will want to run the program D:\usr\setup.exe. In the control panel, you need only to click on the setup icon.
3.2 Cygwin installation

Cygwin is a Linux-like environment for Windows. This set of instructions explains how to use the provided Cygwin installation CD to install the software package Cygwin on your Windows XP computer.
The first thing to do is to start the Cygwin Setup. You will see the following:
We now indicate the source of the installation: For the distribution CD, we will use “Install from Local Directory”.

![Cygwin Setup - Choose Installation Type](image)
Indicate the installation folder. The default of “C:\cygwin” is OK to use.
The program asks for the local package directory. If the CDROM is on the “D:” drive, then modify the next screen to use “D:\usr\cygwin.dist”.

Cygwin will now provide a menu by which you can install everything or just part of the distribution. To modify a selection, just click on the Default entry. If you click on the Default entry under the upper level category All, then you will get the entire distribution. This is the simplest way to install. If you do not have enough disk space for the entire distribution, follow instructions below to select the minimum necessary files.
The window list of categories looks like this.
Open the category “Devel” by clicking on the “+” to the left of the name “Devel”.

A long list of all the packages in the Devel category will open.
Scroll the window down until you see “gcc” in the Package column.
Select the “gcc” package for installation by single clicking next to the word “Skip” across from “gcc”.

*When properly selected for installation, it will display the version number of the gcc package it will install.*

Similarly, select the “gcc-g77” package for installation by clicking next to “Skip”.

![Cygwin Setup - Select Packages](image-url)
Scroll the window down some more until you see the package “gdb”.

Select the “gdb” package for installation by clicking the word “Skip” once to change the display to the package version number.
Scroll down farther until you see the package "make".
Select the "make" package for installation.

Note that some other packages may be listed for installation already. Do not change their installation status.
Scroll the window down farther until the “Editors” category appears on the left. Open the “Editors” category by clicking the “+” next to the category name. Select the package “vim” for installation. If you wish a graphical editor, select “nedit.” “ed” is useful for editing within shell scripts.
Scroll farther down until you see the “X11” package.

Install the entire “X11” package by carefully clicking the word “Default” once.

*Please wait after clicking for the system to change the status word to “Install”. It may take a moment. If you click too much and the word “Install” doesn’t appear, please click again until it does.*

*Once you see “Install” next to “X11”, then you are finished selecting packages.*

Press “Next” to actually start the installation.
When the installation has finished, select “Finish” to exit the setup program.

The installation is now complete. Click “OK” to acknowledge.

A Cygwin icon will appear on the Desktop and in the Start menu Programs tab.

Note: The entire Cygwin package is available from the official Cygwin web page http://www.cygwin.com. If you wish to add more programs or to update from the internet, if you have a high speed connection, repeat the “setup” procedure.
3.3 Modify the Cygwin environment

Start Cygwin

At this point you should have a Cygwin icon on your desktop. Click this icon. A terminal window will appear. We need to modify some startup information for Cygwin to allow it to find all the programs we want to use.

Change the search order for X11 programs

We must do this to permit the program “GhostScript” to work properly.

Edit the file “/etc/profile” so that the search PATH has “/usr/X11R6/bin” first. This line at the beginning of the file must look like:

```
PATH="/usr/X11R6/bin:/usr/local/bin:/usr/bin:/bin:$PATH"
export PATH
```

Modify the “/etc/passwd”

Windows will typically attempt to place one in a named folder under

\texttt{C:\Documents and Settings\Owner}

If you log in as user “Owner”. The problem here are the spaces in the folder name. One must be very careful with these spaces under the \texttt{bash} shell because spaces can only be used if they are quoted. There are two ways to handle this.

The simplest is to edit the file /\texttt{etc/passwd}. Look for the entry for you user name, e.g., mkh:unused\_{by nt}/2000/xp:1009:513:mkh,U-FARLEY\textbackslash{}mkh,S-1-5-21-632854848-2332866997-1805960406-1009:/\texttt{cygdrive/c/Documents and Settings/mkh}:/bin/bash or something like this. Then enclose the PATH by double quotes:

```
mkh:unused\_{by nt}/2000/xp:1009:513:mkh,U-FARLEY\textbackslash{}mkh,S-1-5-21-632854848-2332866997-1805960406-1009:/cygdrive/c/"Documents and Settings"/mkh:/bin/bash
```

The other approach is to keep all CYGWIN stuff away from the normal WINDOWS files by placing the user directly under the CYGWIN tree. This is done by ensuring that the user HOME directory is located directly under the CYGWIN installation, specifically that there be a

```
/home/Owner
```

directory. If /home or /home/Owner do not exist when you log in, create it using the command

```
mkdir /home
mkdir /home/Owner
```
Now modify the Owner entry in /etc/passwd to read as:
mkh:unused_by_nt/2000/xp:1009:513:mkh,U-FARLEY\mkh,S-1-5-21-632854848-2332866997-1805960406-1009:/home/mkh:/bin/bash
Owner:unused_by_nt/2000/xp:1003:513:rbh,U-FARLEY\Owner,S-1-5-21-632854848-2332866997-1805960406-1003:/home/Owner:/bin/bash

You only have to worry about the **bold faced** name for the login directory. Note that there are no spaces.

Now exit by typing `exit` and then restart the CYGWIN program.

**Modify your “.bash_profile”**
You will need a way to find the programs that is independent of the system’s idea. Change directory to your login directory by entering the command “cd” to get to your login directory.

```
cd
```

Now edit the “.bash_profile” file there so that it looks like the following:

```
export PATH=$PATH:/cygdrive/c/usr/PROGRAMS.330/bin:
```

In this example, the PROGRAMS are installed on the C: drive in a folder called “usr”. Cygwin defines the Windows C: drive in a UNIX-like manner through the file path “/cygdrive/c”. To see the Cygwin view of the file system, enter the command “df”.

**Set up your X11 environment**
To get a useful X11 window system, do the following:

```
cd
cp /etc/X11/xinit/xinitrc .xinitrc
```

Now edit the “.xinitrc” file by commenting out the reference to the xterm command at the end and invoking the “wmaker” window manager. The last line should look like:

```
wmaker
#exec xterm -s1 1000 -sb -rightbar -ms red -fg yellow -bg black -e /usr/bin/bash -l
```

which is obtained by commenting the xterm line with the “#” symbol and adding the “wmaker” command.

**Now start X11**
There are two choices here. Either you can start up the GNUstep window manager or
you can start just two terminal session without the clutter of an additional window
manager.

**No Window Manager:**

This is the simplest to start. However to make it easier to use edit the following file:

    /usr/X11R6/bin/startxwin.sh

Then find the line that starts with "xterm" and duplicate the line. This last lines of this
shell script should then appear as follows when you are done:

    # Startup the X Server with the integrated Windows-based window manager.
    # WARNING: Do not use 'xwinclip' in conjunction with the ```-clipboard``
    # command-line parameter for XWin. Doing so would start two clipboard
    # managers, which is never supposed to happen.
    XWin -multiwindow -clipboard &

    # Startup an xterm, using bash as the shell.
    xterm -sl 1000 -sb -rightbar -ms red -fg yellow -bg black -e /usr/bin/bash -l &
    xterm -sl 1000 -sb -rightbar -ms red -fg yellow -bg black -e /usr/bin/bash -l &

    #
    # Startup the twm window manager.
    # WARNING: Do not use an external window manager in conjunction with
    # the ```-multiwindow``` command-line parameter for XWin. Doing so
    # would start two window managers, which is never supposed to happen.
    #
    #
    # twm &

    # Set a background color. Only needed when not using -multwindow for XWin.
    # xsetroot -solid aquamarine4

    # Return from sh.
    exit

To start the X11 session from your first DOS command terminal, just enter the command

    startxwin.sh &
Two “xterm” sessions will appear from which you can start any Computer Programs in Seismology program, even one using X22 graphics.

**GNUstep Session:**

The other alternative is to just enter the command

```
xinit
```

The computer will spend some time copying window manager files to your login directory. When the window manager starts, just hit the mouse buttons. You will see a menu appear.

Now start an Xterm session. From one of the menu items you can start an xterm terminal session. You can also exit or switch to another window. Not all of the menu options are implemented.

At this point you can “ssh” to other computers if you have access to them. You can start other programs from within the X11 environment:
3.4 Optional setup

The CDROM also contains the file rbhenv.tgz which has my versions of .bashrc, bash_profile, .xinitrc and the GNUStep directory. This will ensure that the Window manager works well – it also implements my preference of moving a mouse cursor over a window to raise it instead of clicking. To install this from the CDROM, do this under CYGWIN

```
cd
cp D:/usr/rbhenv.tgz | tar xf -
```

if D: is the name of the CD drive used. Of course please examine these files. You will see that I have implemented some simple aliases that you may wish to use.

3.5 Cygwin Help

Much information is provided with the distribution. From within a Cygwin terminal window enter the command

```
cd /usr/share/doc
```
To answer specific questions go to the Cygwin website http://www.cygwin.com at which you will find a link to a User's Guide under documentation.

Since the commands are those of Linux systems, a book on Linux or the bash shell would be useful.

### 3.6 Cygwin X11 Help

The fine tuning of X11 is not simple because of the fact that the X11 distribution tries to be as independent of Windows as possible. Many details of the installation are given at the Cygwin/X home at http://x.cygwin.com.

The frequently asked questions (FAQ) at http://x.cygwin.com/docs/faq will be able to assist you. The documentation is available in HTML, PDF, PS, RTF and TXT formats.

There are several important issues that must be addressed.

#### Keyboard

The bash shell uses certain characters: ` # ` ~ & % / \ { } | that may not be directly available on non-US keyboards. Windows knows about your keyboard, but X11 does not. This means that a symbol typed under Windows may not appear the same under X11.

#### Copy/Paste

There may be times that you wish to copy text between Windows and X11. You will not be able to copy graphics images though. Text copying can be done as follows:

You copy text to the clipboard in Windows with Ctrl+C. You then paste that in X11 with either a middle mouse button click or via a menu in the current application (if it has a Paste menu item).

You copy text in X11 by highlighting it and, optionally, clicking the Copy button in a menu (if the application has a Copy menu item). Leave the text highlighted just to be sure. To paste that text in Windows, press Ctrl+V.

The difficulty with this is that the lines of text files in Windows are terminated by a carriage return (CR) and a line feed (LF), but by just a line feed (LF) in UNIX and the way that we set up Cygwin. It is better to do the following:

On Windows, save the text as a text file under SAVE AS. Then from within Cygwin run the command “dos2unix textfile”. This program replaces the CR LF combination by just a LF.

On X11, save the text as a textfile and then run the command “unix2dos textfile”.

Graphics
The ImageMagick package (which requires GhostScript) permits conversion of graphics formats. For example, the Computer Programs in Seismology package graphics consists of a binary graphics metafile, which can be converted to Encapsulated PostScript. If this CALPLOT file is called SHWMOD96.PLT, then I can create a portable network graphics file (PNG) for insertion into MS Office documents or web pages using the commands:

```
plotnps -F7 -W10 -EPS -K < SHWMOD96.PLT > SHWMOD96.eps
convert -trim SHWMOD96.eps SHWMOD96.png
```
The “–trim” flag eliminates any unnecessary white space.

3.7 CYGWIN X11 and Windows XP Security
With the recent security patch to Windows XP, any communication between the PC and the outside world is now severely limited by default. This security concern affects the initial operation of X11 programs, both those distributed as part of CYGWIN and the Computer Programs in Seismology programs plotxvig, calxvig, do_mft and do_pom. When these programs are run the first time, an XP interface appears. Select the option that permits the use of these programs through DNS. This is necessary because X11 components inter-communicate using networking protocols.

In another instance, Norton Firewall software prohibited the use of ssh and scp. Either turn the Norton Firewall off temporarily or learn enough to tell it that ssh and scp packets can be transferred.

3.8 Installation of Computer Programs in Seismology
First, create a folder called “usr” on one of your drives or partitions. You can do this from the Windows Control Panel or from within Cygwin. Do the following to place everything on the C: drive

```
cd /cygdrive/c
mkdir usr
```
Now copy the distribution from the CD and unpack it. If the CDROM is on the D: drive just drag or copy/paste "D:/usr/NP330.tgz" to the “usr” folder.

From the Cygwin terminal window,

```
cd /cygdrive/c/usr
 gunzip -c NP330.tgz | tar xf -
```
This will create the folder PROGRAMS.330. To compile and install the programs we follow the procedure similar to that for the UNIX/Linux/MacOS–X systems:

```
cd PROGRAMS.330
./Setup CYGWIN
./C
```
If your SHELL path is properly set, you will be able to do the following:
which plotxvig
To test the distribution, I would do the following.

    cd PROGRAMS.330/CALPLOT/testc
    plotxvig < PLTTST.1
This will draw a set of colored circles. Now try

    make new
    new
This test program uses the cursor and tests some of the CALPLOT library calls.

3.9 Documentation
To view the documentation you can use your Adobe acroread program or the Cygwin “gv” to access the pdf files in the folders that end with “.pdf” in Computer Programs in Seismology. All documentation is within the PROGRAMS.330/DOC folder.

3.10 SHELL scripts
This comment applies primarily to user written shell scripts black under CYGWIN, but may also apply to other operating systems.

In sh or bash shell scripts, it is often convenient to indicate the relative location of an executable directory through the following sequence:

    export PATH=../bin:$PATH

On Windows machines, it is permissible to have a path component that looks like

    .../cygdrive/c/Program Files/Common Files/Adaptec Shared/System

Note the blanks between Command and Files and between Adaptec and Shared. These will cause the export command to fail. The remedy is to use the following in SHELL scripts:

    export PATH=../bin:"$PATH"

The double quotes permit the original PATH variable to be used in its entirety.

3.11 Printing
Single page graphics plots in Computer Programs in Seismology are output in encapsulated postscript using the commands

    plotnps -F7 -W10 -EPS < calplot_binary_plot_file > plot.eps

The plot.eps can be converted to a png using the commands

    convert -trim plot.eps plot.png
The PNG file plot.png can then be included in Powerpoint of MS Word files.

If it is necessary to print something, I would do the following. First create a PostScript file using `plotnps` for CALPLOT graphics or `a2ps` for text files. Then go to the Windows Start and select ghostgum/ghostview to open the EPS file and then to print. This is the preferred way to print anything since Windows knows about attached printers.

The distribution CD includes a version fo GhostScript and GhostView. From My Computer, go to the CD and then click on gs813w32.exe to install GhostScript and the click on gsv46w32.exe to install GhostView. Use the suggested defaults for installation.
4 Ground Motion Regression

This distribution also includes the file “gmproto.tgz.” To install this you must

    rbh> mkdir GMPROTO
    rbh> cd GMPROTO
    rbh> gunzip –c ..//gmproto.tgz | tar xvf –

This will create prototype directories for high frequency regression studies. For information on the installation please read the DOC/Tutorial.pdf/gmdmot.pdf. You must have PROGRAMS.330 already installed. You will run the script MAKELOCAL which will place a copy of the programs and data directories for your data set. This type of installation was chosen since we often use this same set of tools to study ground motion data sets from different regions.