

Underway Geophysics Lab Cookbook

Intoduction

This section describes the procedures for processing and plotting seismic data using SIOSEIS* and U. of Hawaii programs. The four steps are listed below.

- Reading data from tape to disk
- Pick the water bottom mute using “disp”
- Plotting seismic data
- Migrating seismic data

*SIOSEIS is a computer system for enhancing and manipulating marine seismic reflection and refraction data. Documentation for SIOSEIS can be found on Ross, Hess and Unreal under /usr/local/sioseis/doc.

Reading the segy Tape with “tp2dsk8mm.a2d.1”

Read the seismic data from the segy tape collected from a2d. First make sure that the tape is write protected and there is a back up tape. Use tp2dsk8mm.a2d.1 to read the tape. Edit tp2dsk8mm.a2d.1 in Text Editor according to specifics of your data colletion, then run the program. This is the contents of the program:

tp2dsk8mm.a2d.1

```
#!/bin/csh
sioseis << eof
procs input prout diskoa end
input
    device /dev/rmt/0 nfskip 0 ntrgat 1 end
end
prout
    fno 0 lno 99999 ftr 0 ltr 99999 end
end
diskoa
    opath 196L3s.segy end
end
end
eof
```

The things that might need editing (appear in bold above) are the tape drive:

/dev/rmt/0 Ross exabyte (8mm)
/dev/rmt/1 Ross dat (4mm)
/dev/rmt/0 Hess exabyte (8mm)
dev/rmt/1 Hess dat (4mm)

and the file name:

“196L3s.segy” is the 3rd seismic survey on Leg 196. “L” is for line. It is capitalized here for clarity but should be lower case in the real file name (to be consistent).

“ntrgat 1” is required if you want to use mute to zero the water column noise above the seafloor. Some other SIOSEIS processes may need this too.

Displaying Seismic Data with “disp”

To pick the water bottom mute and display the data, start the “disp” (display) program by typing:

hess% **disp &** “&” puts the program in the background.

1. Type the name of the input file (e.g. 196L3s.segy).
2. Tell disp the name of the file you want to save the picked mute files to (e.g. l3s.pick)
3. Double click on the blue area at the top.
4. When you see the message “check values”, click OK.
5. Grab the sliding bar for the number of traces to display to 100
6. Double click in the blue area. The data should appear.
7. Increase the amplitude up to 3-4.
8. Display 1.5 sec around the seafloor. If the seafloor is at 2.3 sec, type 2 and 3.5 into the time fields in the top.
9. Click on the mute button so it says “enabled”.
10. Double click on the blue area to re-display the data.
11. Now start picking the mutes keeping in mind the following:
 - use the left mouse button to pick a point just above the seafloor
 - to delete a point, use the right mouse button.
 - pick the points so the lines connecting them don’t cut off any of the seafloor.
12. When you have picked one screen, click the “next” button so the next screen of data will be displayed. Continue picking until you reach the end of the data
13. When you are finished, tell disp to save the picked files which contains the line for each pick consisting of the shot and the time you picked. Click save.

14. At this point, look at the data to see what times you want to plot (vertical times) and where the good data starts and stops (i.e. which shot numbers).
15. When you are finished, click the “pau” (Hawaiian for finished/done).
16. To look at the file, type “more l3s.pick”.
17. Highlight the two columns of numbers and hit the copy button.
18. Open hp.plot in the SUN text editor.
19. Paste numbers after “wbt” (see next section).

Plotting Seismic Data with “hp.plot”

Hp.plot enables you to plot the shots you want as well as the times/length of data you want. It will also mute the times you picked using disp. First, get into the directory with your data:

```
hess% cd segyfiles
```

```
/export/home/underway/segyfiles
```

```
hess% ls
```

list the files in the directory

```
187/          hp.features.plot%*  seisl1*          tp2dsk8mm.a2d.1*
a2dtotape|    hp.plot*           seisl4*          tp2dsk8mm.a2d.1%*
basicplot*    hp.plot%*          tapetoa2d|
basicplot%*   out                196l3s.segy  *
hp.features.plot*  rasterFile*
```

Edit hp.plot in Text Editor according to the specifics of your data collection then run the program. Here are definitions of some of the parameters.

diskin – controls input of data

- ipath – input segy data file you want to plot
- fno and lno – first and last shots you want to plot; reads in only the number of lines you specify (no need to change other line numbers from 1-99999 since only lines read can be processed)

filter -

- pass – filters 15 (high pass), 200 (low pass)

wbt - is the output from disp (i.e. the list of shots and times that you picked using disp), cut and paste this into hp.plot.

mute – no changes necessary

agc – no changes necessary

plot -

- trpin – trace per inch (horizontal scale)
- nibs – hp plotter nibs must be 2848
- vscale – vertical scale
- nsecs – # of secs of data you want to plot
- stime – the time that you want data to start plotting
- wiggle – add “wiggle 0” if you want just the shaded portion of the trace plotted.

mix - [note: get definition from SIOSEIS manual]

prout - [note: get definition from SIOSEIS manual]
This is the contents of the program:

hp.plot

```
procs diskin filter wbt agc mute plot prout end

diskin
  fno 1 lno 99999 ipath 19613s.segy end
end

filter
  fno 1 lno 9999 pass 15 200 fillen 35 end
end

wbt
101 1.89
123 1.90
146 1.95
172 2.00
200 2.07
201 2.06
233 2.16
264 2.31
. .
. .
. .
659 1.97
660 1.94
709 1.96
end

mute
  ttp 0 0.0 9999 0.0 addwb yes end
end

agc
  fno 1 lno 9999 winlen 0.5 end
end

plot
  anntyp 2 anninc 10 trpin 25 icdots 1 dir ltr
  nibs 2848 vscale 8.32 nsecs 4 stime 0 def .04 opath rasterFile end
end

mix
  fno 1 lno 9999 weight 1 2 1 end
end

prout
  fno 0 lno 9999 ftr 0 ltr 9999 end
end
end
eof
```

← Cut and paste output from disp here.

After saving the edited hp.plot, run the program.

hess% hp.plot

```
****      0 ERRORS IN THIS JOB      ****
***  WARNING  ***  Uneven spacing between plot samples.
                    Interpolation will be done.
The computed PLOT SCALAR is      1.54030E-06
SHOT      1 TRACE      1 RP      1 TRACE      1
SHOT      2 TRACE      1 RP      2 TRACE      1

SHOT      655 TRACE    1 RP      655 TRACE    1
SHOT      656 TRACE    1 RP      656 TRACE    1
SHOT      657 TRACE    1 RP      657 TRACE    1
SHOT      658 TRACE    1 RP      658 TRACE    1
SHOT      659 TRACE    1 RP      659 TRACE    1
SHOT      660 TRACE    1 RP      660 TRACE    1
SHOT      661 TRACE    1 RP      661 TRACE    1
SHOT      662 TRACE    1 RP      662 TRACE    1
SHOT      663 TRACE    1 RP      663 TRACE    1
SHOT      664 TRACE    1 RP      664 TRACE    1
SHOT      665 TRACE    1 RP      665 TRACE    1
SHOT      666 TRACE    1 RP      666 TRACE    1
SHOT      667 TRACE    1 RP      667 TRACE    1
SHOT      668 TRACE    1 RP      668 TRACE    1
END OF SIOSEIS RUN
```

The output is to rasterFile. To plot the data on the HP Plotter, run sio2hp.

hess% sio2hp

sio2hp takes the output from SIOSEIS and turns it into something the plotter can read.

The program returns with the following:

SIO2HP version 1.0, 28 Feb. 1994

```
      then type:      ipath rasterFile
      type:           opath out
      type:           end
```

You will be returned the prompt. Now print to the plotter.

hess% lp -d underway_plot out

request id is underway_plot-2312 (1 file(s))

Plotting for a Figure

In order to make a file that can be used to make a figure in a site report, run “sio2sun” instead of “sio2hp” on the rasterFile. Open the output file using Imagetool on the workstation. Save the file in b&w “tiff” format. The file can then be transferred to the network and opened in a graphics program such as Adobe Illustrator.

Seismic Migration (Optional)

This is an optional section to add a migration step to the data if no scientist is assigned to process the data. Migration, put simply, is transforming the seismic section from the time domain to the depth domain.

Edit `fdmigr.run` in a text editor according to the specifics of your data then run the program. Here are definitions and important parameters.

fdmigr – migration program

- `dx` – Trace separation distance
- `bpad` and `epad` – Number of zero amplitude traces to insert before the first trace and after the last trace respectively.
- `nx` – Total number of traces to migrate including pads.
- `vtp` - Velocity in m/s to use in the migration. Given as velocity-time pairs, a single velocity can be used for the entire migration.
- `tsteps` – A set of time-delta-tau pairs.

diskoa – controls output of data.

- `opath` – output segy file
- `ofmt` – data format of the output file (see SIOSEIS documentation for details)

`hess% csh fdmigr.run` (to run the program)

```
#!/bin/csh

sioseis << eof

## Procedures List ##
procs diskin fdmigr prout diskoa end

## Input file and lines read ##
diskin
    ipath 203_13s.segy fno 1 lno 99999 ftr 1 ltr 99999 end
end

## FD Migration ##
fdmigr
    dx 25.0 bpad 50 epad 50 nx 1000 vtp 1500 7.0 tsteps 5.0 0.05 7.0 0.1 end
end

## Screen Output ##
prout
    fno 1 lno 99999 ftr 1 ltr 99999 end
end

## Output File ##
diskoa
    opath 203_13s_fdmigr.segy ofmt 1 end
end
```