A Tutorial for



SeismicUnixGui, a graphical user interface for Seismic Unix (CSM), under Linux

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1 Genera	al Information	1-3
1.1 Acl	<nowledgements< td=""><td>1-3</td></nowledgements<>	1-3
1.2 Wł	nat is SeismicUnixGui?	1-3
1.3 GU	I Sections	1-5
1.3.1	Overview	1-5
1.3.2	Top Menu	1-5
1.3.3	Side Menu	1-6
1.4 Wł	nat is an example directory structure for a Project?	1-7
1.4.1	Copying data into the project directory structure from elsewhere in the	ne system
	1-7	
	Where are my flows kept?	
1.5 Tex	xt conventions in this tutorial and their meaning	1-8
1.6 Glo	ossary	1-8
2 Demor	nstration Projects	
2.1 A C	Quick start to preparing a demonstrations	
2.1.1	Where are my data sets stored?	2-10
2.1.2	Install example flows and data sets	2-10
2.1.3	Create a new project, e.g., Servilleta_demos (IRIS demonstration data	a set)2-11
2.1.4	For the IRIS Data set, confirm you are working Project called	
"Servilleta	a_demos"	2-12
2.1.5	For the GPR data sets (from LSBB), confirm you are working Project c	alled
"LSBB"	2-14	
2.1.6	For the remaining Demo Project confirm you are working Project call	ed
2.1.6 "demos"	For the remaining Demo Project confirm you are working Project call 2-14	ed
"demos"	2-14 en a pre-existing project	2-15
"demos" 2.2 Op 2.2.1	2-14 en a pre-existing project The following instruction starts the program, and open the pane of th	2-15 ne Project
"demos" 2.2 Op 2.2.1 Selector v	2-14 en a pre-existing project The following instruction starts the program, and open the pane of th vindow:	2-15 ne Project 2-15
"demos" 2.2 Op 2.2.1 Selector v	2-14 en a pre-existing project The following instruction starts the program, and open the pane of th vindow: nning your first flows	2-15 ne Project 2-15 2-15
"demos" 2.2 Op 2.2.1 Selector v	2-14 en a pre-existing project The following instruction starts the program, and open the pane of the vindow: nning your first flows Perl and Shell script flows generated by SeismicUnixGui	
"demos" 2.2 Op 2.2.1 Selector v 2.3 Ru	2-14 en a pre-existing project The following instruction starts the program, and open the pane of th vindow: nning your first flows	
"demos" 2.2 Op 2.2.1 Selector v 2.3 Ru 2.3.1 2.3.2	2-14 en a pre-existing project The following instruction starts the program, and open the pane of the vindow: nning your first flows Perl and Shell script flows generated by SeismicUnixGui	2-15 ne Project 2-15 2-15 2-17 2-18
"demos" 2.2 Op 2.2.1 Selector v 2.3 Ru 2.3.1 2.3.2 3 Simple 3.1 Pro	2-14 en a pre-existing project The following instruction starts the program, and open the pane of the vindow: nning your first flows Perl and Shell script flows generated by SeismicUnixGui Access to Documentation Processing Flow: IRIS Data Set, Socorro New Mexico processing steps	2-15 ne Project 2-15 2-17 2-17 2-18 3-19 3-19
"demos" 2.2 Op 2.2.1 Selector v 2.3 Ru 2.3.1 2.3.2 3 Simple 3.1 Pro 3.2 STE	2-14 en a pre-existing project The following instruction starts the program, and open the pane of the vindow: nning your first flows Perl and Shell script flows generated by SeismicUnixGui Access to Documentation Processing Flow: IRIS Data Set, Socorro New Mexico pcessing steps EP 1. File format conversion	2-15 ne Project 2-15 2-15 2-17 2-18 3-19 3-19 3-20
"demos" 2.2 Op 2.2.1 Selector v 2.3 Ru 2.3.1 2.3.2 3 Simple 3.1 Pro 3.2 STR 3.3 STR	2-14 en a pre-existing project The following instruction starts the program, and open the pane of the vindow: nning your first flows Perl and Shell script flows generated by SeismicUnixGui Access to Documentation Processing Flow: IRIS Data Set, Socorro New Mexico ocessing steps EP 1. File format conversion EP 2. Concatenate files	2-15 ne Project 2-15 2-17 2-17 3-19 3-19 3-20 3-21
"demos" 2.2 Op 2.2.1 Selector v 2.3 Ru 2.3.1 2.3.2 3 Simple 3.1 Pro 3.2 STR 3.3 STR 3.4 STR	2-14 en a pre-existing project The following instruction starts the program, and open the pane of the vindow: nning your first flows Perl and Shell script flows generated by SeismicUnixGui Access to Documentation Processing Flow: IRIS Data Set, Socorro New Mexico poessing steps EP 1. File format conversion EP 2. Concatenate files EP 3. Clean headers	2-15 ne Project 2-15 2-15 2-17 2-18 3-19 3-19 3-20 3-21 3-21
"demos" 2.2 Op 2.2.1 Selector v 2.3 Ru 2.3.1 2.3.2 3 Simple 3.1 Pro 3.2 STR 3.3 STR 3.4 STR 3.5 STR	2-14 en a pre-existing project The following instruction starts the program, and open the pane of the vindow: nning your first flows Perl and Shell script flows generated by SeismicUnixGui Access to Documentation Processing Flow: IRIS Data Set, Socorro New Mexico Decessing steps EP 1. File format conversion EP 2. Concatenate files EP 3. Clean headers EP 4. Window the shotpoint gathers	2-15 ne Project 2-15 2-17 2-18 3-19 3-19 3-20 3-21 3-21 3-21 3-22
"demos" 2.2 Op 2.2.1 Selector v 2.3 Ru 2.3.1 2.3.2 3 Simple 3.1 Pro 3.2 STR 3.3 STR 3.3 STR 3.4 STR 3.5 STR 3.6 STR	2-14 en a pre-existing project The following instruction starts the program, and open the pane of the vindow: nning your first flows Perl and Shell script flows generated by SeismicUnixGui Access to Documentation Processing Flow: IRIS Data Set, Socorro New Mexico ocessing steps EP 1. File format conversion EP 2. Concatenate files EP 3. Clean headers EP 4. Window the shotpoint gathers EP 5. Negative stack	2-15 ne Project 2-15 2-17 2-17 3-19 3-19 3-20 3-21 3-21 3-22 3-22
"demos" 2.2 Op 2.2.1 Selector v 2.3 Ru 2.3.1 2.3.2 3 Simple 3.1 Pro 3.2 STR 3.3 STR 3.4 STR 3.5 STR 3.6 STR 3.7 STR	2-14 en a pre-existing project The following instruction starts the program, and open the pane of the vindow: nning your first flows Perl and Shell script flows generated by SeismicUnixGui Access to Documentation Processing Flow: IRIS Data Set, Socorro New Mexico ocessing steps EP 1. File format conversion EP 2. Concatenate files EP 3. Clean headers EP 4. Window the shotpoint gathers EP 5. Negative stack EP 6. Modify header filesgx,ep,sx Error! Bookmark metabolic conversion	2-15 ne Project 2-15 2-17 2-17 3-19 3-19 3-20 3-21 3-21 3-21 3-22 3-22 ot defined.
"demos" 2.2 Op 2.2.1 Selector v 2.3 Ru 2.3.1 2.3.2 3 Simple 3.1 Pro 3.2 STR 3.3 STR 3.4 STR 3.5 STR 3.6 STR 3.7 STR 3.8 STR	 2-14 en a pre-existing project	2-15 ne Project 2-15 2-17 2-17 3-19 3-19 3-20 3-21 3-21 3-22 3-22 ot defined. 3-23
"demos" 2.2 Op 2.2.1 Selector v 2.3 Ru 2.3.1 2.3.2 3 Simple 3.1 Pro 3.2 STR 3.3 STR 3.4 STR 3.5 STR 3.6 STR 3.6 STR 3.7 STR 3.8 STR 3.9 STR	2-14 en a pre-existing project The following instruction starts the program, and open the pane of th vindow: nning your first flows Perl and Shell script flows generated by SeismicUnixGui Access to Documentation Processing Flow: IRIS Data Set, Socorro New Mexico coessing steps EP 1. File format conversion EP 2. Concatenate files EP 3. Clean headers EP 4. Window the shotpoint gathers EP 5. Negative stack EP 6. Modify header filesgx,ep,sx Error! Bookmark no EP 7. Modify Header filesOffsets EP 8. Modify Header filesMake CMP's	2-15 ne Project 2-15 2-17 2-17 3-19 3-19 3-20 3-21 3-21 3-21 3-22 ot defined. 3-23 3-25
"demos" 2.2 Op 2.2.1 Selector v 2.3 Ru 2.3.1 2.3.2 3 Simple 3.1 Pro 3.2 STR 3.3 STR 3.4 STR 3.5 STR 3.6 STR 3.6 STR 3.7 STR 3.8 STR 3.9 STR 3.10 S	2-14 en a pre-existing project The following instruction starts the program, and open the pane of the vindow: nning your first flows Perl and Shell script flows generated by SeismicUnixGui Access to Documentation Processing Flow: IRIS Data Set, Socorro New Mexico processing steps P 1. File format conversion P 2. Concatenate files P 3. Clean headers P 4. Window the shotpoint gathers P 5. Negative stack P 6. Modify header filesgx,ep,sx	2-15 ne Project 2-15 2-17 2-17 3-19 3-19 3-20 3-21 3-21 3-22 ot defined. 3-23 3-25 3-26
"demos" 2.2 Op 2.2.1 Selector v 2.3 Ru 2.3.1 2.3.2 3 Simple 3.1 Pro 3.2 STR 3.3 STR 3.4 STR 3.5 STR 3.6 STR 3.6 STR 3.7 STR 3.8 STR 3.8 STR 3.9 STR 3.10 S	2-14 en a pre-existing project The following instruction starts the program, and open the pane of th vindow: nning your first flows Perl and Shell script flows generated by SeismicUnixGui Access to Documentation Processing Flow: IRIS Data Set, Socorro New Mexico coessing steps EP 1. File format conversion EP 2. Concatenate files EP 3. Clean headers EP 4. Window the shotpoint gathers EP 5. Negative stack EP 6. Modify header filesgx,ep,sx Error! Bookmark no EP 7. Modify Header filesOffsets EP 8. Modify Header filesMake CMP's	2-15 ne Project 2-15 2-17 2-17 3-19 3-19 3-20 3-21 3-21 3-22 ot defined. 3-23 3-25 3-26 3-27

3.13 STEP 12. Normal Moveout and Stacking and Migration	3-32
4 Simple Processing Flow for GPR data	6-33
5 Perl and Shell script flows generated by SeismicUnixGui	7-34
5.1 IRIS Data Set, Socorro, New Mexico	7-34
5.2 GPR data	7-37
5.3 General tools	7-38
5.3.1 How to mute a data set consisting of a range of multiple gathers	7-38

1

General Information

1.1 Acknowledgements

This project is possible only because of the selfless work of others. I have shamelessly copied and modified notes extensively from the Colorado School of Mines website (Stockwell) for S*nix. Over the years, many students have also contributed to these notes: Class of 2008: Erin Walden, Kody Kramer, Erin Elliott, Andrew Harrison, Andrew Sampson, Ana Felix, JohnD'Aquin, Russell Crouch, Michael Massengale, and David Smolkin; Chang Liu (2013), Nevra Bulut (2019).

I will greatly appreciate any and all questions you have regarding installation and running of any of the programs to help us continue developing SeismicUnixGui. Please send your questions to *gllore@lsu.edu*. Please indicate what your operating system is and whether you have administrative priviliges (preferred).

Thanks,

Juan Lorenzo, BatonRouge, Dec. 5, 2019

1.2 What is SeismicUnixGui?

SeismicUnixGui, a graphical user interface (GUI), serves to select and build sequences of Perl modules and their parameters. SeismicUnixGui generates two versions of these instructions in text files. These text files contain a shell and a Perl script version that can be modified and also executed independently of this GUI and from the command line.

Seismic Unix (Stockwell, 1999) is a widely distributed free software package for processing seismic reflection and signal processing. In Seismic Unix, a sequence of independent programs receive modify and generate data files of streams of data that are displayed on the screen. The data file is read in and the generated output data are handled internally by stdin, stdout functions in C while the data exchanges between programs and the linux operating system are managed from the command line via pipes "|" and redirections "> or <" respectively. Traditionally, the instructions on the command line can be assembled and saved as re-usable bash scripts. Seismic UnixGui assembles these same scripts for the operating system to run with the help of modules

written in Perl. SeismicUnixGui generates these scripts within the directory of the user and thes scripts can be run independently of SeismicUnixGui running.

SeismicUnixGui is written using Perl/Tk which is mature, well-documented Perl module that allows its users to construct graphical user interfaces.

In a classroom environment, shell scripting of SU modules engages students and helps focus on the theoretical limitations and strengths of signal processing. However, complex interactive processing stages, e.g., selection of optimal stacking velocities, killing bad data traces, or spectral analysis requires advanced flows beyond the scope of introductory classes. In a research setting, special functionality from other free seismic processing software such as SioSeis (UCSD-NSF) can be incorporated readily via an object-oriented style to programming.

An object-oriented approach is a first step toward efficient extensible programming of multistep processes, and a simple GUI simplifies parameter selection and decision making. Currently, in SeismicUnixGui, Perl 5 packages wrap 65 of the most common SU modules that are used in teaching undergraduate and first-year graduate student classes (e.g., filtering, display, velocity analysis and stacking). Perl packages (classes) can advantageously add new functionality around each module and clarify parameter names for easier usage. For example, through the use of methods, packages can isolate the user from repetitive control structures, as well as replace the names of abbreviated parameters with self-describing names. Moose, an extension of the Perl 5 object system, greatly facilitates an object-oriented style. Perl wrappers are self-documenting via Perl programming document markup language.

An automatic directory structure is created for the user in which data and programs are distributed according to a pre-defined hierarchy. All the directories and minimal files needed by SeismicUnixGui are created whenever a new 'Project' is created within the 'Project Selector' tool. The user can also create new projects within main GUI of SeismicUnixGui as well as selecting different projects. At all times the user can use linux commands to navigate freely through the directories. Sometimes the user may find it convenient to create new subdirectories within the existing file structure. SeismicUnixGui will not be able to detect these folders and their contents.

1.3 GUI Sections

1.3.1 Overview

		L_SU V0.3.9	_ ×
Tools	×	Flow Name	
File		migration model NMO_Vel_Stk par picks	
Run	data_in A segyclean A segyrhars segyread suaddhead	suea2df sufdmod1 sufdmod2	sugain A sugprfb sukill V
Save	transform well	armiana (
	suamp succepstrum succwt		
	Flow -+-> 2+-> 3+-> 4+->		- V A.
	Parameter Names	Values	ey name pink name
			ey name pink name
		X	

The main GUI is divided into 4 areas: Top Menu, Left Side Menu, Parameter Names and their Values, Four flow boxes, and a Message area. The large cross (**X**) in the top-left corner is used to kill many unwanted graphical process running in the background.

1.3.2 Top Menu

There are more than 400 independent programs are available from Seismic Unix. Currently SeismicUnixGui implements over 65 of these.

1.3.3 Side Menu

1.3.3.1 Tools

Tools ×
Project
<u>S</u> seg2su
<u>S</u> ucat
<u>i</u> SpectralAnalysis
<u>i</u> VelAnalysis
<u>i</u> TopMute
<u>i</u> BottomMute
<u>f</u> k
<u>S</u> ynseis
<u>i</u> Pick

Project: Defines the directory structure for data sets and programs in many languages, e.g. matlab, R, Perl etc.

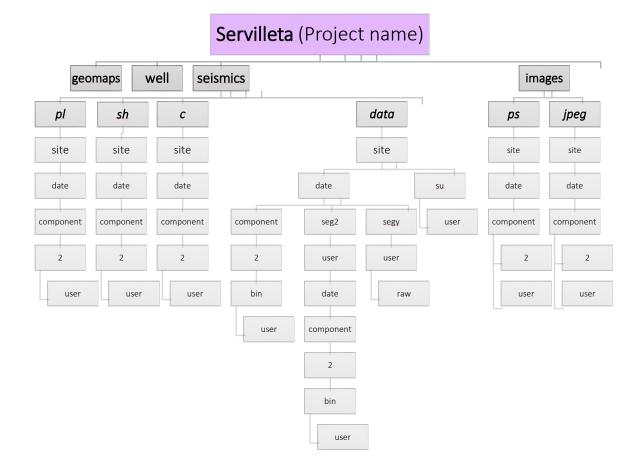
Sseg2su: Converts SEG-2 formatted data into the su format which is a simplified SEG-Y format.

% Sseg2su

Sucat: Concatenates multiple files of any format into a single file. These files can have names related by a continuous sequence of integers, e.g., Seismic Unix data files: 1000.su, 1001.su, 1002.su. If not, a list of names can be specified. Output files from interactive muting or velocity analysis and that have specific "par" formats can be handled.

% Sucat

1.4 What is an example directory structure for a Project?



1.4.1 Copying data into the project directory structure from elsewhere in the system

If you want to copy seismic data already in su (seismic unix) format copy it with the following instruction, but first move yourself into the directory that receives the data.

Example 1:

% cd PROJECT_HOME/seismics/data/site/component/line/username

Example 2:

% cd /home/gllore/seismics/data/Servilleta_demos/H/1/gllore

Example 2:

% cp data /home/refseis18/Aug27_lab1/*.su .

- 1.4.2 Where are my flows kept?
- % cd PROJECT_HOME/seismics/pl/site/component/line/username
- 1.5 Text conventions in this tutorial and their meaning Left Mouse click is abbreviated to <MB1> Instruction

Right Mouse click is abbreviated to <MB3> Instruction

Variable names are shown in a large bold-style font.

% Command-line instructions are shown with pink background

1.6 Glossary

/				
Term	Explanation and Example Brief			
HOME	Full linux directory path to the user's home di- rectory, e.g. /home/xavier45			
PROJECT_HOME	bcated inside HOME directory can be a soft project direct hk path			
Projectname	e.g., Servilleta a National Wildlife Refuge in New Mexico, U.S.A.	name of the project		
spare_dir	can be left empty	a bonus directory		
date	053018	Of field work		
component	Z stands for vertical and and H can be horizon- tal but any name is possible	Geophone particle displacement com- ponent		
line	1	used to identify a profile		
user	e.g., xavier45	login name		

subUser	must be set to the user's login name, e.g.,also xavier45	Allows groups to share Project space		
flow	Data_in, sugain, suximage	Sequence of pro- grams to execute		
geomaps	Directories will be created when working with- maps	Directories for third- party software (if in- stalled and accessi- ble)		
sqlite	Databases	Directories for third- party software (if in- stalled and accessi- ble)		
gmt GMT		Directories for third- party software (if in- stalled and accessi- ble)		
grass	GRASS GIS	Directories for third- party software (if in- stalled and accessi- ble)		

Table 1: Definitions of terms used when creating working projects

2 Demonstration Projects

When either creating a new project or accessing a preexisting project instances, always start by running the following instruction: % SeismicUnixGui

2.1 A Quick start to preparing a demonstrations

2.1.1 Where are my data sets stored?

Before starting a new project you should understand the file structure in which programs and data sets are stored. The main directories are shown above for the example of Servilleta_demos in Section 1.4.

2.1.2 Install example flows and data sets

Several example projects that contain data and examples flows can help you become acquainted with the Seismic Unix Tools. For example:

- Servilleta_demos contains files from the 2018 IRIS internship orientation program
- LSBB contains files from Pau University in France, courtesy of Dominique Dominique Rousset and Guy Sénéchal, both extensive contributors to the improvement of Seismic Unix.
- Demos contains general demonstrations of tools not included in the previous tutorials

The following is explained the SeismicUnixGui Installation manual (Section 1.3.6) but is repeated here for convenience of the user. Once you completely instal SeismicUnixGui on your system, you can move or copy any of the accompanying demonstration folders to the home directory of the user, where /home/user is the complete path to the location of the user (="gllore").

% cp -R \$installation_directory_for_SeismicUnixGui/SeismicUnixGui/demo_projects/Servilleta_demos /home/gllore/

% cp -R \$installation_directory_for_SeismicUnixGui/SeismicUnixGui/ demo_projects/LSBB /home/gllore/

% cp -R \$installation_directory_for_SeismicUnixGui/SeismicUnixGui/ demo_projects/demos /home/gllore/ 2.1.3 Create a new project, e.g., Servilleta_demos (IRIS demonstration data set)

The following instruction starts the program:

% SeismicUnixGui

If you do not have any projects created previously, then:

<MB1> Create New

Otherwise, go to next section 2.1.5: Open a pre-exisitng project

After clicking on Create New, a default set of parameter names (e.g., **HOME**) and their values (e.g. **/home/gllore**) appears:

liour		
HOME	/home/gllore	
PROJECT_HOME	/home/gllore/Servilleta	
site	oma_blanca	
spare_dir	 "	
date	053018	
component	Н	
line	1	
subUser	gllore	
geomaps	no	
sqlite	no	
gmt	no	
grass	no	

Figure 1: Screen capture of Project Selector Pane with parameters and their values

The Project Selector pane displays several default options that work with the test data set that is included for this tutorial. The old variables are defaulted from prior projects and serve as an example to guide your input. The home directory of the user is required to follow the standard linux file structure naming system.

These options should be <u>updated</u> with an actual <u>user</u> name, for example:

Parameter name	Default values	User's new values
HOME	/home/gllore	home/user
PROJECT_HOME	/home/gllore/Ser- villeta_demos	/home/ user /Servilleta_demos
Site	Servilleta	loma-blanca
spare_dir	<i>u</i> (<i>i</i>)	
date	053018	053018
component	Z	н
line	2	1
subUser	gllore	user
geomaps	no	no
sqlite*	no	no
gmt*	no	no
grass*	no	no

 Table 1: Suggested changes to parameter vlaues

* if set to 'yes' only the directories will come to be created although the accompanying programs are not yet available in this version (Nov. 2019)

Finally, select: <MB1> OK

2.1.4 For the IRIS Data set, confirm you are working Project called "Servilleta_demos"

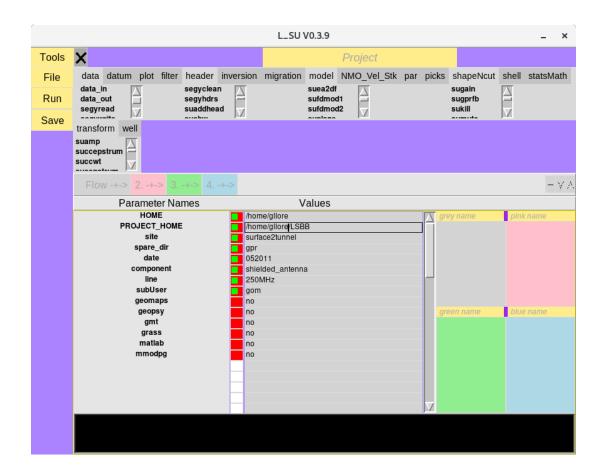
ĺ			L_SU V0.3.9	_ ×
	Tools	X	Project	
	File			par picks shapeNcut shell statsMath
	Run	data_in segyclean data_out segyhdrs segyread suadhead	suea2df sufdmod1 sufdmod2	sugain sugprfb sukill
	Save	transform well suamp succepstrum succevt		
		Flow -+-> 2+-> 3+-> 4+->		- Y.
		Parameter Names	Values	
		HOME PROJECT_HOME site spare_dir date	/home/gllore /home/golloreServilleta_demos loma_blanca	grey name pink name
		component line subUser geomaps	053018 H	
		geopsy gmt grass matlab mmodpg sqlite	no no no yes no	green name blue name

In the top left menu, select <MB1> Tools->Project

In the main window of the SeismicUnixGui GUI you should see the previous changes you made to the same parameter values. It they are incorrect (the figure above show an inconsistent use of the user name) you can modify them again and, whothout exiting this window you can then select:

In the top left menu: <MB1> Save->Run

2.1.5 For the GPR data sets (from LSBB), confirm you are working Project called "LSBB"

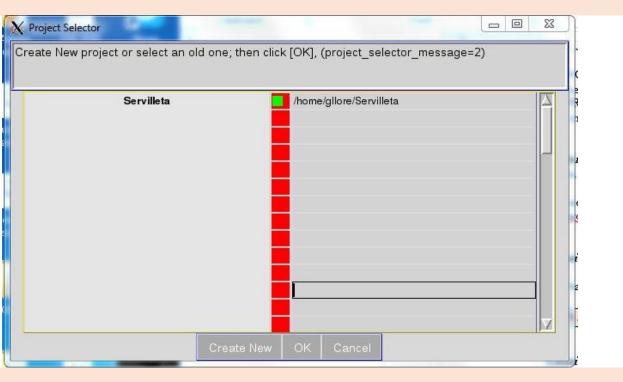


2.1.6 For the remaining Demo Project confirm you are working Project called "demos"

2.2 Open a pre-existing project

2.2.1 The following instruction starts the program, and open the pane of the Project Selector window:

% SeismicUnixGui



If the project of interest (in this case Servilleta_demos) is selected (button is green) :

Select: <MB1> on OK

2.3 Running your first flows

Assemble a sequence of modules to carry out a processing procedure. Choose one of four differently colored flow windows (grey, pink, green and blue) in which to place your sequence. The colored window appear on the right-hand side of the main window.

A module, with a specific functionality, is selected by clicking on its name from within the list on <u>the left-hand side of the main window</u>.

The module name must be <u>transferred</u> to the list on the right by clicking one of <u>the four dif</u><u>ferent colored flow arrows</u>, just to the right of the word "Flow".

A final assembled flow must first be saved to a file before it is executed (**File->SaveAs**). Thereafter all executions <u>require</u> that the flow be first <u>saved</u> before running.

In a simple sequence of modules, data are usually read in first, the data is modified and the result is placed into another file or displayed using an imaging module (e.g., suximage, suxwigb)

			L_SU V0.3	9				_ ×
Tools	×			evince				
File	data datum plot filter				par picks			atsMath
Run	data_in data_out segyread	segyclean segyhdrs suaddhead	sufd	mod1 and and a mod2		sugain sugprfb sukill	Ê	
Save	transform well	auahur 🖂	a.ml			a	1.4	
	succepstrum							
	Flow -+-> 2+-> 3.	-+-> 4+->						$-\vee \wedge$
	Parameter Na	mes	Value	s			_	
	help page named fullscreen presentation preview find display				da	swigp_out.p/ ata_in upswigp ata_out	plot_ps. data_in evince	
					V			

1. Select the following named modules: *data_in, supswig, and data_out*. Click on each names inside list on the left side of the window. When you do that, the words in the row immediately above will become activated. You will then be able to click on the words inside the grey box:

Flow-+->

You should be able to see the name of the program that you just selected move over to a colored box on the right-hand side of the window.

Select each of the three program names: *data_in, supswigp*, and *data_out*

2. You are required to select a Value for base_file_name (= "file name").

To do so, move your cursor into the corresponding row to the right of **base_file_name**.

A click of the right-mouse-button will automatically open a second window from which you can select a file, e.g. **"103.su"**.

Before you can run the program you have built, it must be saved:

For SeismicUnixGui GUI

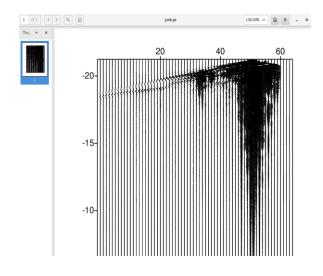
<MB 1> File/SaveAs

Save the resultant perl script file as, e.g.,

"pswigp_out.pl"

Then, click on

Tool: <MB 1> Run



Postscript plot viewed using the GUI

Tool: <MB1> Run

2.3.1 Perl and Shell script flows generated by SeismicUnixGui

GUI-generated perl script: plot_ps.pl

To run from the command line in the directory where the perl flows are kept (see 1.4.3):

% perl plot_ps.pl

To run the bash script from the command line that is generated by plot_ps.pl:

% evince /home/gllore/Servilleta_demos/seismics/images/ps/loma_blanca//053018/H/1/gllore/junk.ps &

(Note that pswigp_out.pl is run first and and plot_ps.pl second.

2.3.2 Access to Documentation

Select **<MB3>** over the name of the program:

	Tkpod: /usr/local/pl/L_SU/sunix/shapeNcut/suwind.pm _ 🗖 🗙						
Fil	e <u>V</u> iew <u>S</u> earch History Section		<u>H</u> elp				
Δ	SEISMIC UNIX NOTES						
	SUWIND - window traces by key word						
	suwind <stdin>stdout [options]</stdin>						
	Required Parameters: none						
	Optional Parameters: verbose-01 for verbose key-trac1 Key header word to window on (see segy.h) min-LONG_MIN min value of key header word to pass max-LONG_MAX max value of key header word to pass						
	abs=0 =1 to take absolute value of key header word j=1 Pass every j-th trace s=0 based at s (if ((key - s)%j) == 0) skip=0 skip the initial N traces count-ULONG_MAX up to count traces reject=none Skip traces with specified key values						
	accept=none Pass traces with specified key values(see notes) processing, but do no window the data ordered=0 =1 if traces sorted in increasing keyword value =-1 if traces are sorted in a decreasing order						
	Options for vertical windowing (time gating): dt=tr.dt (from header) time sampling interval (sec) (seismic data) =tr.dl (nonseismic)						
	fl=tr.delrt (from header) first sample (seismic data) =tr.fl (nonseismic)						
	<pre>tmin=0.0 min time to pass tmax=(from header) max time to pass itmin=0 min time sample to pass itmax=(from header) max time sample to pass nt=itmax=itmin+1 number of time samples to pass</pre>						
	Notes: On large data sets, the count parameter should be set if possible. Otherwise, every trace in the data set will be examined. However, the count parameter overrides the accept parameter, so you can't specify count if you want true unconditional acceptance.						
	The skip= option allows the user to skip over traces, which helps for selecting traces far from the beginning of the dataset. Caveat: skip only works with disk input.						
	The ordered= option will speed up the process if the data are sorted in according to the key.						
	The accept option is a bit strangeit does NOT mean accept ONLY the traces on the accept list! It means accept these traces, even if they would otherwise be rejected (except as noted in the previous paragraph). To implement accept-only, you can use the max=0 option (rejecting everything). For example, to accept only the tracl values 4, suwind max=0 accept+4,5,6						
	Another example is the case of suppressing nonseismic traces in a seismic data set. By the SEGY standard header field trace id, trid=1 designates traces as being seismic traces. Other traces, such as calibration traces may be designated by another value.						
	Example: trid=1 seismic and trid=0 is nonseismic. To reject nonseismic traces suwind key=trid reject=0						

Conventional Seismic Unix documentation for the modul: suwind

3 Simple Processing Flow: IRIS Data Set, Socorro New Mexico

Each year Incorporated Research Institutions for Seismology (IRIS) hold an orientation week for undergraduate research interns in the town of Socorro, New Mexico. As part of a week of training, the on May 30 of 2018, the students collected an active-source seismic data set, which we process using Seismic Unix.

3.1 Processing steps

The following outline is taken from a called notes.pl. This files exists in the perl flow directory (1.4.3) of the Servilelta_demos project. To get there change to the following directory:

```
% cd /home/user/seismics/pl/site/component/line/user
```

To see the marked-up contenst of the perl file:

%perIdoc notes.pl

LOMA BLANCA					
IRIS 2018 survey May 30 2018 on S bank of Rio Salado along same line as pseudo-walkaway taken on 032618 shoot-through					
Acquisition pa	aramters				
Date	053018				
SI	1000 S/s				
delrt	-11 ms				
rec. length	2 s				
num tracr	64				
Live channels	1-64				
		recorder towar	d SE		
Channel 64	farthest fi	rom recorder to	oward NW		
geophones: G	ieospace	28 Hz L-4 3 com	ponent		
geophone spa	acing: 1 m				
line orientation	on: NW-SE	later shots more	e toward NW		
Number of Ge	-	60			
Shotpoint Spa	-				
GPS is availab	ole (etrex garmi	n 10 m)			
	(sx-m) NOM	INAL offset-m	• •		
Raw SP 1	0	1-60	0.5 - 59.5		
Raw SP 2	1	0-59	-0.5 - 58.5		
Raw SP 3	2	-1-58	-1.5 - 57.5		
Raw SP 4	3	-2-57	-2.5 - 56.5		
Raw SP 60	59	-58-1	-58.5 - 0.5		
Striker plate	I-beam				
Hammer	10 lb sl	edge			
No. blows	No. blows 3 per side				
Noise sources: 5 - 10 mph from SE					
I-25					

Acquisition parameters taken from the file notes.pl

3.2 STEP 1. File format conversion

Tool: Seg2su

(from GUI)

Purpose: Convert Seg2 to Seismic Unix format Input: 1 to 120.dat Output: 1 to 120.su

3.3 STEP 2. Concatenate files

Tool: **Sucat** (from GUI) Purpose: cat all files Input: 1.su to 120.su Output: 1_120.su Uses: /home/gllore/Servilleta_demos/seismics/pl/loma_blanca/053018/**Sucat.config**

SeismicUnixGui Gui:

			_ ×			
Tools	×			Sucat		
File				NMO_Vel_Stk pa	r picks shapeNcut	shell statsMath
Run	data_in data_out segyread	segyclean segyhdrs suaddhead	suea2df sufdmod sufdmod		sugain sugprfb sukill	
Save	transform well	anahur 🖂	auniana	p.e.	armarita	
	suamp succepstrum succwt					
	Flow -+-> 2+-> 3	+-> 4+->				- V A
	Parameter Na		Values			
	first_file_number last_file_number number_of_files_ input_suffix input_name_pre	_in 120 _in 121 	I		data_in	pink name
	input_name_exten list output_file_nam alternative_inbound_d	e 1_1 irectory	20		-	
	alternative_outbound_o				green name	blue name

3.4 STEP 3. Clean headers

Flow name: Suclean_geom.pl

(from GUI)

Purpose: Modify the geometry headers for shoot-through survey

by wiping certain headers and populating new ones

Input: 1_120.su Output: 1_120_clean_geom.su

3.5 STEP 4. Window the shotpoint gathers (from GUI)

Flow name: Suwind.pl

(from GUI)

Purpose: Allow ONLY traces traces 1-60 data: time 0 s to 1 s

Input: 1_120_clean_geom.su Output: All.su

To view the data as an image: view_All.pl (Select and run Flow in GUI)

3.6 STEP 5. Separate shear-wave shots from alternate direc-

tions

Flow name<mark>: % perl Sudiff.pl (from command line, and in the "pl" directory)</mark> Input: All.su Output: L28HzHit_fromNE.su and L28HzHit_fromSW.su

Extract and group 'from-NE_shotgathers' from 'from-SW-gathers'

3.7 STEP 6. Negative stack

Flow name: **suop2.pl** (from GUI) Input: L28HzHit_fromNE.su and L28HzHit_fromSW.su Output: L28Hz_Ibeam.su

Subtract 'from-NE_shotgathers' from 'from-SW-gathers'

To view the data: view_L28Hz_Ibeam.pl (from GUI)

3.8 STEP 7. Add values for headers--gx,ep,sx

Flow name: **SuGeom2.pl** (from GUI) Purpose: populate headers with meaningful values; header names are: sx, gx, ep (explosion point), tracl, tracf, fldr Input: L28Hz_Ibeam Output: L28Hz_Ibeam_geom2

tracl now counts the sequential increase of traces for the whole line tracf and fldr are now removed completely ep signifies the shotpoint number sx is the x location (m) of the shotpoint gx is the x location (m) of the geophone

To verify new header parameters: SuPlotHeader.pl (from GUI)

To view new header parameter numerical values: **suxedit** If you want to directly view the data change to the current data directory (2.4.1):

4 % cd /home/gllore/Servilleta_demos/seimics/data/loma_blanca//053018/H/1/su/user

And then when you are in the correct data directory:

5 % suxedit L28Hz_lbeam_geom2

(at trace number = 181):

>

tracl=181 tracr=1 ep=4 sx=3 gx=1 ns=1001 dt=1000

5.1 STEP 8. Modify Header files--offsets

make_offsets.pl (from GUI)

Purpose: Calculate offsets from the headers

Input: L28Hz_Ibeam_geom2 Output: L28Hz_Ibeam_geom3

Confirm the result by examing the numerical values for offset:

% cd /home/gllore/Servilleta_demos/seimics/data/loma_blanca//053018/H/1/su/user

And then when you are in the correct data directory:

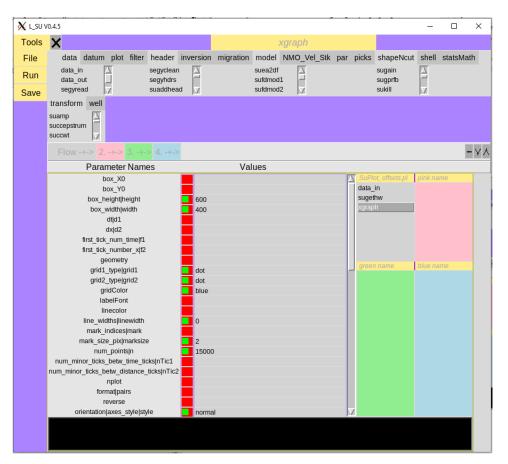
% **suxedit** L28Hz_lbeam_geom3

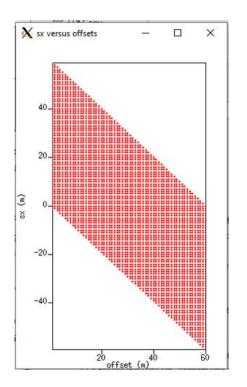
```
(at trace number = 181):
```

>

tracl=181 tracr=1 ep=4 offset=-2 sx=3 gx=1 ns=1001 dt=1000

Graphically, verify new header parameters using **SuPlot_offsets.pl** (from GUI)





Plotted header values of sx versus offset display a regular geometric pattern that reflects the regular acquisition geometry of sources versus offest used in the experiment.

Verify the new header parameter values using suxedit

Convention: Positive offets are when geophones lie N of shot. Negative offsets are when shot lies N geophone

% cd /home/gllore/Servilleta_demos/seimics/data/loma_blanca//053018/H/1/su/**user**

And then when you are in the correct data directory:

% suxedit L28Hz_Ibeam_geom3.su

5.2 STEP 8. Modify Header files--Make CMP's make_cmp.pl (from GUI)

Purpose: Put cdp values in the "cdp" headers

Input: L28Hz_Ibeam_geom3 Output: All_cmp

Numerically verify new header parameters using **suxedit** Convention: The range of cdp varies systematically

% cd /home/gllore/Servilleta_demos/seimics/data/loma_blanca//053018/H/1/su/user

And then when you are in the correct data directory:

% perl **suxedit** All_cmp.su

Records 59 through 61 are as follows:

59

tracl=59 tracr=59 ep=1 cdp=29 offset=59 gx=59

ns=1001 dt=1000

> 60

tracl=60 tracr=60 ep=1 cdp=30 offset=60 gx=60

ns=1001 dt=1000

> 61

tracl=61 tracr=1 ep=2 cdp=1 sx=1 gx=1

ns=1001 dt=1000

5.3

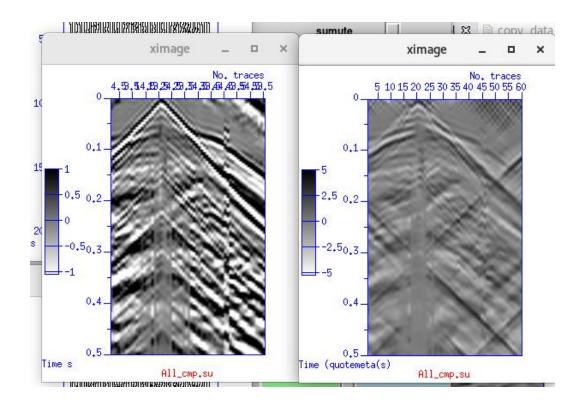
5.4 STEP 9. Dip filter

Tool: ifk (interactive velocity filtering)

Purpose: Useful for separation of reflections from surface waves Uses: /home/gllore/Servilleta_demos/seismics/pl/loma_blanca/053018/Sucat.config

SeismicUnixGui Gui

		L_SU V0.3.9	_ ×
Tools	X	iTopMute	
File Run	data datum plot filter header in sudipfilt sustoit sufilter supef	rersion migration model NMO_Vel_Stk suea2df sufdmod1 sufdmod2	par picks shapeNcut shell statsMath sugain sukill
Save	suamp	teractive Top Mute X	
	Flow -+-> 2+-> 3+-> 4+-		
	Parameter Names	Values	
,	base_file_name gather_header offset_type first_gather gather_inc last_gather freq gather_type min_ampiltude	All.cmp ep tracl 30 49 0.3.150,200 SP 59 -9	Sunmo_sustack.pl suop2.pl data_in suop2 susort data_out sufilter sunmo sustack sugain suximage
	max_amplitude	5	piot_tract/softset,p_view_Alppi diata_in data_in sugethw sugain xgraph suximage

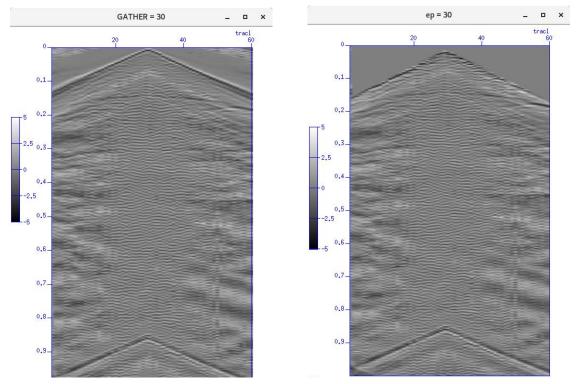


Before (left) and after (right) f-k filtering

5.5 STEP 10. Test Muting of surface waves and refracted waves Tool: **iBottomMute** Interactive Top Bottom Mute,SP 1

Testing- not used in this flow Input: Output: Uses: Uses: /home/gllore/Servilleta_demos/seismics/pl/loma_blanca/053018/Sucat.config

				L_SU	V0.3.9							_ ×
Tools	X				i	ТорМи	te					
File Run	data datum plot sudipfilt sufilter supef	filter heade sustolt		migration	model suea2df sufdmod sufdmod	1	el_Stk	par	picks	shapeNcut sugain sugprfb sukill	shell	statsMath
Save	transform well suamp succepstrum succvt	CALC 🕹 NE	(т 🕹 ріск	ve Top Mut		EXIT	×					- V A
		er Names	F+->	V	/alues							- ¥ /
	base_file gather_h offset_ first_g gather last_ge free gather_ min_am;	eader type ather _inc ather q type plitude	SP	cmp					da su su su su su su	nmo_sustack.p ta_in sort filter nmo stack gain ximage	suop data	2 _out
	max_am	plitude	5						da su	o <u>t_traciVsoffset</u> ta_in gethw raph	p view data suga suxir	_in in
						pt (100)						



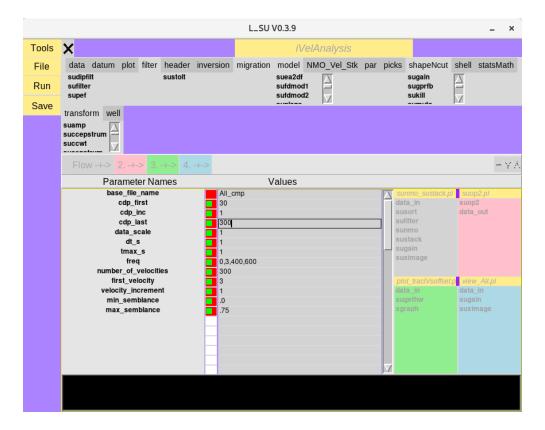
(Left) Before and after (Right) images of cdp=30 gather generated during application of interactive top-muting Tool.

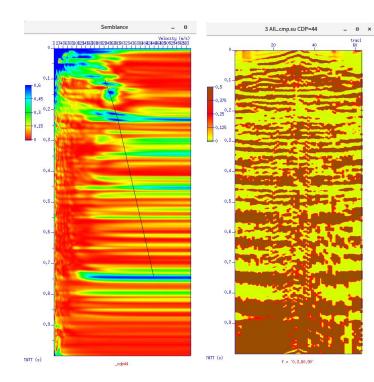
5.6 STEP 11. Test Semblance Analysis

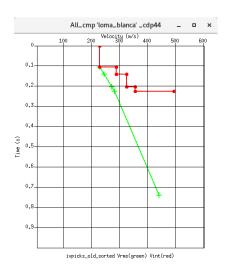
Tool iVA: Interactive velocity analysis

Uses: Uses: /home/gllore/Servilleta_demos/seismics/pl/loma_blanca/053018/iVA.config

SeismicUnixGui Gui







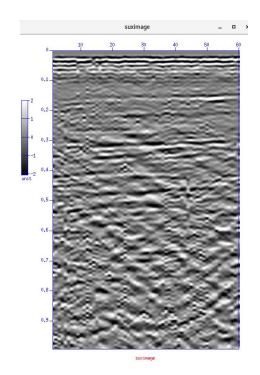
Velocity-time picks interpreted from the semblance plot (far left)

(Left) Velocity verusus time and semblance image (left) and two selected points connected by a line. (Right) CDP/CMP gather analyzed in the adjoining semblance image. Data are NMO-corrected with the two velocitytime values selected in the semblance image.

5.7 STEP 12. Normal Moveout and Stacking

Uses two velocity-time pairs from the iVA above. **STEP 12: SeismicUnixGui Gui:**

Run sudipfilit suadhead suea2df sugain supf suchw sufate sugain supf sugathw sufate sugain supf sugathw sufate sugain supf supf sugathw sufate sugain supf sugathw sufate sugathw supprise transform well succeptrum succeptrum succeptrum succeptrum succeptrum succeptrum succeptrum succeptrum Flow ++> 2.++> 3.++> 4.++> Parameter Names Values data_in succeptrum absclip/clip abalance succeptrum succeptrum succeptrum balance hiclip/wclip abak succeptrum succeptrum succeptrum		
Run sudipfilit suadhead sue2df sugarh sugarh Save transform well sudimod2 sudimod2 sugarh Flow -+-> 2+-> 3.++-> 4+-> Parameter Names Values absclip/clip alance floip/bclip sus of data sus of data balance hiclip/wclip balank sus of data sumo sumo		
Run suffier suchw suffier sugethw suffier Save ransform well succepstrum succepstrum succepstrum succepstrum Flow ++> 2.++> 3.++> Parameter Names Values absclip/clip ausort balance hiclip/wclip locilp/bclip ausort balank summo	statsMath	
Save transform well suamp succepstrum su		
Success Summo_sustack.pl Parameter Names Values absclip/clip absclip/clip balance absclip/clip hiclip/wclip absclip/clip balank summo_sustack.pl		
Parameter Names Values Balance Adsclip/clip Ada_in suo hiclip/wclip balance susort data_in suo billoclip/bclip balance susort data_in suo billoclip/bclip balance susort data_in suo		
absclip/clip 2 sumo_sustack.pl suc balance data_in suc hiclip/wclip susort data loclip/bclip susitiler sufilter blank sumo sumo	$-\vee \wedge$	
balance data_in suo hiclip wclip loclip bclip blank sunmo		
hiclip/wclip susort data loclip/bclip blank summo	op2.pl	
loclipibclip blank sufficer sumo		
blak sunmo	a_out	
blockinterp sustack s		
bperc sugain sugain		
cmap sv0 suximage		
curve dia		
	w_All.pl	
curvefile data_in data		
curvewidth sugethw sug		
	image	
y_tick_increment d1num		
dx d2 1.0 x tick increment d2num		
first time sample value f1 0.0		
first time tick num/f1num		
first_distance_sample_value f2		

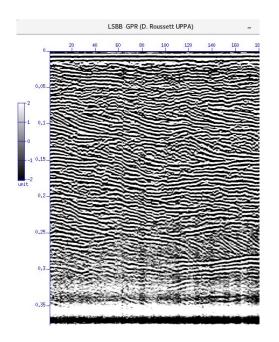


STEP 12: Output image of field data

6 Simple Processing Flow for GPR data

SeismicUnixGui GUI:

							L_SU	v0.3.9						_ ×	
Tools	X														mΝ
File			plot	filter			n migration		NMO_Vel_Stk	par	picks			statsMath	/g /0
Run	data_i data_o segyre	out ead	Z		segyclea segyhdra suaddhe	; =		suea2df sufdmod sufdmod				sugain sugprfb sukill			pl
Save	transfo				aah	1 M		armlana	J.V.				J.X.		50 18
	suamp		1												=0
	succep: succwt	strum													ro \.
															=u
		V -+->				-+->								- ¥ ,	ά δ
		Par	amet	er Na	mes		Values								
												e_process_late ta in	ra viev data		=6 se
											sus	shw static	sust	w	se
											sug	gain	suga	un	
												filter ta_out	sufil	ter mage	- 1
											- uu	u_out	JUAN	muge	a_
															se
													blue	e name	t.
															 18
															id
															wt 0+
															9+
	_														d: a
															se



Output image of GPR data

7 Perl and Shell script flows generated by SeismicUnixGui

7.1 IRIS Data Set, Socorro, New Mexico

Project Name: Servilleta_demos

STEP 2: GUI Tool Name: Sucat

Uses: /home/gllore/Servilleta_demos/seismics/pl/loma_blanca/053018/Sucat.config

To run from the command line in the directory where the perl flows are kept (see 1.4.3)

% Sucat

STEP 5: GUI-generated perl script: suop2.pl

To run from the command line in the directory where the perl flows are kept (see 1.4.3):

% perl suop2.pl

To run the bash script from the command line that is generated by suop2.pl:

% suop2 \/home\/gllore\/Servilleta_demos\/seismics\/data\/loma_blanca\/\053018\/H\/1\/su\/gllore\/L28HzHit_fromNE\.su \/home\/gllore\/Servilleta_demos\/seismics\/data\/loma_blanca\/\053018\/H\/1\/su\/gllore\/L28HzHit_fromSW\.su op=diff > /home/gllore/Servilleta_demos/seismics/data/loma_blanca//053018/H/1/su/gllore/L28Hz_Ibeam.su &

STEP 5: GUI-generated perl script: view_L28Hz_lbeam.pl

To run from the command line in the directory where the perl flows are kept (see 1.4.3):

% perl view_L28Hz_lbeam.pl

To run the bash script from the command line that is generated by view_L28Hz_lbeam.pl:

% sufilter f=3\,6\,50\,80 verbose=0 < /home/gllore/Servilleta_demos/seismics/data/loma_blanca//053018/H/1/su/gllore/L28Hz_Ibeam.su | sugain agc=1 wagc=0\.1 | suximage clip=1 cmap=hsv0 d2=1 f1=0 gridcolor=blue labelcolor=blue labelfont=Erg14 legend=1 legendfont=times_roman10 lwidth=16 lx=3 mpicks=\/dev\/tty n1tic=1 n2tic=1 perc=100 plotfile=plotfile\.ps style=seismic title=suximage titlecolor=red titlefont=Rom22 tmpdir=\.\/ units=unit verbose=1 windowtitle=suximage wperc=100 xbox=500 ybox=500 hbox=550 &

STEP6: GUI-generated perl script: SuGeom2.pl

To run from the command line in the directory where the perl flows are kept (see 1.4.3):

% perl SuGeom2.pl

To run the bash script from the command line that is generated by SuGeom2.pl:

% sushw a=0\,1\,1 j=60\,60\,60 key=sx\,gx\,ep b=0\,1\,0 c=1\,0\,1 < /home/gllore/Servilleta_demos/seismics/data/loma_blanca//053018/H/1/su/gllore/L28Hz_Ibeam.su > /home/gllore/Servilleta_demos/seismics/data/loma_blanca//053018/H/1/su/gllore/L28Hz_Ibeam_geom2.su & **STEP 7**: GUI-generated perl script: SuGeom3.pl

To run from the command line in the directory where the perl flows are kept (see 1.4.3):

% perl SuGeom3.pl

To run the bash script from the command line that is generated by SuGeom3.pl:

% suchw a=0 b=1 c=\-1 d=1 e=1 f=1 key1=offset key2=gx key3=sx < /home/gllore/Servilleta_demos/seismics/data/loma_blanca//053018/H/1/su/gllore/L28Hz_Ibeam_geom2.su > /home/gllore/Servilleta_demos/seismics/data/loma_blanca//053018/H/1/su/gllore/L28Hz_Ibeam_geom3.su &

STEP 7: GUI-generated perl script: plot_traclVsoffset.pl

To run from the command line in the directory where the perl flows are kept (see 1.4.3):

% perl plot_traclVsoffset.pl

To run the bash script from the command line that is generated by plot_traclVsoffset.pl:

% sugethw key=tracl\,ep output=binary < /home/gllore/Servilleta_demos/seismics/data/loma_blanca//053018/H/1/su/gllore/L28Hz_Ibeam_geom3.su | xgraph grid1=dot grid2=dot gridColor=4 linewidth=0 marksize=1 n=15000 reverse=0 style=normal title=blue windowtitle=windowtitle x1beg=0 x1end=120 x2beg=0 x2end=100 label2=ep label1=tracl -geometry 400x600+0+0 &

STEP 8: GUI-generated perl script: make_cmp.pl

To run from the command line in the directory where the perl flows are kept (see 1.4.3):

% perl make_cmp.pl

To run the bash script from the command line that is generated by plot_traclVsoffset.pl:

suchw a=0 b=1 c=1 d=2 e=1 f=1 key1=cdp key2=gx key3=sx < /home/gllore/Servilleta_demos/seismics/data/loma_blanca//053018/H/1/su/gllore/L28Hz_Ibeam_geom3.su > /home/gllore/Servilleta_demos/seismics/data/loma_blanca//053018/H/1/su/gllore/All_cmp.su & STEP 12: GUI-generated perl script: sunmo_stack.pl

To run from the command line in the directory where the perl flows are kept (see 1.4.3):

% perl sunmo_stack.pl

To run the bash script from the command line that is generated by sunmo_stack.pl:

% cdp offset < /home/gllore/Servilleta_demos/seis-

mics/data/loma_blanca//053018/H/1/su/gllore/All_cmp.su | sufilter f=10\,20\,70\,80 verbose=0 | sunmo invert=0 lmute=25 smute=1\.5 sscale=1 tnmo=0\,1 upward=0 vnmo=100\,600 | sustack key=cdp normpow=0 nrepeat=1 repeat=0 verbose=0 | sugain agc=1 wagc=0\.2 tmpdir=\/tmp | suximage clip=2 cmap=hsv0 d2=1 f1=0 gridcolor=blue labelcolor=blue labelfont=Erg14 legend=1 legendfont=times_roman10 lwidth=16 lx=3 mpicks=\/dev\/tty n1tic=1 n2tic=1 perc=100 plotfile=plotfile\.ps style=seismic title=suximage titlecolor=red titlefont=Rom22 tmpdir=\.\/ units=unit verbose=1 windowtitle=suximage wperc=100 xbox=500 ybox=500 wbox=550 hbox=550 &

7.2 GPR data

Collected in Low-Noise Underground Gallery (LSBB) in southern France forming by Dominique Rousset of the Université de Pau et des Pays de l'Adour (UPPA) Institut Pluridisciplianire de Recherche Appliqué

Project Name: LSBB

To run the bash script from the command line that is generated by view_LSBB-1.pl:

To run from the command line in the directory where the perl flows are kept (see 1.4.3):

% perl view_LSBB-1.pl

In the case immediately above, the location of the perl flow is in the following directory: /home/gllore/LSBB/seismics/data/surface2tunnel/gpr/052011/shielded_antenna/250MHz/su/gllore/. In this example "gllore" is the name of the user and should be changed in your particular case.

To run the bash script from the command line that is generated by .pl:

% sushw a=9\,1 key=tstat\,cdp b=0\,1 < /home/gllore/LSBB/seismics/data/surface2tunnel/gpr/052011/shielded_antenna/250MHz/su/gllore/LSBB1\-1.su | sustatic hdrs=1 | sugain mbal=1 tmpdir=\/tmp | sufilter f=0\,30\,400\,500 verbose=0 | suximage clip=2 cmap=hsv0 d2=1 f1=0 gridcolor=blue labelcolor=blue labelfont=Erg14 legend=1 legendfont=times_roman10 lwidth=16 lx=3 mpicks=\/dev\/tty n1tic=1 n2tic=1 perc=100 plotfile=plotfile\.ps style=seismic title=suximage titlecolor=red titlefont=Rom22 tmpdir=\.\/ units=unit verbose=1 windowtitle=LSBB\ \ GPR\ \(D\.\ Roussett\ UPPA\) wperc=100 xbox=500 ybox=500 wbox=550 hbox=550 &

7.3 General tools

7.3.1 How to mute a data set consisting of a range of multiple gathers

Data set: