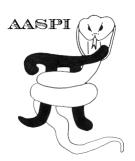
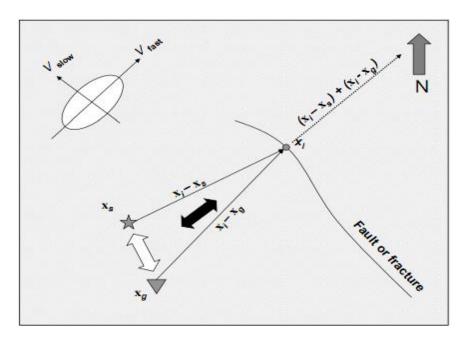
PRESTACK STRUCTURE-ORIENTED FILTERING – PROGRAM aaspi_azim_offset_mig



PROGRAM aaspi_azim_offset_mig

Program **aaspi_azim_offset_mig** is a prestack time migration based on the Kirchhoff algorithm which adds the anti_aliasing operator based on Gray, S. H. (1992). Program **aaspi_azim_offset_mig** divides the seismic data into bandpass filtered data, and then migrates the data on selective frequency based on the dip information from source and receiver to image point.

Perez and Marfurt (2008) proposed a new azimuth binning algorithm for Kirchhoff prestack migration, consisting of sorting the seismic data by the azimuth of average travel path from source to subsurface image point and back to receiver, rather than the azimuth between source and receiver directly. The new azimuth binning allows for identification of image contribution from out-of-the-plane, steeply dipping reflectors, fractures, and faults, and it can migrate the original seismic data to be 5 dimensional gathers (e.g. *time, azimuth, offset, cdp_no, Line_no)*.



Kui and Marfurt (2009) modified the migration to utilize MPI, which can now run on numerous processors, reaching high levels of efficiency.

Launching the Graphical User Interface (GUI) - aaspi_azim_offset_mig

You can open the Prestack Utility from the aaspi_util GUI (or type : aaspi_util_prestack)

🗙 AASPI program aaspi_util - Post Stack Utilities (Release Date: September 19, 2013)	<u> </u>
Eile Volumetric Attributes Formation attributes Display Tools Other Utilities Set AASPI Default Parameters	<u>H</u> elp
SEGY to AASPI format conversion (multiple files) AASPI to SEGY format conversion (multiple files) AASPI to SEGY format conversion (single file) AASPI QC Plotting AASP AASPI QC Plotting AASP	
AASPI Prestack Utilities (Pre-stack data conditioning, Migration, AVAz, NMO, Sort, Stack, etc.) AASPI Prestack Utilities AASPI Prestack Utilities	
(c) 2008-2013 AASPI - The University of Oklahoma	

The following GUI appears:

24. Prestack migration – Program aaspi_azim_offset_mig

🗙 AASPI program aaspi_util_pre	stack (Release Date: September 1	9, 2013)		
<u> </u>	Display Tools Other Tools		<u>H</u> elp	
SEG formal <u>a</u> zim_offset_mig (mig <u>s</u> of_prestack	format conver	AASPI to SEGY format conversion (single file)		
Conv <u>r</u> otate_2c_by_2c <u>c</u> rop_prestack	m SEGY to AASF	m SEGY to AASPI format (regular offset)		
SEGY <u>S</u> ort into separat stack	e gathers	SEGY Header Utility		
SEGY <u>n</u> mo	SGY,*.SEGY):		Browse View EBCDIC He	
Optio <u>r</u> nmo <u>m</u> pnmo	ne (*.prn,*.txt):	NONE	Browse	
AASP <u>i</u> va <u>v</u> el ascii2aaspi				
Verbo <u>a</u> vaz	7			
VBlock:	10000			
Byte loc. of X coordinate o	of gathers : 181	4 byte int 💌		
Byte loc. of Y coordinate o	f gathers : 185	4 byte int 💌		
Byte loc. of line (inline) no	189	4 byte int 💌		
Byte loc. of cdp (xline) no.	.: 193	4 byte int 💌		
Byte loc. of offset value :	37	4 byte int 💌		
Byte loc. of azimuth value	197	4 byte int 💌		
Override scalco :	0 - use value in	header 💌		
Override Value of first san	nple (ms) : 0			
Vertical Unit :	s 💌			
Horizontal Unit :	ft 💌			
Amplitude Threshold :	1E+10			
<u>E</u> xecute				
(c) 2008-2013 AASPI - The	University of Oklahoma			

Note: You can also invoke the **aaspi_azim_offset_mig** GUI directly, by typing:

aaspi_azim_offset_mig &

24. Prestack migration - Program aaspi_azim_offset_mig

AASPI - program azim_offset_mi	ia (Release Date: September 19, 1	2013)	
<u> </u>	5 (10		Help
3D Kirchhoff prestack time mig	gration into offset and azimu	uth bins	<u> </u>
Seismic Input (*.H):	man_data/cmp_gathers.H	Browse 1	
Velocity Input (*.H):	kman_data/stacking_vel.H		
Fold Map Input (*.H):	n_data/fold_test_project.H		
Offset Information Input (*.H):	, ,		
Mute Input (*.H):		Browse 5	
*Unique Project Name:	test_project	Load default values	
Suffix:	0		
Typical Coordinates E	stended		
Minimum frequency:	Atended 1	2	6
Maximum frequency:		120	
Number of offset bins:		60	7
Minimum Offset:		0	
Maximum Offset:		0000	
nazim:			
Taper length in time:			<mark>_8</mark>
Max emerge angle:		30	<u> </u>
Taper length for migration of	perator:	500	
Migration Aperture:		20000	11
t_power:			<u>12</u> 13
Output amplitude weight file	?		
Output file showing maximum	m frequency imaged at each	n time-offset pair? 🗖	
Apply anti-alias filters?			
		N	
			_
(c) 2008-2013 AASPI - The Un	niversity of Oklahoma		Execute azim_offset_mig

First, (1) select your original seismic gathers, which in this example is cmp_gathers.H. Next (2) select the velocity file, which in this example is stacking_vel.H. As, we have already generated a fold map (3), we input the fold map here, as well as we generated offset information file when we computed the fold, (4) we select the offset information file. Selecting (5) a mute file is optional. Next we see the default parameters. The minimum frequency (6 & 7) and maximum frequency is the frequency range applied to the original gathers before migration. Following that, we see the offset and azimuth information, with default values above, indicating that **aaspi_azim_offset_mig** will migrate the data offsets of 0 ft to 9000 ft, with

a 500 ft increment and single azimuth bin. Also, the taper length (9) in time means the taper applied to the filter. Next is the max emerge angle (10) which denotes the maximum emergence angle to be migrated, and the taper length for migration operator (11) represents the taper length applied to the edge. In addition, you can change the migration aperture (12) as desired, with a default value of 20000 ft. Moreover, you can output the migration weight and alias frequency result if wanted, which can serve as quality control for the resulting migration.

When you click the Coordinates tab, it appears as below:

🗙 AASPI - program azim_offset_mig	g (Release Date: September 19, 2	2013)	
<u> </u>			<u>H</u> elp
3D Kirchhoff prestack time mig	ration into offset and azimu	ith bins	_
Seismic Input (*.H):	man_data/cmp_gathers.H	Browse	
Velocity Input (*.H):	, kman_data/stacking_vel.H	Browse	
Fold Map Input (*.H):	n_data/fold_test_project.H	Browse	
Offset Information Input (*.H):		Browse	
Mute Input (*.H):		Browse	
*Unique Project Name:	test_project	Load default values	
Suffix:	0		
Typical Coordinates Ex	ktended		
Survey Coordinate			
	x1: 5949E+06 y1: 6898		
	x2: 5596E+06 y2: 7028 x3: 7346E+06 y3: 7027		
	x4: 7335E+06 y4: 68974		
	x4. 1/2225+00 34. 10897	49	
(c) 2008-2013 AASPI - The Uni	iversity of Oklahoma		Execute azim_offset_mig

The coordinate information is based on the velocity file. It can read from the velocity history file automatically.

When you click the extended tab, the following window appears:

🗙 AASPI - program azim_offset_mi	g (Release Date: September 19, 2	2013)	
]] <u>F</u> ile			<u>H</u> elp
3D Kirchhoff prestack time mig	gration into offset and azimu	uth bins	
Seismic Input (*.H):	man_data/cmp_gathers.H	Browse	
Velocity Input (*.H):	kman_data/stacking_vel.H	Browse	
Fold Map Input (*.H):	n_data/fold_test_project.H	Browse	
Offset Information Input (*.H):		Browse	
Mute Input (*.H):		Browse	
*Unique Project Name:	test_project	Load default values	
Suffix:	0		
Typical Coordinates E	xtended		
Use MPI:	, प		
Processors per node:	8		
Node list:	localhost		
Verbose:			
Build an LSF Script?	Do Not Run Under LS	1	
Maximum LSF run time (hrs):			
LSF Batch Queue:			
mbytes_per_proc:	2048		
maxtr_per_block:	10000		
First Line Out:	1		
Last Line Out:	158 2		
Skip Line:	1	_	
First CDP Out:	1	_	
Last CDP Out:	127 3]	
Skip CDP:	1		
Start Time/Depth (s or km):	0		
End Time/Depth (s or km):	2		
First Trace:	1		
Last Trace:	288025		
Skip Trace Increment:	1		
threshold:	1E+10		
max_spike	2		
(c) 2008-2013 AASPI - The Un	iversity of Oklahoma		Execute azim_offset_mig

From this window you can choose to use MPI and how many processors per node to use. Also, you can put in control information, for example, there are 158 lines (2) and 127 CDPs (3), you can choose to only output

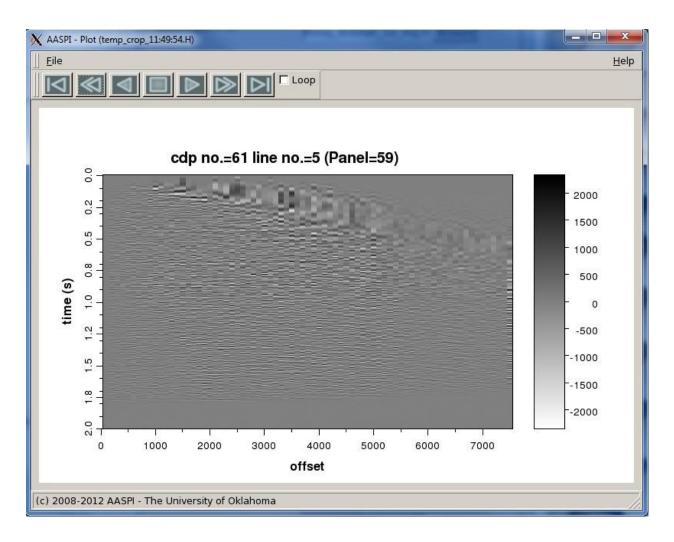
from line 10 to line 120 and from CDP 10 to CDP 100. The same applies with the skip line and skip CDP.

In addition the program will print out information like this to allow you to monitor the program's progress, the flow looks as follows:

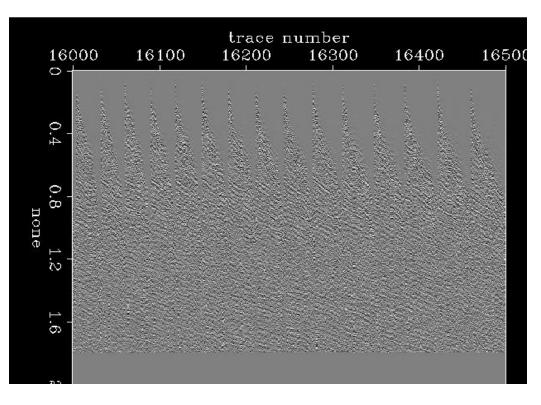
119.048 120.000 39.960 0.001 119.544 120.000 39.960 0.000	0.000E+00 0.000E+00		0.000E+00 0.000E+00	0.105E+01 0.242E+00	
emerge max,tanmax 30.00000	0.5773503				
emerge_max,tanmax 30.00000	0.5773503				
emerge_max,tanmax 30.00000	0.5773503				
emerge_max,tanmax 30.00000	0.5773503				
jr,r,start_amp(jr),end_amp(jr),tm	ax,smin2 0 0.00	00000E+00 0	1000	2.000000	4.5512287E-09
jr,r,start_amp(jr),end_amp(jr),tm	ax,smin2 1 109	.999 11	1000 2.0	00000	4.5512287E-09
jr,r,start_amp(jr),end_amp(jr),tm		.999 21	1000 2.0	00000	4.5512287E-09
jr,r,start_amp(jr),end_amp(jr),tm	ax,smin2 3 329	.998 31	1000 2.0	00000	4.5512287E-09
· · · · · · · · · · · · · · ·		1 100 000	~		

As, we plot the migrated output data on the AASPI plot on one CDP point we get :

24. Prestack migration - Program aaspi_azim_offset_mig

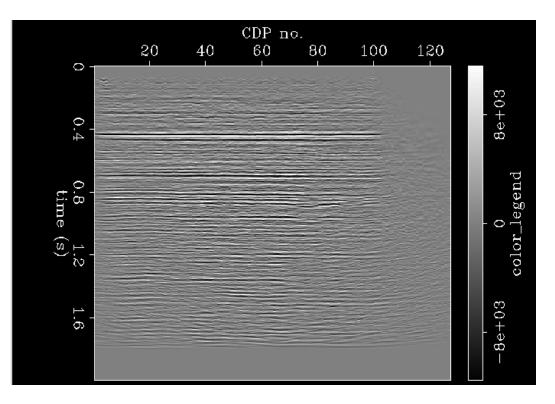


We can see the improvement in the image as we see the original gather and the final stacked data.



Original Gathers

Stack After Prestack Migration



References :

- *Gray*, S. H., 1992, Frequency-selective design of the Kirchhoff migration operator: *Geophysical* prospecting, 40, 565-571
- T Perez, G. and K. J. Marfurt, 2008, New azimuthal binning for improved delineation of faults and fractures Geophysics, 73, S7-S15.