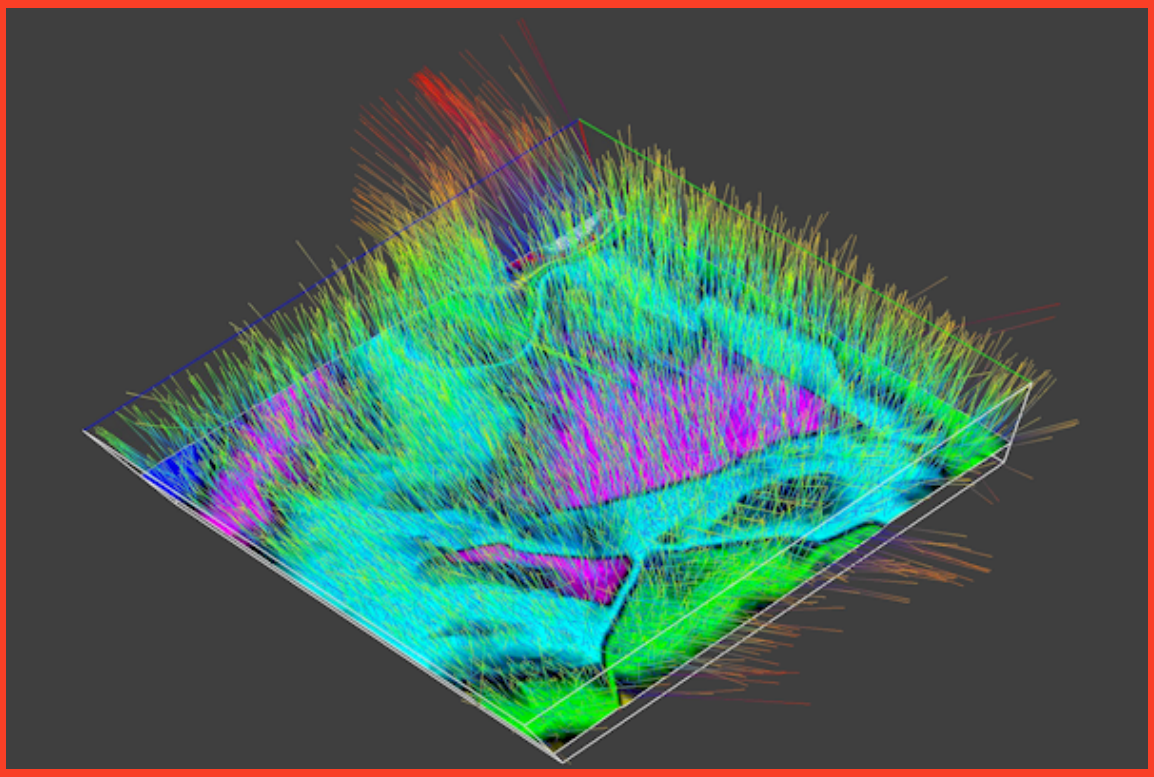
MARVEL® Reference Manual

Version 2.1.1



Panorama Technologies

www.panoramatech.com

MARVEL Reference Manual

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About This Book

This book contains information about installing and licensing the MARVEL program developed by Panorama Technologies.

The book is intended for people doing seismographic data analysis, specifically migration, residual velocity analysis, and interpretation. This includes students in applied geophysics and employees of the petroleum industry, particularly those who deal with seismic migration as processors or interpreters, as well as anyone who is interested in the methodology of subsurface imaging using reflection seismology.

The book assumes that you are familiar with the following topics:

- using the operating systems and applications in your enterprise
- editing and saving text files
- performing seismographic data analysis

Online books are formatted as Portable Document Format (PDF) documents. To view, print, or copy PDF books, use the free Acrobat Reader from Adobe Systems. If you do not have the reader on your system, you can obtain the reader at http://www.adobe.com.

Conventions

This book uses the following special conventions:

- All syntax, operating system terms, and literal examples are presented in this typeface.
- Variable text in path names, system messages, or syntax is displayed in italic text: testsys/instance/*fileName*.
- File names and paths are displayed as path/filename.
- The symbol => connects items in a menu sequence. For example, Actions => Create Test instructs you to choose the Create Test command from the Actions menu.
- If you move the cursor over text shown in blue, such as Chapter 1, the cursor will change to a pointer. If you then click the cursor, Acrobat Reader displays the location indicated by the text.
- Web and email addresses are shown as underlined blue text, such as www.panoramatech.com, and will open your default web browser when you click the mouse cursor on the link.

Chapter

Introduction

This chapter provides a brief overview of the MARVEL Migration and Residual Velocity Analysis program by Panorama Technologies.

Determining the structure, composition, and state of the earth's subsurface from measured data is the principal task of many geophysical experiments or surveys. Standard procedures involve the recording of appropriate data sets followed by the application of data analysis techniques to extract the desired information.

Panorama Technologies provides a complete suite of interpretive processing software for the oil and gas industry, including fast, flexible Kirchhoff migration, common azimuth migration, shot profile migration, and full wave-equation velocity inversion. Our fully-distributed software is the fastest and most accurate in the industry for prestack time migration and prestack depth migration.

Figure 1 shows the initial panel for MARVEL after you start the program. Table 1 contains short descriptions of the chapters and appendices in the *MARVEL Reference Manual*. The *eyeView-3D Reference Manual* describes Panorama Technologies' eyeView-3D product, used to produce complex, geologically consistent models in a straightforward manner.

Figure 1. MARVEL Window

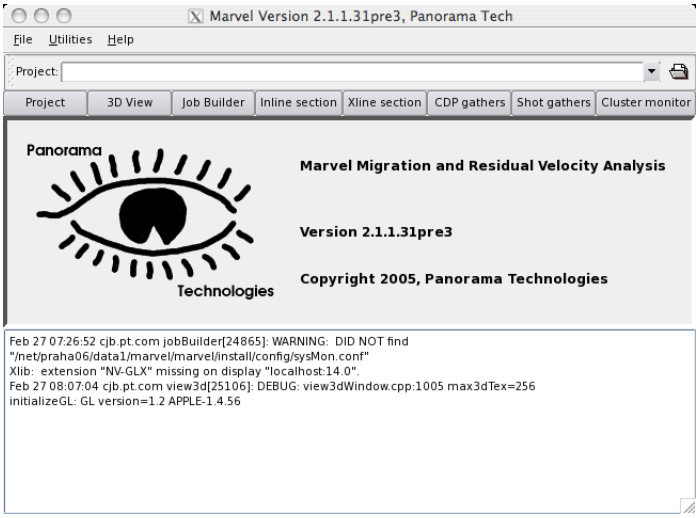


Table 1. Chapter Descriptions

Chapter	Title	Description
1	Introduction	Provides a brief introduction to the book contents.
2	Project Operations	Defines the relationship between global and local coordinates. These relationships allow the various technologies in MARVEL to process and position the output data relative to its true surface location(s).
4	jobBuilder Operations	Constructs the processing stream and parameters for specific distributed seismic processing jobs.
5	Inline Section Operations	Enables you to visually inspect and interact with line-oriented data.
6	XLine Operations	Enables you to visually inspect and interact with crossline-oriented data.
7	CDP Gathers Operations	Enables you to visually inspect and interact with display data. You can also pick time-velocity pairs and time-mute pairs.

continues on next page

Table 1. Chapter Descriptions–continued

Chapter	Title	Description
8	Shot Gathers Operations	Enables you to perform a visual inspection of shot records and to select the shot range you want to process.
9	eyeGlass Cluster Monitor Operations	Provides the ability to monitor current CPU status and define the cluster on which distributed jobs will be executed.
A	jobBuilder Tree Structure	Lists the modules available under each node in the jobBuilder module tree.
B	Topographic Migration Velocity Analysis	Provides a work flow on which topographic migration velocity analysis can be based, including specific information about using topographic migration analysis in MARVEL.
C	3D Surface Related Multiple Elimination	Explains the parameters defining Panorama Technologies' 3D Surface Related Multiple Elimination algorithm (SRME3D) and provides a brief explanation of the assumptions underlying the process.

Chapter 2

Project Operations

Project Operations defines the relationship between global or world coordinates and local coordinates. These relationships allow the various technologies in MARVEL to process and position the output data relative to its true surface location(s). The data is stored as an XML file having a .project extension. You can edit an existing project file using the Project panel or with any text editing tool, such as vi.

Project Panel

The Project Panel enables you to select the seismic files you want to process with MARVEL, including datasets, models and output. Figure 2 shows the data tab, while Figure 3 shows the preferences tab. The fields on the panel are described in Table 2.

Figure 2. Project Panel, Data Tab

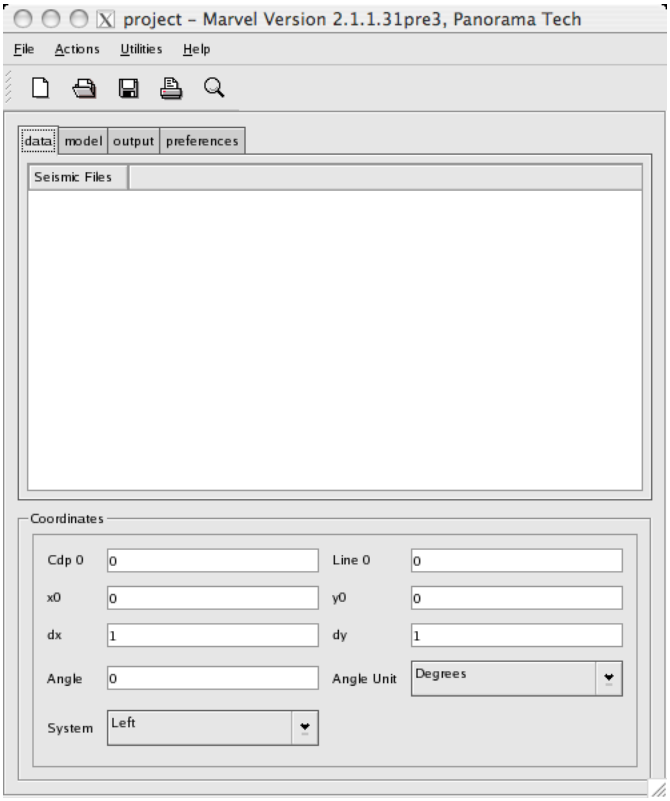


Figure 3. Project Panel Preferences Tab

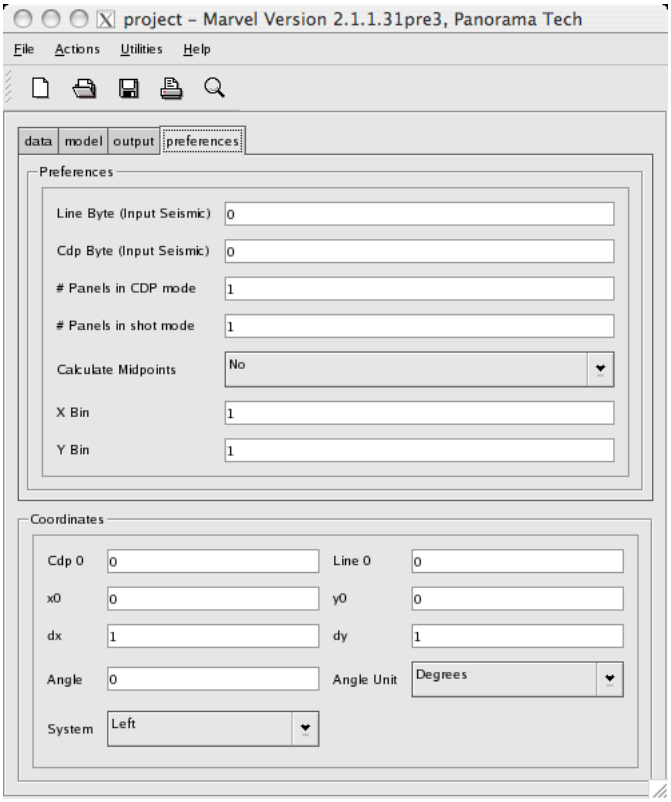


Table 2. Project Panel Fields

Tab	Description
Tabs	
data	Displays a list of all open seismic files in the Seismic Files display area. Seismic files are selected from the File menu (see File Menu).
model	Displays a list of all open model files in the Model Files display area. Model files are selected from the File menu (see Project Menus and Toolbar).
output	Displays a list of all selected output volumes in the Output Volumes display area. Output volumes are selected from the File menu (see Project Menus and Toolbar).
preferences	Enables you to modify project preferences.

continues on next page

Table 2. Project Panel Fields–continued

Tab	Description
Coordinates	
Cdp 0	Default: 0
Line 0	Default: 0
x0	Default: 0
y0	Default: 0
dx	Defines the CDP spacing. Default: 1
dy	Defines the line spacing. Default: 1
Angle	Default: 0
Angle Unit	The angle unit associated with the angle, either degrees or radians. Default: Degrees
System	Defines the model system to be used for the current display, that is, whether the project is to be a left-hand or a right-hand system. Default: Left
Preferences	
Line Byte (Input Seismic)	
Cdp Byte (Input Seismic)	
# Panels in CDP mode	The default number of panels to display in CDP mode.
# Panels in shot mode	The default number of panels to display in shot mode.
Calculate midpoints	
X Bin	
Y Bin	

Project Menus and Toolbar

Project operations has a File menu, an Actions menu, and a toolbar.

File Menu

The Project operations File menu, Figure 4 contains the eight commands described in Table 3.

Figure 4. File Menu

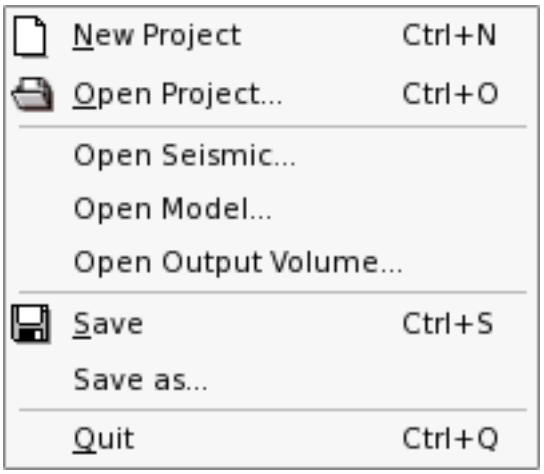


Table 3. File Menu Commands

Menu Item	Description
New Project	Creates a new project, resetting all project settings to their default values, and clearing the project files lists.
Open Project...	Displays standard File Open dialog box enabling you to open an existing project file having a .project extension.
Open Seismic...	Displays standard File Open dialog box enabling you to open an existing seismic data file having a .segy extension.
Open Model...	Displays standard File Open dialog box enabling you to open an existing model file having a .segy extension.
Open Output Volume...	Displays standard File Open dialog box enabling you to open an existing output data file having a .segy extension.
Save	Saves the displayed project data as a project file. Open a Save As dialog box if you are attempting to save an unnamed project.

continues on next page

Table 3. File Menu Commands–continued

Menu Item	Description
Save as...	Opens a Save As dialog box enabling you to save the project data to the file you specify.
Quit	Quits the MARVEL program.

Actions Menu

The Project operations Actions menu, Figure 5, contains the four items described in Table 4.

Figure 5. Actions Menu

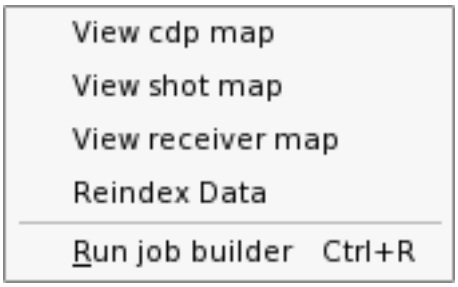


Table 4. Actions Menu Commands

Menu Item	Description
View cdp map	Displays a map of the CDP versus EP (shotpoint) values. See View CDP, Shot and Receiver Maps.
View shot map	Displays a map of the shot versus EP (shotpoint) values. See View CDP, Shot and Receiver Maps.
View receiver map	
Reindex Data	
Run job builder	Displays the JobBuilder panel. See jobBuilder Operations.

Toolbar

The Project operations toolbar, Figure 6 contains the five items described in Table 5.

Figure 6. Project Toolbar



Table 5. Toolbar Commands

Symbol	Description
	Creates a new project, resetting all project settings to their default values, and clearing the project files lists.
	Opens a project dataset.
	Saves the project using the current project name.
	Sends the project XML file to the default printer.
	Scans the model identified in the project to get the coordinates specified in the model for display in the Coordinates pane at the bottom of this window.

View CDP, Shot and Receiver Maps

Figure 7 shows a sample CDP map displayed in MARVEL. Note that the figure shows a selection of the CDPs, shown in black. Figure 8 shows a sample shot map displayed by MARVEL. The fields in the figure are defined in Table 6. The items in the File menu and the Actions menu are defined in Table 7 and Table 8, respectively.

Figure 7. Sample CDP Map with Selection

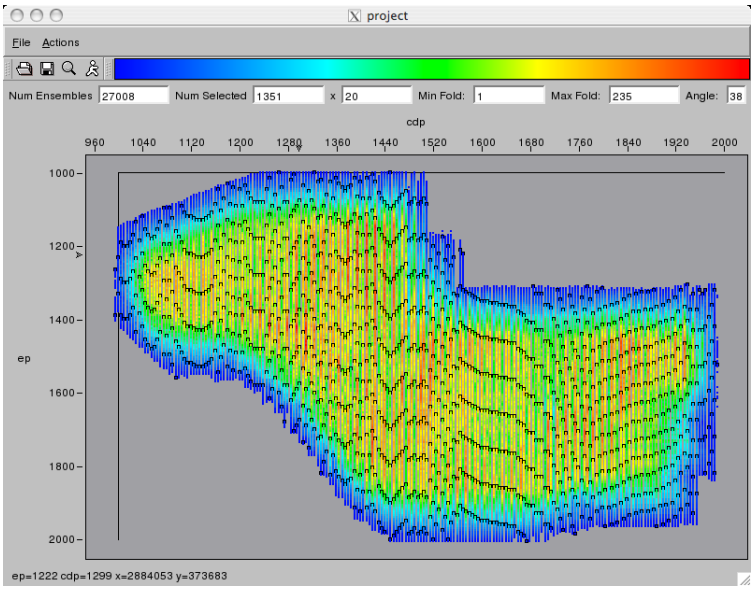


Figure 8. Sample Shot Map

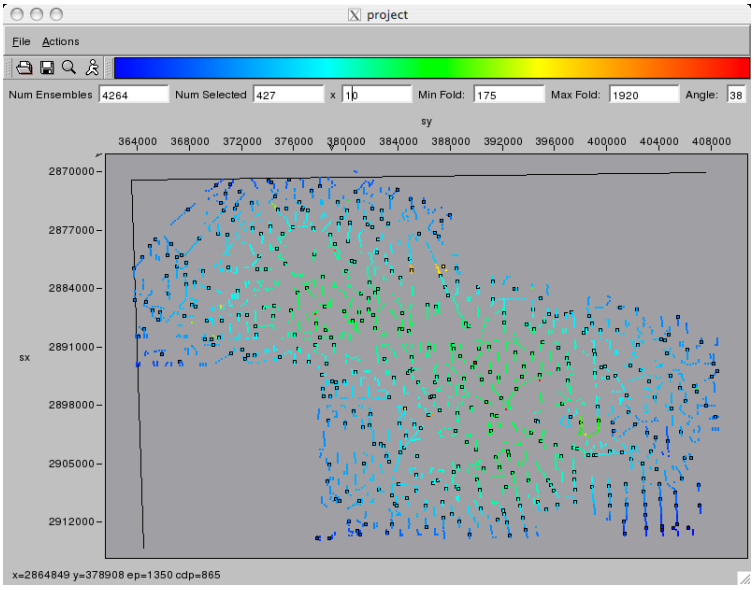


Table 6. View CDP and Shot Data Fields

Data Field	Description
Num Ensembles	The actual number of CDPs or shots in the project.
Num Selected	The number of CDPs or shots that have been selected (in black in Figure 7).
Min Fold	The smallest number of traces in a CDP or shot map.
Max Fold	The maximum number of traces in a CDP or shot map.

Table 7. File Menu

Command	Description
Open...	Opens a new dataset. MARVEL displays a new CDP map of the dataset.
Save	Saves the selected area of the CDP map into a dataset.
Save as...	Saves the selected area of the CDP map into a dataset.
Quit	Closes the Project module and display.

Table 8. Actions Menu

Command	Description
View	Displays selected CDP or shot maps. The number of sequential maps displayed at one time depends on the value of the panel setting. This command is the same as the magnifying glass.
Calculate project	
Run	Job Runs the JobBuilder program (see jobBuilder Operations). The parameters from this panel are entered automatically in the appropriate locations in the JobBuilder panel.

Chapter 3

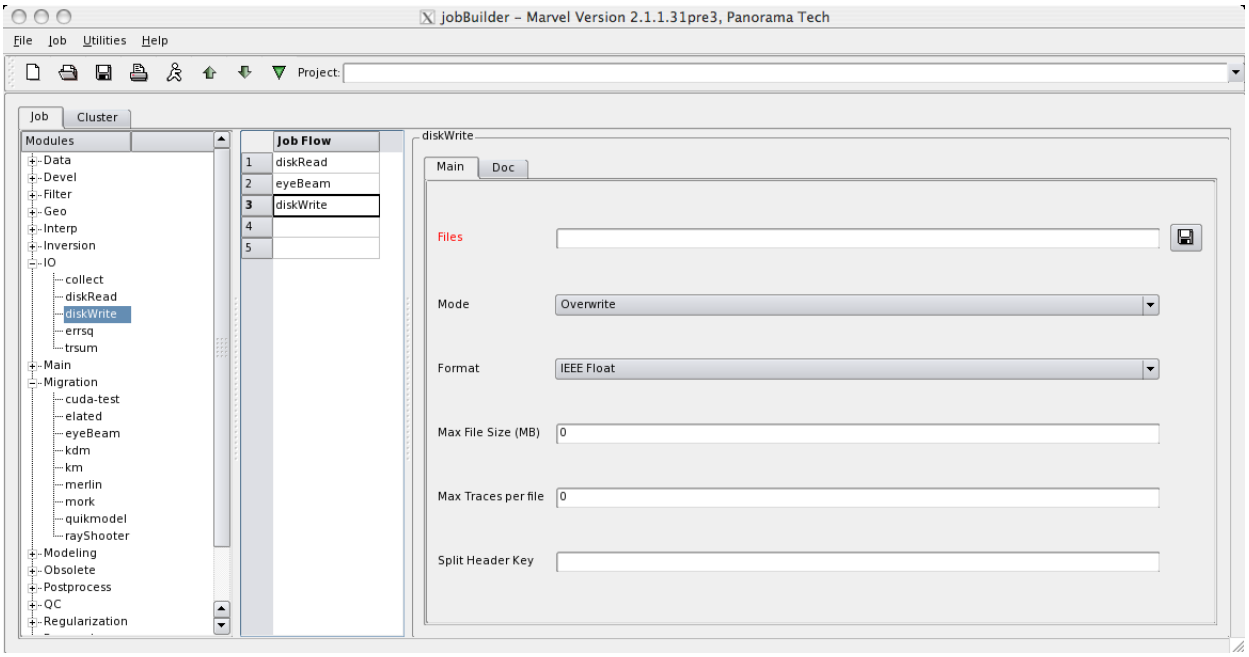
jobBuilder Operations

jobBuilder Operations constructs the processing stream and parameters for specific distributed seismic processing jobs.

Note:

A field name shown in red, such as Files in Figure 9, indicates that the field is a required entry. Also, if a tab name is underlined, such as the Main tab in this figure, at least one of the fields in the tab is a required entry.

Figure 9. Example jobBuilder Panel



jobBuilder Panel

Figure 10 shows the jobBuilder panel. This panel enables you to select the components you want to use to process your seismic data set. Table 9 defines the terms used on the panel.

Figure 10. jobBuilder Panel

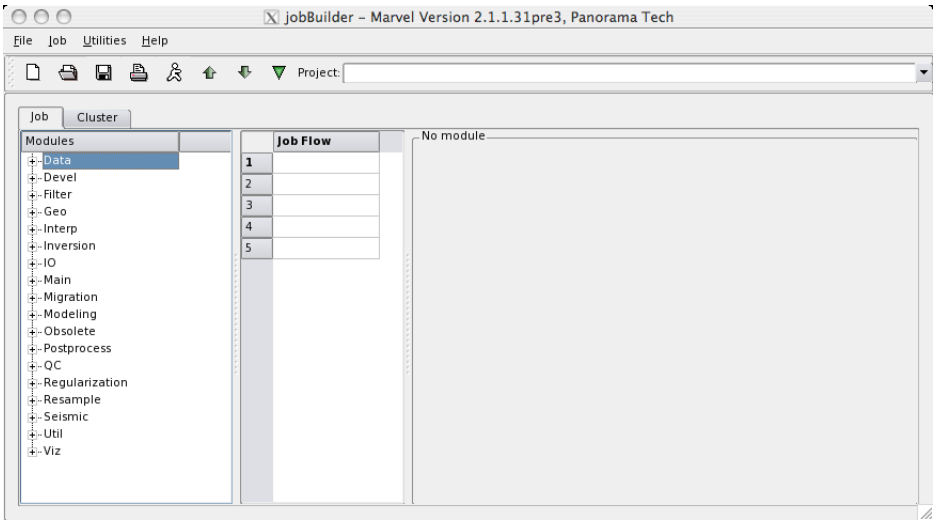


Table 9. jobBuilder Modules

Module	Grouping	Description
angle2offset	Postprocess	
antialias	Filter	Enables you to eliminate unwanted portions of the spectra and frequencies that might cause aliasing when the sample rate is decreased during seismic processing.
attributes	Data	
autoMute	Seismic	Reads and automatically extracts mute information from an input data stream. The mute information is then written to a mute (.pick) output file.
autopick	Geo	Uses a shifted-hyperbola technology to calculate the semblance and constant velocity stacks of an input CDP.
balance	Filter	
bias	Filter	Calculates the trace bias (dc) within a sliding window, and either outputs the debiased trace or the bias function.
bulkStatic	Resample	Applies a bulk static to each trace in an input data stream.

continues on next page

Table 9. jobBuilder Modules–continued

Module	Grouping	Description
collect	IO	Stacks output from migrations.
demig	Modeling	Performs demigration operations.
dipFilter	Geo	Removes non-propagating, evanescent waves from the traces.
diskRead	IO	Controls reading information from .segy data files.
diskWrite	IO	Controls writing MARVEL output data to a data file.
elated	Migration, Modeling	
eyeBeam	Migration	Panorama Technologies' parsimonious beam migration program.
fdmod2d	Modeling	
filter	Filter	Applies a (f, k) domain pie shaped filter to an input ensemble or gather of traces. This gather can be a line, cdp, or shot record, but you are responsible for selecting the appropriate data and building the job stream to supply it to dipFilter.
fkamo	Regularization	
gain	Filter	Scales each input trace by either a fixed power of time or a time-variant automatic gain control, or both.
gathers	Viz	
gridem	Regularization	Converts arbitrarily oriented 2-D seismic data in an area into a dense, evenly spaced 3-D data volume.
hdrMath	Data	Changes header words.
kmodel	Modeling	
importGrid	Main	
importVtp	Util	Imports VIEWS VTP or FOCUS HANDVEL time-velocity pairs from an input file and converts them to the internal format used by Panorama Technologies. The output file name is just the input file name with .picks appended.
interpShot	Interp	
interp2d	Interp	

continues on next page

Table 9. jobBuilder Modules–continued

Module	Grouping	Description
interpVolume	Interp	
inv2d	Inversion	
kdm	Migration	Performs Kirchhoff Depth Migration.
km	Migration	Performs Kirchhoff curved-ray time migration.
kmodel	Modeling	
Merlin	Migration, Modeling	Panorama Technologies' two-way wave equation program for modeling, velocity analysis and depth imaging.
MORK	Migration	Panorama Technologies' one-way migration module.
moveout	Geo	Applies normal moveout (NMO) or the inverse of NMO to input traces.
mute	Geo	Mutes above, below, or along a linearly interpolated curve whose width is defined by the times in the mute file, or by the mute X and T values.
off2angle	Postprocess	
oned	Devel	
parsim	Obsolete	
pef	Filter	
postproc	Postprocess	
pruneShooter	Obsolete	Provides an interface to a dynamic-anisotropic-maximum-energy traveltime generator. **Note:** The pruneshooter and shooter modules are provided for compatibility purposes only. You should use the rayshooter module, instead.
quikmodel	Migration, Modeling	
radon	Geo	
rayshooter	Migration	Provides an interface to a dynamic-anisotropic-maximum-energy traveltime generator. The rayshooter module completely replaces the pruneshooter, rayshooter, and shooter modules.

continues on next page

Table 9. jobBuilder Modules–continued

Module	Grouping	Description
resamp3d	Resample	
resample	Resample	
rtmodel	Obsolete	Provides an interface to the reverse time modeling module. **Note:** You should use MERLIN® to perform migrations instead of rtmodel.
samo	Regularization	
scan	QC	Performs scans, thresholds input traces and outputs various statistical quantities.
semblance	Geo	Computes the semblance panel for a given CDP gather.
setStatics	Geo	Enables you to specify a file containing a topographic surface file.
shooter	Obsolete	Provides an interface to a dynamic-anisotropic-maximum-energy traveltime generator. **Note:** The pruneshooter and shooter modules are provided for compatibility purposes only. You should use the rayshooter module, instead.
smoother	Geo	Enables you to control the smoothing operation performed on the output data.
srme	Filter	Surface-related multiple elimination uses the recorded seismic data to predict and iteratively subtract the multiple series.
srme3d	Filter	Surface-related multiple elimination uses the recorded seismic data to predict and iteratively subtract the multiple series in three dimensions.
stack	Geo	Stacks all traces in a given gather.
staticShift	Geo	Calculates and applies elevations statics. The statics can be calculated from information stored in the trace headers, or the module can simply apply a single static shift already stored in an appropriate header location. The module assumes that appropriate elevations are already stored in the trace headers.
threed	Devel	
timeDepth	Geo	Converts time-to-depth and depth-to-time.

continues on next page

Table 9. jobBuilder Modules–continued

Module	Grouping	Description
tomo3d	Geo	
trsum	IO	Performs basic operations on the input data stream.
trWindow	Data	Performs a spatial windowing operation on the input data stream.
tvq	Filter	
wem	Obsolete	Panorama Technologies' wave-equation migration module. This module can run in either the common-shot mode for pre-stack shot-profile migrations, or it can run in the poststack mode for post-stack migrations. Regardless of which mode is selected, this is a one-way phase panel method.

jobBuilder Menus and Toolbar

The jobBuilder module has a File menu (Figure 11), a Job menu(Figure 12), and a toolbar (Figure 13).

File Menu

Figure 11. File Menu



Table 10. File Menu Commands

Command	Description
New	Removes all modules from the job flow.
Open	Displays a dialog box enabling you to select and open an existing MARVEL job (.job extension).
Open project	Displays a dialog box enabling you to select and open an existing MARVEL project (.project extension).
Save	Saves the current jobBuilder information to the open job file.
Save as...	Displays a dialog box that enables you to save to jobBuilder information to the file you specify.

Job Menu

The Job menu, Figure 12, contains only one command that enables you to run the open job against a project.

Figure 12. Job Menu



Toolbar

The jobBuilder toolbar, Figure 13, enables you to perform certain operations without accessing the menu items.

Figure 13. jobBuilder Toolbar



Table 11. jobBuilder Toolbar Commands

Icon	Description
	Removes all modules from the job flow in preparation for creating a new job.
	Displays a dialog box enabling you to select and open an existing MARVEL job (.job extension).
	Saves the current jobBuilder information to the open job file.
	Sends the current job file to the default printer.
	Runs the open job against a project.
	Changes the order modules in the job list.
	Changes the order of modules in the job list.

angle2offset Module

The angle2offset module is accessed under the Postprocess node of the jobBuilder module tree.

Figure 14. angle2offset Panel

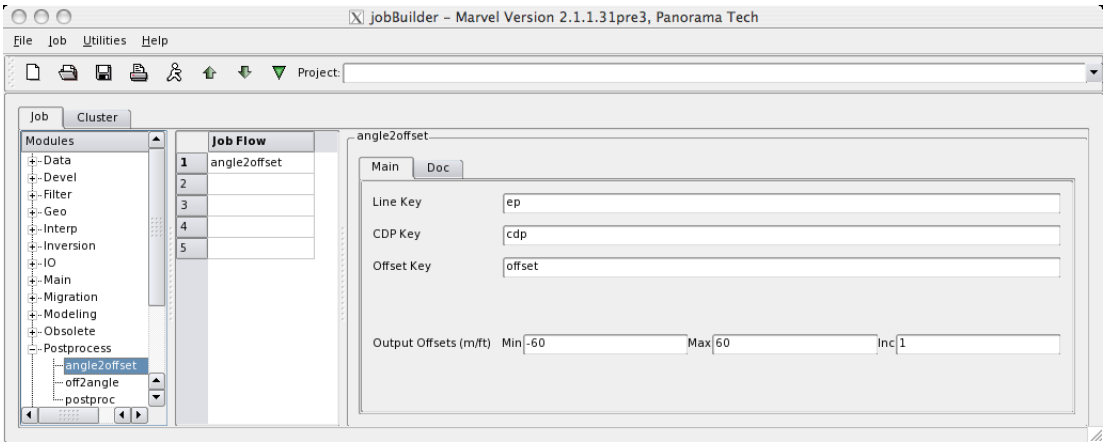


Table 12. angle2offset Panel Fields

Field	Description
LineKey	The header key specifying where line data is stored in the trace. default: ep
CDPKey	The header key specifying where CDP data is stored in the trace. default: cdp
OffsetKey	The header key specifying where offset data is stored in the trace. default: offset
OutputOffsets (m/ft)	*Min* (default: -60), *Max* (default: 60), *Inc* (default:1)

antialias Module

This module enables you to eliminate unwanted portions of the spectra and frequencies that might cause aliasing when the sample rate is decreased during seismic processing. The antialias module is accessed under the Filter node of the jobBuilder module tree.

Figure 15. antialias panel

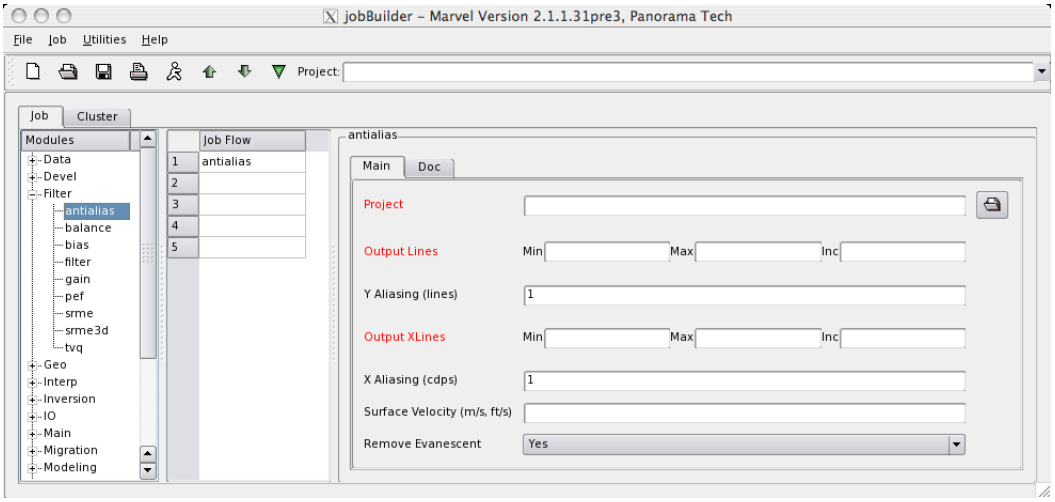


Table 13. antialias Panel Fields

Field	Description
Project	File describing the coordinate system, and how line, crossline and CDP data relate to the x-y coordinates. **This is a required entry.**
Output Lines	Min, max, and increment for lines in the output volume. **This is a required entry.**
Y Aliasing (lines)	The inline anti-aliasing distance, in units of lines.
Output XLines	Min, max, and increment for CDPs in the output volume. **This is a required entry.**
X Aliasing (cdps)	The crossline anti-aliasing distance, in units of lines.
Surface Velocity	The near surface velocity in Equation 2 on page 27.
Remove Evanescent	If velocity is available, do you want to remove seismic noise from the processing (which is typically in the form of exponentially decaying evanescent waves)?

attributes Module

The attributes module is accessed under the Data node of the jobBuilder module tree.

Figure 16. attributes Panel

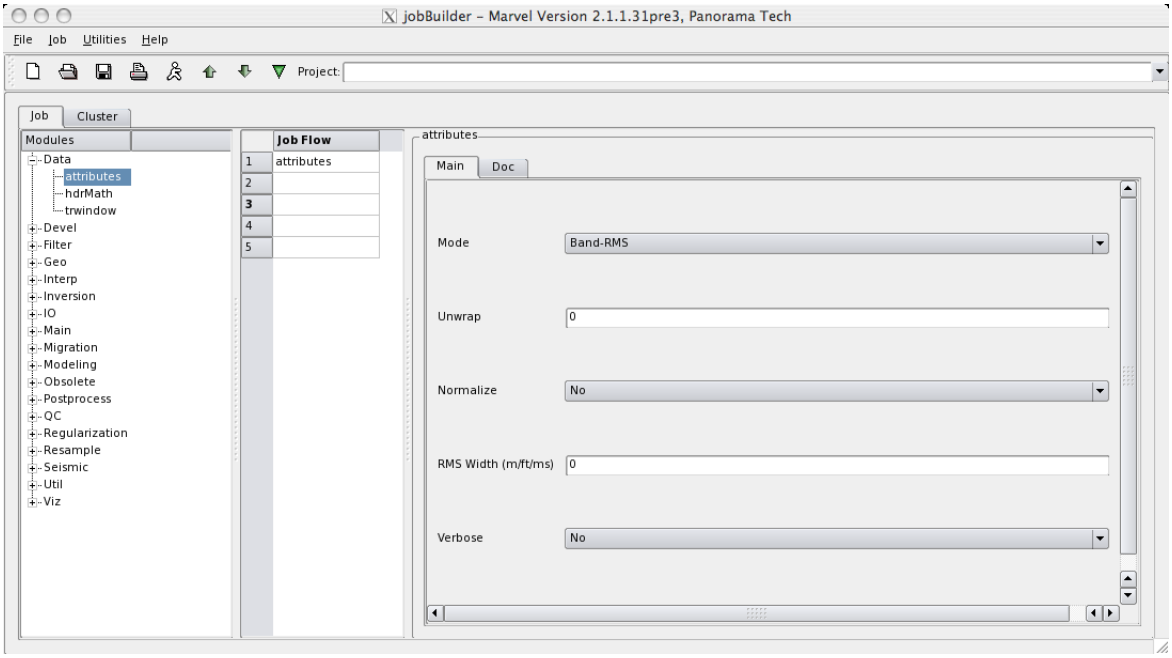


Table 14. attributes attributes Panel Fields

Field	Description
Mode	Amplitude or BandRMS
Unwrap	
Normalize	
RMS Width	This field is only visible if you have selected Mode Band-RMS.
verbose	Switch for turning debug printing on and off. default: No

autoMute Module

This module reads and automatically extracts mute information from an input data stream. The mute information is then written to a mute (.pick) output file. The autoMute module is accessed under the Seismic node of the jobBuilder module tree.

Figure 17. autoMute Panel

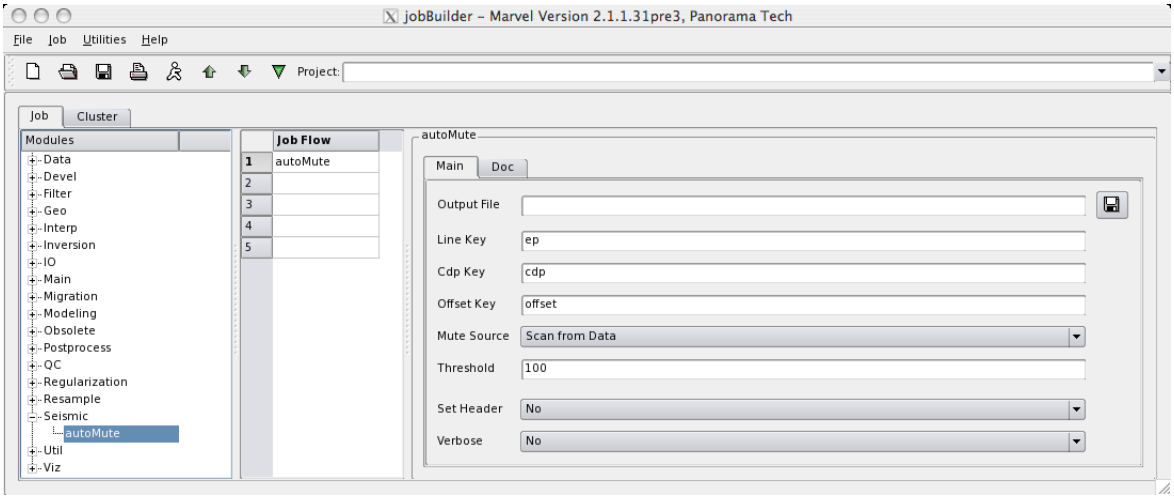


Table 15. autoMute Panel Fields

Field	Description
Output File	The name of the .pick file that will be created by autoMute.
Line Key	The header key specifying where line data is stored in the trace. default: ep
Cdp Key	The header key specifying where CDP data is stored in the trace. default: cdp
Offset Key	The header key specifying where offset data is stored in the trace. default: offset
Mute Source	Scan from Data, Read from Header
Threshold	Percentile threshold for mute detection. This field is displayed only if the Mute Source is Scan from Data. default: 100
Set Header	If this toggle is set to Yes, set the indicated header in the output trace.
Verbose	Switch for turning debug printing on and off. default: No

autopick Module

The autopick module is accessed under the Geo node of the jobBuilder module tree.

Theory

The autopick module uses a sophisticated shifted-hyperbola technology based loosely on the paper, Normal Moveout Revisited: Inhomogeneous Media and Curved Interfaces, by Eric de Bazelaire in the February 1988 issue of GEOPHYSICS. The module is able to calculate the semblance and constant velocity stacks of an input CDP rapidly using this technology. The computed ensembles are then used to automatically determine the optimum RMS stacking or migration velocity. The time-velocity pairs specifying peak semblance values at each time-increment are selected, and then edited to assure that the number of spurious values is held to a manageable level.

Traditionally, normal moveout is governed by an equation of the form shown in Equation 1, where t_0 is vertical time and t is the arrival time at half-offset h. In this case, v is the velocity of a homogenous medium with a single reflector at depth $0.5vt_0$.

Equation 1:

$$t^2 = t_0^2 + \frac{h^2}{4v^2}$$

While this equation has been used effectively for velocity analysis for many years, it has several deficiencies. The primary deficiency is that using it to correct large offset data dynamically to vertical time requires excessive stretching, and as a result can significantly reduce the frequency content of the data.

A second deficiency occurs because the stretch, as specified by $t - t_0$, has considerable variation as a function of h and v, calculating multiple stacks or semblance panels can become computationally expensive when the number of such panels is large. In addition, if the medium is not homogeneous and has even a few curved interfaces, the difference between the stacking velocity estimated by the traditional equation, Equation 1, and the true RMS velocity can be quite large.

In his 1988 paper, de Bazelaire showed that both of the difficulties with the traditional equation, Equation 1 are overcome by using an equation of the form shown in Equation 2, where v_a is a near surface velocity and t_p is related to the time of a shifted hyperbola fitting the arrival time curve on a given gather.

Equation 2:

$$(t - t_0 + t_p)^2 = t_p^2 + \frac{h^2}{4v_a^2}$$

You can rewrite the hyperbola equation as a shift, as shown in Equation 3.

Equation 3:

$$t - t_0 = \Delta t = t_p + \sqrt{t_p^2 + \frac{h^2}{4v_a^2}}$$

You can see that calculating stacking or semblance panels is purely a function of a single shift used for every time value in a trace. Note that the two variables of interest in Equation 3 are Δt and t_p. Thus, you are computing and picking (t_0, t_p) panels computed through Δt.

For any given (t_0, t_p) pair, the correct stacking velocity can then be obtained from Equation 4.

Equation 4:

$$v = v_a \sqrt{\frac{t_0}{t_p}}$$

Thus, this approach provides an efficient approach to computing accurate stacking velocities in a fully automatic manner over the entire 3D project volume.

autopick Input Model Panels

The autopick module has three forms of the Input Model panel, depending on the Model Type you select: Single Function (Figure 18), Gridded Seismic (Figure 19), or Picks (Figure 20). The parameter fields on these panels are described in Table 16.

Figure 18. autopick Module Input Model–Single Function Model Panel

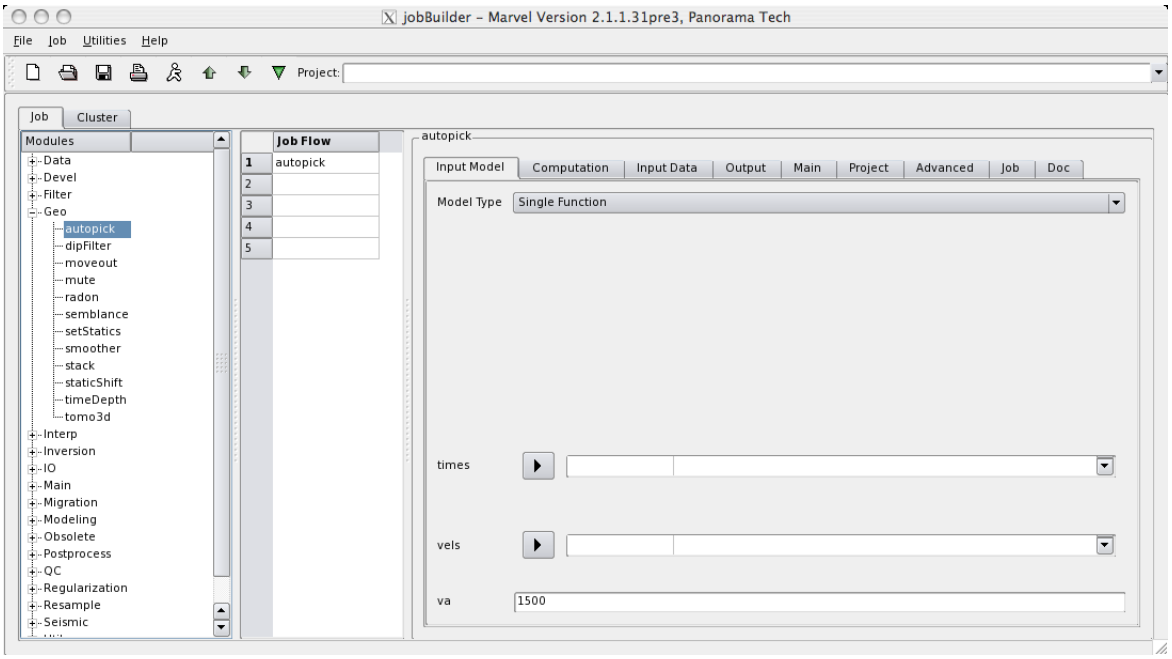


Figure 19. autopick Module Input Model–Gridded Seismic Model Panel

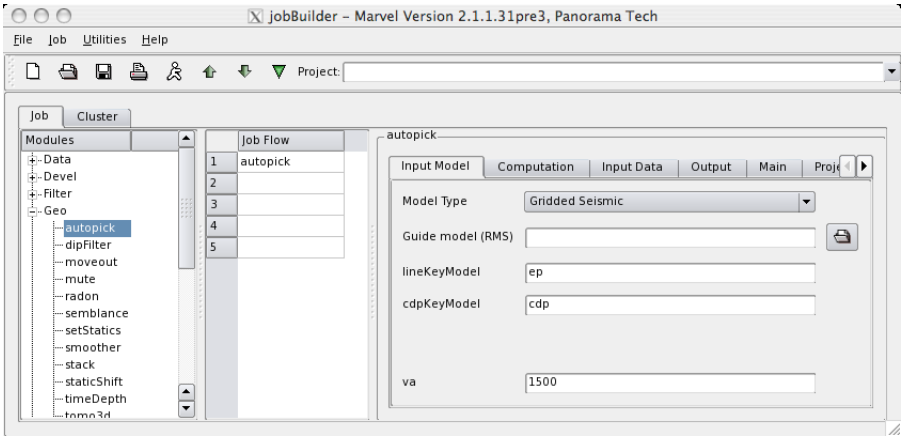


Figure 20. autopick Module Input Model–Picks Model Panel

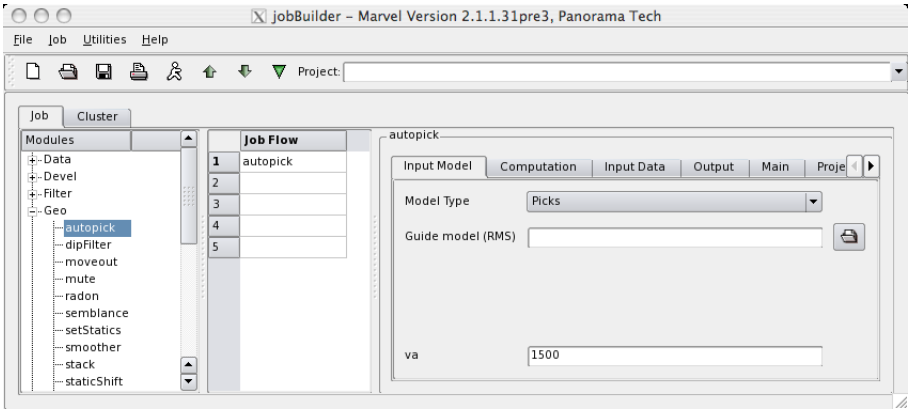


Table 16. autopick Input Model Panel Fields

Field	Description
Model Type	Type of guide model input: Single Function, Gridded Seismic, or Picks. default: Single Function
times	Pick times for a (single) guide function.
vels	Pick velocities for a (single) guide function.
va	The near surface velocity in Equation 2. default: 1500
Guide Model (RMS)	RMS velocity guide function.
lineKey Model	Header key for line data in model. default: same as data
cdpKey Model	Header key for CDP data in model. default: same as data

autopick Computation Panel

The autopick Computation panel shown in Figure 21 enables you to set the values of several parameters used in generating autopicks. The fields are described in Table 17.

Figure 21. autopick Module Computation Panel

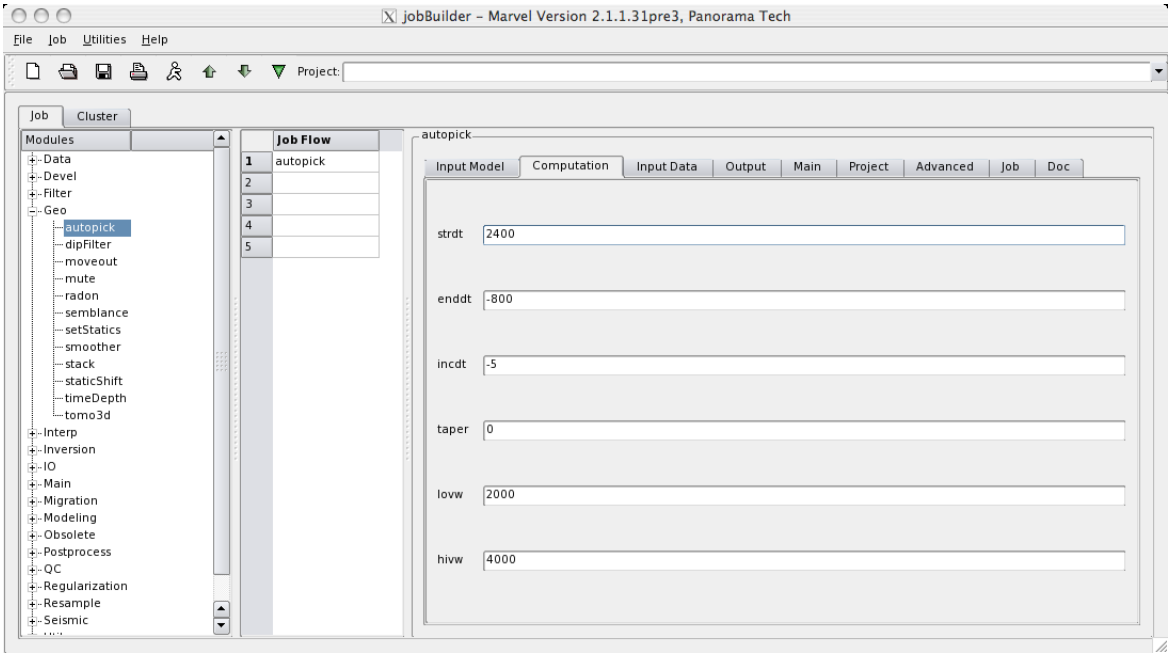


Table 17. autopick Computation Panel Fields

Field	Description
strdt	Starting dt value for the (t0, tp) analysis. default: 2400
enddt	Ending dt value for the (t0, tp) analysis. default: -800
incdt	Increment for the dt value. The value should always be negative. default: -5
taper	Number of traces to taper, where traces are tapered to 0 to avoid edge effects. default: 0
loovw	The short-time velocity width of the picking window. default: 2000
hivw	The long-time velocity width of the picking window. default: 4000

autopick Input Data Panel

The autopick module has two forms of the Input Data panels, depending on whether you set Mute Input to No or Yes. Figure 22 shows the combined panel. The parameter fields on these panels are described in Table 18.

Figure 22. autopick Input Data Panel

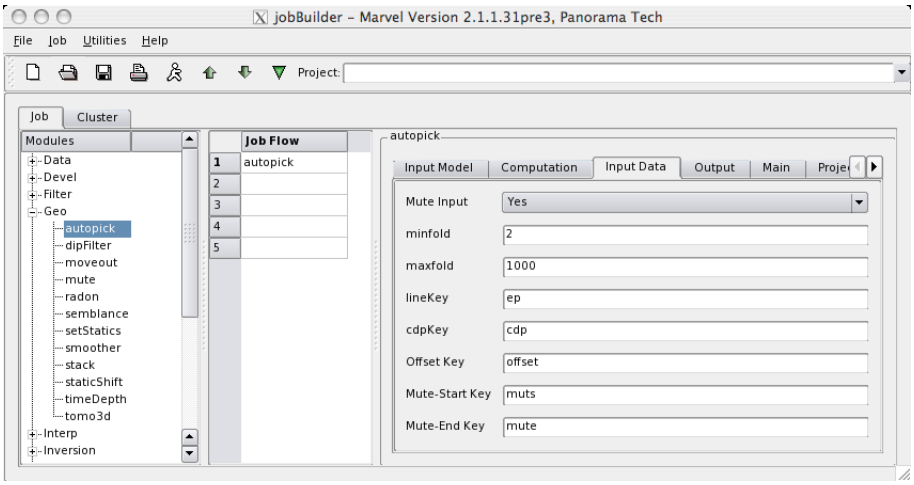


Table 18. autopick Input Data Panel Fields

Field	Description
Mute Input	Flag indicating whether or not the data is to be muted internally. default: No
minfold	This is the minimum input data fold. Nothing is done for smaller gathers. default: 2
maxfold	The maximum input data fold. default: 1000
lineKey	Header key for a line in the trace. default: ep
cdpKey	Header key for a CDP in the trace. default: cdp
Offset Key	Header key for offset in the trace. default: offset
Mute Start Key	Header key signifying the start of the mute values. **This field is only visible if you have selected Mute Input Yes.** default: muts
Mute End Key	Header key signifying the end of the mute values. **This field is only visible if you have selected Mute Input Yes.** default: mute

autopick Output Panel

The autopick Output panel contains only one variable, Output. You can set the value to Picked Trace, Stack and Velocity Trace, TP Panel, TP Semblance, or Velocity Trace. The default value is Picked Trace.

autopick Main Panel

Figure 23 enables you to change the values of several parameters used in the autopicking process, Table 19.

Figure 23. autopick Module Main Panel

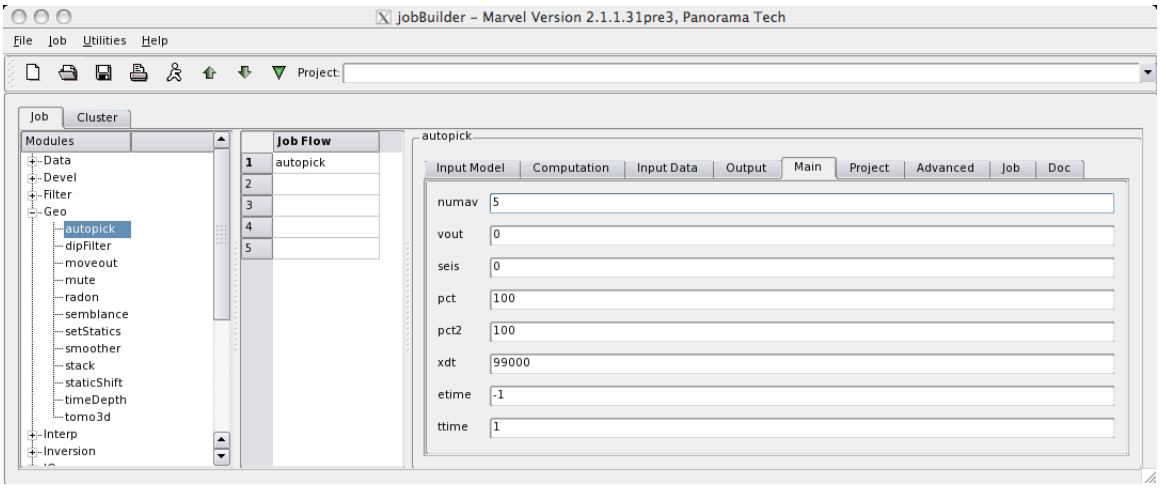


Table 19. autopick Main Panel Fields

Field	Description
numav	The number of iterations of a two-point, two-dimensional running average that is applied to computed (t0, tp) panels to stabilize the picking process. default: 5
vout	The velocity output format, vout, can be set to 0, 1, 2, 3, or 4, where • 0 tells autopick to output velocities • 1 outputs picked velocities • 2 outputs reference velocities • 3 outputs interval velocities using the Dix equation • 4 outputs reference velocities default: 0

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Table 19. autopick Main Panel Fields–continued

Field	Description
seis	The kind of seismic data to output. The value can be set to 0 or 1, where 0 means to output the stacked trace, while 1 means to output the amplitudes at the pick points only. default: 0
pct	The percent of the current picked function to add to the current reference function to use in picking the next CDP. default: 100
pct2	The percent of the current picked function to add to the new model velocity trace to generate the next reference function. default: 100
xdt	The maximum deviation from current reference. default: 99000
etime	An override time at which picking stops and the reference function is used to define velocities. Normally, this is set to the maximum trace time. default: -1
ttime	The duration used to merge picked and reference times. This parameter is normally set to the sampling increment. default: 1

autopick Project Panel

The autopick Project panel enables you to set the CDP and line spacing.

- *dx* defines the CDP spacing. The default is 12.5.
- *dy* defines the line spacing. The default is 12.5.

autopick Advanced Panel

The autopick Advanced panel contains two variables that enable debugging control.

- *verbose* is a switch for turning debug printing on and off.
- *debug* is a switch for turning debug on and off.

autopick Job Panel

There are two fields on this job control panel: *Master is Worker* and *Run Workers Low Priority*.

- *Master is Worker* controls whether the master I/O controller is also used for migrating data. The default is *Yes*.
- If *Run workers low priority* is set to *Yes*, workers will be spawned with reduced priority. although the master process will remain at high priority. This can be useful especially when *Master Is Worker* is set, so that one worker does not slow down collection or submission of shots for all of the others.

balance Module

The balance module is accessed under the Filter node of the jobBuilder module tree.

Figure 24. balance panel

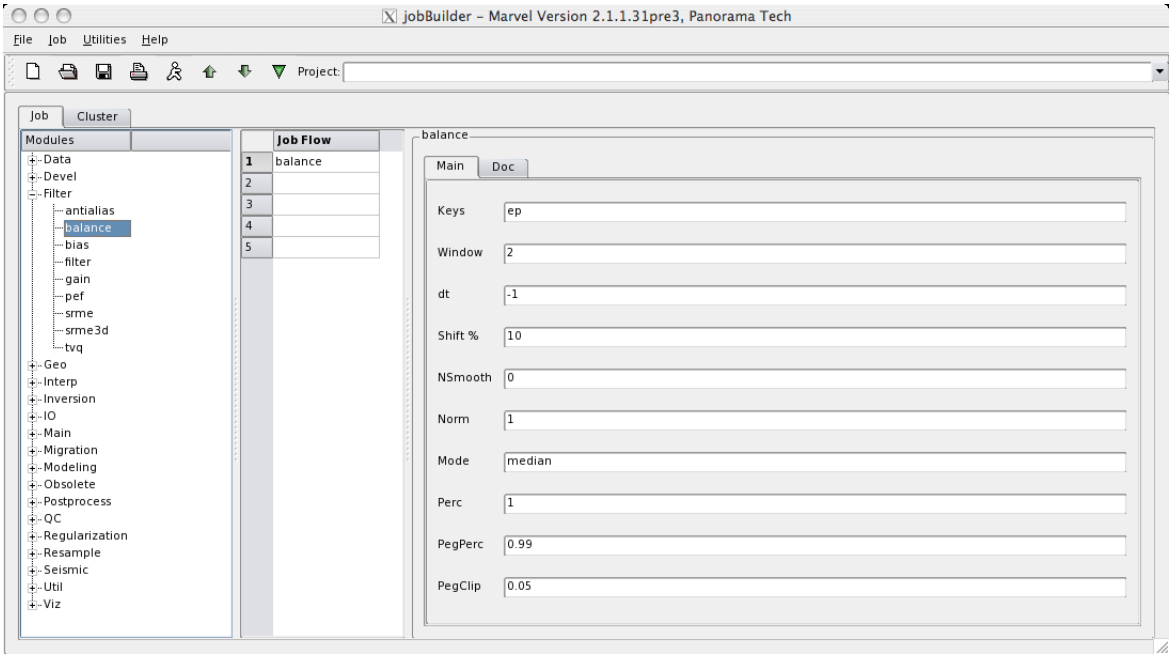


Table 20. balance Panel Fields

Field	Description
Keys	The header keys used to define an ensemble. default: ep
Window	The length of the window, in seconds. default: 2
dt	The time increment, if not provided in the data. default: -1
Shift %	The percentage by which the window should be shifted. default: 10
NSmooth	THe number of tracves over which to smooth the gain. default: 0
Norm	Normalize the output to this value. default: 1
Mode	median or RMS default: median
Perc	Samples are perc-clipped by this amount. default: 1
PegPerc	default: 0.99
PegClip	default: 0.05

bias Module

The bias module calculates the trace bias (dc) within a sliding window, and either outputs the debiased trace, or the bias function. The bias panel is shown in Figure 25, and the fields are described in Table 21. The bias module is accessed under the Filter node of the jobBuilder module tree.

Figure 25. bias Panel

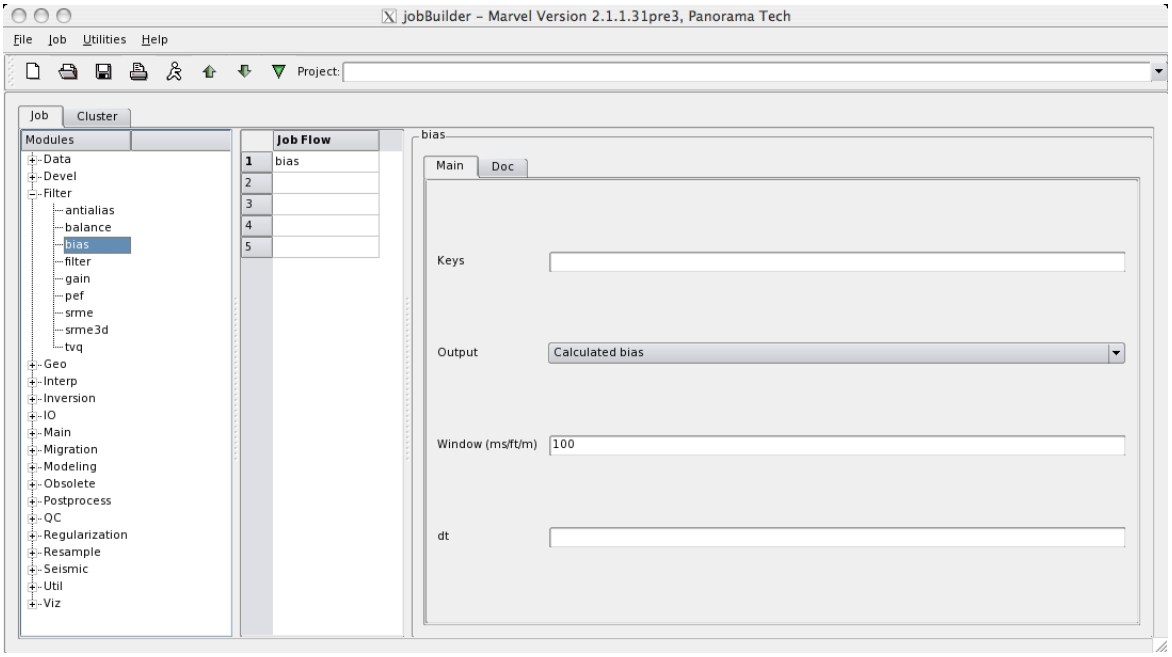


Table 21. bias Panel Fields

Field	Description
Keys	The keys defining an ensemble.
Output	What kind of data to output: debiased data or calculated bias data. default: Calculated bias
Window (ms/ft/m)	default: 100
dt	Time interval to use if the value is incorrect in the header.

bulkStatic Module

The bulkStatic module applies a bulk static correction to each seismic trace in time in an input data stream. A common static correction is the weathering correction, which compensates for a layer of low seismic velocity material near the surface of the Earth. Other corrections compensate for differences in topography and differences in the elevations of sources and receivers. The bulkStatic panel is shown in Figure 26, and the fields are described in Table 22. The bulkStatic module is accessed under the Resample node of the jobBuilder module tree.

Figure 26. bulkStatic Panel

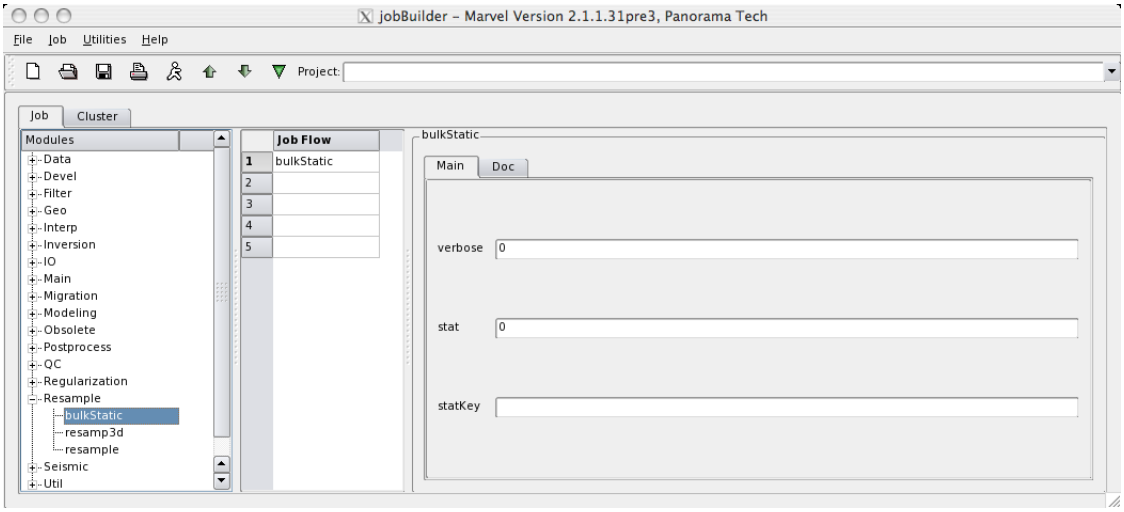


Table 22. bulkStatic Panel Fields

Field	Description
verbose	Switch for turning debug printing on and off. default: No
stat	Bulk static correction to be applied to the data. default: 0
statKey	The key word to be used for statics data in the MARVEL format.

collect Module

The collect module is designed to stack output from migrations. The collect module is accessed under the IO node of the jobBuilder module tree.

The collect module panels are shown in Figure 27, Figure 28, and Figure 29, and the fields are described in Table 23.

Figure 27. collect Main Panel

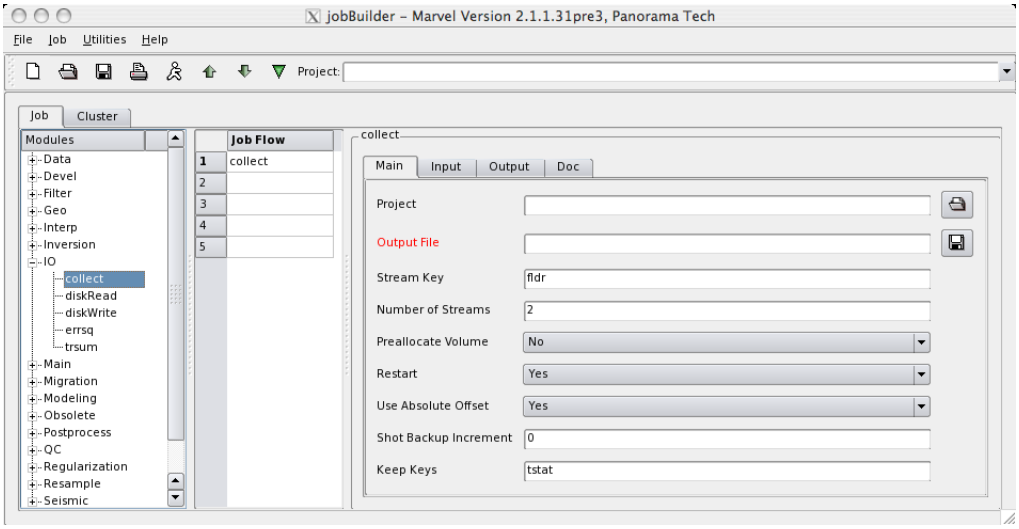


Figure 28. collect Input Panel

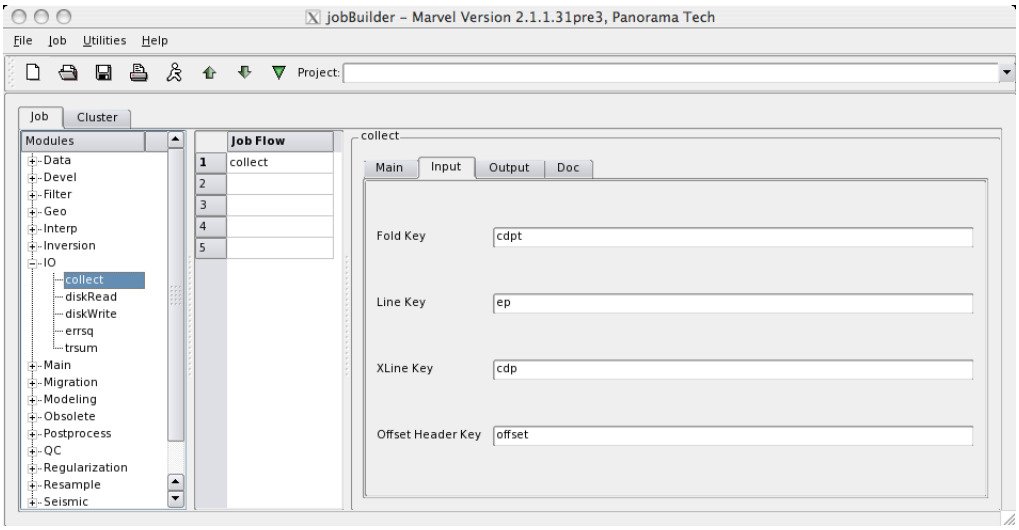


Figure 29. collect Output Panel

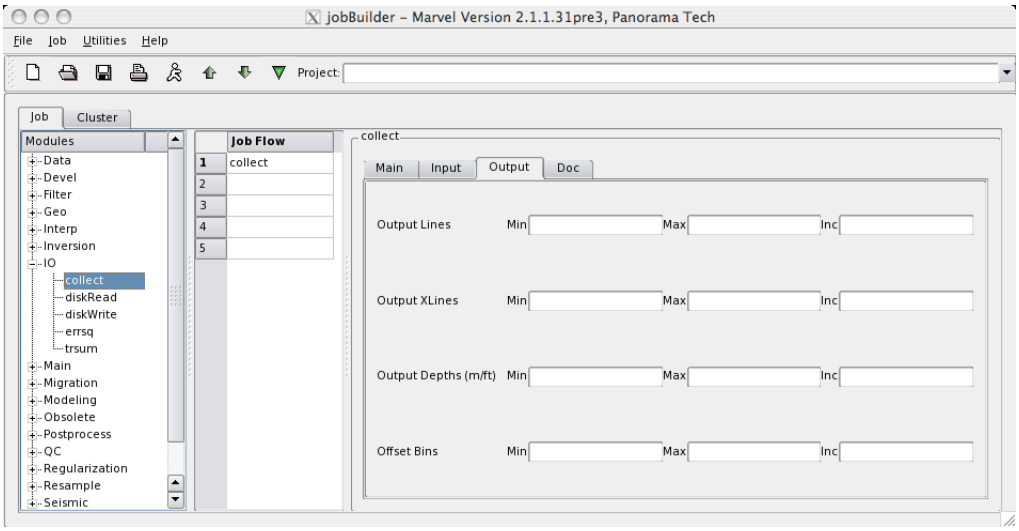


Table 23. collect Panel Fields

Field	Description
Main Panel	
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates.
Output File	The name of the file to be used for output.
Stream Key	The key word to be used for streams in the MARVEL format. default: fldr
Number of Streams	 default: 2
Preallocate Volume	Do you want MARVEL to allocate space for the output data before the job starts? The collect module is designed to stack output from migrations. By default, it does this first-come, first-served, and the output files will be unsorted. Choose the Preallocate Volume option to avoid this behavior. Default: No
Restart	Do you want to be able to restart the job? If Yes, the application will keep information about shots already processed in a restart file. Default: Yes
Use Absolute Offset	

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Table 23. collect Panel Fields–continued

Field	Description
Shot Backup Increment	
Keep Keys	default: tstat
Input Panel	
Fold Key	The key word to be used for FOLD in the MARVEL format. default: cdpt
Line Key	The key word to be used for LINE in the MARVEL format. default: ep
XLine Key	The key word to be used for XLINE in the MARVEL format. default: cdp
Offset Header Key	The key word to be used for OFFSET in the MARVEL format. default: offset
Output Panel	
Output Lines	The number of lines to be contained in the output data.
Output XLines	The number of crosslines to be contained in the output data.
Output Depths	The number of depths to be contained in the output data.
Offset Bins	Specifies the offset bins in which to read the data.

demig Module

The demig module performs demigration operations. It is accessed under the Modeling node of the jobBuilder module tree.

Figure 30. demig Main Panel

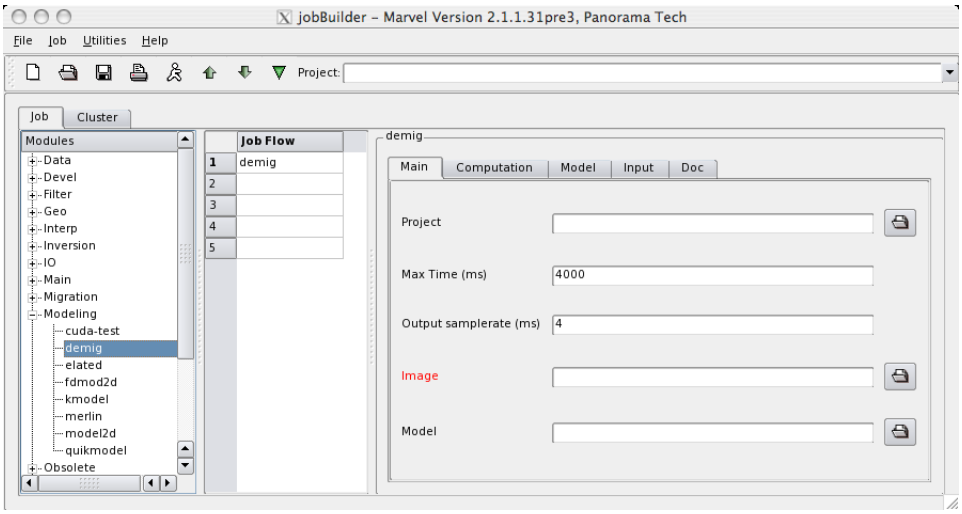


Table 24. deimg Main Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates.
Max Time (ms)	default: 4000
Output sample rate (ms)	default: 4
Image	**This is a REQUIRED entry.**
Model	

demig Computation Panel

Figure 31. demig Module Computation Panel

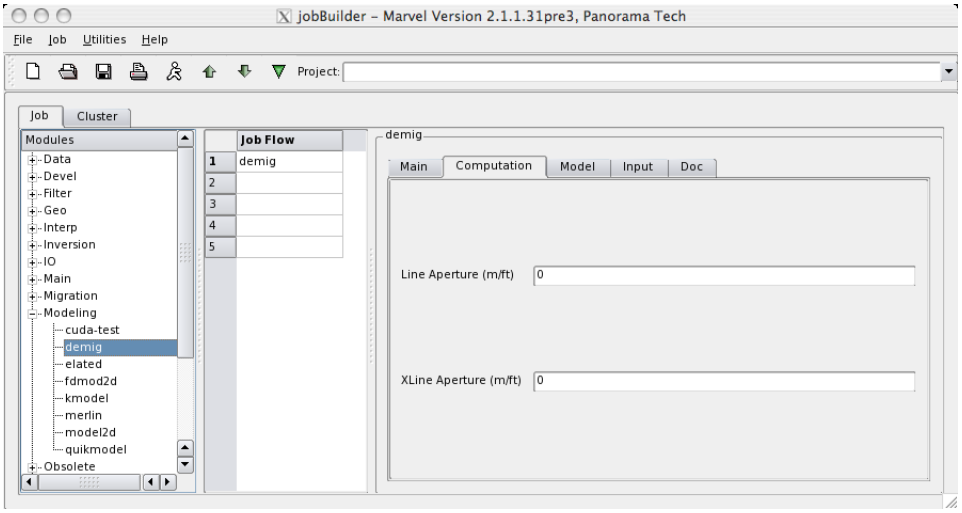


Table 25. demig Main Panel Fields

Field	Description
Line Aperture (m/ft)	The length, in meters or feet, of the line direction aperture limit.
XLine Aperture (m/ft)	The length, in meters or feet, of the crossline direction aperture limit.

demig Model Panel

Figure 32. demig Model Panel

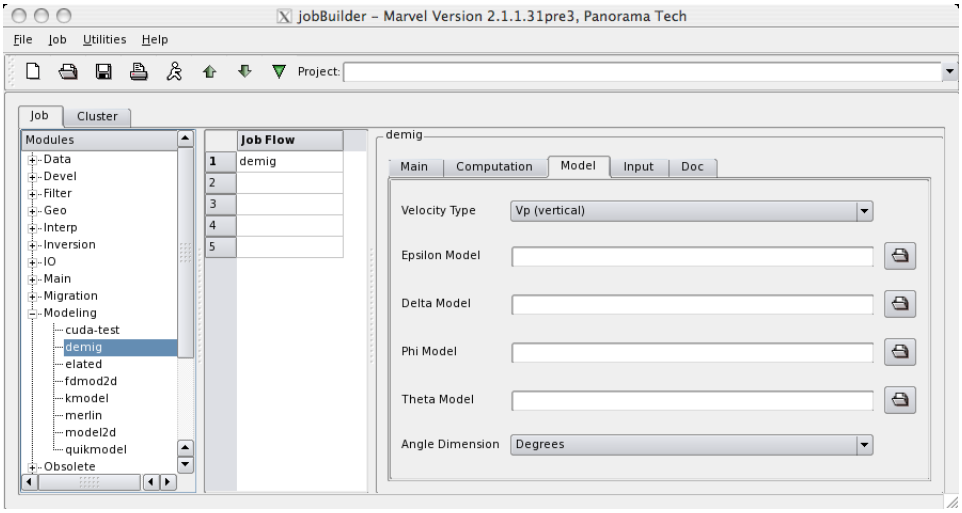


Table 26. demig Model Panel Fields

Field	Description
Velocity Type	Vp (vertical) or VNMO (vertical)
Epsilon Model	File containing a model of Thomsen's epsilon, ε.
Delta Model	File containing a model of Thomsen's delta, δ.
Phi Model	File containing a model of Thomsen's phi, φ.
Theta Model	File containing a model of Thomsen's theta, θ.
Angle Dimension	Degrees or Radians

demig Input Panel

Figure 33. demig Module Input Panel

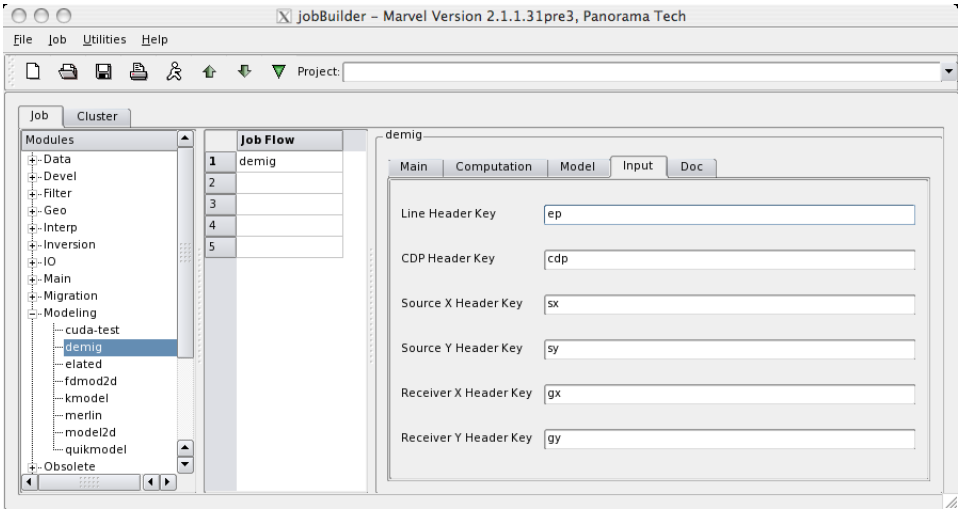


Table 27. demig Input Panel Fields

Field	Description
Line Header Key	Header key containing line designators. MARVEL usually uses ep, which is a 4-byte integer at location 17 in SEG-Y files. default: ep
CDP Header Key	Header key containing CDP designators. MARVEL usually uses cdp, which is a 4-byte integer at location 21 in SEG-Y files. default: cdp
Source X Header Key	Header key specifying where inline source locations are stored in the trace. default: sx
Source Y Header Key	Header key specifying where crossline source locations are stored in the trace. default: sy
Receiver X Header Key	Header key specifying where inline geophone data is stored in the trace. default: gx
Receiver Y Header Key	Header key specifying where crossline geophone data is stored in the trace. default: gy

dipFilter Module

The dipFilter module removes the non-propagating, evanescent waves. It is accessed under the Geo node of the jobBuilder module tree.

Figure 34. dipFilter Panel

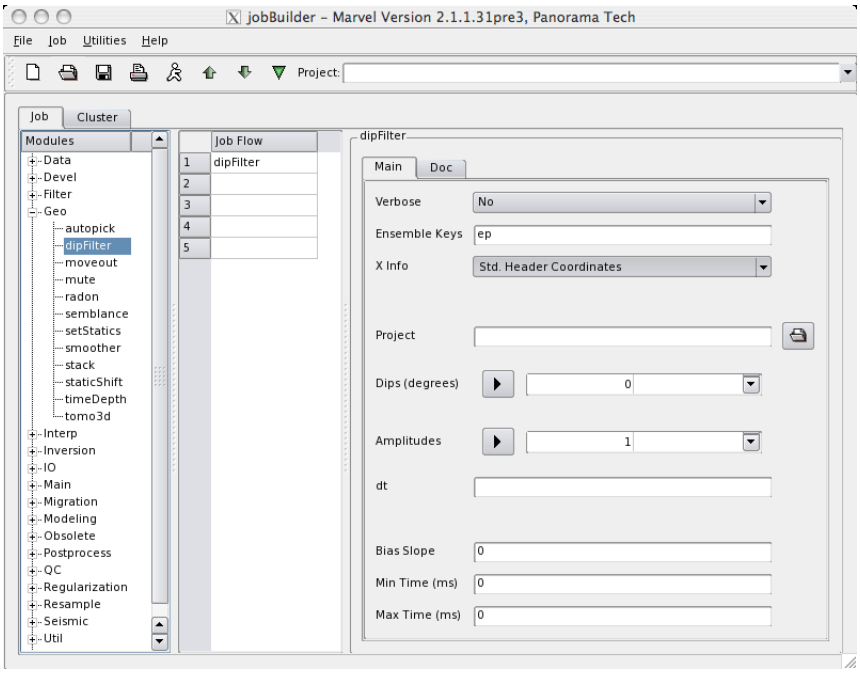


Table 28. dipFIlter Panel Fields

Field	Description
verbose	Switch for turning debug printing on and off. default: No
Ensemble Keys	default: ep
X Info	• Header Key • Std. Header Coordinates • Parameters default: Std. Header Coordinates

continues on next page

Table 28. dipFilter Panel Fields–continued

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates. **This is a REQUIRED entry.**
Dips	
Amplitudes	
dt	
Bias Slope	
Min TIme	
Max Time	

diskRead Module

The diskRead module enables you to select the seismic files you want to read. It also enables you to set parameters that control how this data is handled by MARVEL. The diskRead module is accessed under the IO node of the jobBuilder module tree.

diskRead Main Panels

The format of the diskRead Main panel depends on the Mode you select on the panel: General (Figure 35), Kirchhoff Migration (Figure 36), Beam Migration (Figure 37), or Shot Migration (Figure 38). The data fields are defined in Table 29.

Figure 35. diskRead Main Panel, General

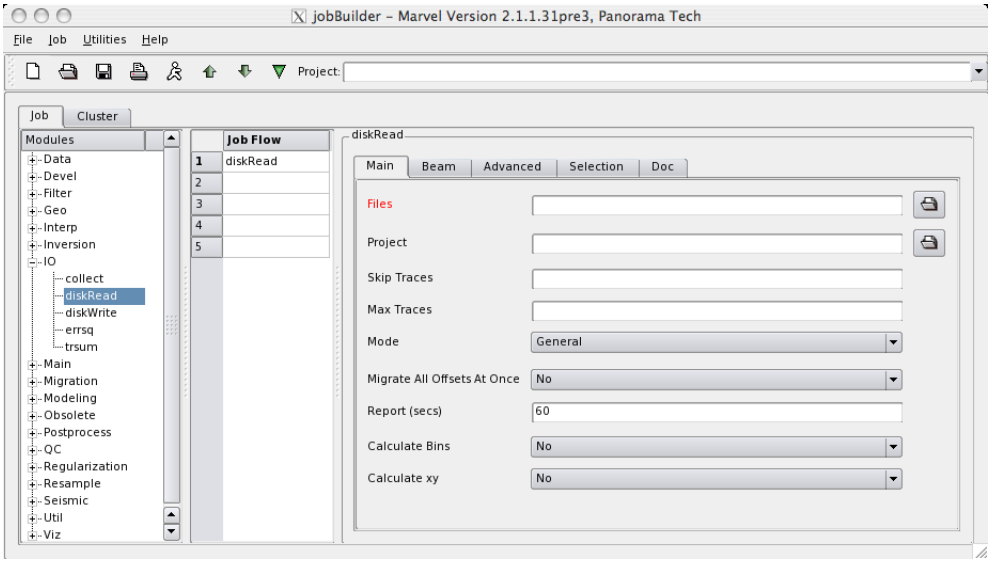


Figure 36. diskRead Main Panel, Kirchhoff Migration

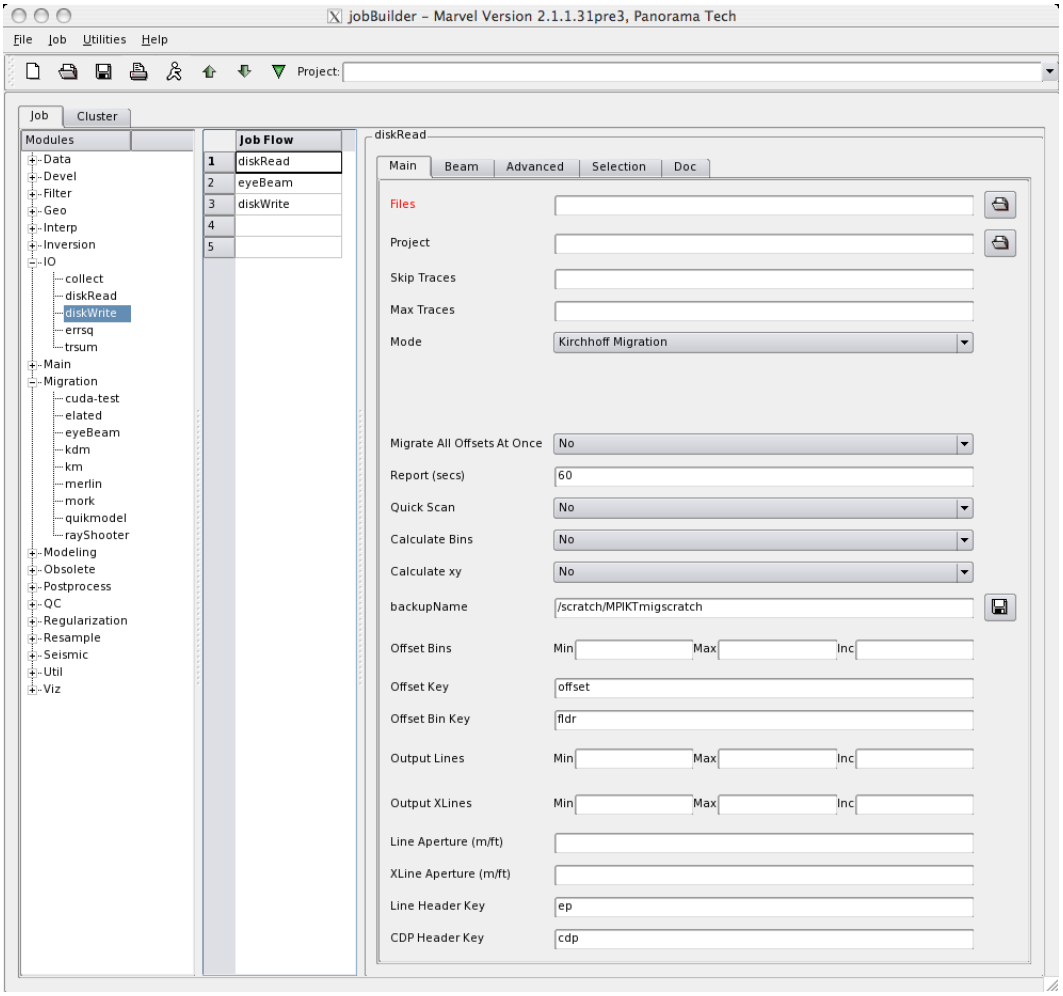


Figure 37. diskRead Main Panel, Beam Migration

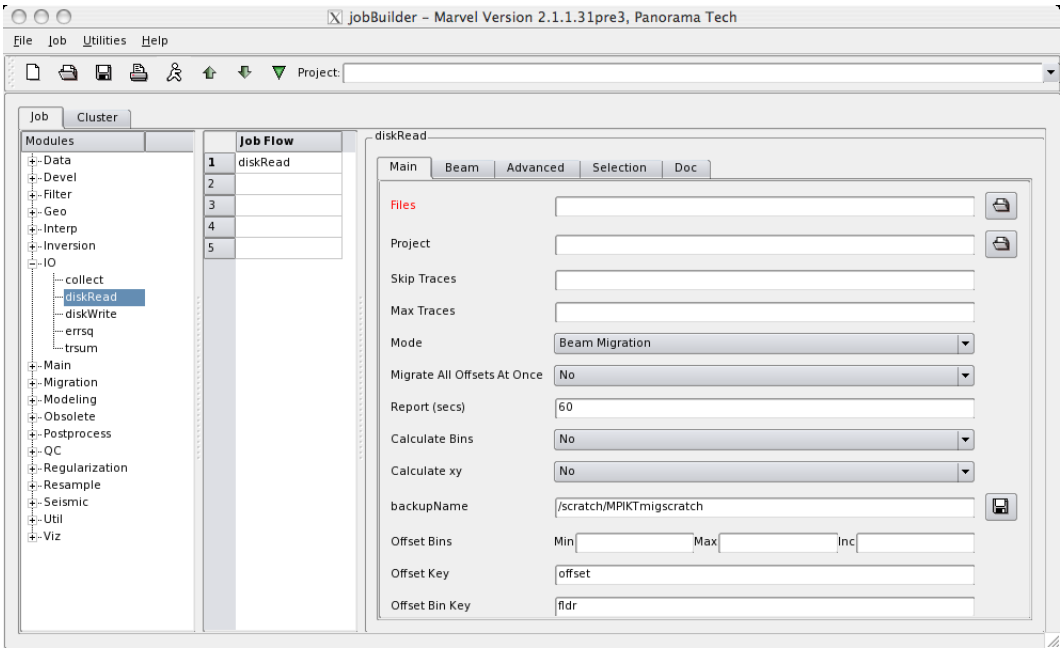


Figure 38. diskRead Main Panel, Shot Migration

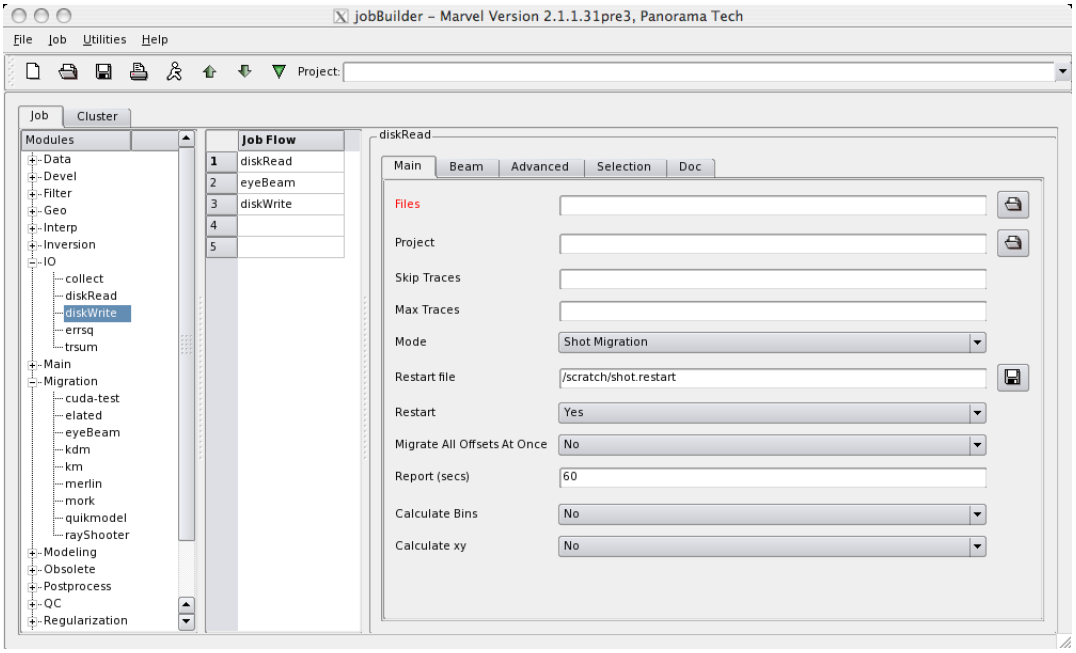


Table 29. diskRead Main Panel Fields

Field	Description
Mode: General	
Files	List of the input files to be read.
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates.
Skip Traces	The maximum number of traces to skip.
Max Traces	The maximum number of traces to read.
Mode	Mode to read data for specific applications: General, Kirchhoff Migration, or Shot Migration. The selection in this field determines the complement of fields you see on this panel. default: General
Migrate All Offsets At Once	Enables all offsets to be held in memory at one time. This is good for increasing I/O performance. default: No
Report (secs)	How often to report output, in seconds. default: 60
Calculate Bins	If the input data has only CDPs and lines in the headers, this will calculate the real world coordinates for selecting super-gathers.
Calculate xy	If the input data does not have CDPs and lines set in the header, set this parameter to YES to have diskRead calculate CDP and line information from the world coordinates in the trace headers.
Mode: Kirchhoff Migration	
Quick Scan	default: no
backupName	The name of the file to contain backup data if a restart becomes necessary. default: */scratch/KDmigscratch* **Note: This file is not deleted when a job finishes successfully. You must delete the file manually.**
Offset Bins	These three fields are the minimum, maximum, and increment defining the leading edges of the offset bins. For example, if these values are set to 0, 20000, 100, then 199 offset bins beginning at 50 will be output.

continues on next page

Table 29. diskRead Main Panel Fields–continued

Field	Description
Offset Key	Header key defining the location of the offset in the trace.
Offset Bin Key	The header key for the offset bin parameter.
Output Lines	These three fields are the minimum, maximum, and increment for the desired output line range.
Output XLines	These three fields are the minimum, maximum, and increment for the desired output crossline range.
Line Aperture (m/ft)	The length, in meters or feet, of the line direction aperture limit.
XLine Aperture (m/ft)	The length, in meters or feet, of the crossline direction aperture limit.
Line Header Key	Header key containing line designators. MARVEL usually uses ep, which is a 4-byte integer at location 17 in SEG-Y files. default: ep
CDP Header Key	Header key containing line designators. MARVEL usually uses ep, which is a 4-byte integer at location 17 in SEG-Y files. default: cdp
Line Aperture	The length, in meters or feet, of the line direction aperture limit.
XLine Aperture	The length, in meters or feet, of the crossline direction aperture limit.
Line Header Key	Header key containing line designators. MARVEL usually uses ep, which is a 4-byte integer at location 17 in SEG-Y files. default: ep
CDP Header Key	Header key containing CDP designators. MARVEL usually uses cdp, which is a 4-byte integer at location 21 in SEG-Y files. default: cdp
Restart File	The application keeps information about shots already processed in this file. It is usually best to put it in the same directory where your output files are located and to give it a similar name. default: */scratch/shot.restart*
Calculate Bins	If the input data has only CDPs and lines in the headers, this will calculate the real world coordinates for selecting super-gathers. default: No

continues on next page

Table 29. diskRead Main Panel Fields–continued

Field	Description
Calculate xy	If the input data does not have CDPs and lines set in the header, set this parameter to YES to have diskRead calculate CDP and line information from the world coordinates in the trace headers. default: No
Mode: Beam Migration	
Patch Size (m/ft)	The actual patch or super gather size. The value defines a square around sources and receivers. Every trace with a source and a receiver in the corresponding square is included in the patch. default: 150
Overlap Patches	Set this to YES to increase the coherence at shallow depths. default: No
Bundle Key	The header word location containing the unique value assigned to each patch. default: tracf
Mode: Shot Migration	
backupName	The name of the file to contain backup data if a restart becomes necessary. default: */scratch/KDmigscratch* **Note: This file is not deleted when a job finishes successfully. You must delete the file manually.**
Report (secs)	default: 60
Quick scan	default: 60

diskRead Advanced Panel

This panel enables you to define the advanced parameters for the module. Currently there is only one parameter on the panel: Number of Traces to Map. The default value is 10000.

diskRead Selection Panel

The diskRead Selection panel identifies the file to which the MARVEL output data will be written. The panel is shown in Figure 39, and the terms are defined in Table 30.

Figure 39. diskRead Selection Panel

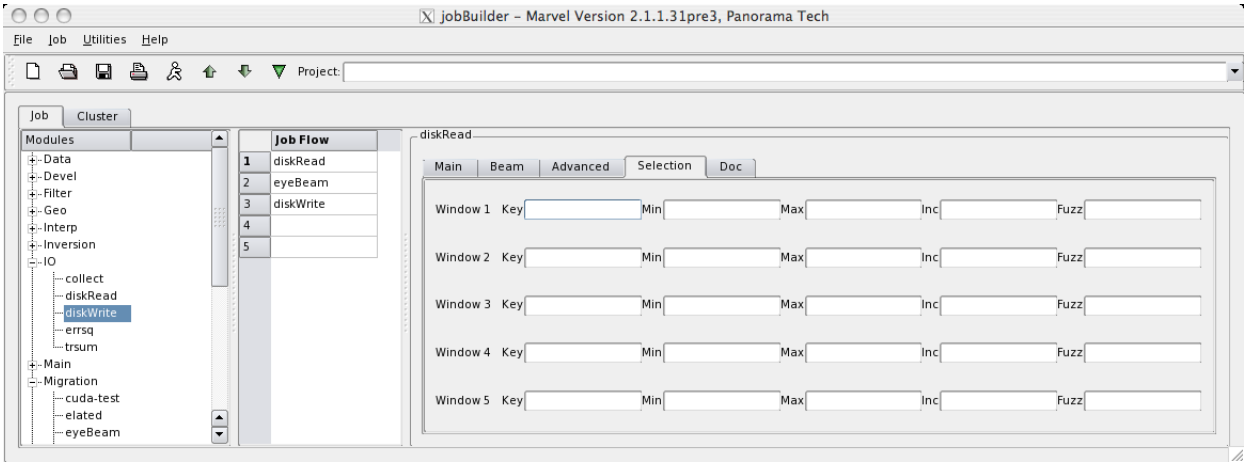


Table 30. diskRead Selection Panel Fields

Field	Description
Window 1	• Key— • Min— • Max— • Inc— • Fuzz—

diskWrite Module

The diskWrite module identifies the file to which the MARVEL output data will be written. The diskWrite panel is shown in Figure 40, and the terms are defined in Table 31. The diskWrite module is accessed under the IO node of the jobBuilder module tree.

Figure 40. diskWrite Panel

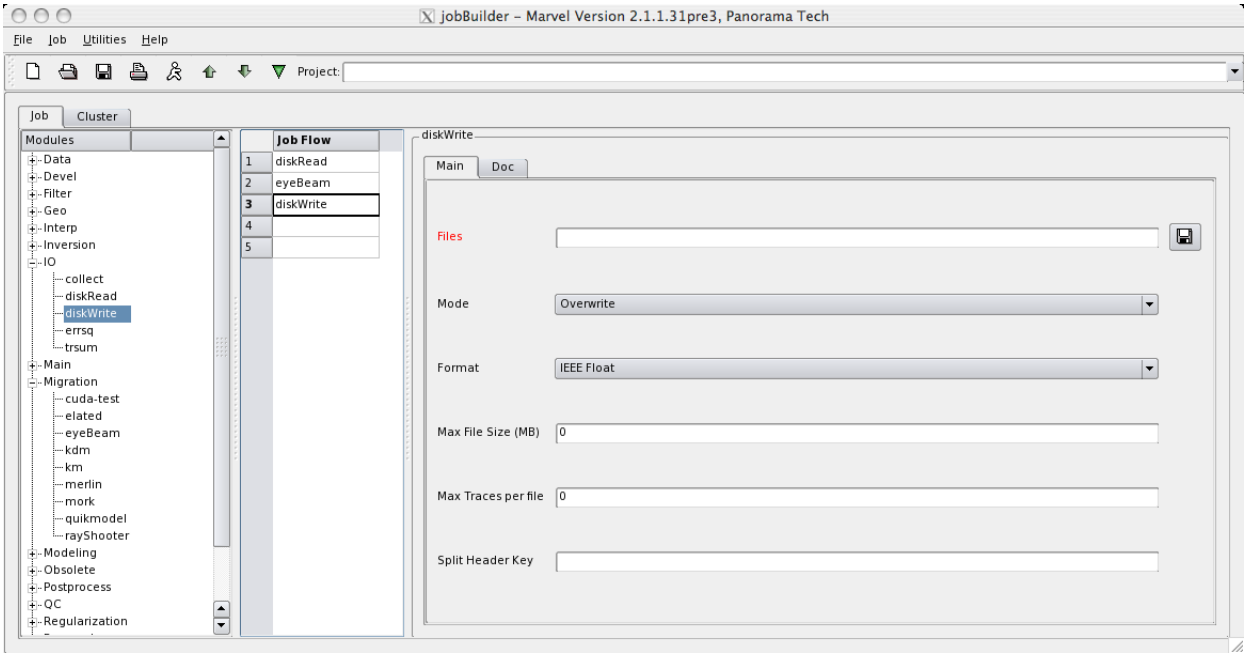


Table 31. diskWrite Panel Fields

Field	Description
Files	The names of the file to write. **This is a REQUIRED entry.**
Mode	The mode to write the files: Overwrite or Append.
Format	The format to be used for the output data: IEEE floating, IBM floating, or Scaled short.
Max File Size (MB)	The maximum size of the file that MARVEL should write. default: 0, no size limit
Max Traces per file	The maximum number of traces to be included in a file. default: 0, no size limit
Split Header Key	

elated Module

The elated module is accessed under both the Migration and Modeling nodes of the jobBuilder module tree.

Figure 41. elated Main Elasticity panel

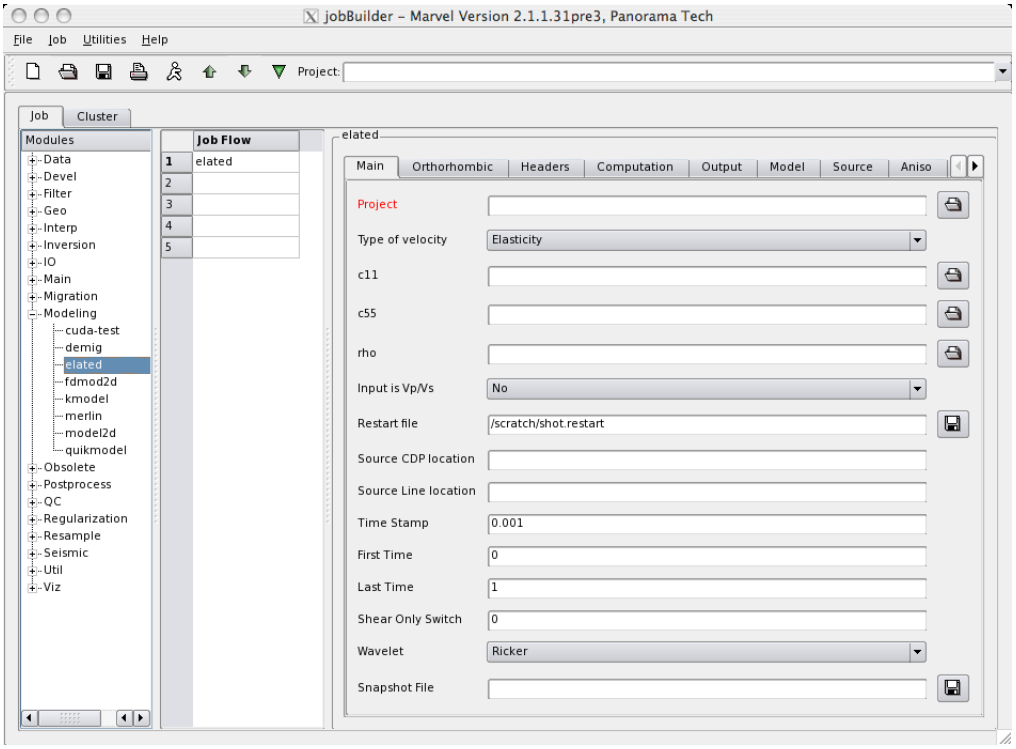


Figure 42. elated Main Thomsen panel

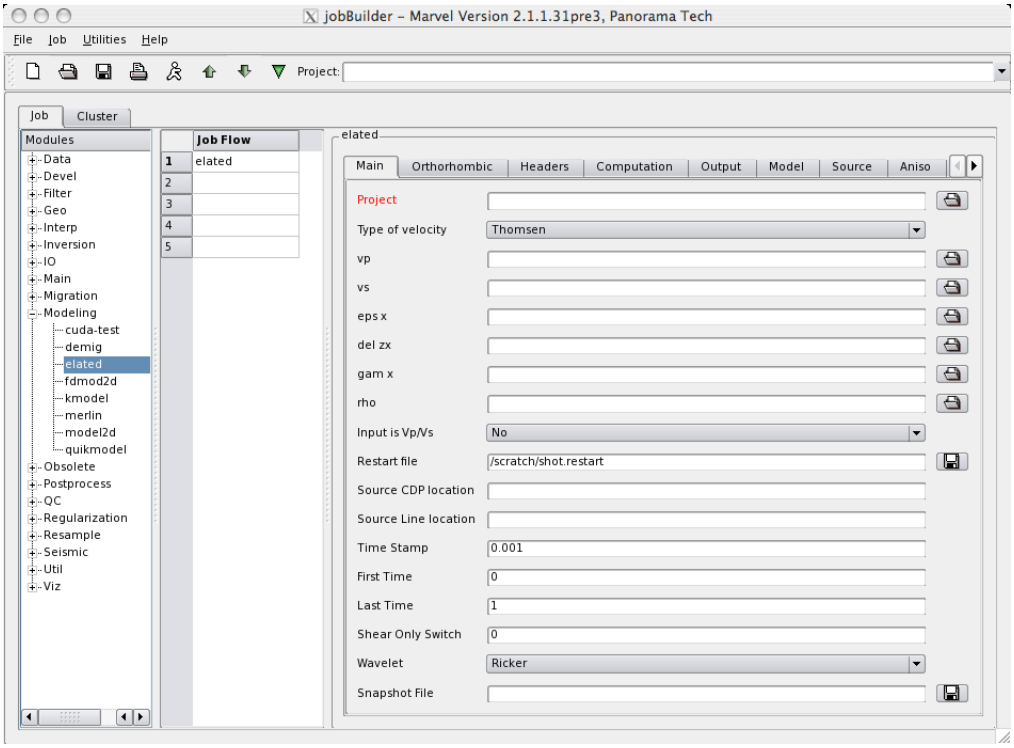


Figure 43. elated Main Wavelet panel

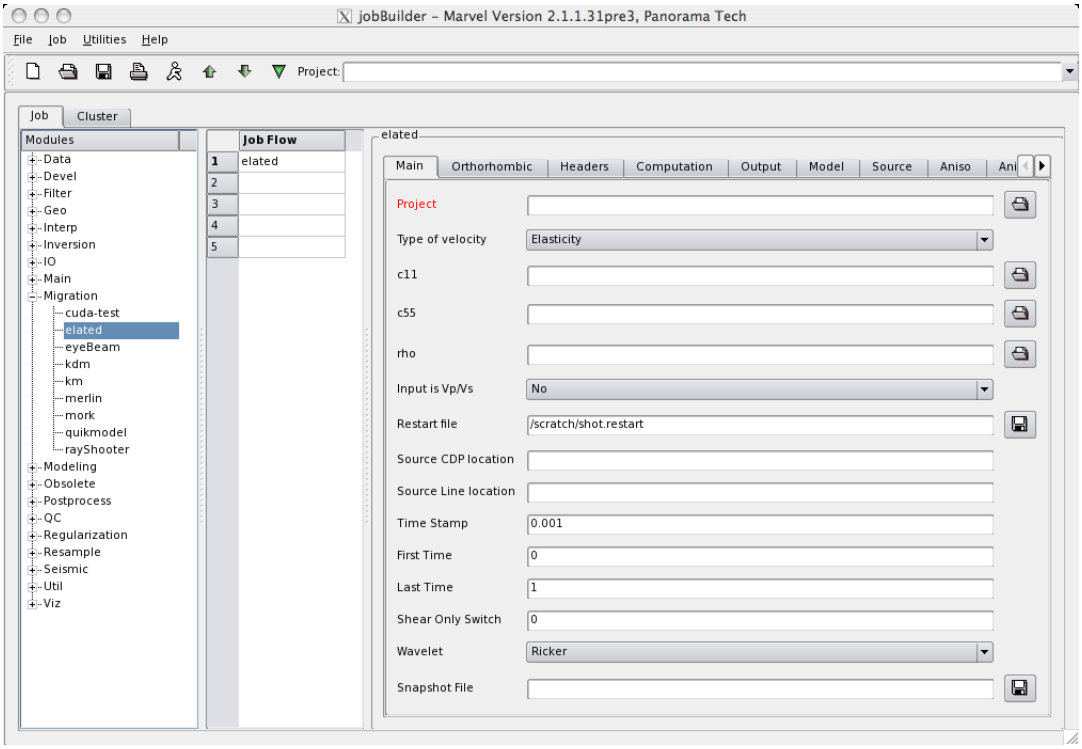


Table 32. elated Main Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates. **This is a REQUIRED entry.**
Type of Velocity	• Elasticity • Thomsen
Elasticity Velocity	
c11	
c55	
Thomsen Velocity	
vp	
vs	
eps x	
del zx	
gam x	
Common to All	
rho	
Input is Vp/Vs	• No • Yes - in English Units • Yes - in Metric Units
Restart File	The application keeps information about shots already processed in this file. It is usually best to put it in the same directory where your output files are located and to give it a similar name. default: */scratch/shot.restart*
Source CDP location	
Source Line location	

continues on next page

Table 32. elated Main Panel Fields–continued

Field	Description
Time Stamp	
First Time	
Last Time	
Shear Only Switch	
Wavelet	• Ricker • From File
Wavelet File	Displayed only if *Wavelet* is set to *FromFile*.
Wavelet Lead (ms)	Displayed only if *Wavelet* is set to *FromFile*.
Snapshot File	

elated Orthorhombic Panel

Figure 44. elated Orthorhombic Panel

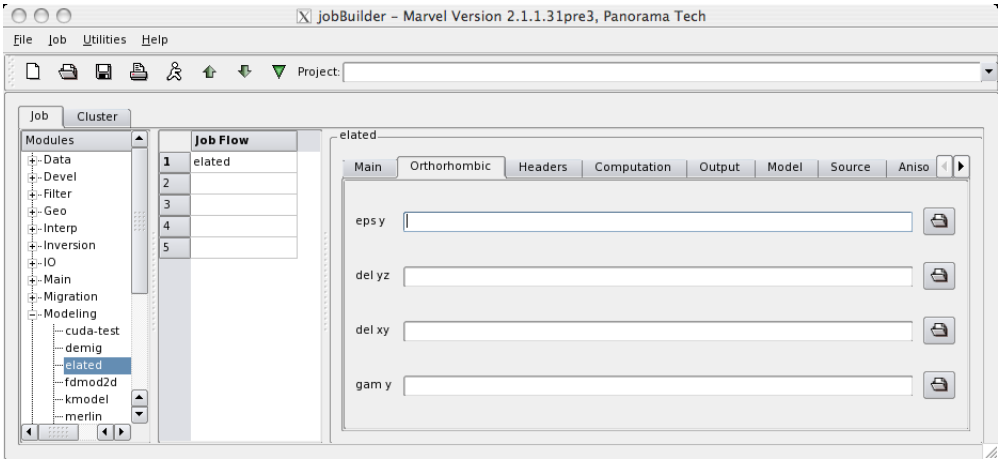


Table 33. elated Orthorhombic Panel Fields

Field	Description
eps y	
del yz	
del xy	
gam y	

elated Headers Panel

Figure 45. elated Headers Panel

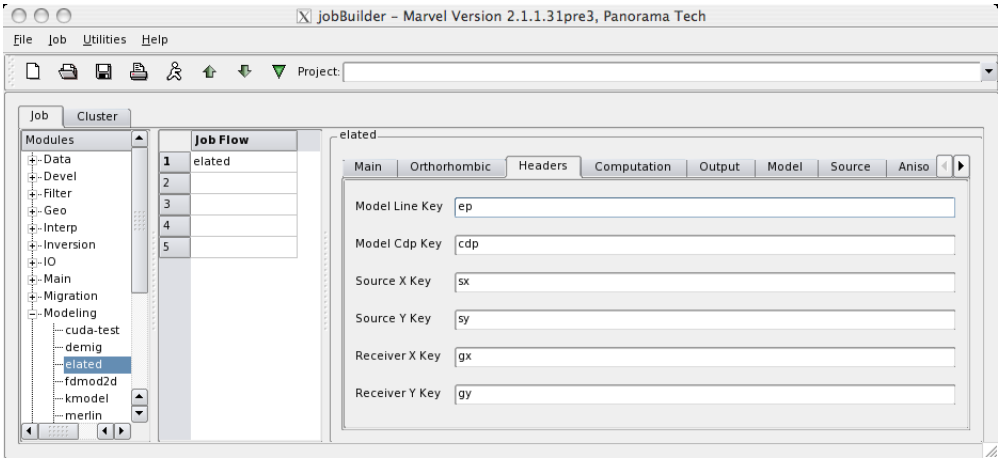


Table 34. elated Headers Panel Fields

Field	Description
Model Line Key	The header word key for line information when the model is gridded. Use if different from the data. default: same as data
Model Cdp Key	The header word key for CDP information when the model is gridded. Use if different from the data. default: same as data
Source X Key	
Source Y Key	
Receiver X Key	
Receiver Y Key	

elated Computation Panel

Figure 46. elated Computation Panel

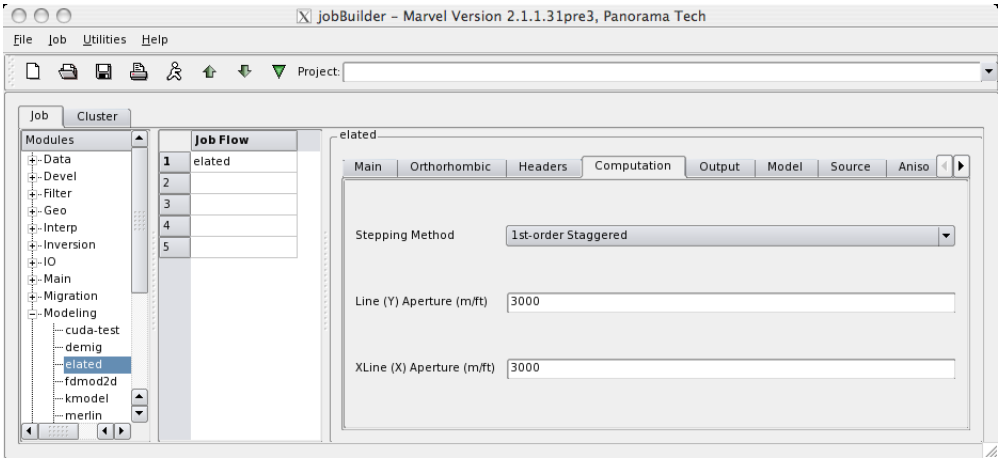


Table 35. elated Computation Panel Fields

Field	Description
Stepping Method	*1stOrderStaggered* or *2ndOrderLeapfrog*
Line (Y) Aperture (m/ft)	The length, in meters or feet, of the line direction aperture limit.
XLine Aperture (m/ft)	The length, in meters or feet, of the crossline direction aperture limit.

elated Output Panel

Figure 47. elated Output Panel

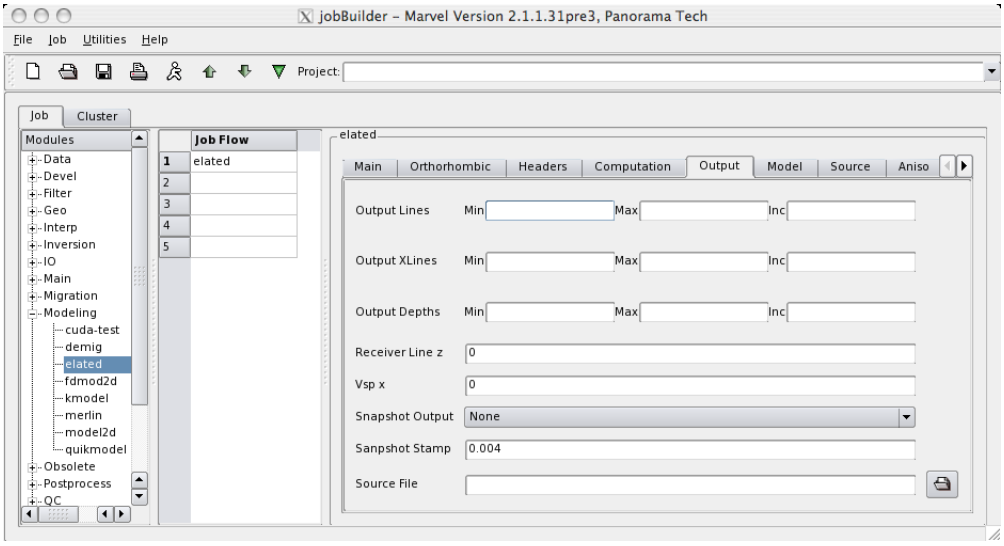


Table 36. elated Output Panel Fields

Field	Description
Output Lines	The minimum, maximum, and increment values for output lines.
Output XLines	The minimum, maximum, and increment values for output crosslines.
Output Depths	The minimum, maximum, and increment values for output depths.
Receiver Line z	default: 0
Vsp x	default: 0
Snapshot Output	• None • Stresses • Particle Velocity
Snapshot Stamp	default: 0.004
Source File	

elated Model Panel

Figure 48. elated Model Panel

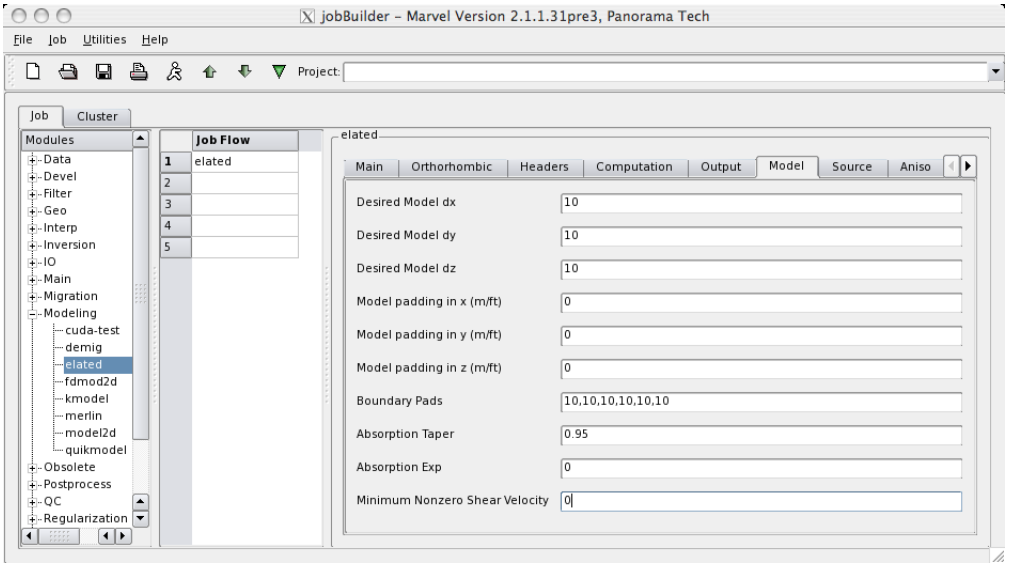


Table 37. elated Model Panel Fields

Field	Description
Desired Model dx	default: 10
Desired Model dy	default: 10
Desired Model dz	default: 10
Model Padding in x	default: 0
Model Padding in y	default: 0
Model Padding in z	default: 0
Boundary Pads	default: 10,10,10,10,10,10
Absorption Taper	default: 0.95

continues on next page

Table 37. elated Model Panel Fields–continued

Field	Description
Absorption Exp	default: 0
Minimum Nonzero Shear Velocity	default: 0

elated Source Panel

Figure 49. elated Source Panel

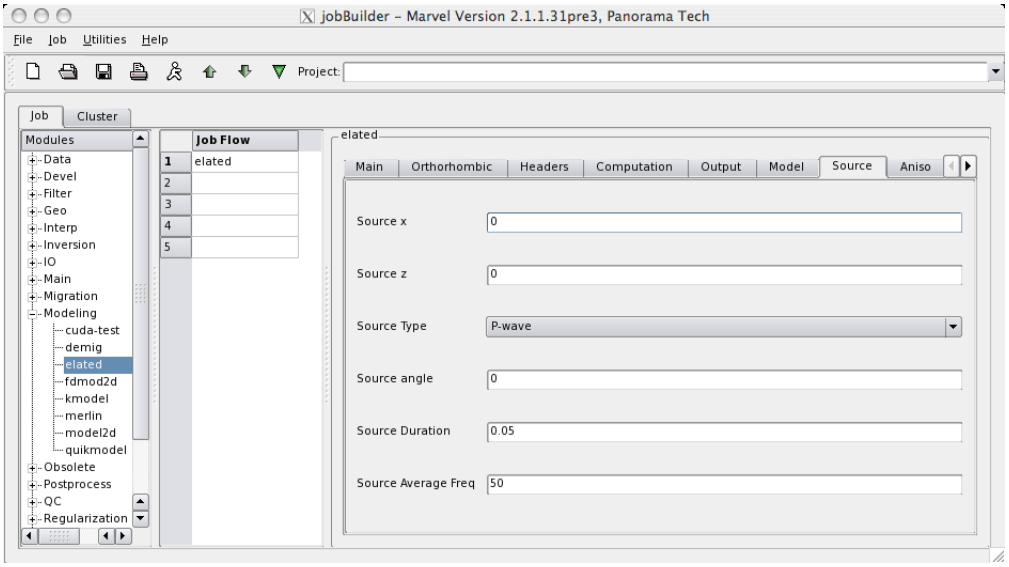


Table 38. elated Source Panel Fields

Field	Description
Source x	default: 0
Source y	default: 0
Source Type	• P-Wave • Velocity • Plane Wave default: P-Wave
Source Angle	default: 0
Source Duration	default: 0.05
Source Average Freq	default: 50

elated Aniso Panel

Figure 50. elated Aniso Panel

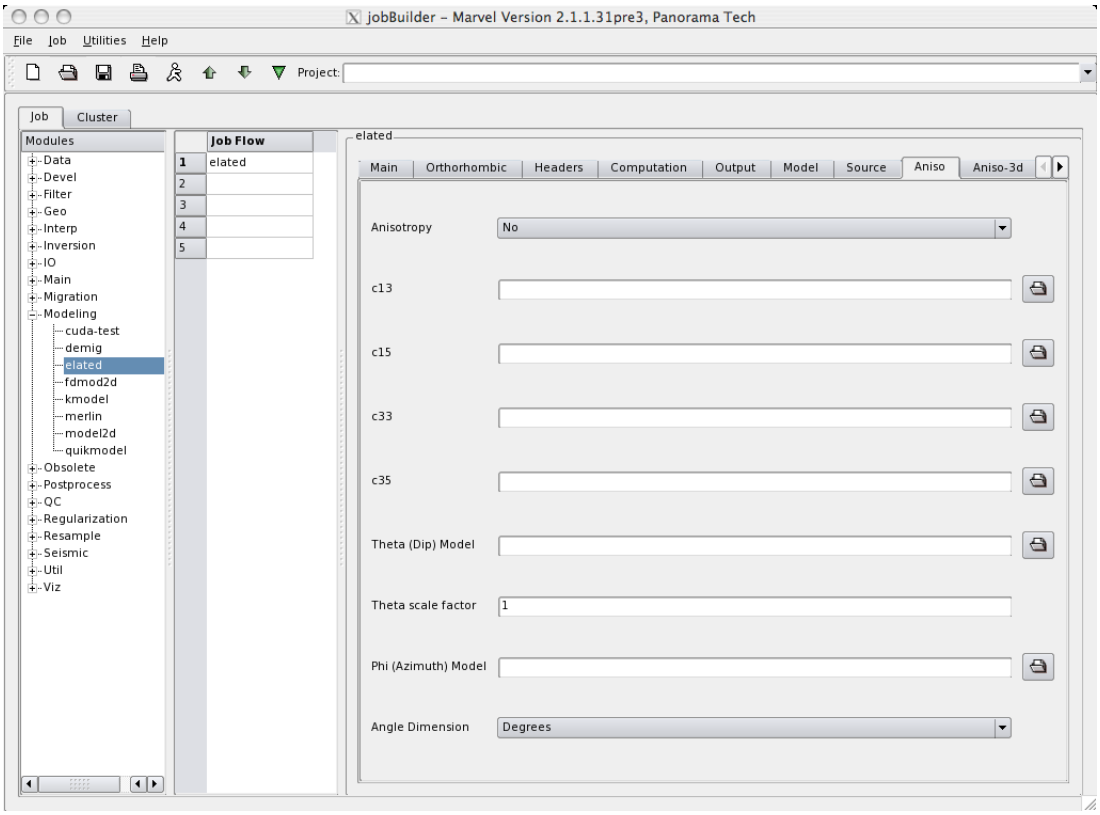


Table 39. elated Aniso Panel Fields

Field	Description
Anisotropy	default: 0
c13	**This field is only visible if you have selected Elasticity as the Type of Velocity on the Main Panel.**
c15	**This field is only visible if you have selected Elasticity as the Type of Velocity on the Main Panel.**
c33	**This field is only visible if you have selected Elasticity as the Type of Velocity on the Main Panel.**

continues on next page

Table 39. elated Aniso Panel Fields–continued

Field	Description
c35	**This field is only visible if you have selected Elasticity as the Type of Velocity on the Main Panel.**
Theta (Dip) Model	
Theta scale factor	default: 1
Angle Dimension	
Source Average Freq	Degrees or Radians

elated Aniso-3d Panel

Note:

The fields on this panel are only visible if you have selected Elasticity as the Type of Velocity on the elated Main Panel.

Figure 51. elated Aniso-3d Panel

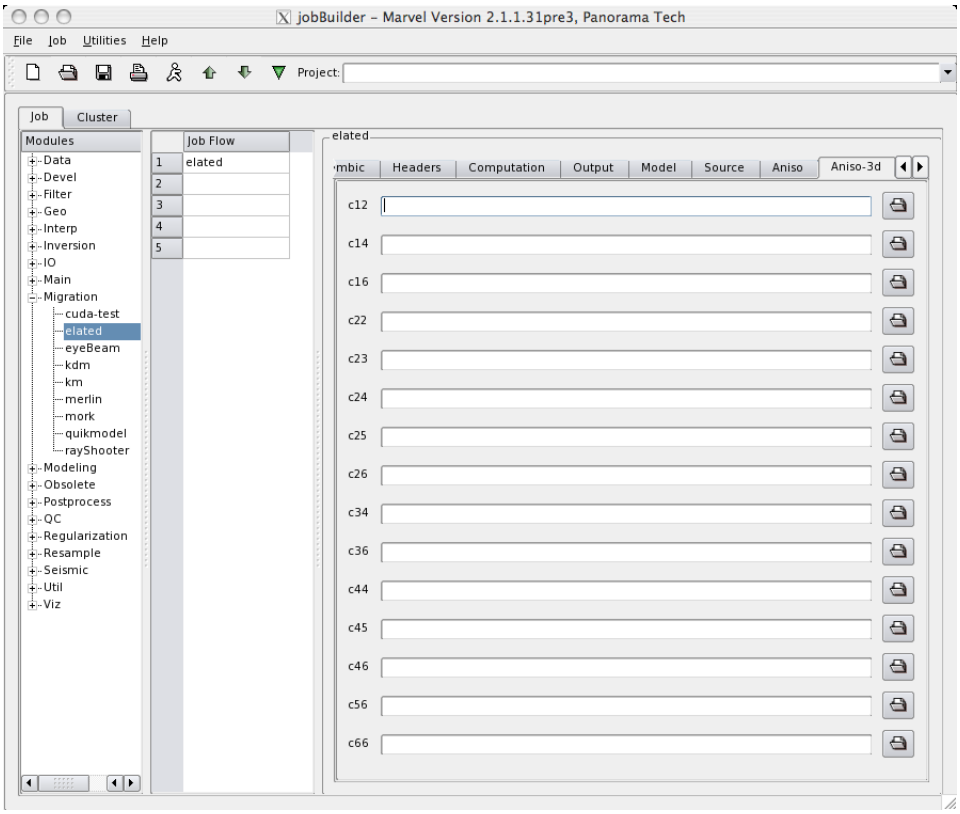


Table 40. elated Aniso-3d Panel Fields

Field	Description
c12	
c14	
c16	
c22	
c24	

continues on next page

Table 40. elated Aniso-3d Panel Fields–continued

Field	Description
c25	
c26	
c34	
c36	
c44	
c45	
c46	
c56	
c66	

elated Attenuation Panel

Figure 52. elated Attenuation Panel

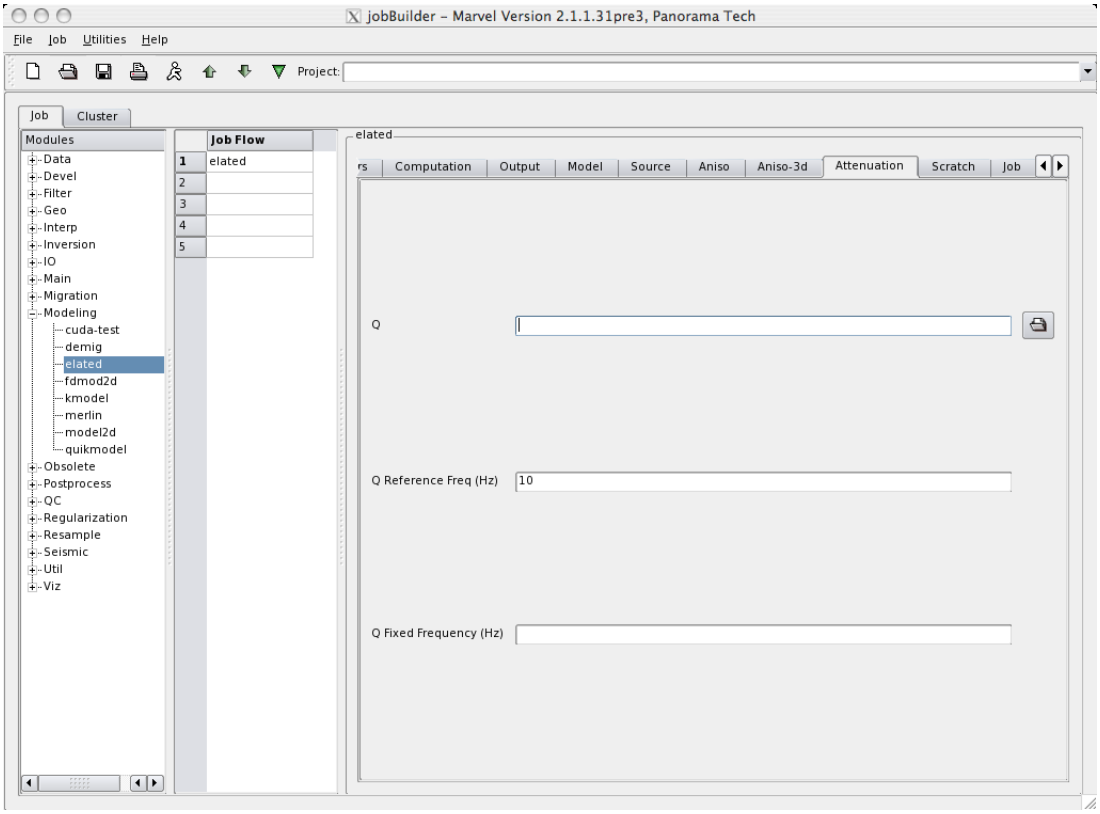
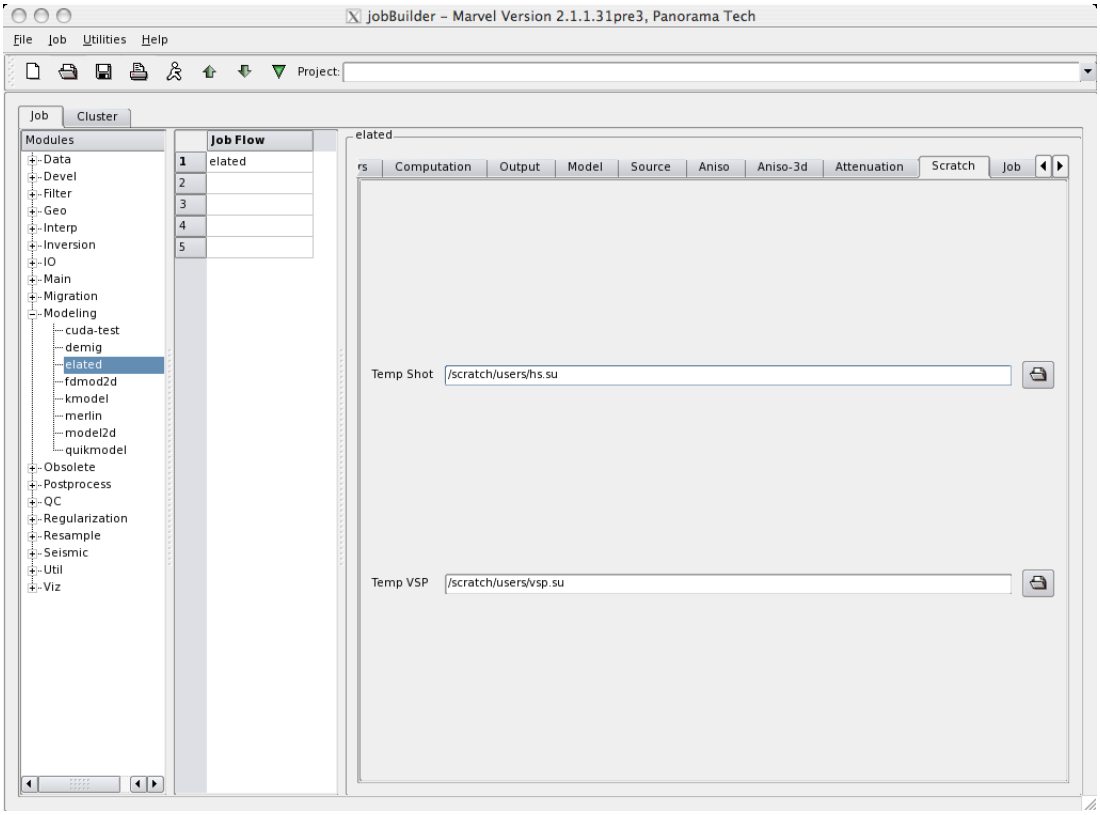


Table 41. elated Attenuation Panel Fields

Field	Description
Q	
Q Reference Freq (Hz)	
Q Fixed Frequency (Hz)	

elated Scratch Panel

Figure 53. elated Scratch Panel



- Temp Shot /scratch/users/hs.su
- Temp VSP /scratch/users/vsp.su

elated Job Panel

Figure 54. elated Job Panel

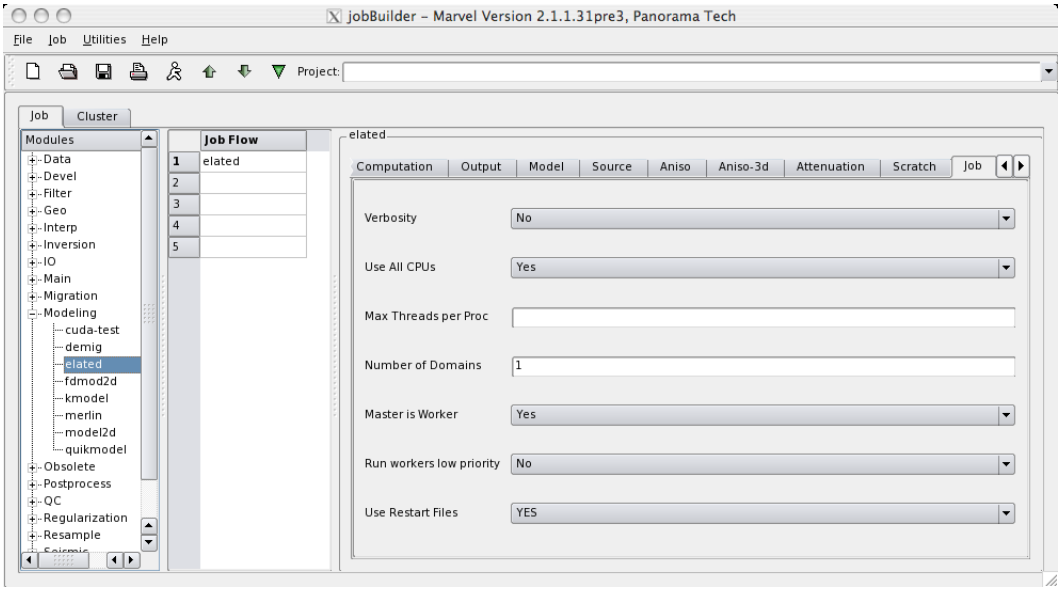


Table 42. elated Job Panel Fields

Field	Description
Verbosity	Switch for turning debug printing on and off. default: No
Use All CPUs	This really means that each worker should use multiple threads. If No, then there will be one independent worker spawned for each CPU (or core) in the cluster. default: Yes
Max Threads per Proc	If *UseAllCPUs* is set to *Yes*, this field limits the number of CPUs (cores) that a single worker can use.
Number of Domains	The computation grid will be split up among this number of workers for each shot. default: 1
Master is Worker	Flag that controls whether the master I/O controller is also used for performing calculations. default: Yes
Run workers low priority	If Yes, workers will be spawned with reduced priority, although the master process will remain at high priority. This can be useful, especially when *MasterIsWorker* is set, so that one worker does not slow down collection or submission of shots for the others. default: No

continues on next page

Table 42. elated Job Panel Fields–continued

Field	Description
Use Restart Files	If NO, the job ignores restart information and start from the beginning. default: Yes

eyeBeam Module

The eyeBeam module is Panorama Technologies' parsimonious beam migration program. The module decomposes seismic data into effective beamlets and images those beamlets along rays generated by the anisotropic raytracer (see rayshooter Module). The eyeBeam module is accessed under the Migration node of the jobBuilder module tree.

Figure 55. eyeBeam Main Panel, Stack Mode

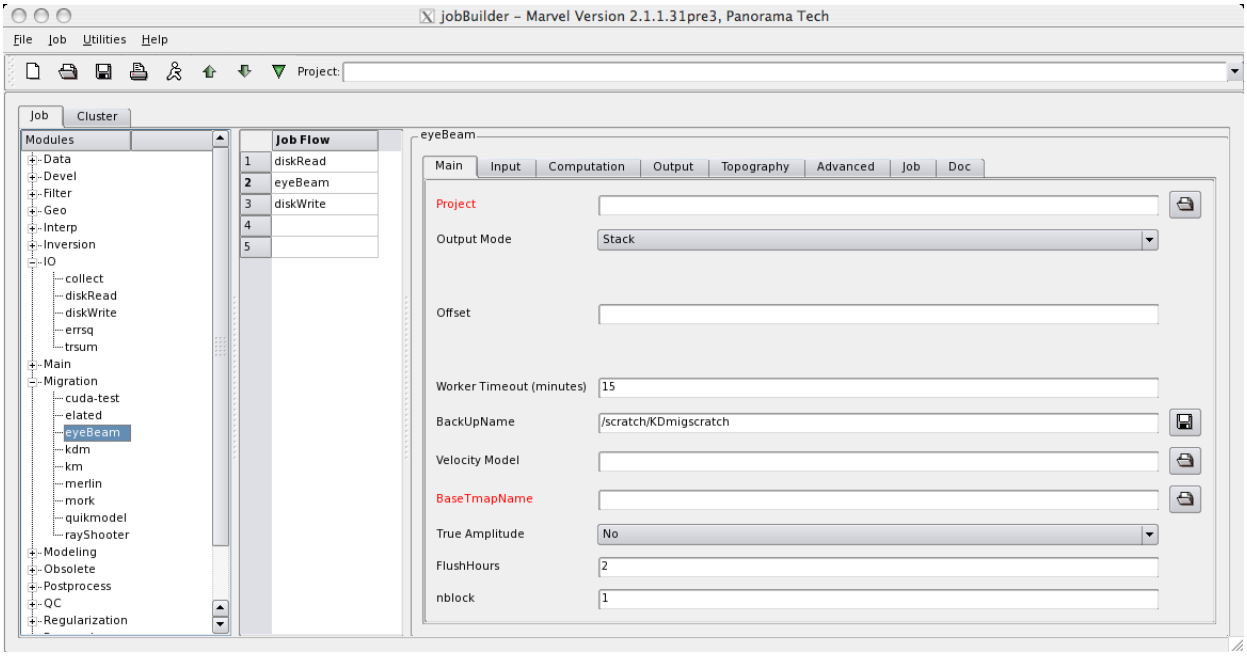


Figure 56. eyeBeam Main Panel, Offsets Mode

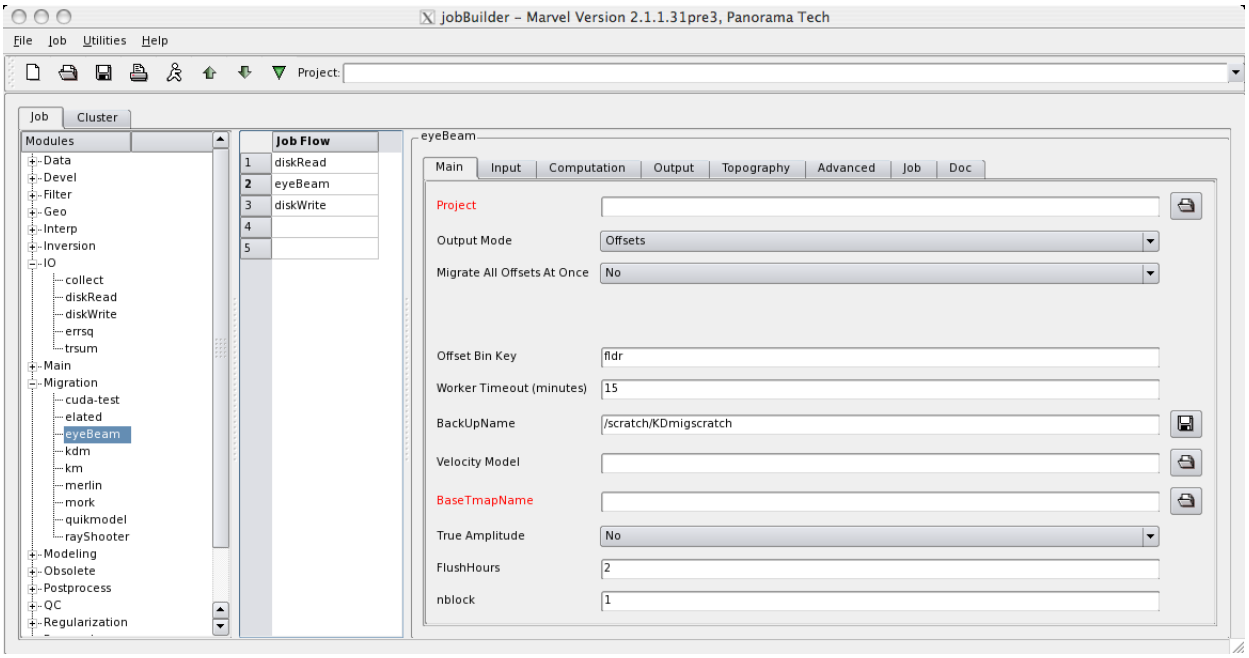


Table 43. eyeBeam Main Panel Fields

Field	Description
Mode: Stack	
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates. **This is a REQUIRED entry.**
Output Mode	The mode to write the files: Stack or Offsets.
Offset	Defines the bin of the run to be used for the output header.
Worker Timeout (minutes)	Worker components that have not responded in this amount of time are assumed to be dead. default: 15 minutes
BackupName	The name of the file to contain backup data if a restart becomes necessary. default: */scratch/KDmigscratch* **Note: This file is not deleted when a job finishes successfully. You must delete the file manually.**

continues on next page

Table 43. eyeBeam Main Panel Fields–continued

Field	Description
Velocity Model	The path and filename of the velocity model to be used in the calculations. This is a seismic file in any format MARVEL can read, typically, SEG-Y. The units are m/s, or ft/s, but can be anything else, depending on the choice of units in the seismic data. The velocity model serves two purposes. It provides the necessary velocity information for differential moveout of the traces in each super gather to the average offset of that ensemble. It also defines the near surface velocity for computation of take-off angles.
BaseTmapName	Base name of the required traveltime data. This name is the tmap file name without the .tmap extension. **Note: This is a REQUIRED entry.**
True Amplitude	When set to YES, eyeBeam will use the amplitudes computed during the generation of traveltimes by rayShooter. default: N
Flush Hours	The time, in hours, between backups. default: 2
nblock	The size of the trace block. **Note: This parameter should not be set when using eyeBeam.** default: 1
Mode: Offsets	
Output Mode	The mode to write the files: Stack or Offsets.
Migrate All Offsets At Once	If set to YES, traces are read in exactly the order they are stored. If set to NO, traces are read in common offset order. This should be set to NO for Beam Migrations. default: No
Offset Bin Key	The header key for the offset bin parameter. default: fldr

eyeBeam Input Panel

Figure 57. eyeBeam Input Panel

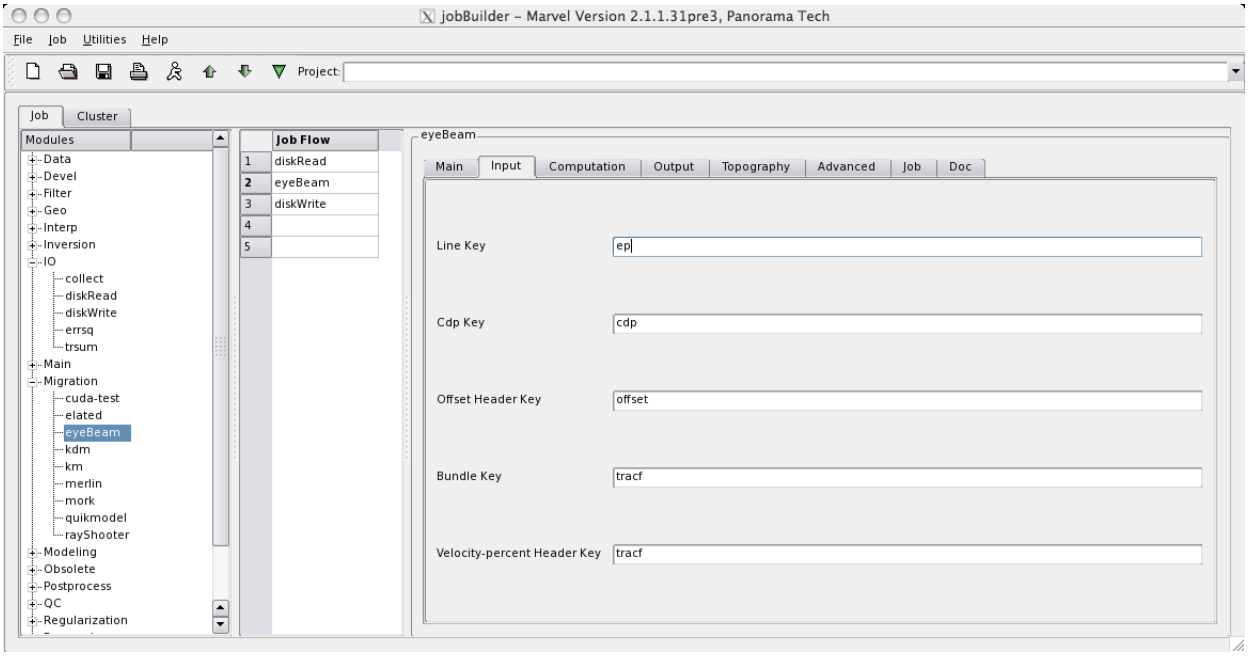


Table 44. eyeBeam Input Panel Fields

Field	Description
Line key	The header key specifying where line data is stored in the trace. default: ep
Cdp key	The header key specifying where CDP data is stored in the trace. default: cdp
Offset header key	Header key for the offset parameter. default: offset
Bundle key	The header word location containing the unique value assigned to each patch. default: tracf
Velocity-percent Header key	The header word location containing the unique value assigned to the velcity-percent value. default: tracf

eyeBeam Computation Panel

Figure 58. eyeBeam Computation Panel, Max Stack Search Method

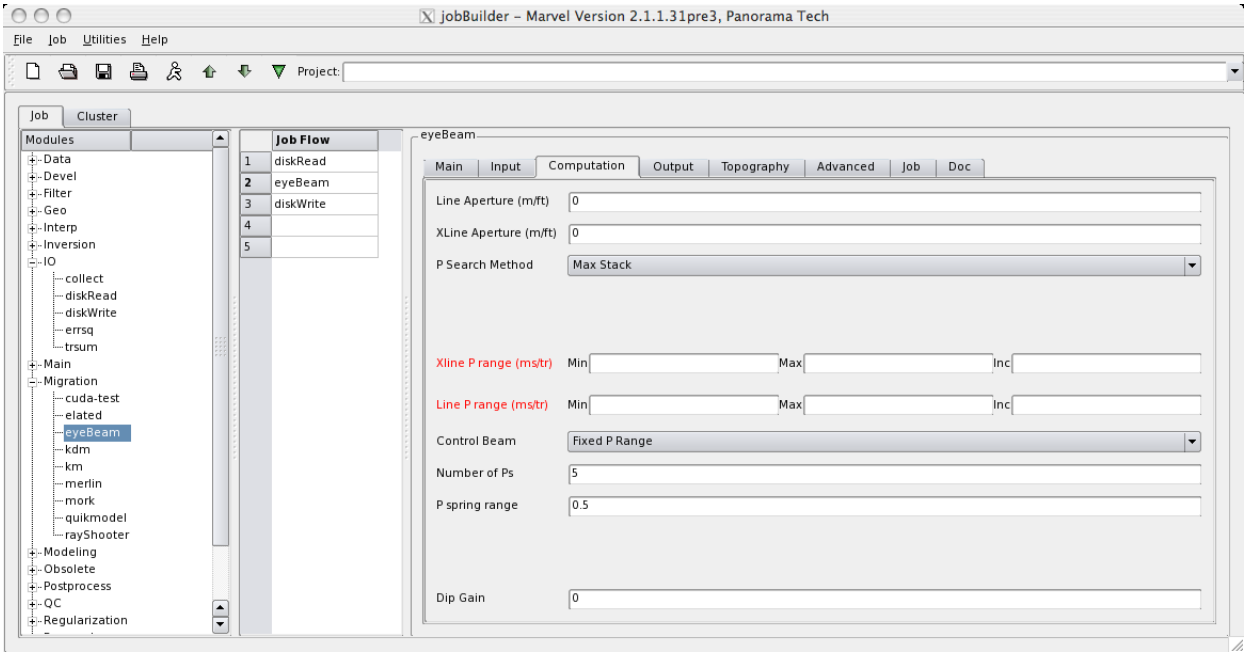


Figure 59. eyeBeam Computation Panel, Max Semblance Search Method

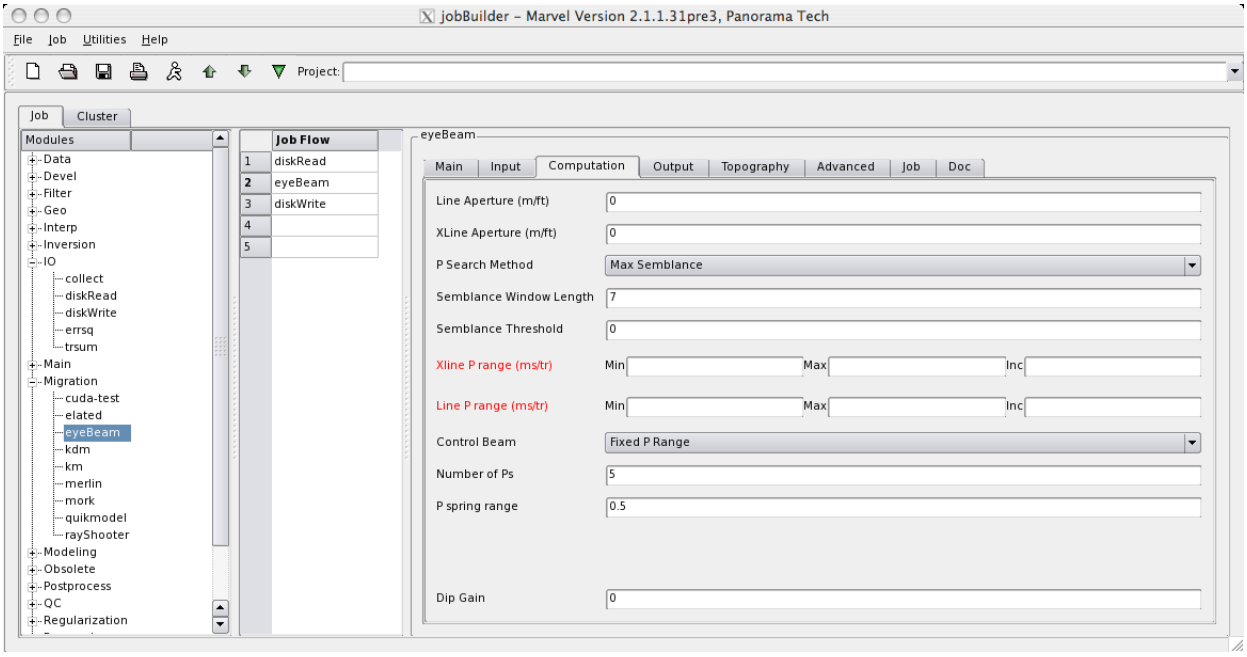


Figure 60. eyeBeam Computation Panel, Fixed P Range Control Beam

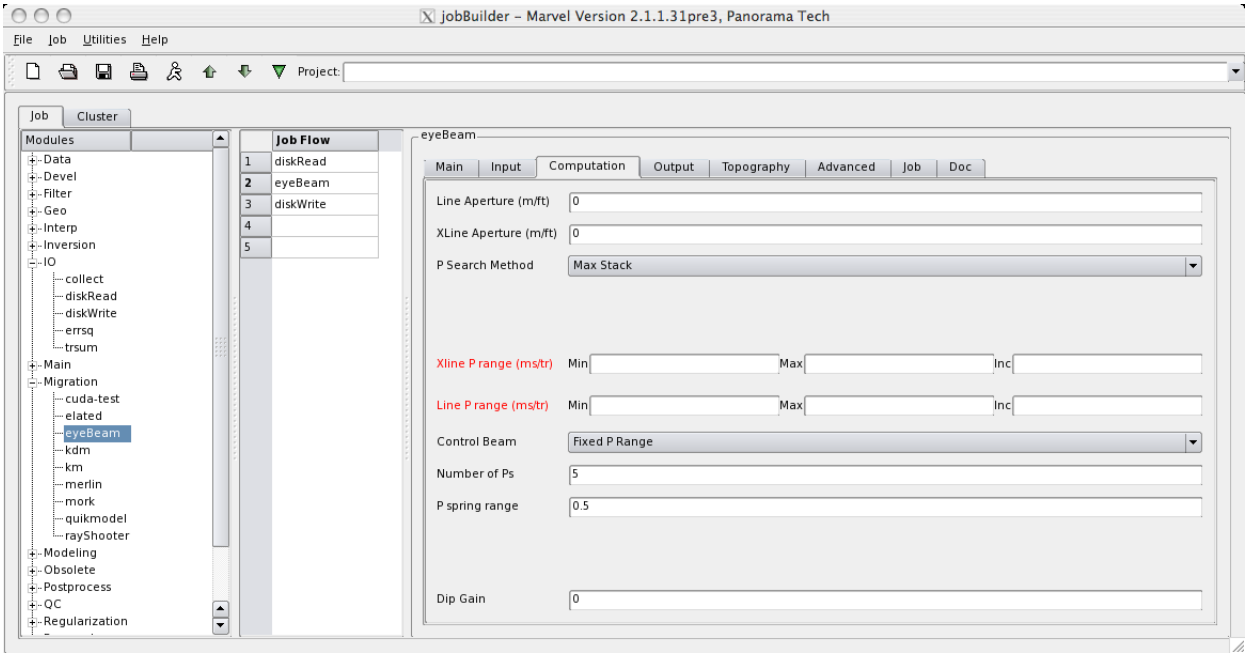


Figure 61. eyeBeam Computation Panel, Automatic Control Beam

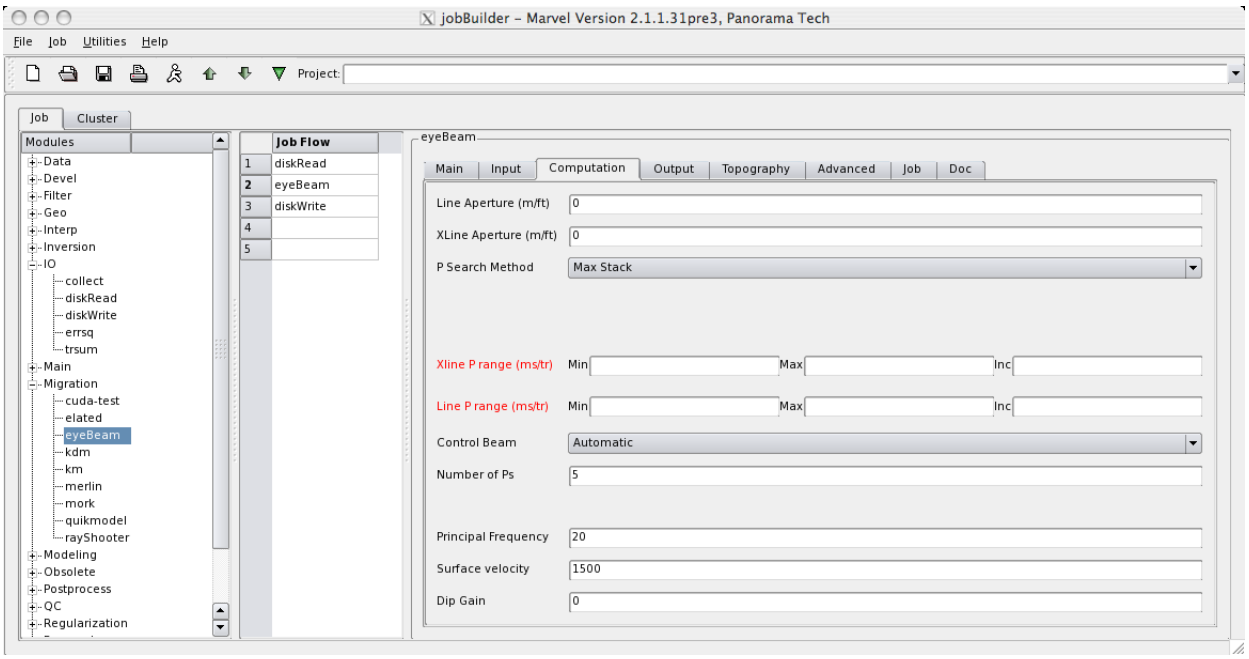


Figure 62. eyeBeam Computation Panel, No Control Beam

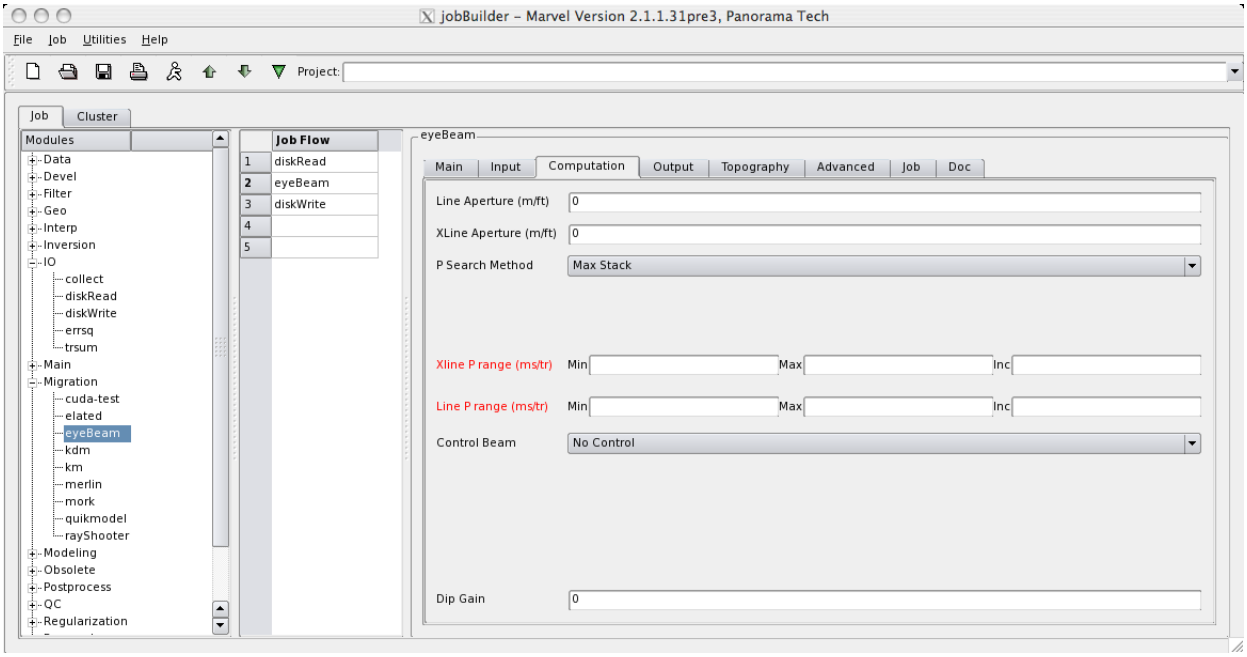


Table 45. eyeBeam Computation Panel Fields

Field	Description
Line Aperture (m/ft)	The length, in meters or feet, of the line direction aperture limit.
XLine Aperture (m/ft)	The length, in meters or feet, of the crossline direction aperture limit.
P Search Method	Max Stack or Max Semblance.
Semblance Window Length	The window length, in seconds, of the window to use in the semblance spectra. The window length should include a full wavelength. **This field is only displayed if P Search Method is set to Max Semblance.** default: 0
Semblance Threshold	**This field is only displayed if P Search Method is set to Max Semblance.** default: 7
XLine P range (ms/tr)	The max value and increment. The range is then defined from negative max to max. **This is a REQUIRED entry.**

continues on next page

Table 45. eyeBeam Computation Panel Fields–continued

Field	Description
Line P range (ms/tr)	The max value and increment. The range is then defined from negative max to max. **This is a REQUIRED entry.**
Control Beam	• No Control • Fixed P Range (default) • Automatic
Number of Ps	The actual number of p-values to migrate when Control Beam is Automatic. **This field is shown only for a Fixed P Range and Automatic Control Beam.** default: 5
P spring range	**This field is shown only for a Fixed P Range Control Beam.** default: 0.5
Principal Frequency	The Principal Frequency is used to define the Fresnel Zone. **This field is shown only for an Automatic Control Beam.** default: 20
Surface velocity	If no initial velocity volume is provided, this value defines the near surface velocity in Equation 2. **This field is shown only for an Automatic Control Beam.** default: 1500
Curvature Correction	When set to 1, this flag causes the eyeBeam algorithm to correct for local curvature.
Dip Gain	When set, a linearly increasing scale factor will be applied to higher dips. The value can range from 0 through 100. default: 0, do not apply a gain

eyeBeam Output Panel

Figure 63. eyeBeam Output Panel

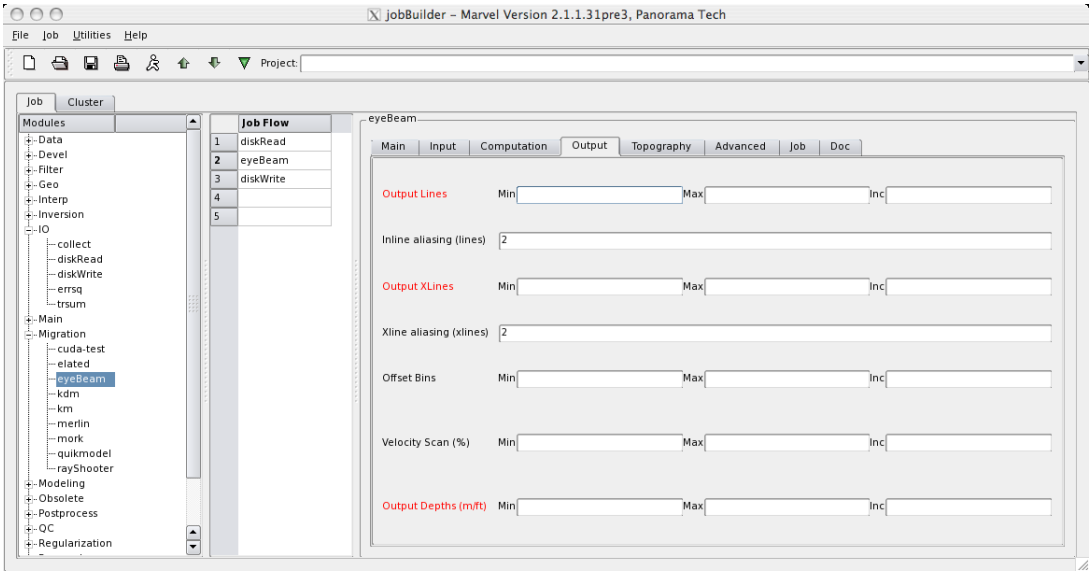


Table 46. eyeBeam Output Panel Fields

Field	Description
Output Lines	The number of lines to be contained in the output data. **This is a REQUIRED entry.**
Inline aliasing (lines)	Attempt to compensate for aliasing in the inline direction (units: lines). **Note: This can be a costly operation. default: 2**
Output XLines	The number of crosslines to be contained in the output data. **This is a REQUIRED entry.**
Xline aliasing (lines)	Defines the desired spacing length for antialiasing. The larger this value is, the more anti-aliasing is applied. (units: lines). **Note: This can be a costly operation. default: 2**
Velocity scan (%)	Setting the minimum, maximum, and increment provide the percentage range over which migrations should be performed. Thus, setting the range to 90, 110, 5 produces output volumes using 90, 95, 100, 105, and 110 percent of the original velocity field.
Output Depths (m/ft)	The minimum, maximum, and increment values for output depths. **This is a REQUIRED entry.**

eyeBeam Topography Panel

The eyeBeam Topography Panel defines the surface topography for the project. There are two variables on the panel.

- *TopoSurfaceFile* is the path and name of the topographic surface file. If given, this specifies the acquisition topography (and if no Source Topo File is given, this is for both sources and receivers). This can be a MARVEL surface file, or a simple flat file defining the topography, with each line containing the line, crossline and depth values,, for example: ep = 100 cdp = 500 z = 20.

- *TopoSurfaceName* is the header key specifying where the topographic data are stored. A MARVEL surface file can have many surfaces. This is the name of the one to be used. default: Topo

eyeBeam Advanced Panel

The eyeBeam Module Advanced panel, Figure 64, enables you to define several advanced usage parameters. The parameters are defined in Table 47.

Figure 64. eyeBeam Advanced Panel

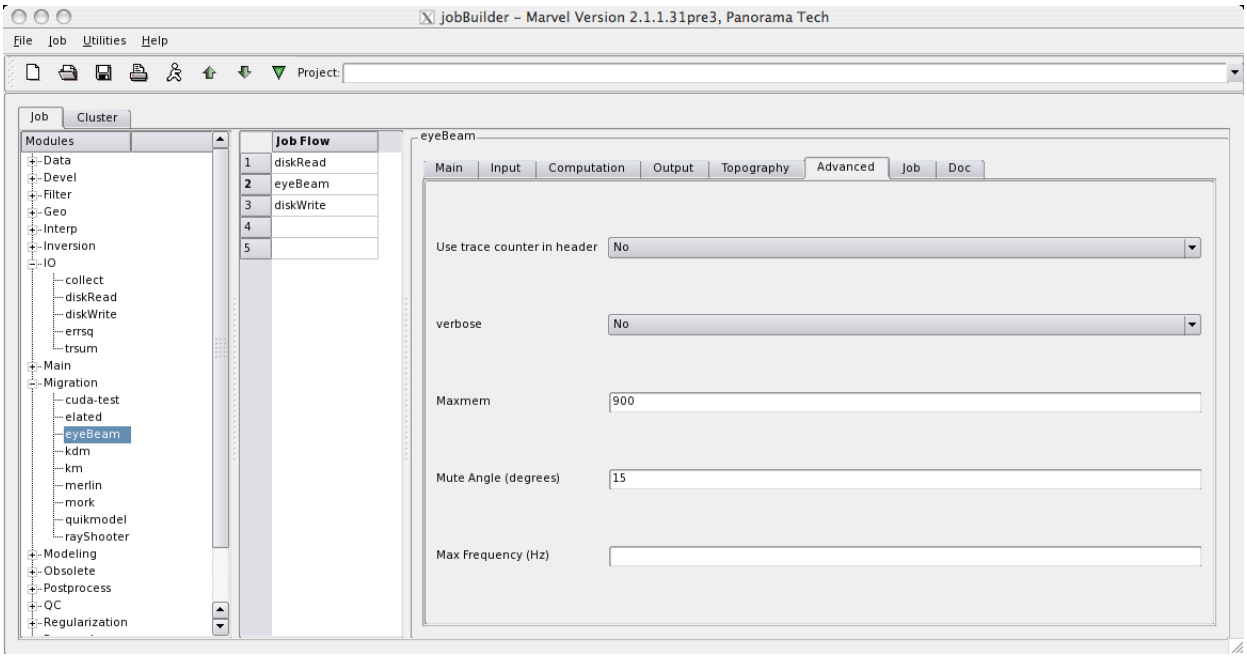


Table 47. eyeBeam Advanced Panel Fields

Field	Description
Use trace counter in header	Flag indicating whether or not the trace counter that diskRead puts in the trace header will be used. default: Yes
verbose	Switch for turning debug printing on and off. default: No
Maxmem	Maximum amount of memory to be used by MARVEL per eyeBeam instance. default: 900
Mute Angle	The angle, in degrees, measured down from the surface defining a cone limiting the near surface aperture. default: 15
Max Frequency	The maximum frequency allowed by the filtering process. Default: 0, do not filter

eyeBeam Job Panel

This panel, Figure 65, enables you to define the basic parameters for the module. Table 48 describes the terms used on both panels.

Figure 65. eyeBeam Job Panel

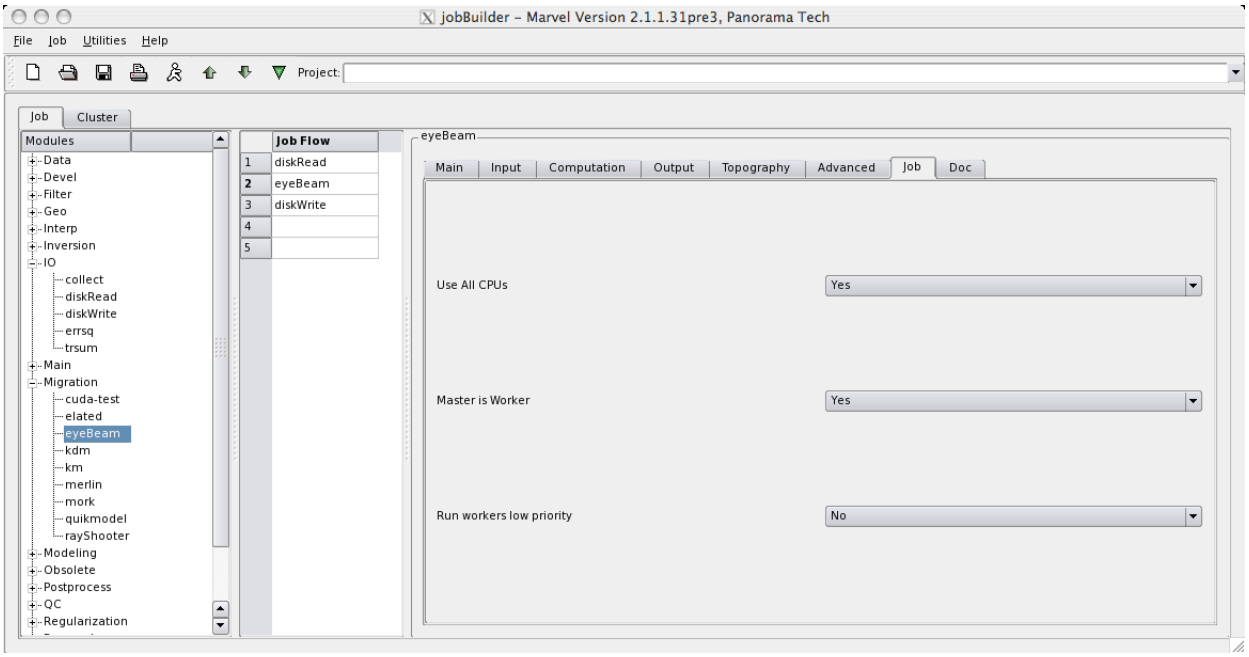


Table 48. eyeBeam Job Panel Fields

Field	Description
Use All CPUs	This really means that each worker should use multiple threads. If No, then there will be one independent worker spawned for each CPU (or core) in the cluster. default: Yes
Master is Worker	Flag that controls whether the master I/O controller is also used for performing calculations. default: Yes
Run workers low priority	If Yes, workers will be spawned with reduced priority, although the master process will remain at high priority. This can be useful, especially when *MasterIsWorker* is set, so that one worker does not slow down collection or submission of shots for all of the others. default: No

fdmod2d Module

The fdmod2d module is accessed under the Modeling node of the jobBuilder module tree.

Figure 66. fdmod2d Main Panel

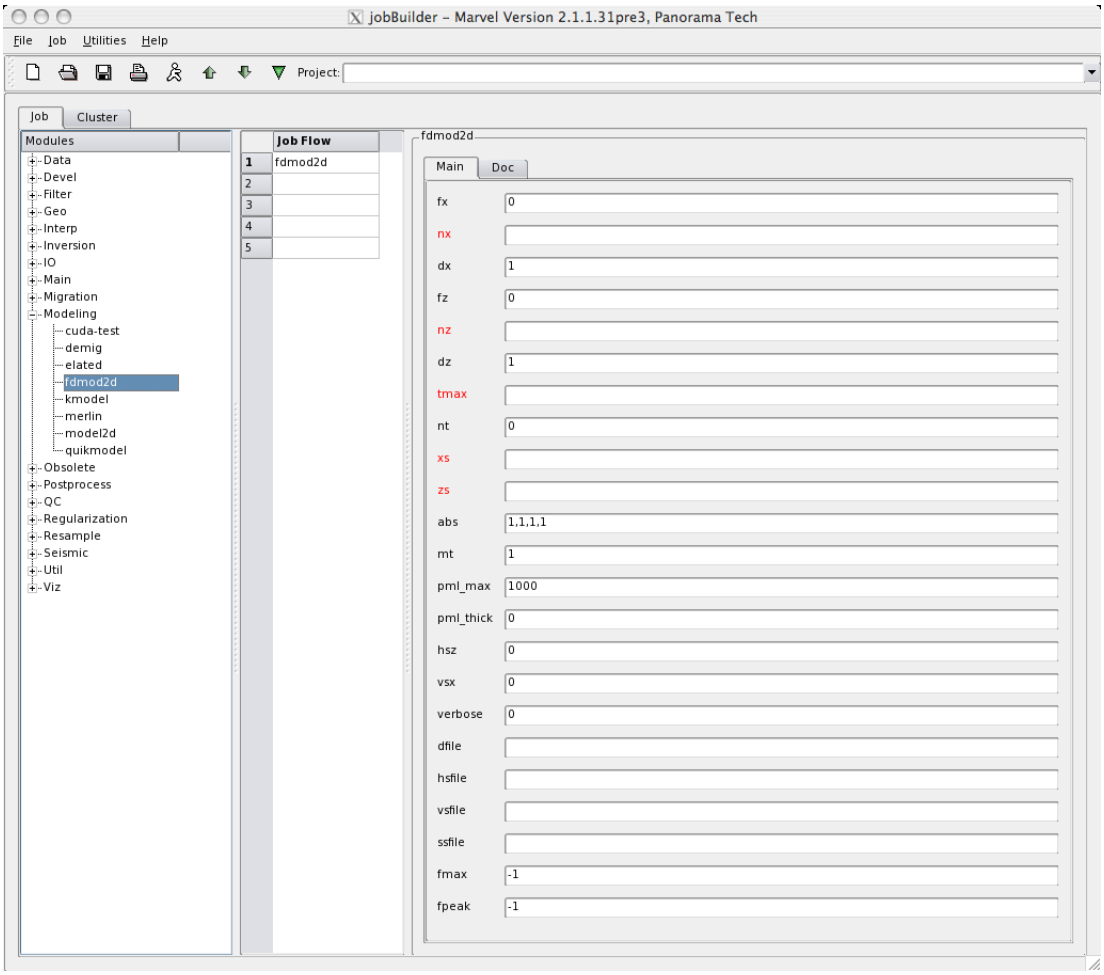


Table 49. fdmod2d Panel Fields

Field	Description
fx	default: 0
nx	**This is a REQUIRED entry.**
dx	default: 1

continues on next page

Table 49. fdmod2d Panel Fields–continued

Field	Description
fz	default: 0
nz	**This is a REQUIRED entry.**
dz	default: 1
tmax	**This is a REQUIRED entry.**
ny	default: 0
xs	**This is a REQUIRED entry.**
zs	**This is a REQUIRED entry.**
abs	default: 1,1,1,1
mt	default: 1
pml_max	default: 1000
pml_thick	default: 0
hsz	default: 0
vsx	default: 0
verbose	Switch for turning debug printing on and off. default: 0
dfile	
hsfile	
vsfile	
ssfile	

continues on next page

Table 49. fdmod2d Panel Fields–continued

Field	Description
fmax	default: -1
fpeak	default: -1

filter Module

The filter module applies a (f,k) domain pie-shaped filter to an input ensemble or gather of traces. This gather can be a line, CDP, or shot record, but you are responsible for selecting the appropriate data, and for building the job stream to supply it to the filter module. The filter module is accessed under the Filter node of the jobBuilder module tree.

Figure 67. filter Panel

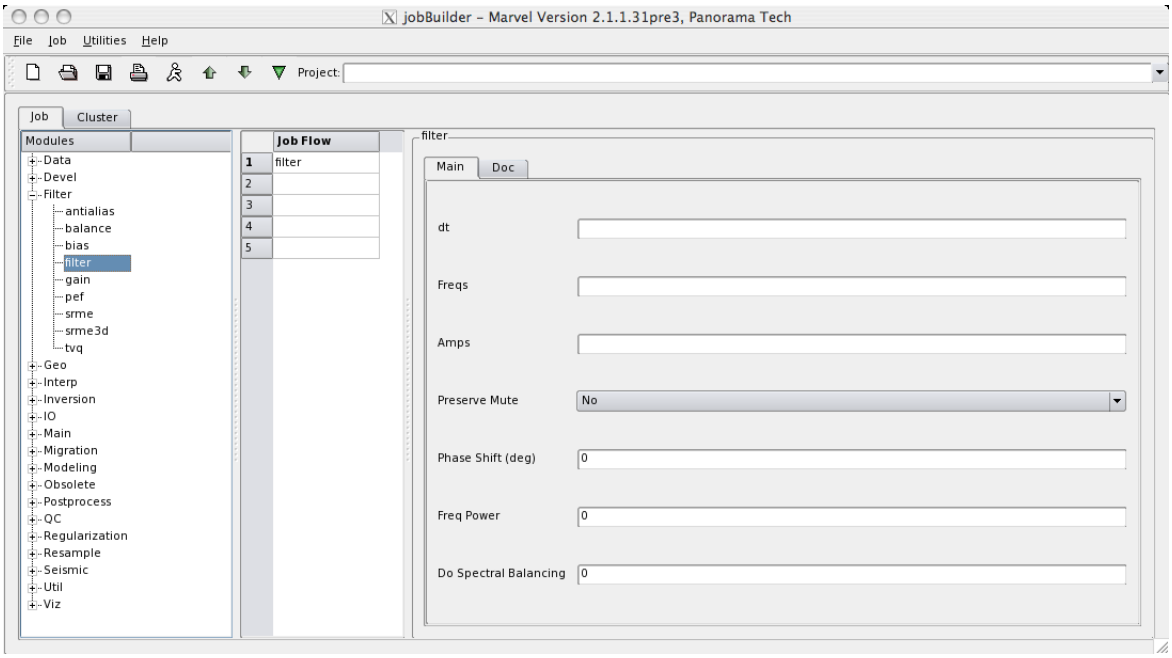


Table 50. filter Panel Fields

Field	Description
dt	
Freqs	Specifies the filter frequencies.
Amps	Specifies the filter amplitudes.
Preserve Mute	If enabled, autodetect the upper mute zone and reapply the mute after the filter has been run.
Phase Shift (deg)	default: 0
Freq Power	default: 0

continues on next page

Table 50. filter Panel Fields–continued

Field	Description
Do Spectral Balancing?	

fkamo Module

The fkamo module is accessed under the Regularization node of the jobBuilder module tree.

Figure 68. fkamo Main Panel

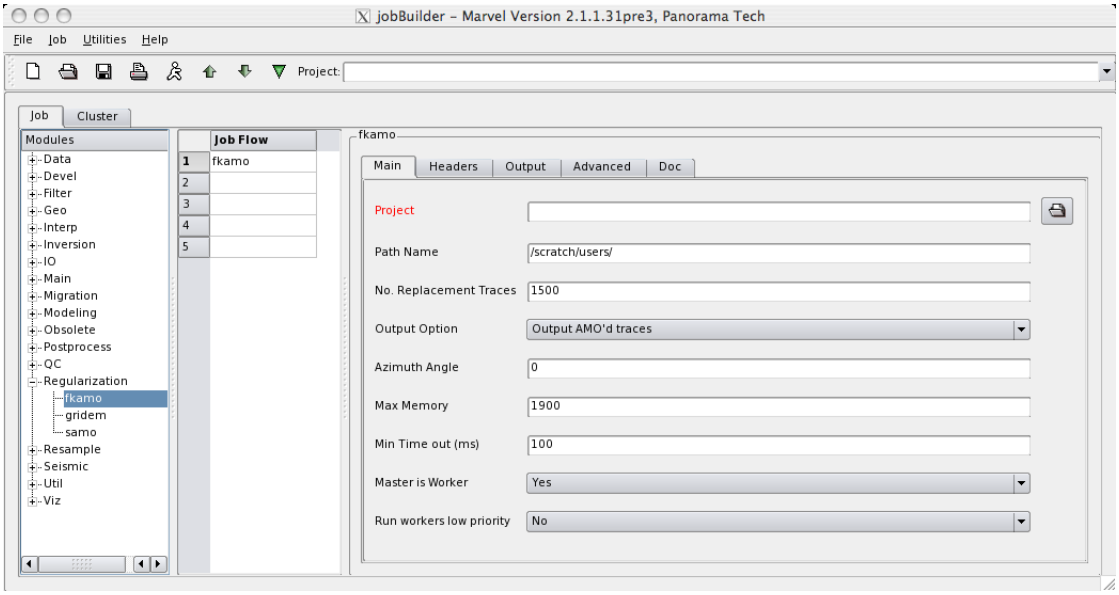


Table 51. fkamo Main Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates.
Path Name	default: /scratch/users/
No. Replacement Traces	default: 1500
Output Option	Output AMO□d traces or Output DMO□d traces
Azimuth Angle	default: 0
Max Memory	Maximum amount of memory (in MB) to be used by MARVEL per fkamo instance. default: 1900

continues on next page

Table 51. fkamo Main Panel Fields–continued

Field	Description
Min Time out (ms)	default: 100
Master is Worker	Flag that controls whether the master I/O controller is also used for performing calculations. default: Yes
Run workers low priority	If Yes, workers will be spawned with reduced priority, although the master process will remain at high priority. This can be useful, especially when *MasterIsWorker* is set, so that one worker does not slow down collection or submission of shots for all of the others. default: No

fkamo Headers Panel

Figure 69. fkamo Headers Panel

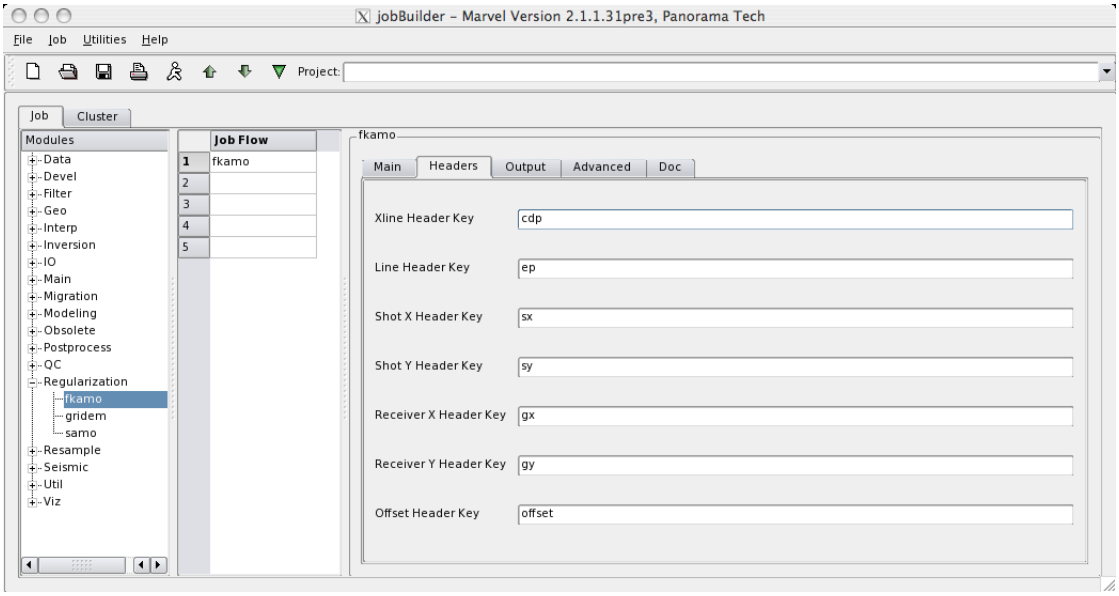


Table 52. fkamo Headers Panel Fields

Field	Description
Xline Header Key	cdp
Line Header Key	ep
Shot X Header Key	sx
Shot Y Header Key	sy
Receiver X Header Key	gx
Receiver Y Header Key	gy
Offset Header Key	offset

fkamo Output Panel

Figure 70. fkamo Output Panel

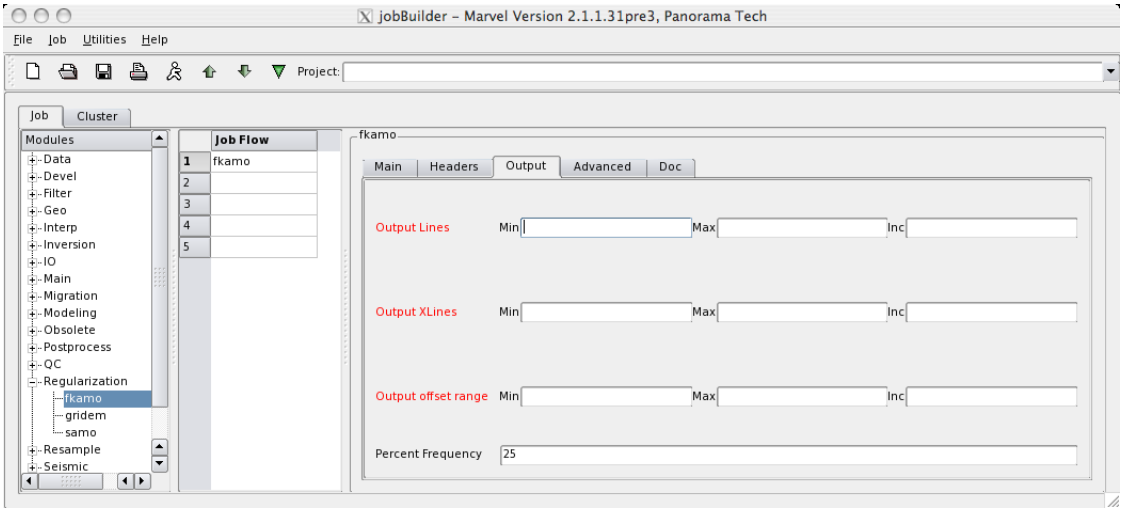


Table 53. fkamo Output Panel Fields

Field	Description
Output Lines	Minimum, Maximum, and Increment **Note: This is a required entry.**
Output XLines	Minimum, Maximum, and Increment **Note: This is a required entry.**
Output offset range	Minimum, Maximum, and Increment **Note: This is a required entry.**
Percent frequency	default: 25

fkamo Advanced Panel

This panel contains only one field, *Taper*.

gain Module

The gain module scales each input trace by either a fixed power of time or a time-variant automatic gain control, or both. There are six panels used with the gain module, shown in Figure 71 through Figure 76, and the fields are described in Table 54. The gain module is accessed under the Filter node of the jobBuilder module tree.

Figure 71. gain Powers Panel

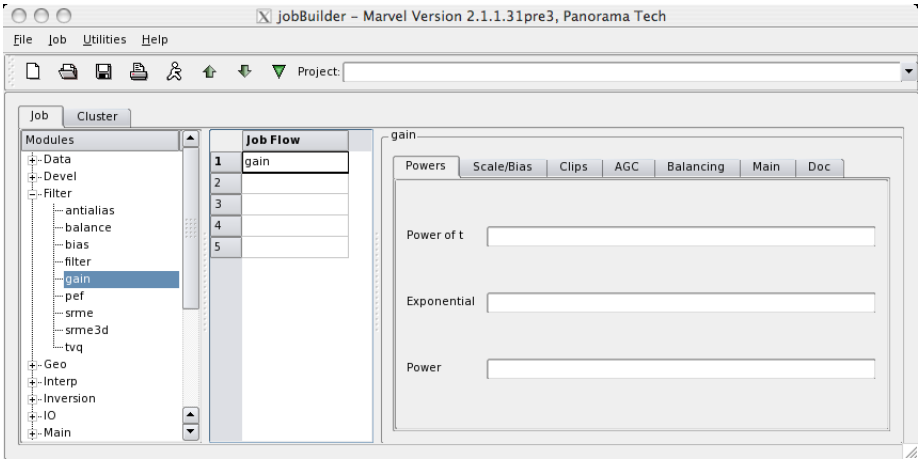


Figure 72. gain Scale/Bias Panel

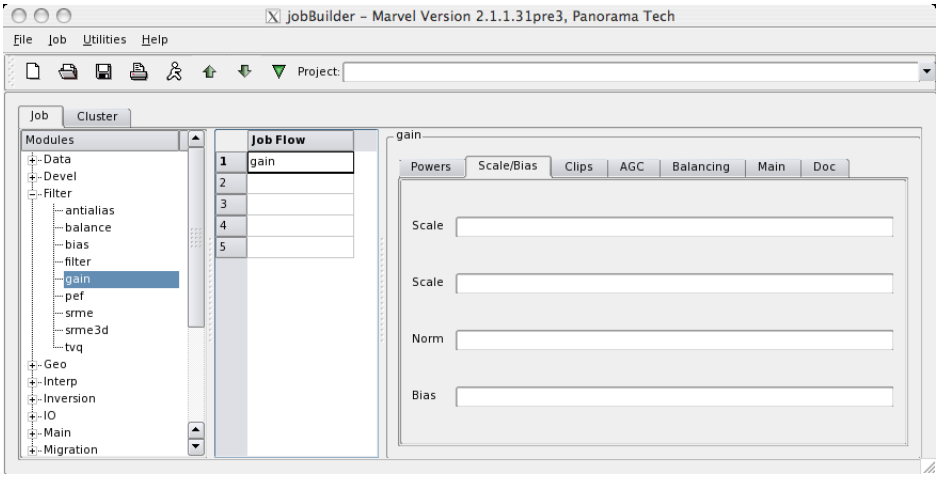


Figure 73. gain Clips Panel

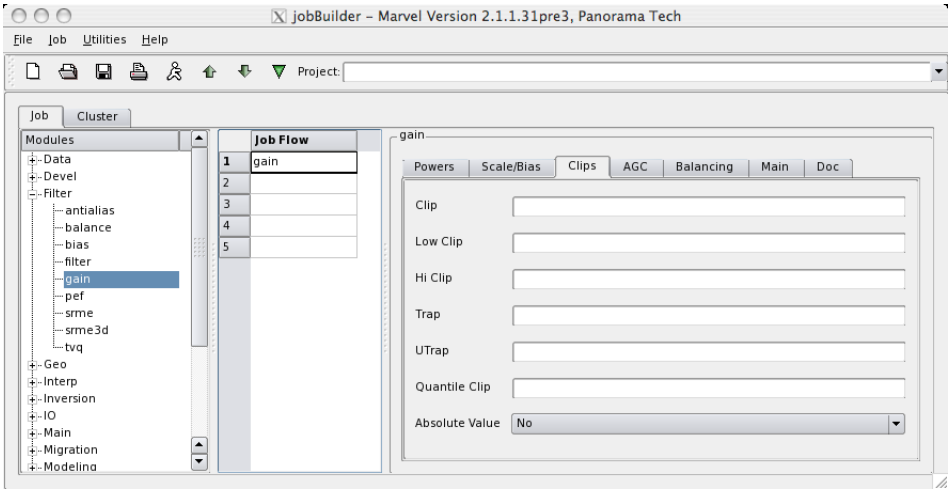


Figure 74. gain AGC Panel

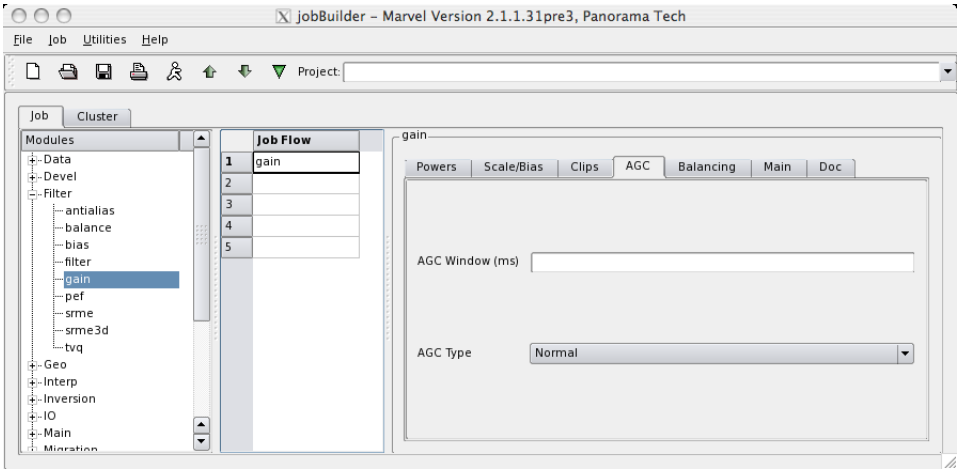


Figure 75. gain Balancing Panel

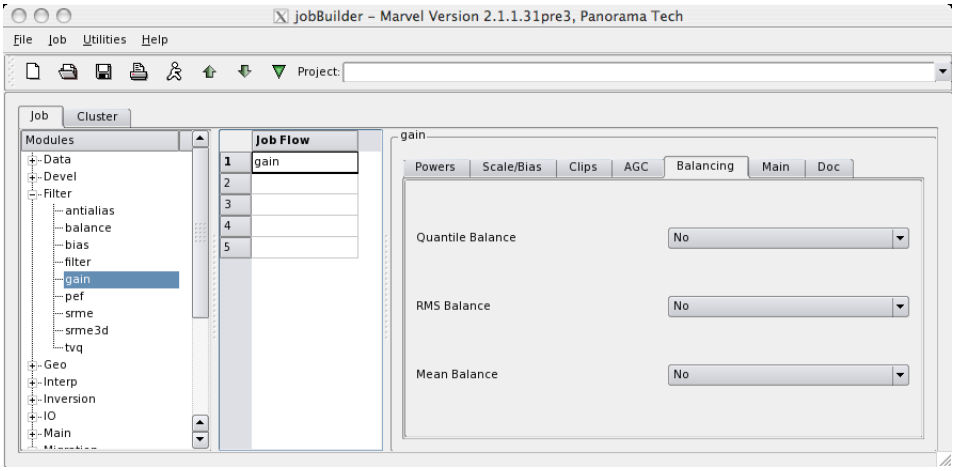


Figure 76. gain Main Panel

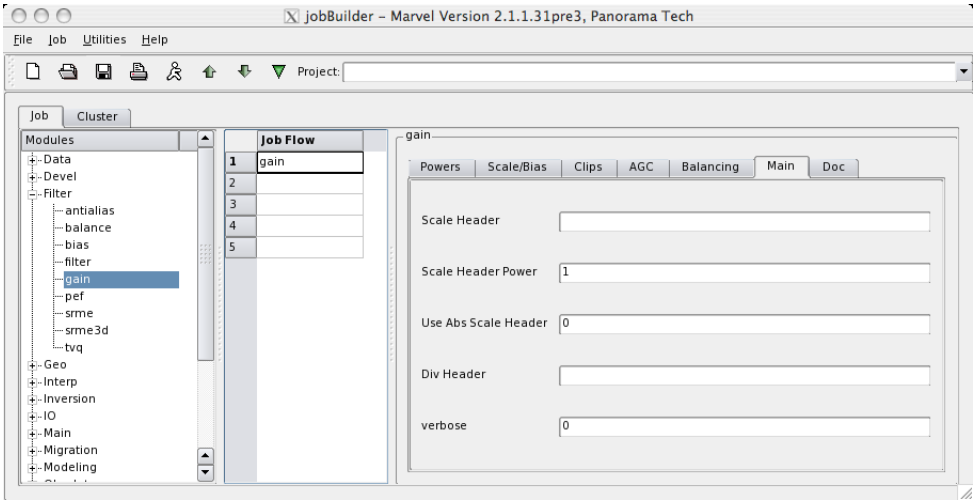


Table 54. gain Panel Fields

Panel	Field	Description
Powers	Power of t	Value used to apply *Tpow* to each input trace. See Gathers Settings Window.
	Exponential	
	Power	
Scale&Bias	Scale	
	Norm	

continues on next page

Table 54. gain Panel Fields–continued

Panel	Field	Description
	Bias	
Clips	Clip	
	Low Clip	
	Hi Clip	
	Trap	
	UTrap	
	Quantile Clip	
	Absolute Value	default: No
AGC	AGC Window	The automatic gain control window is the length of the time gate used to calculate the time-varying gain function, in ms. default: 0
	AGC Type	Specifies the type of taper to be applied to the input trace, where traces are tapered to 0 to avoid edge effects. The taper may be either Normal or Gaussian Taper. default: Normal
Balancing	Quantile Balance	
	RMS Balance	
	Mean Balance	
Main	Scale Header	
	Scale Header Power	This is a fixed constant to be applied to each trace. default: 1
	Use Abs Scale Header	default: 0
	Div Header	
	verbose	Switch for turning debug printing on and off.

gathers Module

The gathers module is accessed under the Viz node of the jobBuilder module tree.

Figure 77. gathers Panel

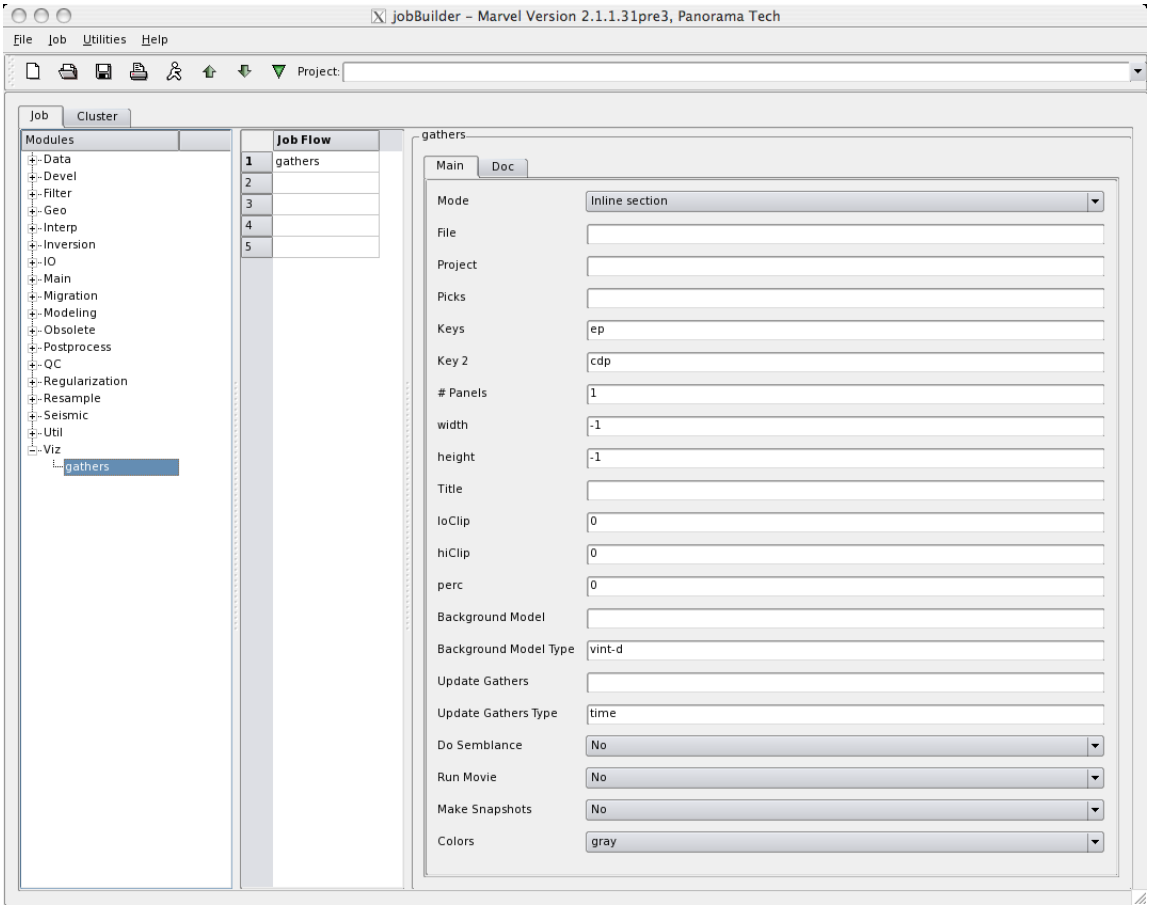


Table 55. gathers Panel Fields

Field	Description
Mode	• Inline section • Crossline section • CDP gathers • Shot gathers • CDP Semblances • Offset panels

continues on next page

Table 55. gathers Panel Fields–continued

Field	Description
File	
Project	
Picks	
Keys	
Key 2	
# Panels	
width	
height	
Title	
loClip	
hiClip	
perc	
Background Model	
Background Model Type	
Update Gathers	
Update Gathers Type	
Do Semblance	
Run Movie	
Make Snapshots	
Colors	

gridem Module

The gridem module is accessed under the Regularization node of the jobBuilder module tree.

Figure 78. gridem Panel

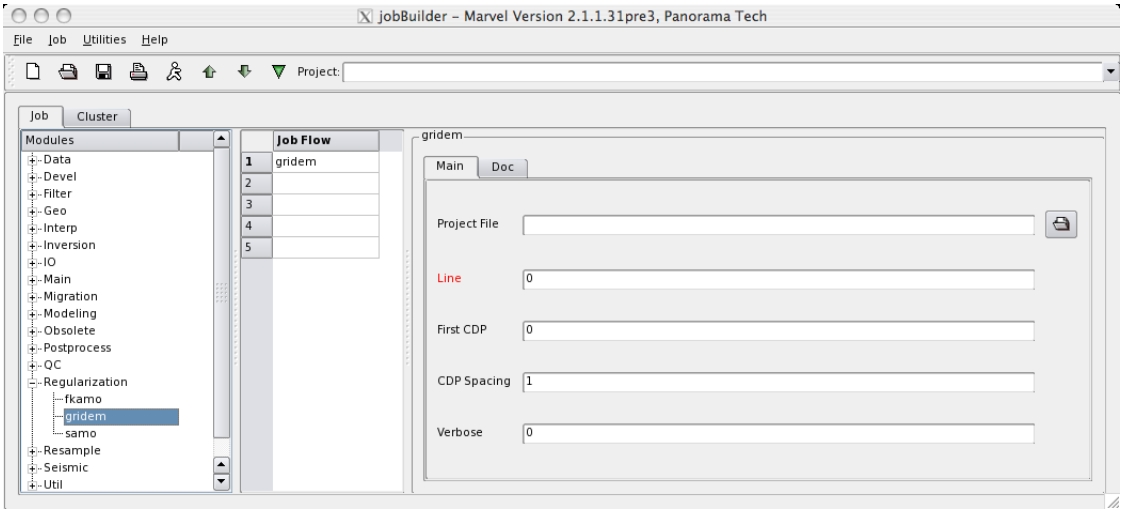


Table 56. gridem Panel Fields

Field	Description
Project File	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates.
Line	
First CDP	
CDP Spacing	
Verbose	Switch for turning debug printing on and off.

hdrMath Module

The hdrMath module changes header words through a simple formula shown in Equation 5, where *ihw* in the value extracted from the input header word.

Equation 5:

$$value = \frac{(shift + scale * ihw)}{div}$$

The hdrMath panel is shown in Figure 79, and the fields are defined in Table 57. The hdrMath module is accessed under the Data node of the jobBuilder module tree.

Figure 79. hdrMath Panel

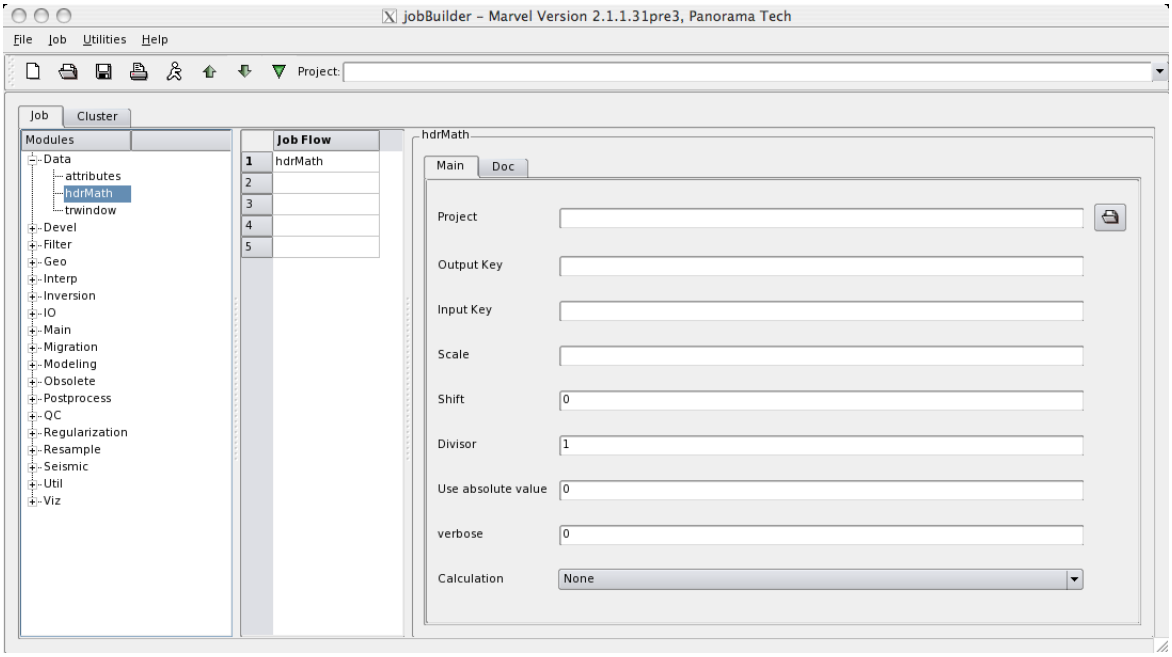


Table 57. hdrMath Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates.
Output Key	Output header key defines the output header location to change.
Input Key	Input header key defines the input header key to use in the calculation.
Scale	A list of floating point numbers used to scale the input header value.

continues on next page

Table 57. hdrMath Panel Fields–continued

Field	Description
Shift	A list of floating point numbers used to shift the input header value. default: 0
Divisor	A list of divisors used to divide each calculated header number. default: 1
Use absolute value	default: 0
verbose	Switch for turning debug printing on and off. default: 0
Calculation	• None • World Coordinates from CDP • World Coordinates from CDP and Offset • CDP from World Coordinates • Offset from World Coordinates • Shift World Coordinates with Offset default: None

importGrid Module

The importGrid module is accessed under the Main node of the jobBuilder module tree.

Figure 80. importGrid Panel

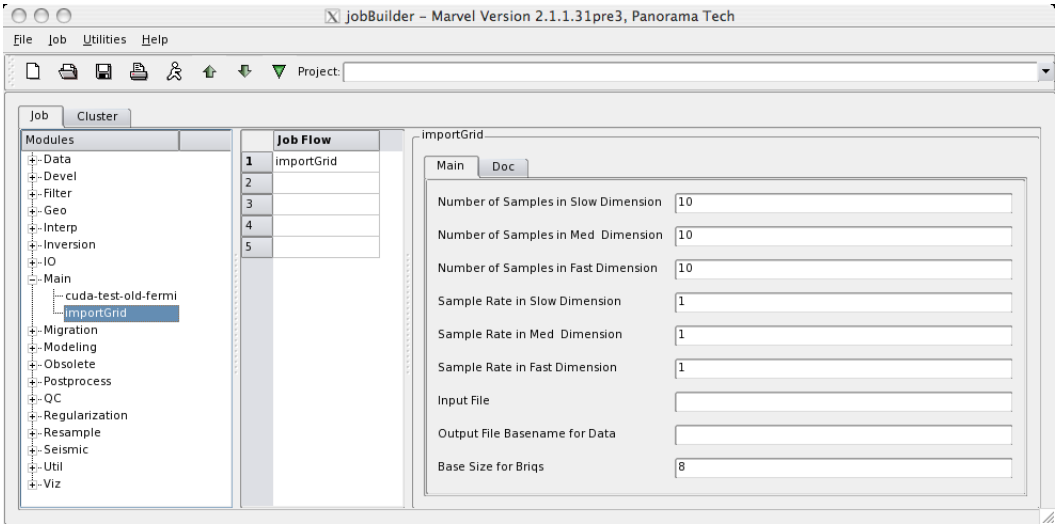


Table 58. importGrid Panel Fields

Field	Description
Number of Samples in Slow Dimension	default: 10
Number of Samples in ed Direction	default: 10
Number of Samples in Fast Dimension	default: 10
Sample Rate in Slow Dimension	default: 1
Sample Rate in Med Dimension	default: 1
Sample Rate in Fast Dimension	default: 1
Input File	The name of the input file to be imported.
Output File Basename for Data	

continues on next page

Table 58. importGrid Panel Fields–continued

Field	Description
Base Size for Briqw	

importVtp Module

The importVtp module imports VIEWS VTP and FOCUS HANDVEL time-velocity pairs from an input file and converts them to the internal data format used by Panorama Technologies. The output file name is just the input file name with .pick appended. The importVtp panel is shown in Figure 81 and the fields are defined in Table 59. The importVtp module is accessed under the Util node of the jobBuilder module tree.

Figure 81. importVtp Panel

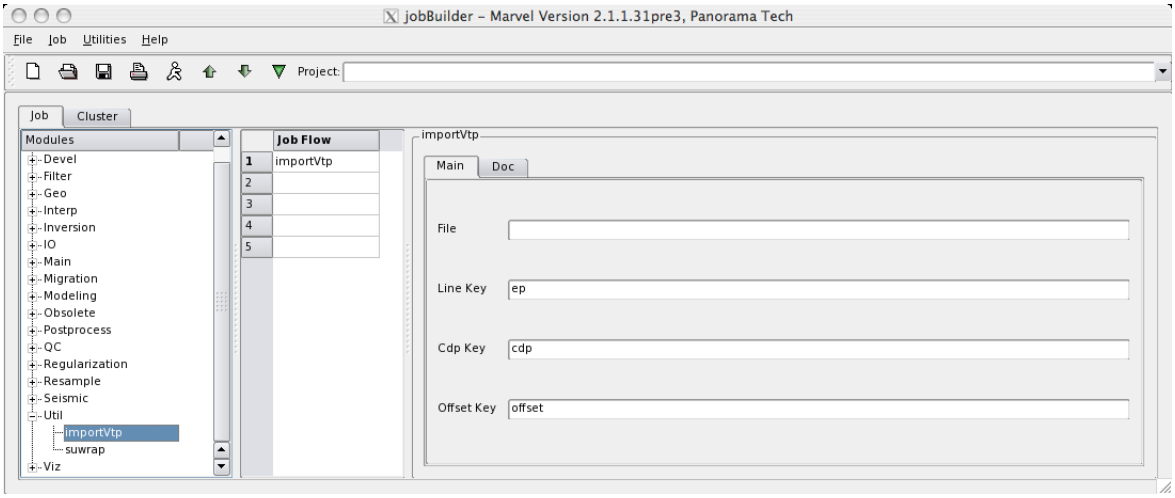


Table 59. importVTP Panel Fields

Field	Description
File	The name of the input file to be imported.
Line Key	The key word used for LINE in the MARVEL format. default: ep
Cdp Key	The key word to be used for CDP in the MARVEL format. default: cdp
Offset Key	The key word to be used for OFFSET in the MARVEL format. default: offset

interpShot Module

The two interpShot panels are shown in Figure 82 and Figure 83. The fields are defined in Table 60 and Table 61. The interpShot module is accessed under the Interp node of the jobBuilder module tree.

interpShot Main Panel

Figure 82. interpShot Main Panel

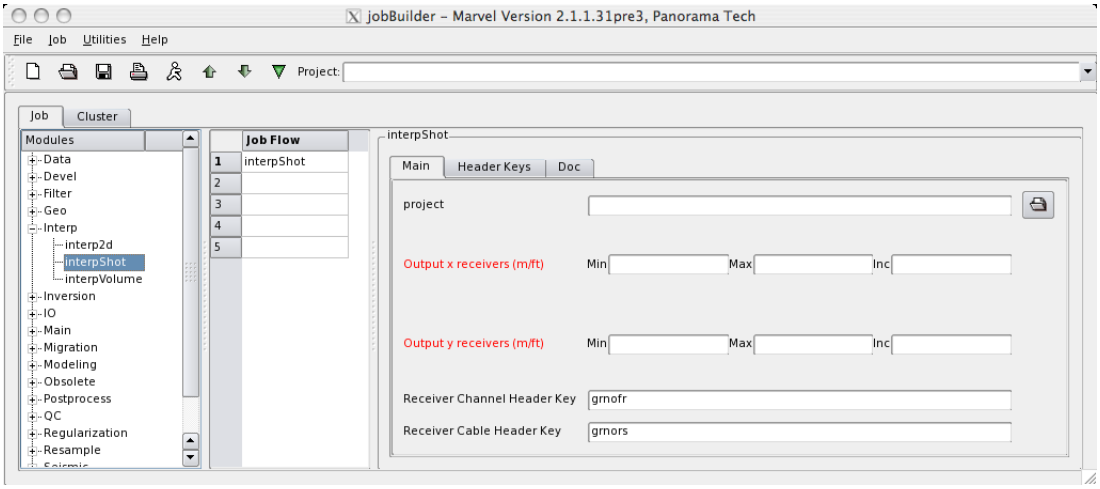


Table 60. interpShot Module Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates.
Output x receivers (m/ft)	**Note: This is a REQUIRED entry.**
Output y receivers (m/ft)	**Note: This is a REQUIRED entry.**
Receiver Channel Header Key	default: gmofr
Receiver Cable Header Key	default: gmors

interpShot Header Keys Panel

Figure 83. interpShot Header Keys Panel

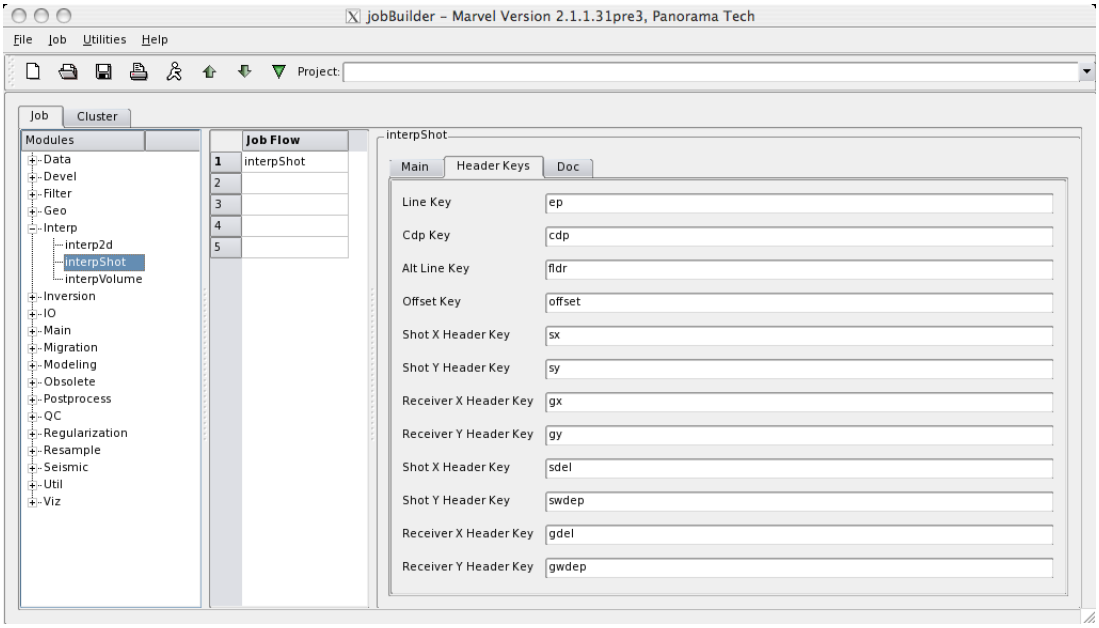


Table 61. interpShot Header Keys Panel Fields

Field	Description
Line Key	The header key specifying where line data is stored in the trace. default: ep
Cdp Key	The header key specifying where CDP data is stored in the trace. default: cdp
Alt Line Key	 default: fldr
Offset Key	Header key defining the location of the offset in the trace. default: offset
Shot X Header Key	The header key specifying where line source data is stored in the trace. default: sx
Shot Y Header Key	The header key specifying where crossline source data is stored in the trace. default: sy

continues on next page

Table 61. interpShot Header Keys Panel Fields–continued

Field	Description
Receiver X Header Key	The header key specifying where inline geophone data is stored in the trace. default: gx
Receiver Y Header Key	The header key specifying where crossline geophone data is stored in the trace. default: gy
Shot X Header Key	default: sdel
Shot Y Header Key	default: swdep
Receiver X Header Key	default: gdel
Receiver Y Header Key	default: gwdep

interp2d Module

The interp2d module is accessed under the Interp node of the jobBuilder module tree.

Figure 84. interp2d Panel

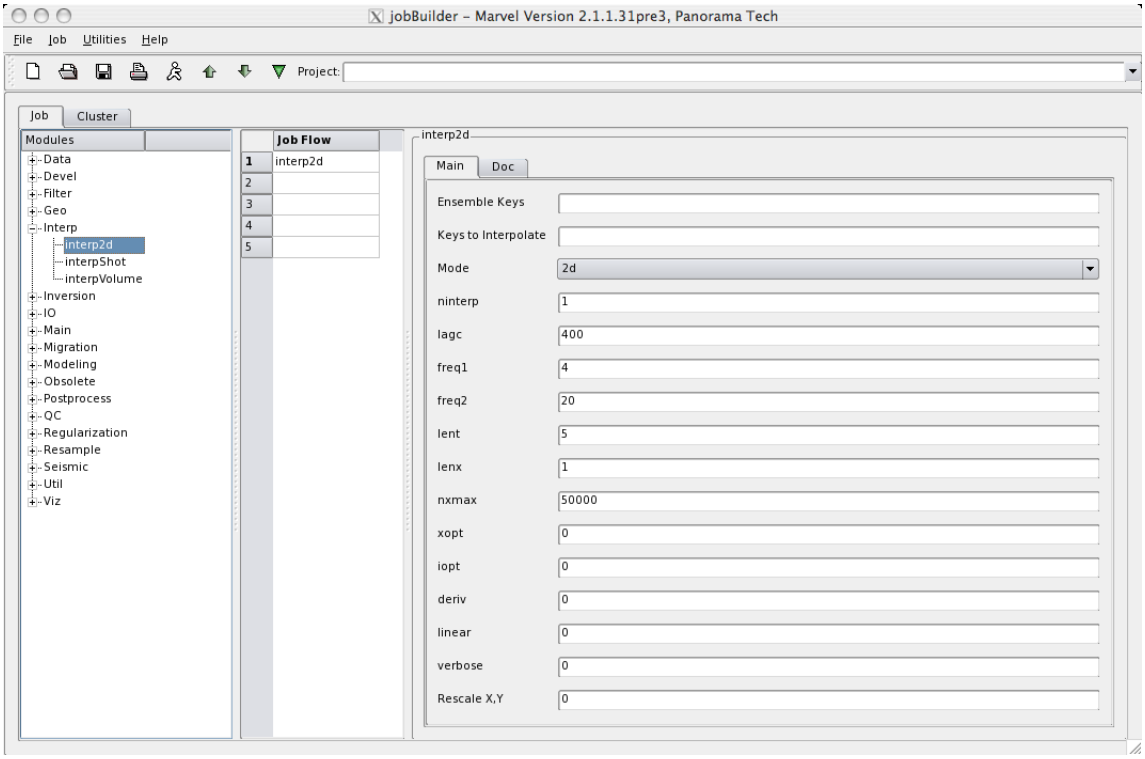


Table 62. interp2d Panel Fields

Field	Description
Ensemble Keys	
Keys to Interpolate	
Mode	default: 2d
ninterp	default: 1
lagc	default: 400
freq1	default: 4

continues on next page

Table 62. interp2d Panel Fields–continued

Field	Description
freq2	default: 4
lent	default: 5
lenx	default: 1
nxmax	default: 50000
xopt	default: 0
lopt	default: 0
deriv	default: 0
linear	default: 0
verbose	Switch for turning debug printing on and off. default: 0
Rescale X,Y	default: 0

interpVolume Module

The interpVolume module is accessed under the Interp node of the jobBuilder module tree.

Figure 85. interpVolume Panel

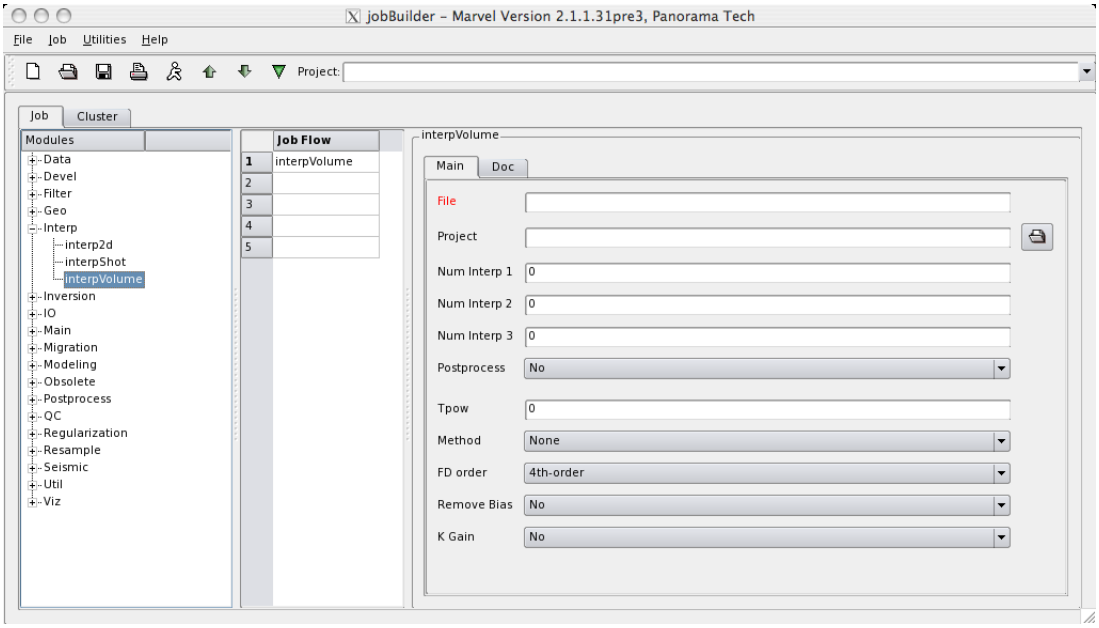


Table 63. interpVolume Panel Fields

Field	Description
File	
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates.
Num interp 1	default: 0
Num interp 2	default: 0
Num interp 3	default: 0
Postprocess	default: No

continues on next page

Table 63. interpVolume Panel Fields–continued

Field	Description
Tpow	Scale traces by time raised to a power. default: 0
Method	• None • Bias • Laplace • Bias 2 default: None
FD Order	This determines the order of accuracy of the spatial derivatives used in the simulation. For second-order, a second derivative is computed using 3 grid points. For 8^{th}-order,9 grid points are used, with 5 unique coefficients. This is usually the ideal combination for speed and accuracy. Possible values are 2nd, 4th, 6th, 8th, 10, 12th order. default: 4th order
Remove Bias	default: No
K Gain	default: No

inv2d Module

The inv2d module is accessed under the Inversion node of the jobBuilder module tree.

Figure 86. inv2d Main Panel

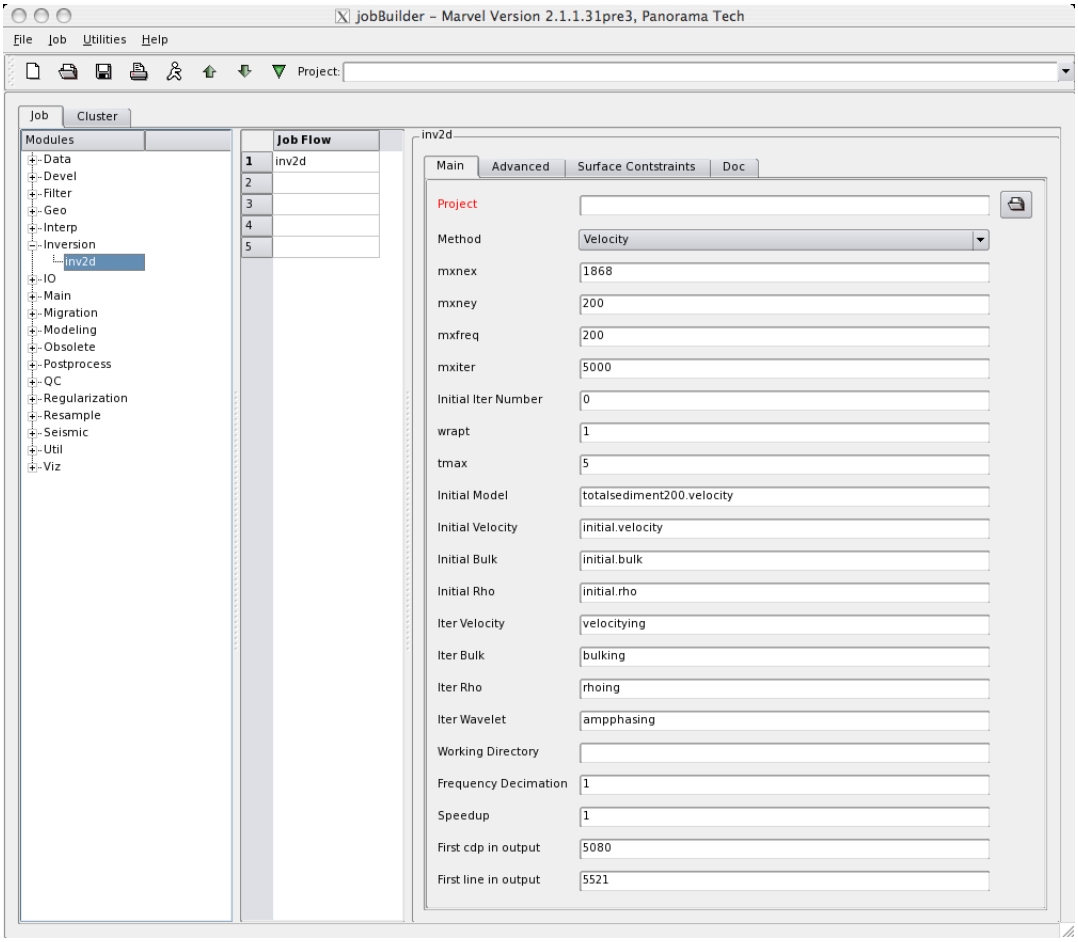


Table 64. inv2d Main Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates. **Note: This is a REQUIRED entry.**
Method default: velocity	

continues on next page

Table 64. inv2d Main Panel Fields–continued

Field	Description
mxnex	default: 1868
mxney	default: 200
mxfreq	default: 200
mxiter	default: 5000
Initial Iter Number	default: 0
wrapt	default: 1
tmax	default: 5
Initial Model	default: totalsediment200.velocity
Initial Velocity	default: initial.velocity
Initial Bulk	default: initial.bulk
Initial Rho	default: initial.rho
Iter Velocity	default: velocitying
Iter Bulk	default: bulking
Iter Rho	default: rhoing
Iter Wavelet	default: ampphasing
Working Directory	

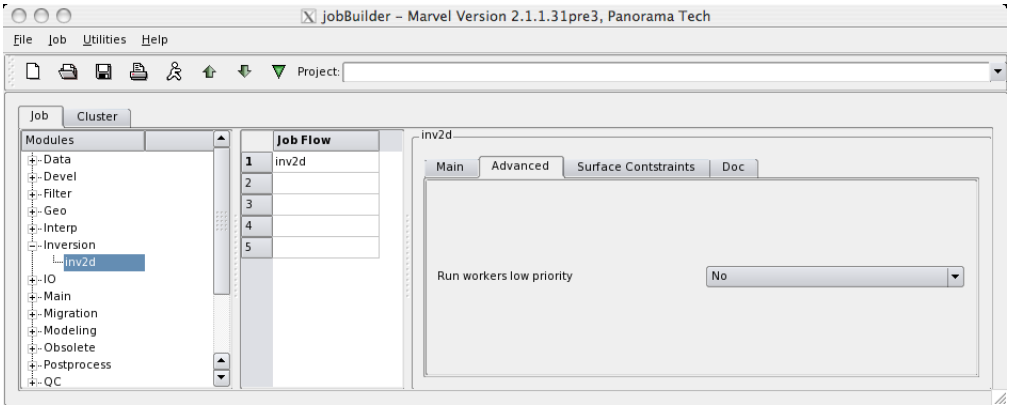
continues on next page

Table 64. inv2d Main Panel Fields–continued

Field	Description
Frequency Decimation	default: 1
Speedup	default: 1
First cdp in output	default: 5080
First line i output	default: 5521

inv2d Advanced

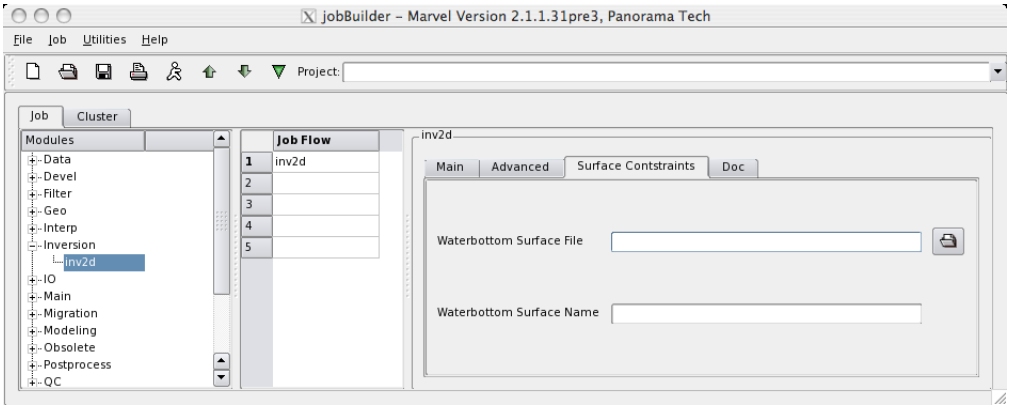
Figure 87. inv2d Advanced Panel



Run workers low priority: If *Yes*, workers will be spawned with reduced priority, although the master process will remain at high priority. This can be useful, especially when *Master Is Worker* is set, so that one worker does not slow down collection or submission of shots for all of the others. default: *No*

inv2d Surface Constraints

Figure 88. inv2d Surface Constraints Panel



Waterbottom Surface File—

Waterbotton Surface Name—

kdm Module

The kdm module is Panorama Technologies' version of Kirchhoff depth migration. The kdm module is accessed under the Migration node of the jobBuilder module tree. This is a full-featured, fault-tolerant, restartable depth migration algorithm which can use parallel processing over both input and output. The major difference between the km and kdm modules is that km calculates the traveltime information it needs internally, while kdm requires that the traveltimes come from the data.

A typical migration job has the following job flow: diskRead ⇒ kdm ⇒ collect

For faster restarts, the Mode option in the diskRead module should be set to Shot Migration (see diskRead Module).

Note:

You should be sure the Restart File parameter is in sync with the kdm module. If you edit the parameter in kdm, the parameter in diskRead will be updated.

The collect module is designed to stack output from migrations. By default, it does this first-come, first-served, and the output files will be unsorted. Choose the Preallocate Volume option in the collect module to avoid this behavior (see collect Module). As with the Restart File option in the diskRead module, make sure the output parameters to collect are in sync with those in kdm.

See also, km Module.

kdm Main Panel

There are two forms of the kdm Main panel depending on the Output Mode you select: Stack (Figure 89), or Offsets (Figure 90). The fields are described in Table 65.

Figure 89. kdm Main Panel, Stack Output

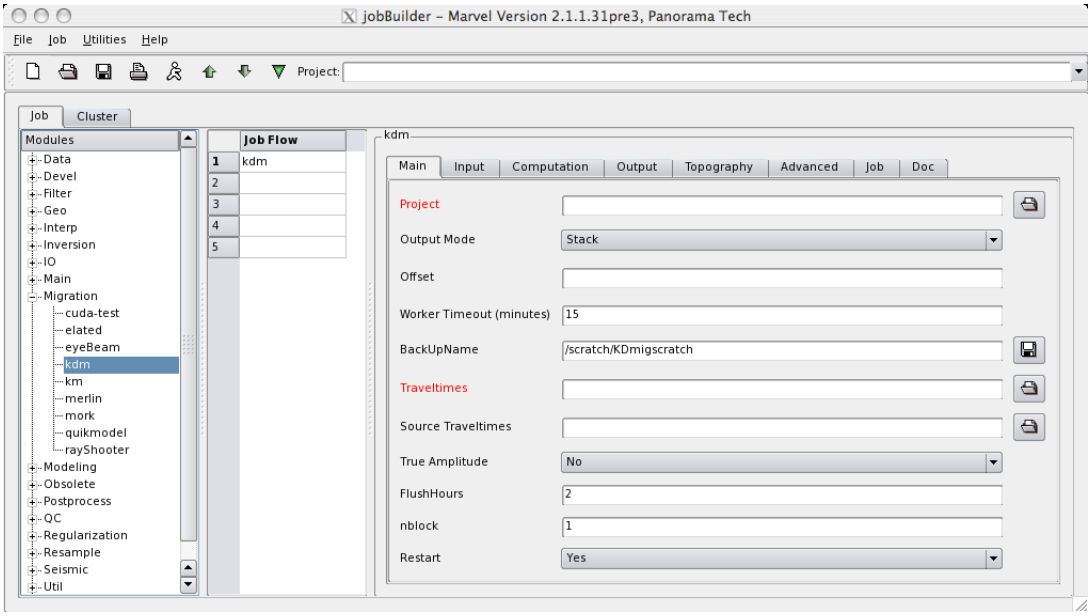


Figure 90. kdm Main Panel, Offsets Output

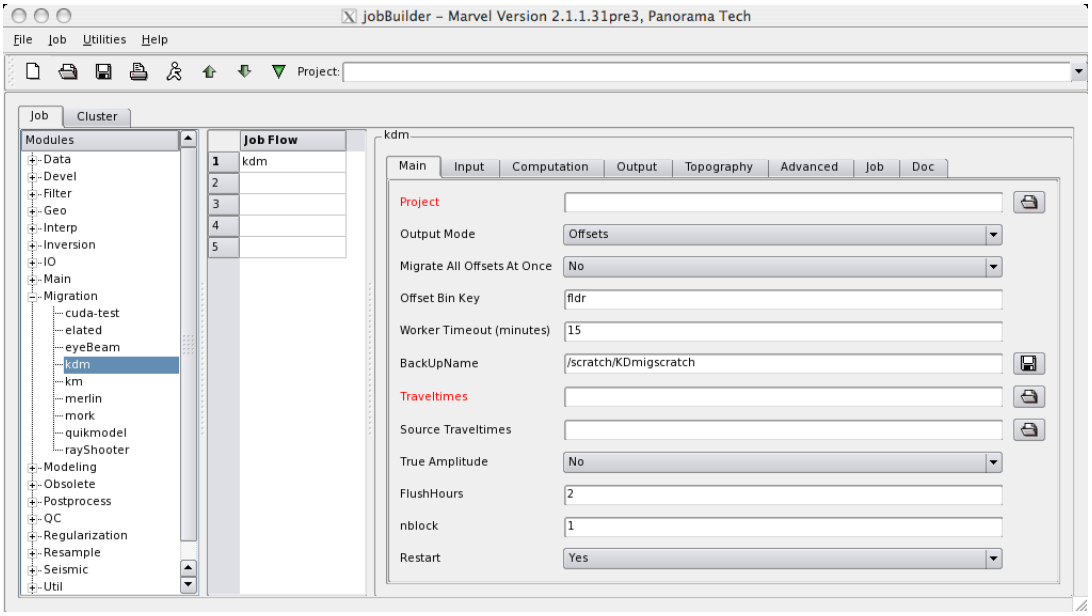


Table 65. kdm Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates. **Note: This is a REQUIRED entry.**
Output Mode	The kind of output: Offset gathers or Stack. default: Stack
Offset	Defines the bin of the run to be used for the output header. This field is visible only if you have selected an *Output Mode* of *Stack*.
Offset Bin Key	The header key for the offset bin parameter. This field is visible only if you have selected an *Output Mode* of *Offsets*. default: fldr
BackUpName	The name of the file to contain backup data if a restart becomes necessary. default: */scratch/KDmigscratch* **Note: This file is not deleted when a job finishes successfully. You must delete the file manually.**
BaseTmapName	Base name of the required traveltime data. This name is the tmap file name without the .tmap extension. **Note: This is a REQUIRED entry.**
FlushHours	The time, in hours, between backups. default: 2
nblock	The size of the trace block. default: 1
Master is Worker	Flag that controls whether the master I/O controller is also used for migrating data. default: Yes

kdm Input Panel

The kdm Module Input Panel, Figure 91 defines the header keys that provide surface information to the module. The fields are described in Table 66.

Figure 91. kdm Input Panel

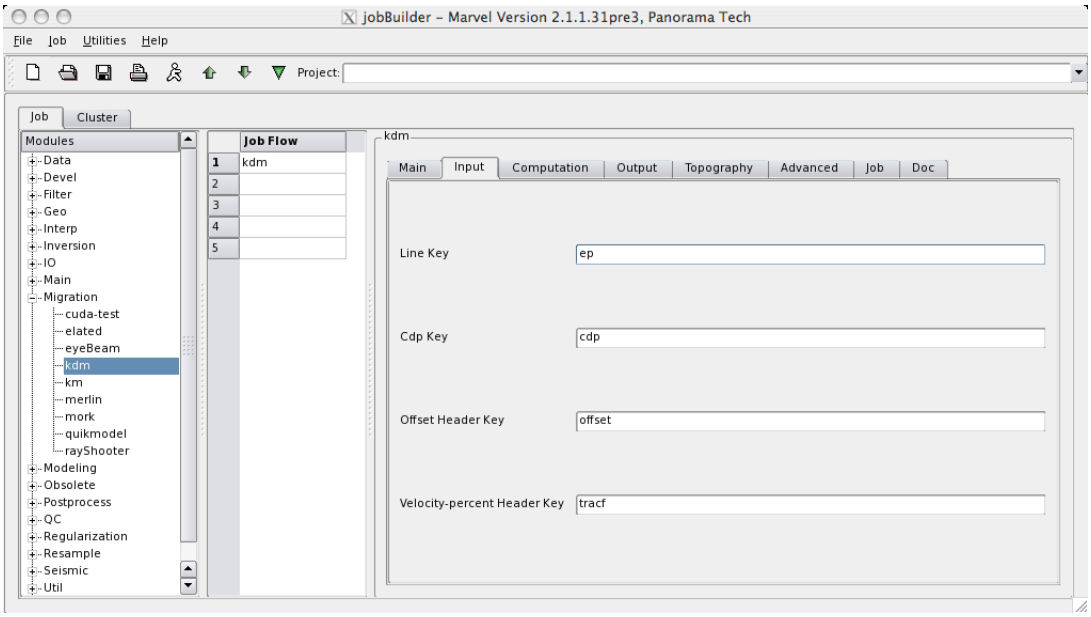


Table 66. kdm Input Panel Fields

Field	Description
Line Key	Header key for line designators. default: ep
Cdp Key	Header key for CDP designators. default: cdp
Offset Header Key	Header key for the offset parameter. default: offset
Velocity-percent Header Key	default: tracf

kdm Computation Panel

The kdm Computation Panel defines the x (line) and y (crossline) aperture limits.

The *Line Aperture* is the length, in meters or feet, of the line direction aperture limit. The default is 0.

The *XLine Aperture* is the length, in meters or feet, of the crossline (CDP) direction aperture limit. The default is 0.

kdm Output Panel

The kdm Output panel, Figure 92, defines the aliasing and output line and crossline dimensions. The fields are described in Table 67.

Figure 92. kdm Output Panel

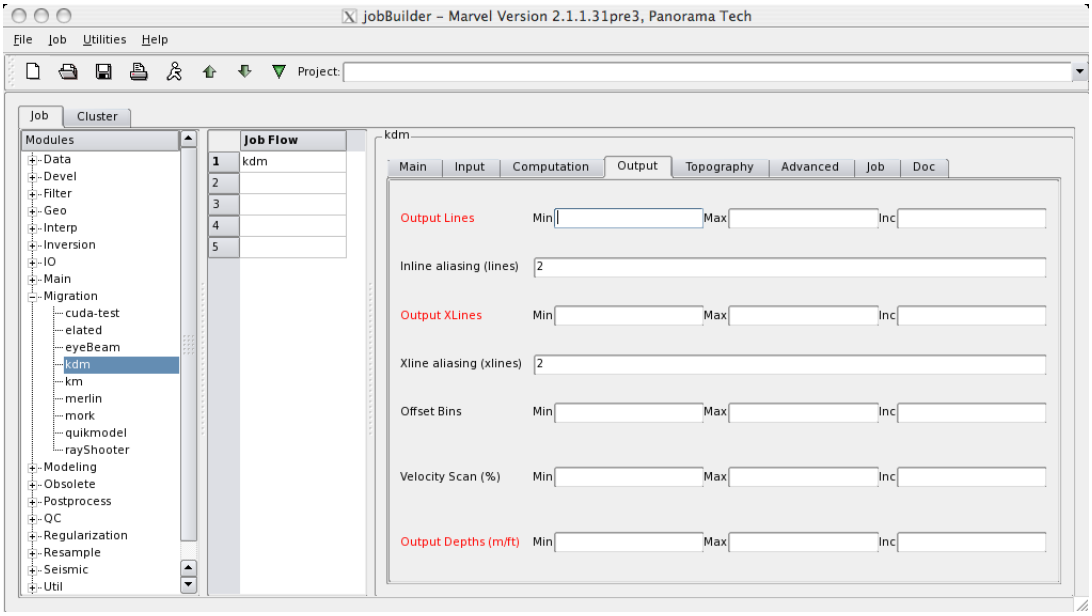


Table 67. kdm Output Panel Fields

Field	Description
Output Lines	The minimum, maximum, and increment values for output lines. **This is a REQUIRED field.**
Inline aliasing	The inline anti-aliasing distance, in units of lines. **Note: This can be a costly operation.** **default: 2**

continues on next page

Table 67. kdm Output Panel Fields–continued

Field	Description
Output XLines	The minimum, maximum, and increment values for output crosslines. **This is a REQUIRED field.**
Xline aliasing	The crossline anti-aliasing distance, in units of lines. **Note: This can be a costly operation.** **default: 2**
Offset Bins	Defines the endpoints of the desired output offset bins. For example, the values 0, 20,000, and 1000, define output offsets ranging from 500 to 19,500.
Velocity scan (%)	Setting the minimum, maximum, and increment provide the percentage range over which migrations should be performed. Thus, setting the range to 90, 110, 5 produces output volumes using 90, 95, 100, 105, and 110 percent of the original velocity field.
Output Depths	The minimum, maximum, and increment values for output depths. **This is a REQUIRED field.**

kdm Topography Panel

The kdm Topography Panel defines the surface topography for the project. There are two variables on the panel.

Figure 93. kdm Topography Panel

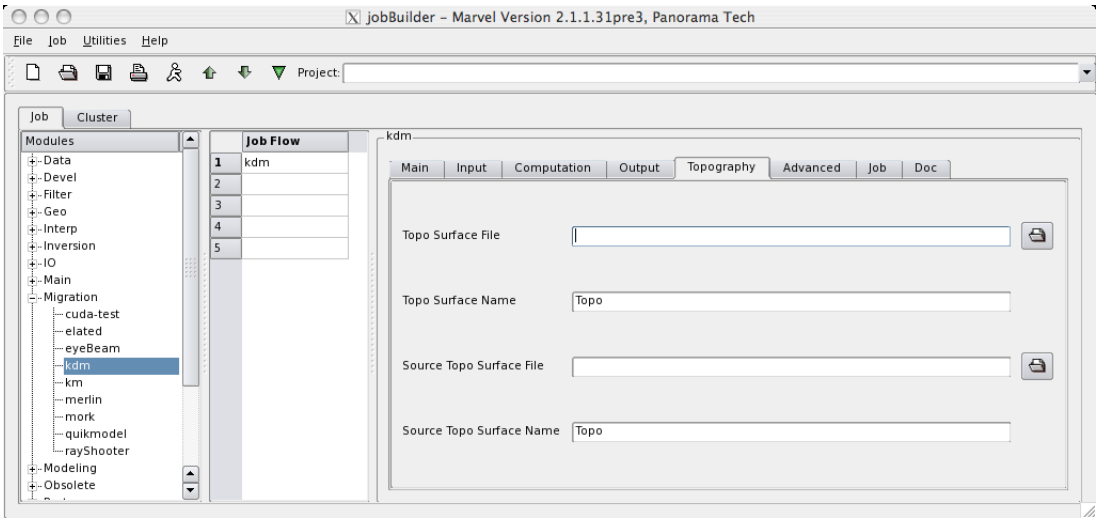


Table 68. kdm Topography Panel Fields

Field	Description
Topo Surface File	The path and name of the topographic surface file. If given, this specifies the acquisition topography (and if no Source Topo File is given, this is for both sources and receivers). This can be a MARVEL surface file, or a simple flat file defining the topography, with each line containing the line, crossline and depth values,, for example: ep = 100 cdp = 500 z = 20.
Topo Surface Name	The header key specifying where the topographic data are stored. A MARVEL surface file can have many surfaces. This is the name of the one to be used. default: Topo
Source Topo Surface File	The path and name of the topographic surface file. If given, this specifies the acquisition topography (and if no Source Topo File is given, this is for both sources and receivers). This can be a MARVEL surface file, or a simple flat file defining the topography, with each line containing the line, crossline and depth values,, for example: ep = 100 cdp = 500 z = 20.
Source Topo Surface Name	The header key specifying where the topographic data are stored. A MARVEL surface file can have many surfaces. This is the name of the one to be used. default: Topo

kdm Advanced Panel

The kdm Advanced panel, Figure 94, enables you to define several advanced usage parameters. The parameters are defined in Table 69.

Figure 94. kdm Advanced Panel

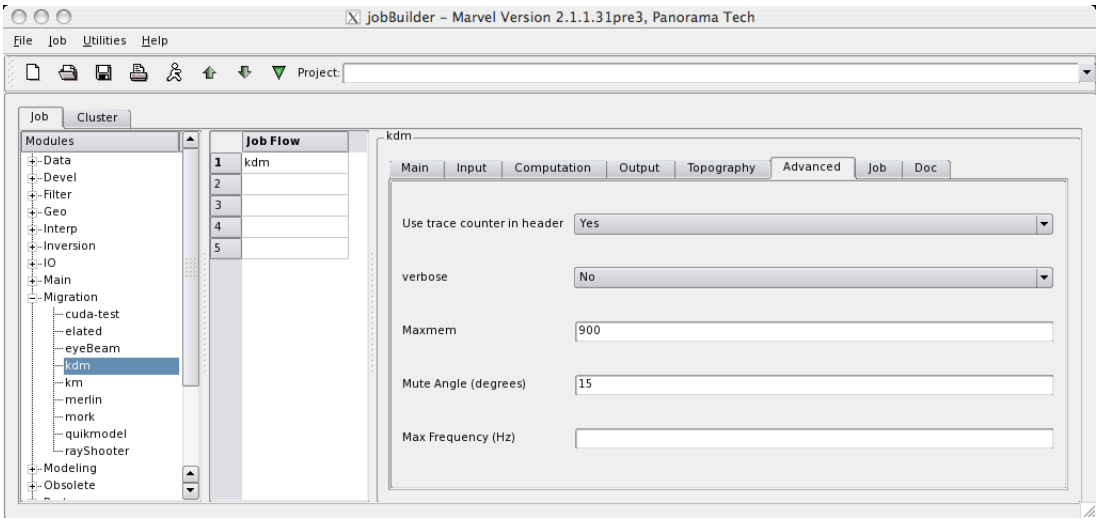


Table 69. kdm Advanced Panel Fields

Field	Description
Use trace counter in header	Flag indicating whether or not the trace counter that diskRead puts in the trace header will be used. default: Yes
verbose	Switch for turning debug printing on and off. default: No
Maxmem	Maximum amount of memory to be used by MARVEL per kdm instance. default: 900
Mute Angle	The angle, in degrees, measured down from the surface defining a cone limiting the near surface aperture. default: 15
Max Frequency	The maximum frequency allowed by the filtering process. Default: 0, do not filter

kmodel Module

The kmodel module is accessed under the Modeling node of the jobBuilder module tree.

Figure 95. kmodel Main Panel

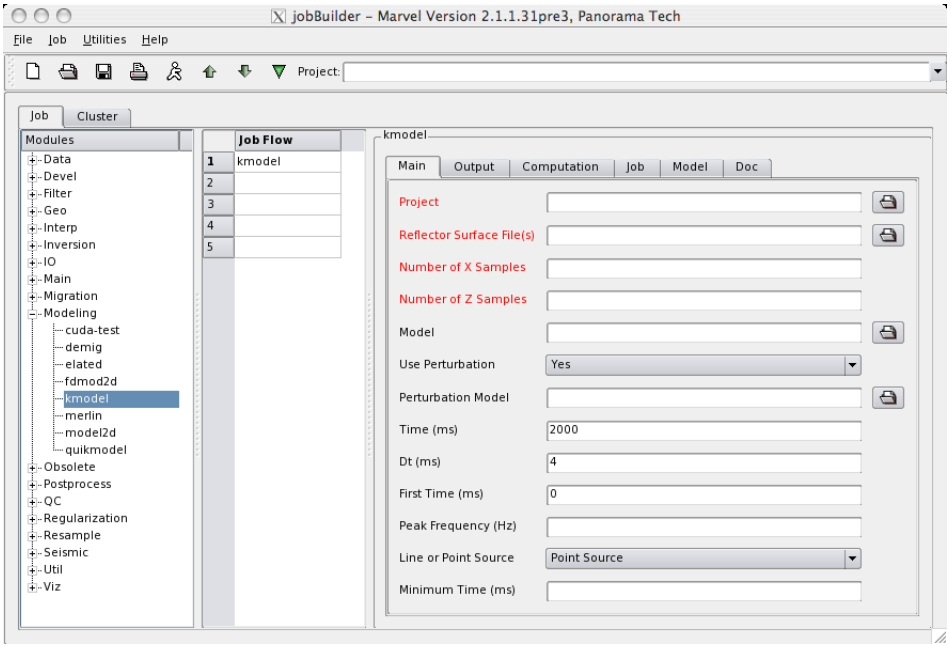


Table 70. kmodel Main Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates. **This is a REQUIRED entry.**
Reflector Surface File(s)	**This is a REQUIRED entry.**
Number of X Samples	**This is a REQUIRED entry.**
Number of Z Samples	**This is a REQUIRED entry.**
Model	
Use Perturbation	

continues on next page

Table 70. kmodel Main Panel Fields–continued

Field	Description
Perturbation Model	
Time (ms)	(default: 2000)
Dt (ms)	(default: 4)
First Time (ms)	(default: 0)
Peak Frequency (Hz)	
Line or Point Source	
Minimum Time	default: offset

kmodel Output Panel

Figure 96. kmodel Output Panel

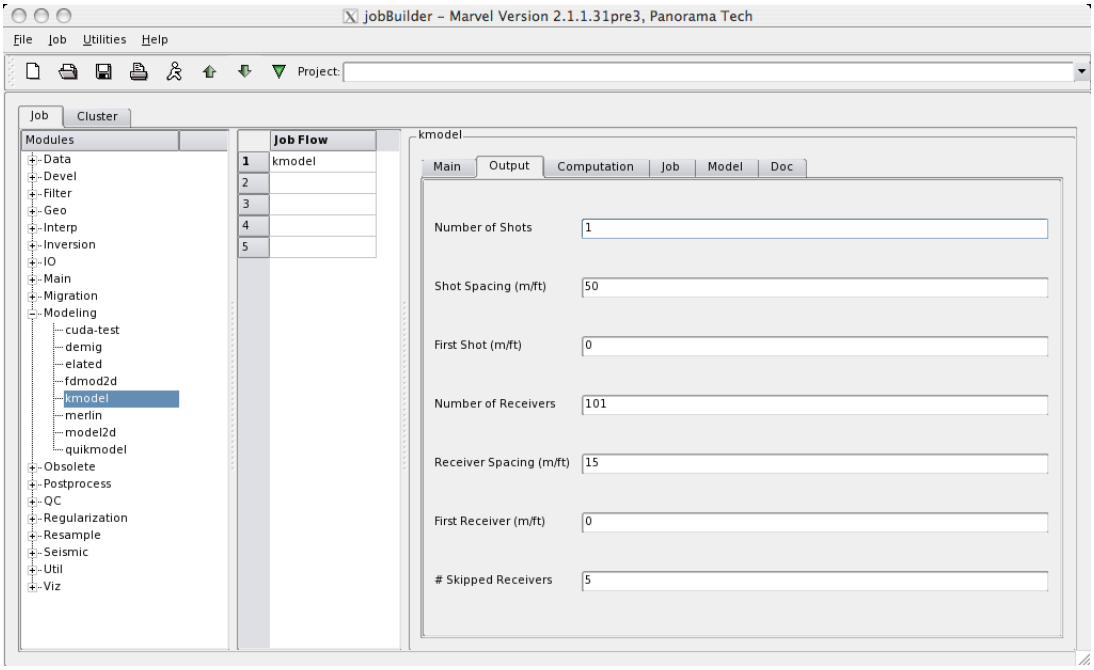


Table 71. kmodel Output Panel Fields

Field	Description
Number of Shots	
Shot Spacing (m/ft)	
First Shot (m/ft)	
Number of Receivers	
Receiver Spacing (m/ft)	
First Receiver (m/ft)	
# Skipped Receivers	

kmodel Computation Panel

Figure 97. kmodel Computation Panel

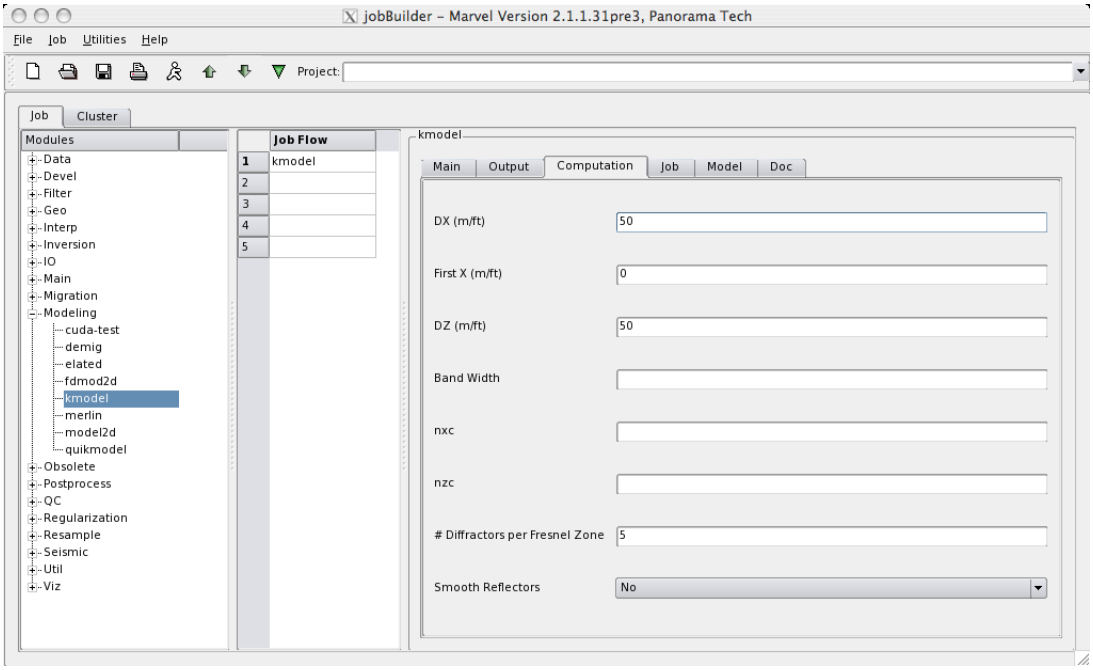


Table 72. kmodel Computation Panel Fields

Field	Description
DX (m/ft)	
First X (m/ft)	
DZ (m/ft)	
Band Width	
nxc	
nzc	
# Diffractors per Fresnel Zone	
Smooth Reflectors	

kmodel Job Panel

Verbose: Switch for turning debug printing on and off.

kmodel Model Panel

ModelLineKey: The header word key for line information when the model is gridded. Use if different from the data. default: same as data

ModelCdpKey: The header word key for CDP information when the model is gridded. Use if different from the data. default: same as data

km Module

The km module is Panorama Technologies' version of Kirchhoff curved-ray time migration. The km module is accessed under the Migration node of the jobBuilder module tree. This is a full featured, fault tolerant, restartable depth migration algorithm which can use parallel processing over both input and output. The parallelization scheme is identical to that used in the kdm module. The major difference between the km and kdm modules is that the km module calculates the traveltime information it needs internally, while the kdm module requires that the traveltime information be present in the data.

A typical migration job has the following job flow: diskRead ⇒ km ⇒ collect

For faster restarts, the Mode option in the diskRead module should be set to Shot Migration (see diskRead Module).

Note:

You should be sure the Restart File parameter is in sync with the km module. If you edit the one in km, the one in diskRead will be updated.

The collect module is designed to stack output from migrations. By default, it does this on a first-come, first-served basis and the output files will be unsorted. Choose the Preallocate Volume option in the collect module to avoid this behavior (see collect Module). As with the Restart File option in the diskRead module, make sure the output parameters that you want to collect are in sync with those in the km module.

km Main Panel

This km Module main panel enables you to define the basic parameters for the module. There are two different versions of the panel depending on the output mode you use: Stack (Figure 98) or Offsets (Figure 99). Table 73 defines the terms used on both panels.

Figure 98. km Main Panel—Stack Output Mode

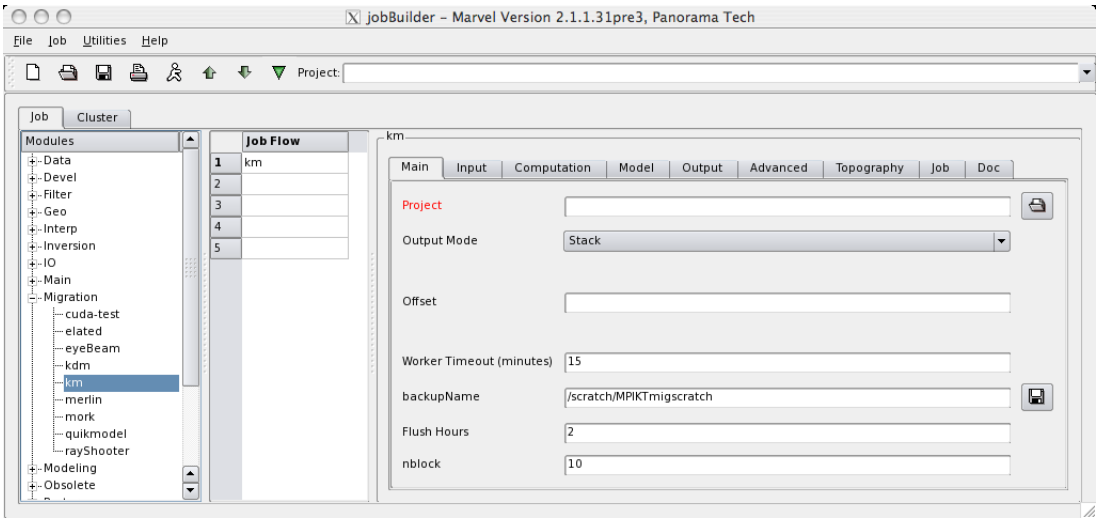


Figure 99. km Main Panel–Offsets Output Mode

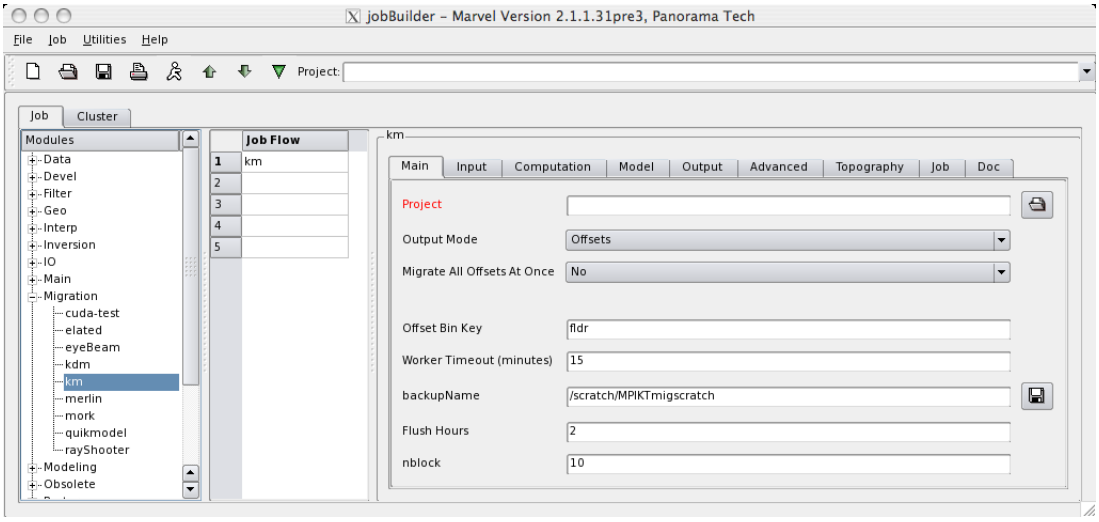


Table 73. km Main Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates. **This is a REQUIRED entry.**
Output Mode	This is the kind of output: Stack or Offset gathers. default: Stack
Migrate All Offsets at Once	(Only visible for Output Mode Offsets.) Enables all offsets to be held in memory at one time. This is good for increasing I/O performance. default: No
Offset Bin Key	(Only visible for Output Mode Offsets.) The header key for the offset bin parameter. default: fldr
Offset	(Only visible for Output Mode Stack.) The bin for the run to be used for the output header.
Worker Timeout (minutes)	Worker components that have not responded in this amount of time are assumed to be dead. default: 15
backupName	The name of the file to contain backup data if a restart becomes necessary. default: */scratch/MPIKTmigscratch* **Note:** This file is not deleted when a job finishes successfully. You must delete the file manually.
Flush Hours	The time, in hours, between backups. default: 2
nblock	The size of the trace block. default: 10

km Input Panel

The km Input panel, Figure 100, defines the header keys that provide surface information to the module. The fields are defined in Table 74.

Figure 100. km Input Panel

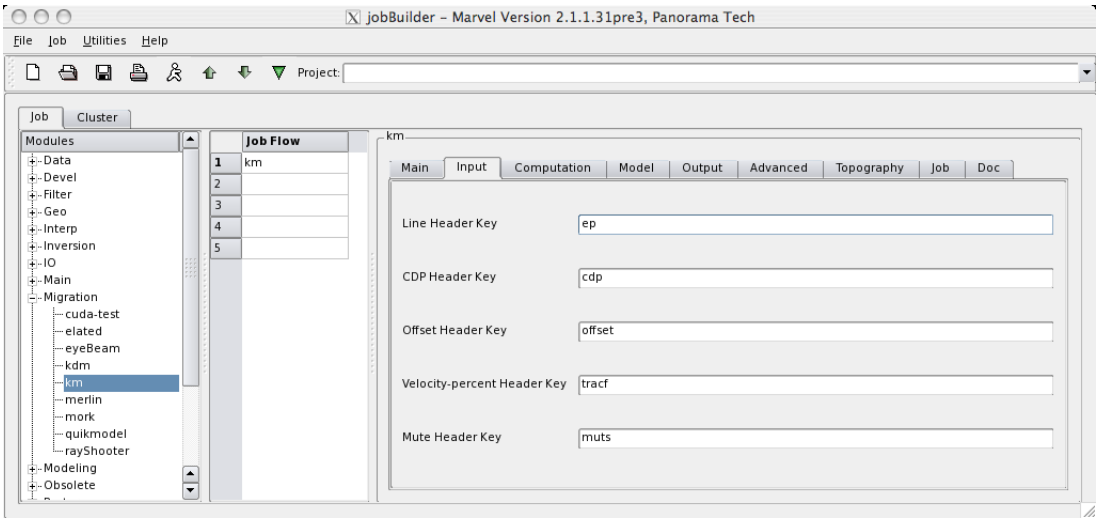


Table 74. km Input Panel Fields

Field	Description
Line Header Key	Header key with line designators. MARVEL usually uses ep, which is a 4-byte integer at location 17 in SEG-Y files. default: ep
CDP Header Key	Header key containing CDP designators. MARVEL usually uses cdp, which is a 4-byte integer at location 21 in SEG-Y files. default: cdp
Offset Header Key	Header key for the offset parameter. default: offset
Velocity-percent Header Key	default: tracf
Mute Header Key	Header key for the mute parameter. default: muts

km Computation Panel

The km Computation panel, Figure 101, defines the x and y aperture limits to be used in the calculations. The fields are described in Table 75.

Figure 101. km Computation Panel

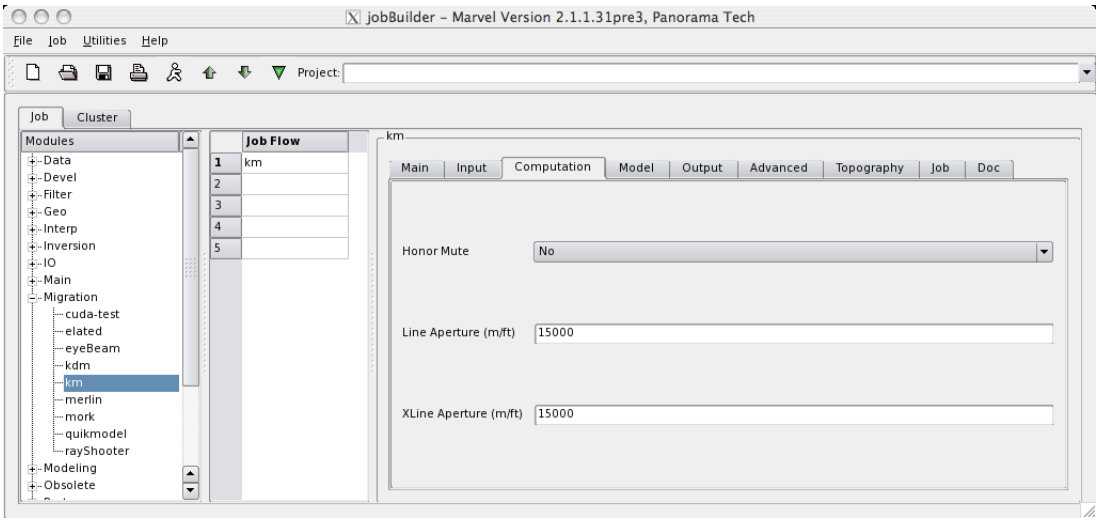


Table 75. km Computation Panel Fields

Field	Description
Honor Mute	Switch indicating whether or not the Kirchhoff migration calculation should use the mute setting.
Line Aperture	The length, in meters or feet, of the line direction aperture limit. default: 15000
XLine Aperture	The length in meters or feet of the crossline aperture limit. default: 15000

km Model Panel

The km model panel, Figure 102, defines the kind and type of input model to be used by MARVEL. The fields are described in Table 76.

Note:

All gridded models are assumed to be SEG-Y formatted.

Figure 102. km Model Panel

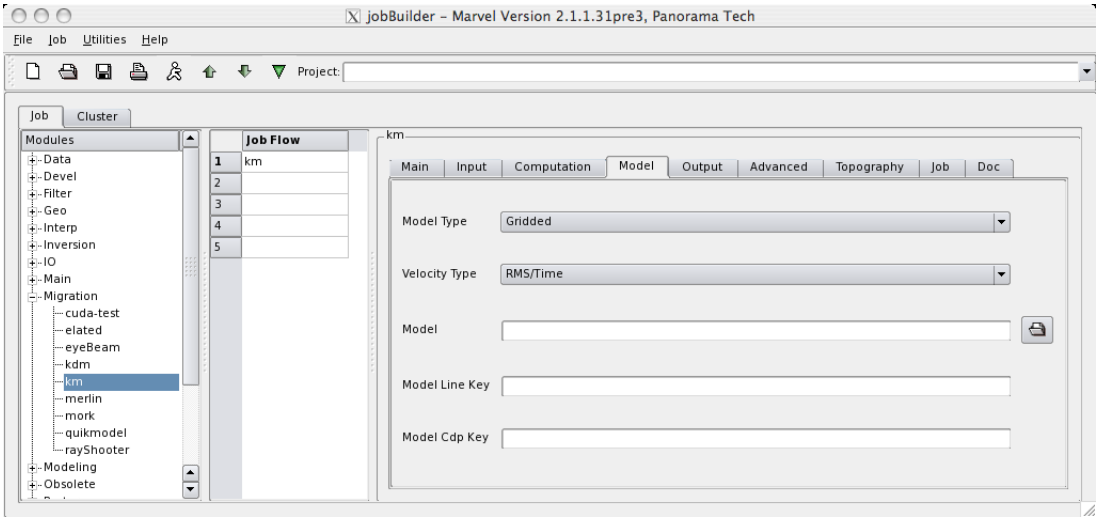


Table 76. km Model Panel Fields

Field	Description
Model Type	Type of input velocity model. Currently, only a Gridded model is allowed. In the future, models defined by time-velocity pairs will also be permitted. default: Gridded
Velocity Type	The velocity type used with this model: RMS/Time, Int/Depth, Int/Time. default: RMS/Time
Model	File containing the model you want to use with the Kirchhoff migration. **Note:** All gridded models are assumed to be SEG-Y formatted.
Model Line Key	The header word key for line information when the model is gridded. Use if different from the data. default: same as data
Model Cdp Key	The header word key for CDP information when the model is gridded. Use if different from the data. default: same as data

km Output Panel

The km Output panel, Figure 103, defines the aliasing, output line and crossline dimensions. The fields are described in Table 77.

Figure 103. km Output Panel

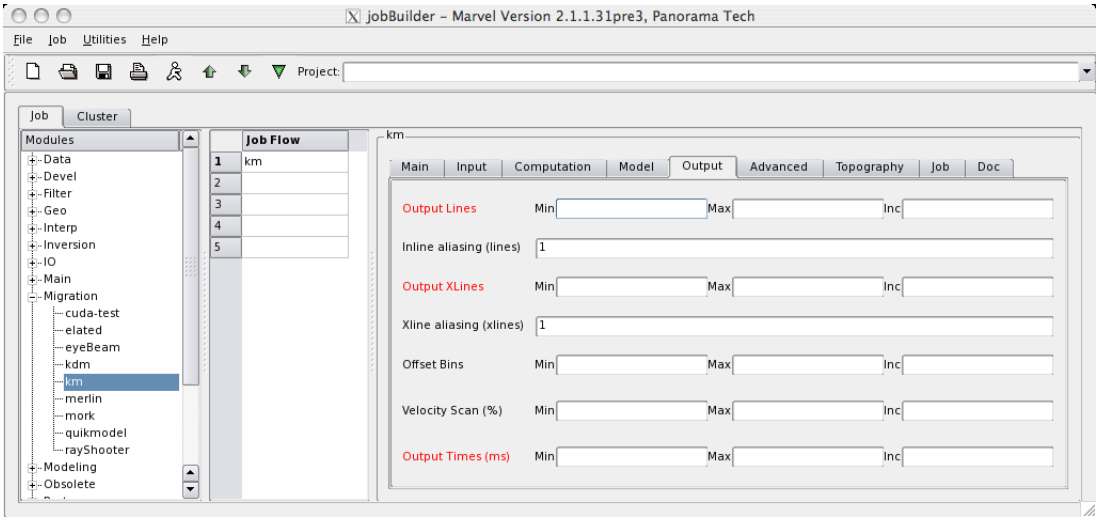


Table 77. km Output Panel Fields

Field	Description
Output Lines	The minimum, maximum, and increment values for output lines. **This is a REQUIRED entry.**
Inline aliasing	Defines the inline anti-aliasing distance, in units of lines. default: 1
Output XLines	Defines the minimum, maximum, and incremental crossline values. **This is a REQUIRED entry.**
Xline aliasing	Defines the crossline anti-aliasing distance, in units of lines. default: 1
Offset Bins	Defines endpoints of the desired output offset bins. For example, the values 0, 20,000, and 1000, define output offsets ranging from 500 to 19,500. *This field is only visible if you have selected an Output Mode of Offsets in the Main panel.*
Velocity Scan (%)	Setting the minimum, maximum, and increment provide the percentage range over which migrations should be performed. For example, setting this range to 90, 110, 5 will produce output volumes using 90, 95, 100, 105, and 110 percent of the original velocity field.
Output Times	Defines the minimum, maximum, and incremental output time values, in milliseconds. **This is a REQUIRED entry.**

km Advanced Panel

The km Advanced panel, Figure 104, defines several advanced user parameters. The fields are described in Table 78.

Figure 104. km Advanced Panel

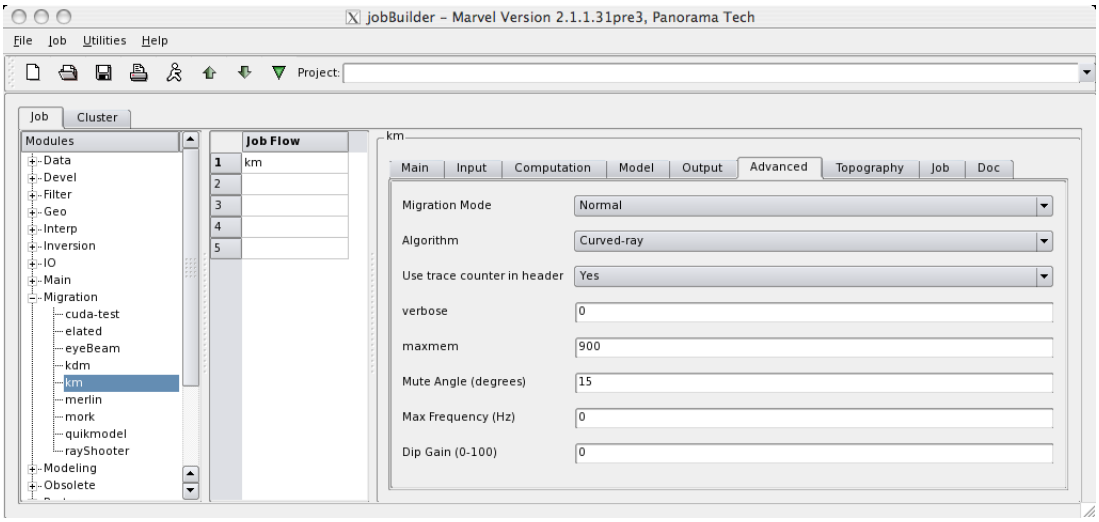


Table 78. km Advanced Panel Fields

Field	Description
Migration Mode	Specifies whether the migration is to be Normal, DoubleV, or from Topography. If the migration is from topography, you can enter data on the km Topography Panel. default: Normal
Algorithm	Specifies the algorithm to be used in the calculations: Curved-ray or Straight-ray. default: Curved-ray
Use trace counter in header	Flag indicating whether or not the trace counter that diskRead puts in the trace header is to be used. default: Yes
Verbose	Switch for turning debug printing on and off. default: 0
maxmem	Maximum amount of memory that MARVEL can use per kdm instance. default: 900

continues on next page

Table 78. km Advanced Panel Fields–continued

Field	Description
Mute Angle	Defines the angle, measured down from the surface, that defines a cone limiting the near surface aperture. default: 15
Max Frequency	The maximum frequency allowed by the filtering process. default: 0, do not filter
Dip Gain	Variable that enables you to control dip. The value can range from 0 through 100. default: 0, do not apply a gain

km Topography Panel

The km Topography panel, Figure 105, defines several topography user parameters. The fields are described in Table 79.

Note:

The fields on the panel are visible are only visible if you select From Topography for the Migration Mode on the km Advanced Panel.

Figure 105. km Topography Panel

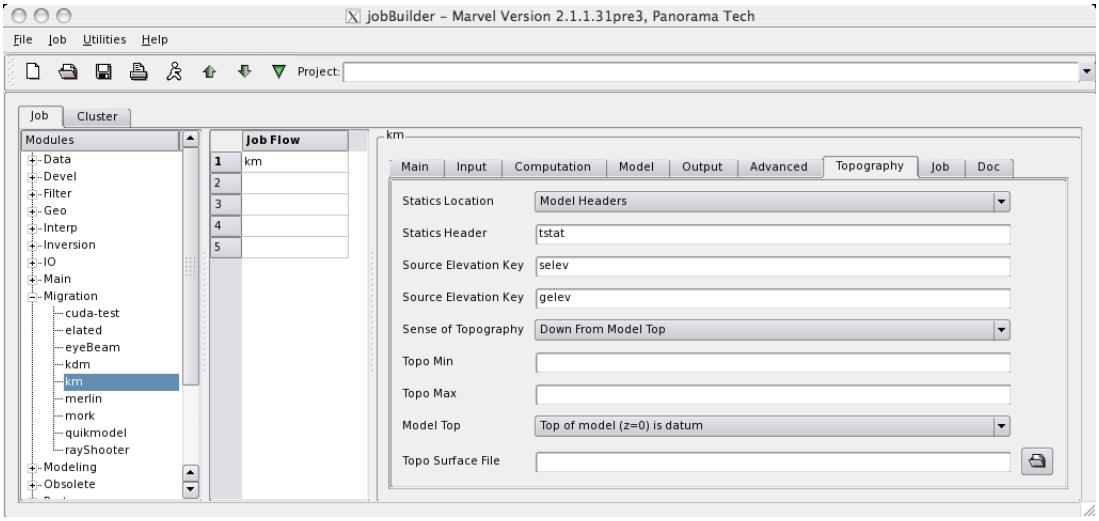


Table 79. km Topography Panel Fields

Field	Description
Statics Location	Model Headers, Data Headers, Surface File default: Model Headers
Statics Header	The header key for the total statics information. default: tstat
Source Elevation Key	The header key for the source elevation information. default: selev
Source Elevation Key	The header key for the source elevation information. default: gelev
Sense of Topography	Down From Model Top, Up From Sea Level/Datum default: Down From Model Top

continues on next page

Table 79. km Topography Panel Fields–continued

Field	Description
Topo Min	
Topo Max	
Model Top	Top of model (z = 0) is datum, Top of model (z = 0) is topo surface default: Top of model (z = 0) is datum
Topo Surface File	The path and name of the topographic surface file. If given, this specifies the acquisition topography (and if no Source Topo File is given, this is for both sources and receivers). This can be a MARVEL surface file, or a simple flat file defining the topography, with each line containing the line, crossline and depth values, for example: ep = 100 cdp = 500 z = 20
Topo Surface Name	The header key specifying where the topographic data are stored. A MARVEL surface file can have many surfaces. This is the name of the one to be used. default: Topo
Reference Velocity	default: 1000

MERLIN Module

Two-way wave equation program for modeling, velocity analysis and depth imaging. The MERLIN module is accessed under both the Migration and Modeling nodes of the jobBuilder module tree.

Note:

You should use MERLIN® to perform migrations instead of **rtmodel**.

MERLIN Main Panel

There are two somewhat different versions of the main panel, depending on your Mode selection: Model (Figure 106), Migrate (Figure 107), or Model and Migrate (which is the same as the Migrate version). The fields in these panels are defined in Table 80.

Figure 106. MERLIN Main Panel, Model Mode

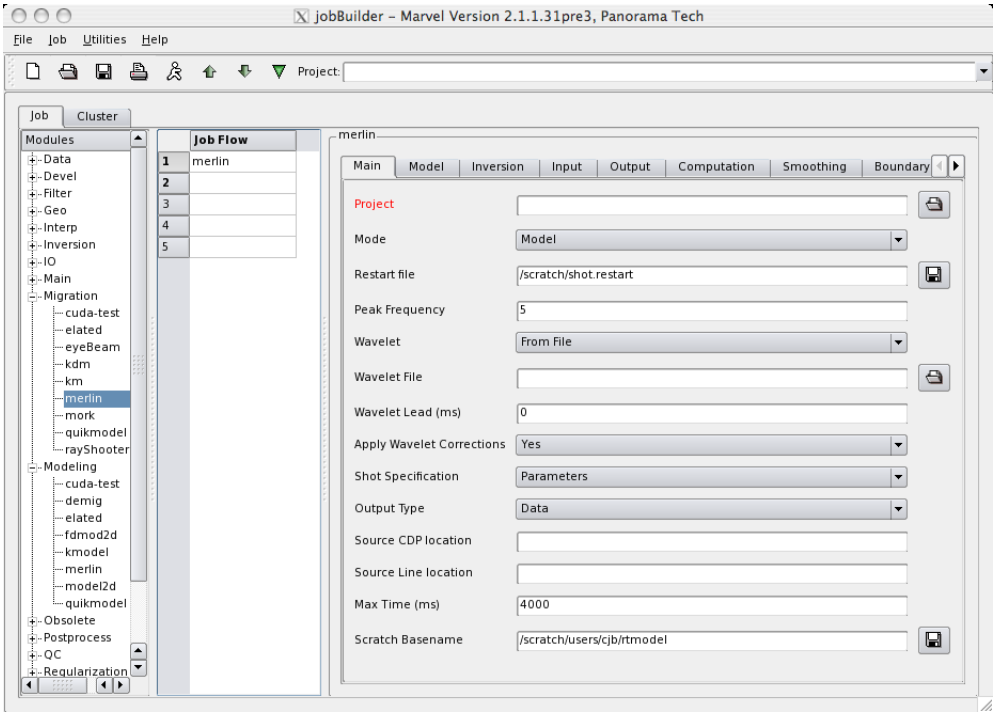


Figure 107. MERLIN Main Panel, Migrate Mode

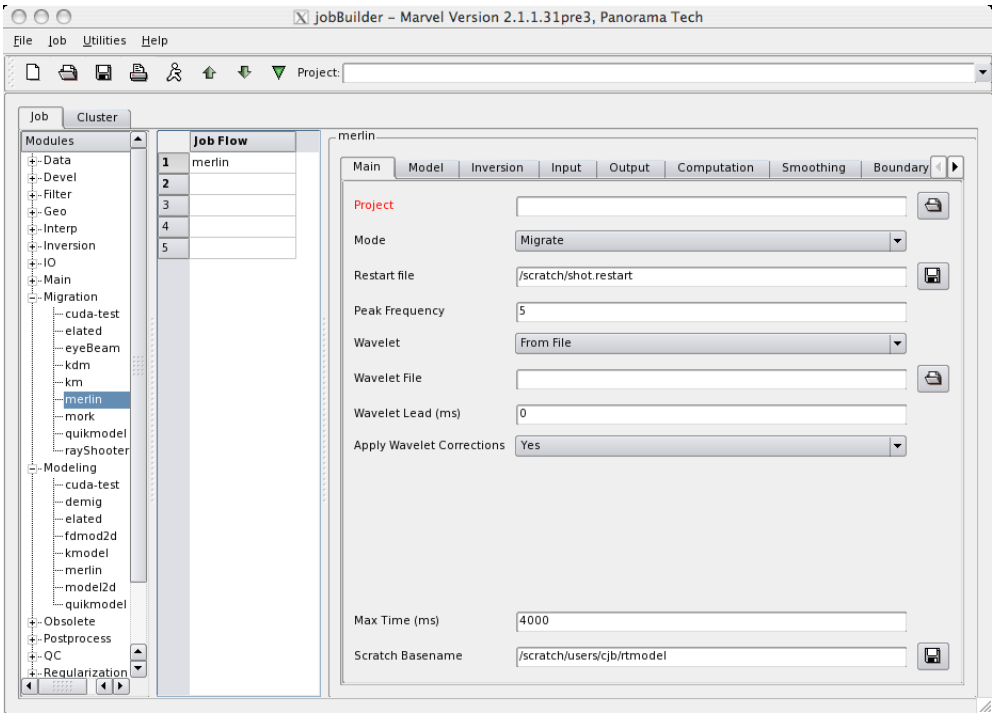


Table 80. MERLIN Main Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates. **This is a REQUIRED entry.**
Mode	Model, Migrate, or Model and Migrate
Restart File	The application keeps information about shots already processed in this file. It is usually best to put it in the same directory where your output files are located and to give it a similar name. default: */scratch/shot.restart*
Peak Frequency	This field has a somewhat historical definition in units of Hz. The value is based on the definition of the default Ricker wavelet, and refers to the peak frequency of the defining Gaussian pulse (since the Ricker wavelet is the second derivative of the Gaussian pulse, its peak frequency is actually higher than the Gaussian pulse itself). The maximum produced frequency will be roughly 2.8 times this number. default: 5

continues on next page

Table 80. MERLIN Main Panel Fields–continued

Field	Description
Wavelet	The name of the wavelet convolved with a reflectivity trace to generate a synthetic seismogram: Ricker (zero-phase) or Spike (which is mostly useful for migration), or From File (where you specify your own wavelet). If you specify a wavelet, you must then specify two additional parameters: *WaveletFile* and *WaveletLead*. default: Ricker
Wavelet File	When you have specified that the wavelet is *FromFile*, this field allows a single trace to be read from a seismic input file to define the source wavelet.
Wavelet Lead (ms)	When you have specified that the wavelet is From File, the specified wavelet will be centered at this point. default: 0
Apply Wavelet Corrections?	*Yes* or *No*
Shot Specifications	Parameters or From Data (This field is only displayed for the Model Mode.) default: Parameters
Output Type	Data or Residual (This field is only displayed for the Model Mode.) default: Data
Source CDP Location	(This field is only displayed for the Model Mode.)
Source Line Location	(This field is only displayed for the Model Mode.)
Max Time (ms)	default: 4000
Scratch Basename	The application needs temporary storage for acquired data, accumulated image, and others. All of these filenames will start with this prefix.

MERLIN Model Panel

Figure 108. MERLIN Model Panel, VTI/TTI Model Type

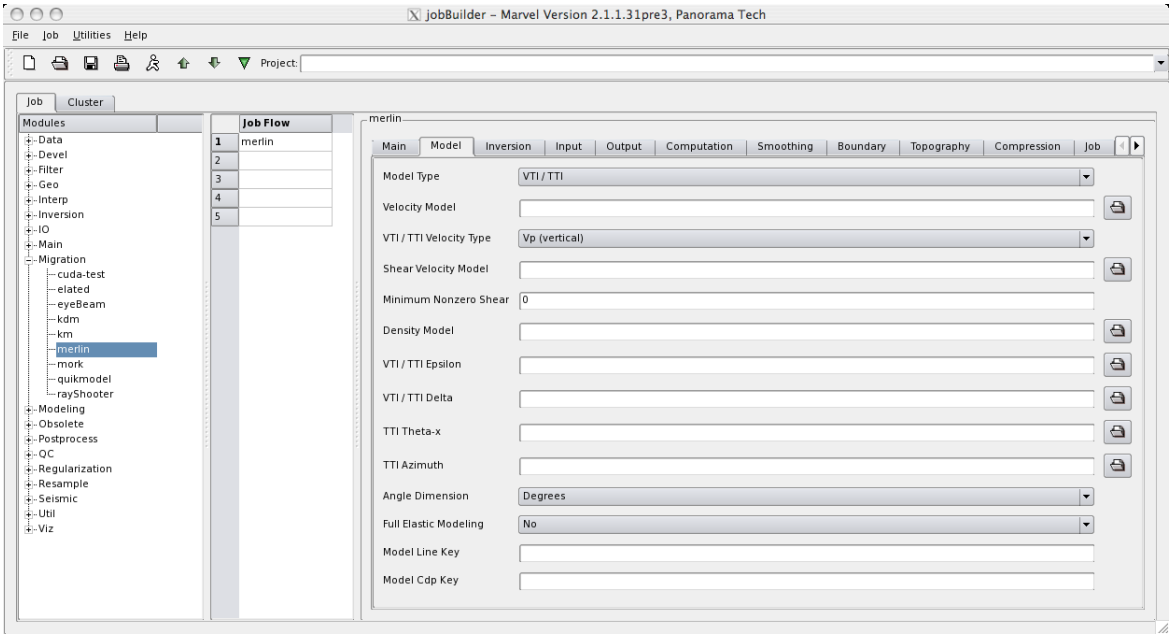


Figure 109. MERLIN Model Panel, Constant-Density Acoustic Model Type

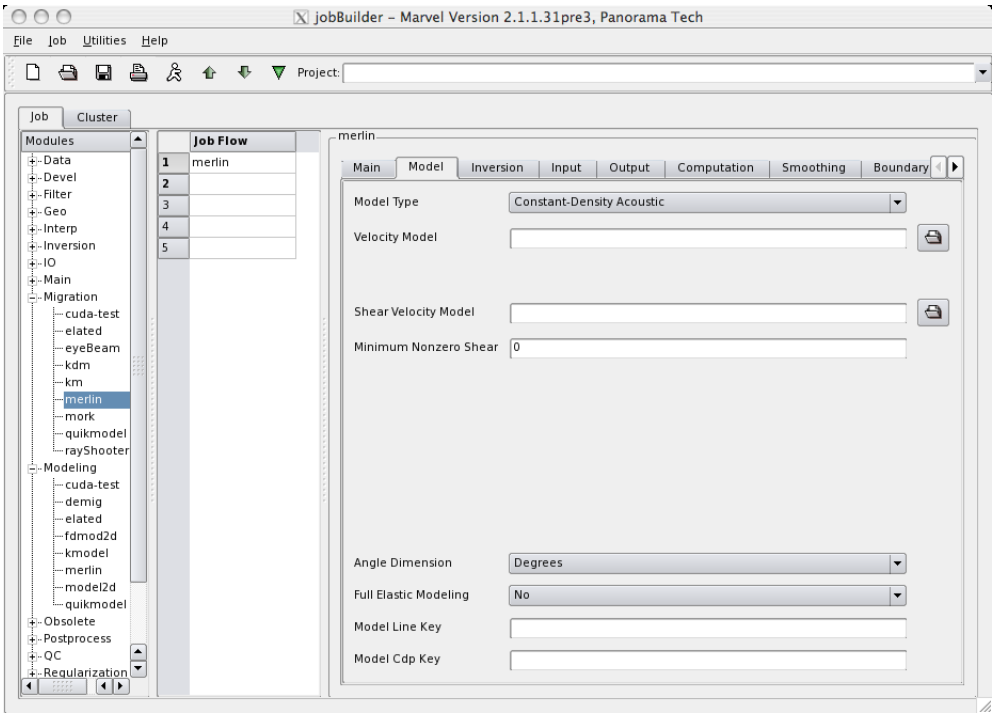


Figure 110. MERLIN Model Panel, Variable-Density Acoustic Model Type

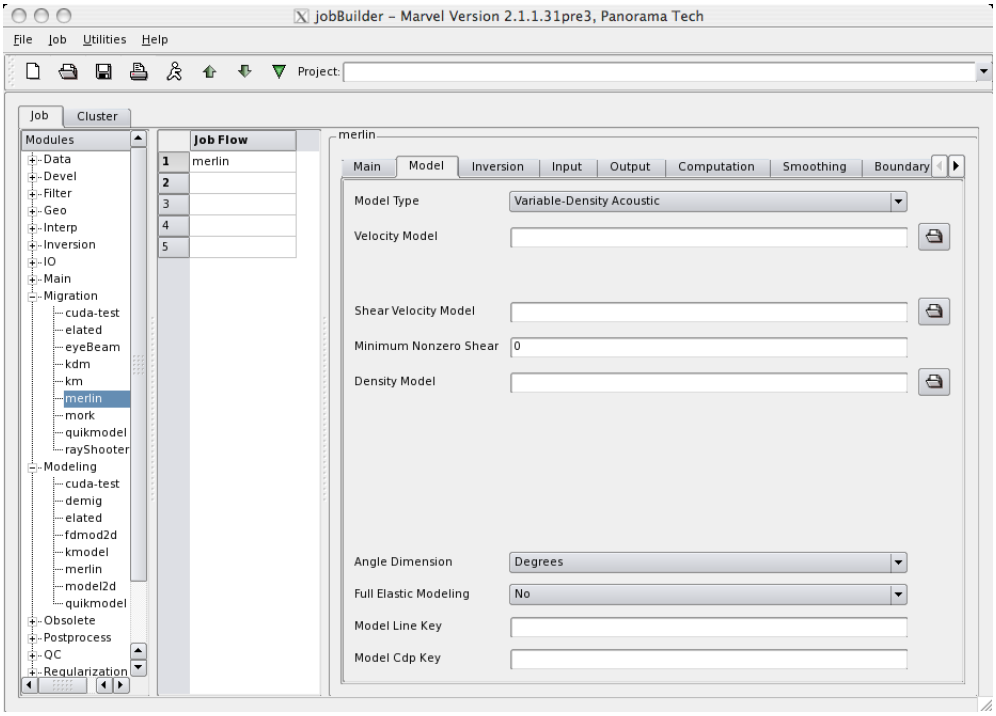


Table 81. MERLIN Model Panel Fields

Field	Description
Common Fields	
Model Type	• VTI/TTI • Constant-Density Acoustic • Variable-Density Acoustic default: VTI/TTI
Velocity Model	The path and filename of the velocity model to be used in the calculations. This is a seismic file in any format MARVEL can read, typically, SEG-Y. The units are m/s, or ft/s, but can be anything else, depending on the choice of units in the seismic data.
Shear Velocity Model	
Minimum Nonzero Shear	default: 0

continues on next page

Table 81. MERLIN Model Panel Fields–continued

Field	Description
Angle Dimension	Degrees or Radians default: Degrees
Full Elastic Modeling	*Yes* or *No*
Model Line Key	The header word key for line information when the model is gridded. Use if different from the data.
Model Cdp Key	The header word key for CDP information when the model is gridded. Use if different from the data.
VTI/TTI Model Type	
VTI/TTI Velocity Type	Vp (vertical) or VNMO (vertical) default: Vp (vertical)
Density Model	File containing the density model.
VTI/TTI Epsilon	Thomsen's epsilon, ε, for the VTI/TTI medium.
VTI/TTI Delta	Thomsen's delta, δ, for the VTI/TTI medium.
TTI Theta-x	Thomsen's theta, θ, for the TTI medium.
TTI Azimuth	
Constant-Density Acoustic Model Type	
There are no fields specific just to this model.	
Variable-Density Acoustic Model Type	
There are no fields specific just to this model.	

MERLIN Inversion Panel

The Inversion Panel, Figure 111, only contains these fields if you have selected a *Mode* of *ModelandMigrate* on the MERLIN Main panel.

Figure 111. MERLIN Inversion Panel

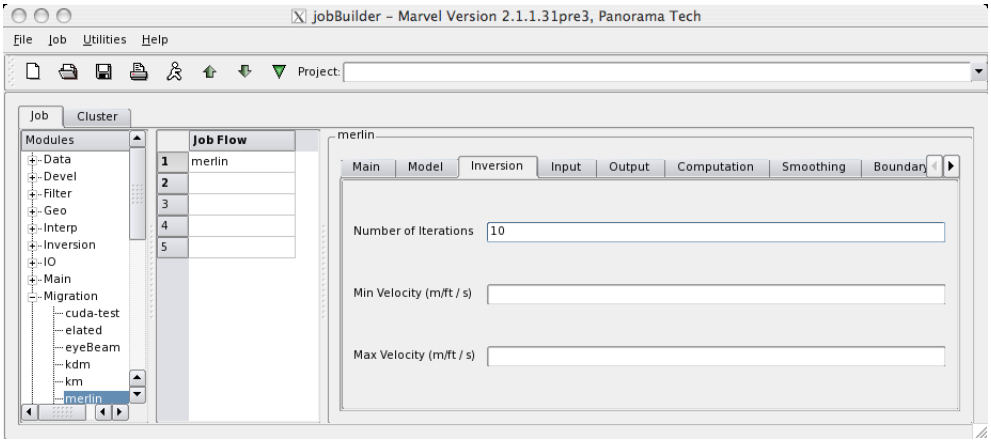


Table 82. MERLIN Inversion Panel Fields

Field	Description
Number of Iterations	
Min Velocity (m/f s)	
Max Velocity (m/ft s)	

MERLIN Input Panel

Figure 112. MERLIN Input Panel

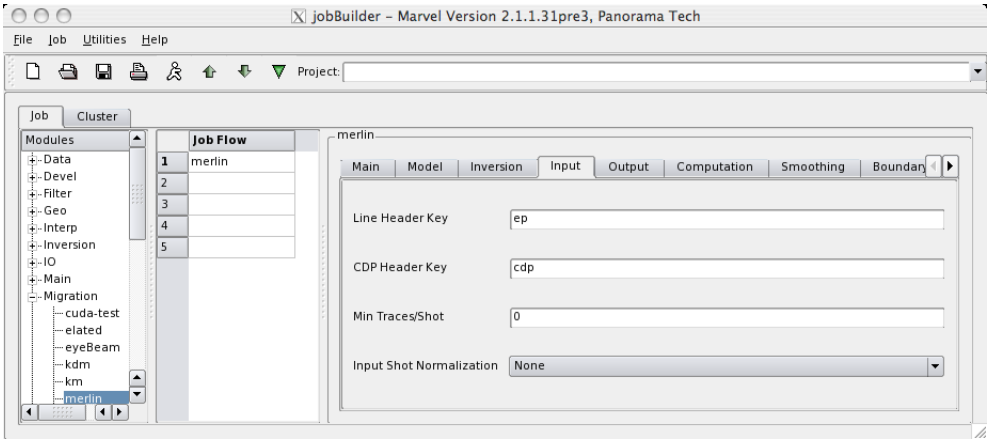


Table 83. MERLIN Input Panel Fields

Field	Description
Line Header Key	Header key containing line designators. MARVEL usually uses ep, which is a 4-byte integer at location 17 in SEG-Y files. default: ep
CDP Header Key	Header key containing CDP designators. MARVEL usually uses cdp, which is a 4-byte integer at location 21 in SEG-Y files. default: cdp
Min Traces/Shot	default: 0
Input Shot Normalization	None or RMS. Normalization corrects for the amplitude effects of wavefront divergence and damping. It is also used when you apply a subsequent filter for eliminating the surface waves. If RMS, each input shot is divided by its RMS value before processing. **This field is only visible if MERLIN is performing a migrate operation, as selected on the Main panel.** default: None

MERLIN Output Panels

Figure 113. MERLIN Output Panel, Model Mode

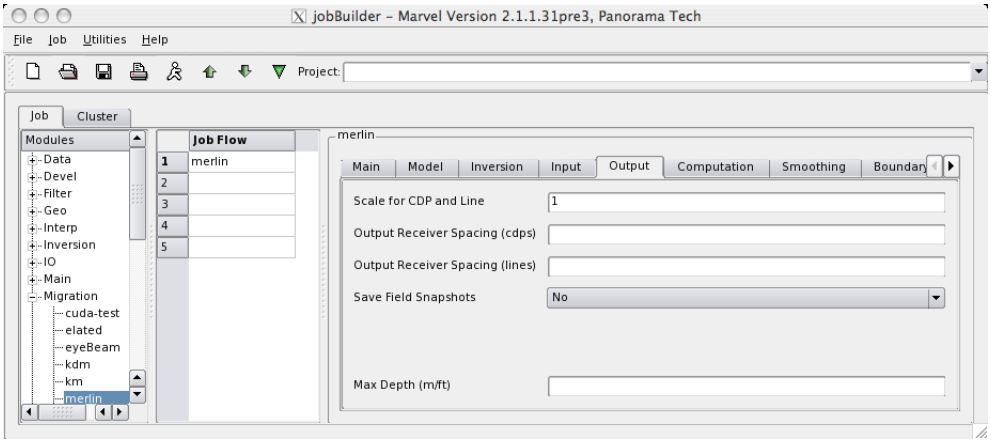


Figure 114. MERLIN Output Panel, Migrate Mode

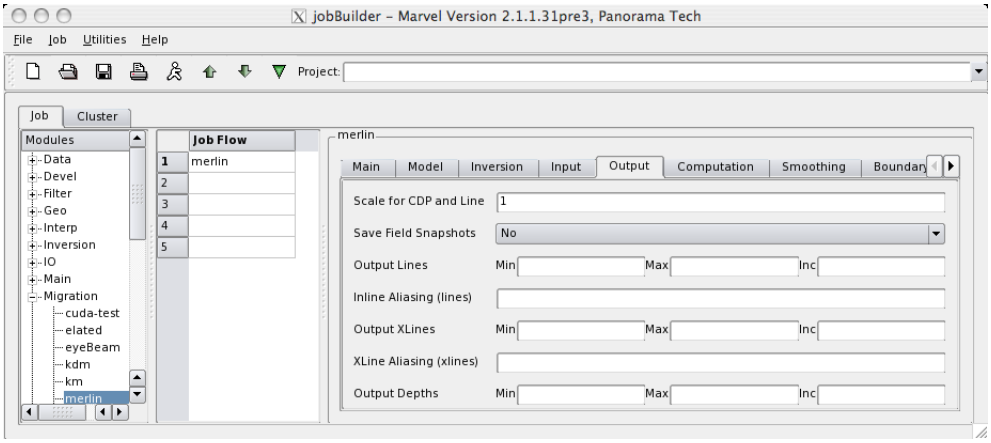


Table 84. MERLIN Output Panel Fields

Field	Description
Common Fields	
Scale for CDP and Line	default: 1
Save Field Snapshots	
Model Mode	

continues on next page

Table 84. MERLIN Output Panel Fields–continued

Field	Description
Output Receiver Spacing (cdps)	Data will be acquired on a grid centered on the shot point, with this spacing along the CDP axis.
Output Receiver Spacing (lines)	Data will be acquired on a grid centered on the shot point, with this spacing along the line axis.
Max Depth (m/ft)	
Migrate Mode	
Output Lines	The number of lines to be contained in the output data.
Input Aliasing (lines)	Attempt to compensate for aliasing in the input (units: lines).
Output XLines	The number of crosslines to be contained in the output data.
XLine Aliasing (xlines)	Attempt to compensate for aliasing in the output crossline direction (units: lines). **Note:** This can be a costly operation.
Output Depths	Defines the minimum, maximum, and increment for the each output trace.

MERLIN Computation Panels

Figure 115. MERLIN Computation Panel, Model Mode

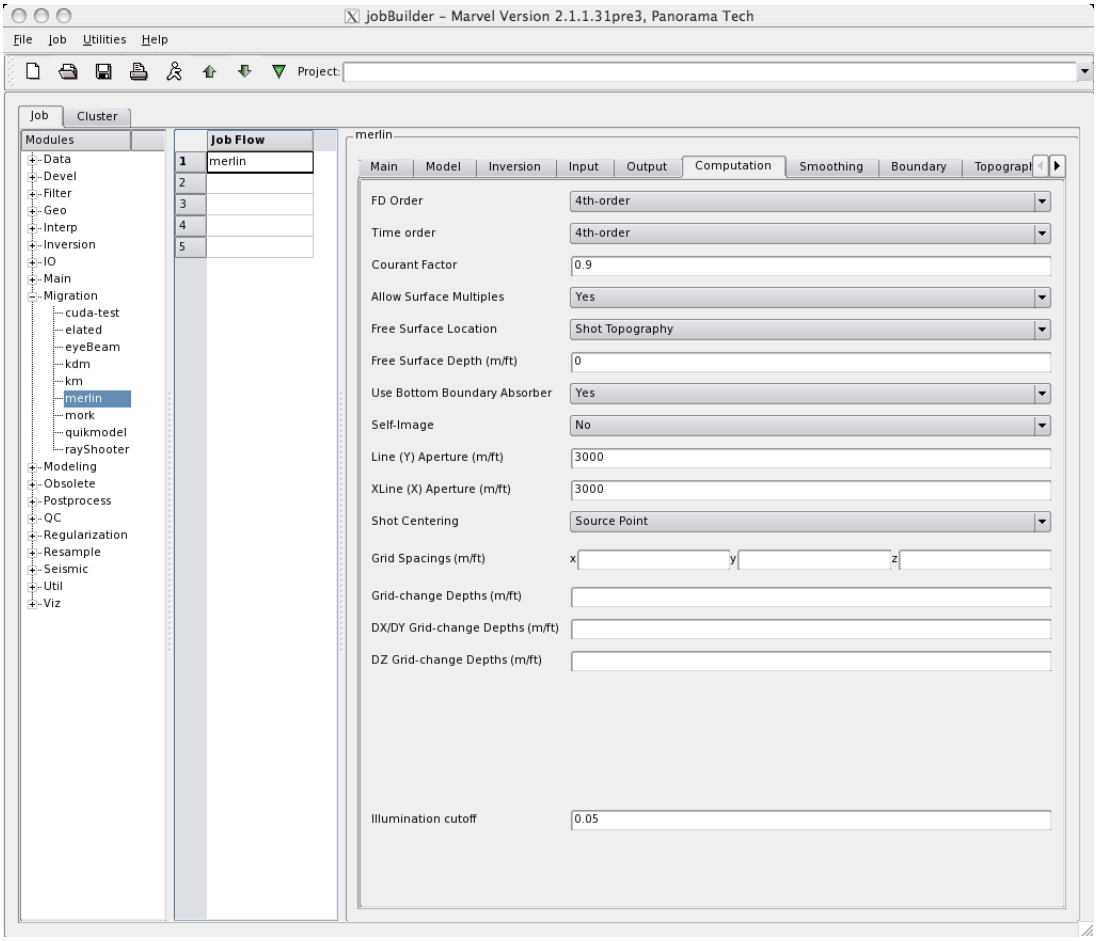


Figure 116. MERLIN Computation Panel, Migrate Mode

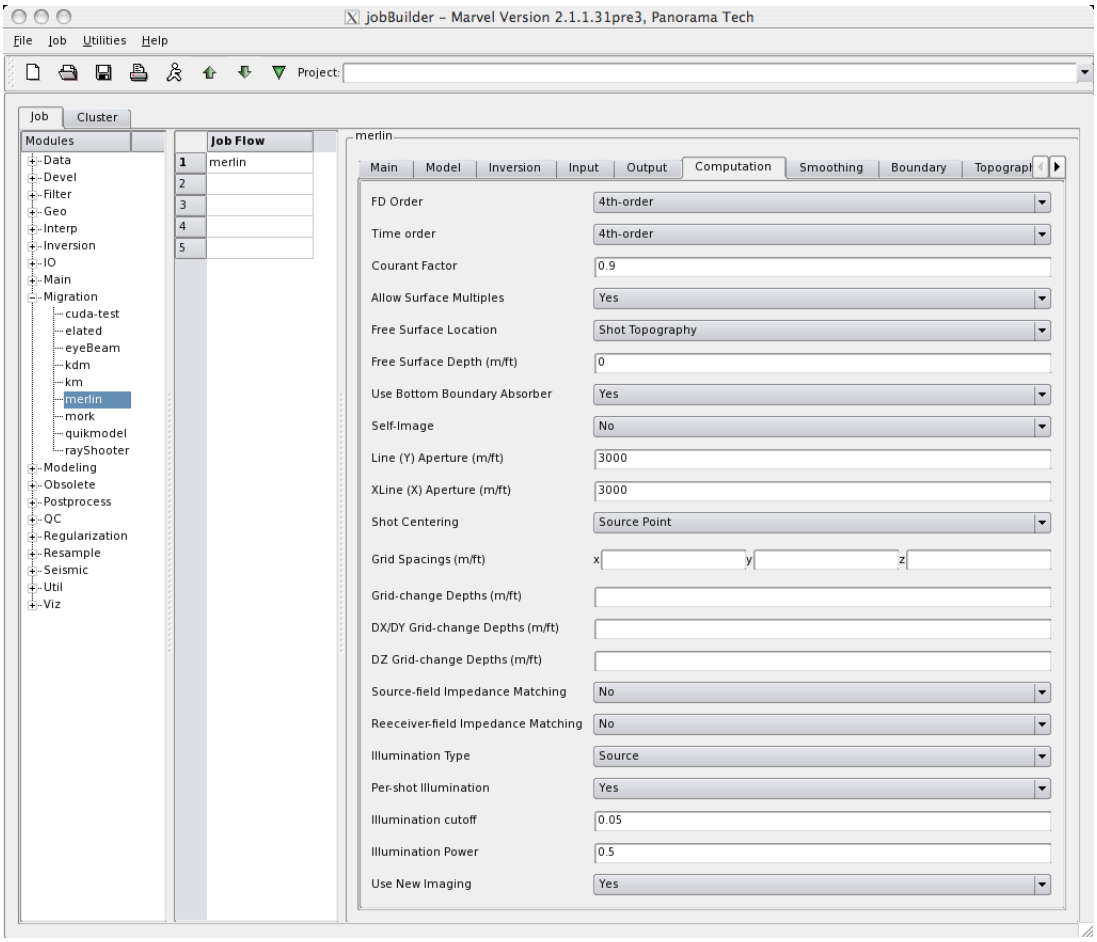


Table 85. MERLIN Computation Panel Fields

Field	Description
Common Fields	
FD Order	This determines the order of accuracy of the spatial derivatives used in the simulation. For second-order, a second derivative is computed using 3 grid points. For 8^{th}-order,9 grid points are used, with 5 unique coefficients. This is usually the ideal combination for speed and accuracy. Possible values are 2nd, 4th, 6th, 8th, 10, 12th, 14th order. default: 4th order
Time order	2^{nd}-order time uses a three-point stepping algorithm. 4^{th}-order uses the wave equation to compensate for errors in the former approach (usually referred to in the industry as 'the Dablain trick').

continues on next page

Table 85. MERLIN Computation Panel Fields–continued

Field	Description
Courant Factor	The internal time step is determined by the Courant stability condition, involving the grid spacing and the maximum velocity. For the default 4^{th}-order time, this code is stable with a factor of .9; for 2^{nd}-order time, a value of .85 is recommended. Slightly smaller values *may* result in slightly better output, but probably will not help.
Allow Surface Multiples	If this field is set to Yes, a free surface is modeled, and the wave field will reflect off the top, leading to multiples in the data. If the field is set to No, an absorbing zone will be placed at the top. default: Yes
Free Surface Location	There are three options to this field: Shot Topography—Reflections occur at the topography defined for shots (see below). Receiver Topography—Reflections occur at the topography defined for receivers (see below). Fixed Depth—Free surface is at user-specified depth.
Free Surface Depth (m/ft)	User-specified free-surface depth, when 'Fixed Depth' is chosen for 'Free Surface Location'.
Use Bottom Boundary Absorber	This field has two options: Yes—Waves are absorbed at the bottom. No—Waves can reflect off the bottom. This generally does little harm, and costs a bit less. default: Yes
Self Image	Yes or No
Line (Y) Aperture (m/ft)	The computation for each shot is limited along the y axis to a range above and below the center of the shot. default: 3000
XLine (X) Aperture (m/ft)	The computation for each shot is limited along the x axis to a range above and below the center of the shot. default: 3000
Shot Centering	• Source Point • Shot + Receiver Box • Avg Midpoint • Model default: Source Point

continues on next page

Table 85. MERLIN Computation Panel Fields–continued

Field	Description
Grid Spacings	If left blank, these will be determined by the 'Output Receiver Spacings' (see above). Otherwise, these specify the spacings of the computation grid.
Grid-change Depths (m/ft)	
DX/DY Grid-change Depths (m/ft)	
DZ Grid-change Depths (m/ft)	
Migrate Panel Only	
Source Field Impedance Matching	Use 'non-reflecting' wave equation for source propagation, and is an attempt to reduce artifacts. Costly, and not very effective. Default: No
Receiver-field Impedance Matching	Use 'non-reflecting' wave equation for receiver back-propagation in an attempt to reduce artifacts. Costly and not very effective. default: No
Illumination Type	An illumination is produced. Generally, the default value of 'Source' should be used. In this case, the illumination is just the sum of the squared source fields at each image point. • Source Point • Shot + Receiver Box • Avg Midpoint • Model default: Source.Receiver
Per-Shot Illumination	Each shot image can be divided by the illumination separately. This tends to be noisier, but can help to image steep dips in some cases.
Illumination cutoff	In Migrate Mode, this field is only available if Per-Shot illumination is set to Yes. default: 0.05

continues on next page

Table 85. MERLIN Computation Panel Fields–continued

Field	Description
Illumination Power	For a value of '1', the illumination is the squared source. This field is only available if Per-Shot Illumination is set to Yes. default: 0.5
Use New Imaging	default: Yes

MERLIN Smoothing Panel

The Smoothing Panel does not display any fields if the the MERLIN Main Panel Mode Type is set to Model.

Figure 117. MERLIN Smoothing Panel

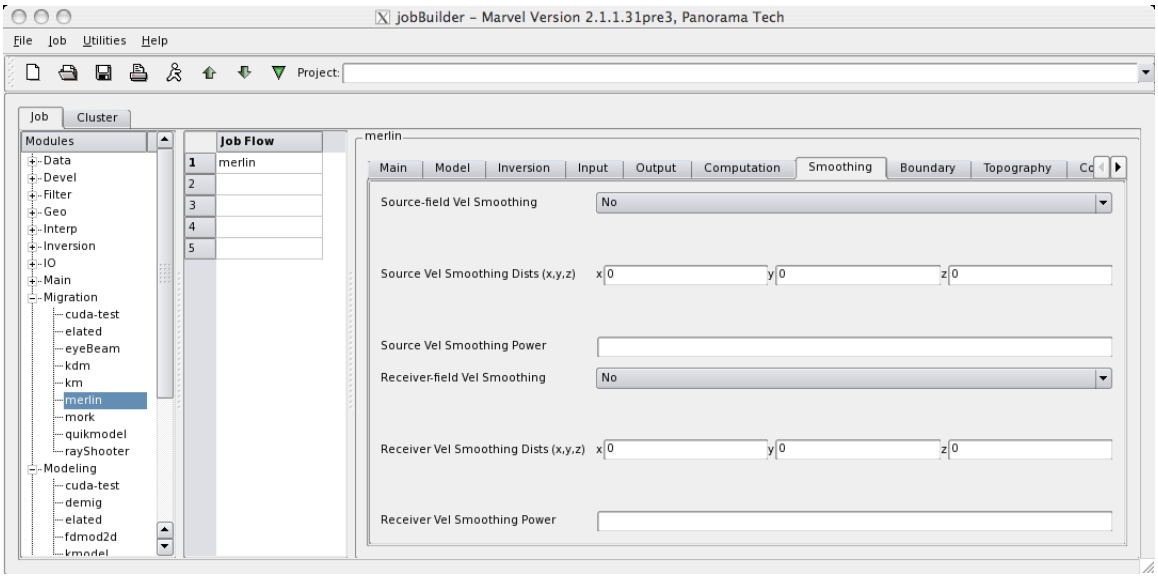


Table 86. MERLIN Smoothing Panel Fields

Field	Description
Source-field Vel Smoothing	Flag controlling the smoothing of the source-field velocity (slowness) field used to propagate the source term. This process can be useful for reducing artifacts.
Source Vel Smoothing Dists (x,y,z)	Gaussian widths for smoothing slowness in each direction for the source. defaults: 0, 0, 0
Source Vel Smoothing Power	The number of times to smooth the source volume.
Receiver-field Vel Smoothing	Turn the smoothing of the receiver-field velocity (slowness) field used to propagate the source term *on* or *off*. This process can be useful for reducing artifacts.
Receiver Vel Smoothing Dists (x,y,z)	Gaussian widths for smoothing slowness in each direction for the receiver. defaults: 0, 0, 0

continues on next page

Table 86. MERLIN Smoothing Panel Fields–continued

Field	Description
Receiver Vel Smoothing Power	The number of times to smooth the receiver volume.

MERLIN Boundary Panel

Figure 118. MERLIN Boundary Panel

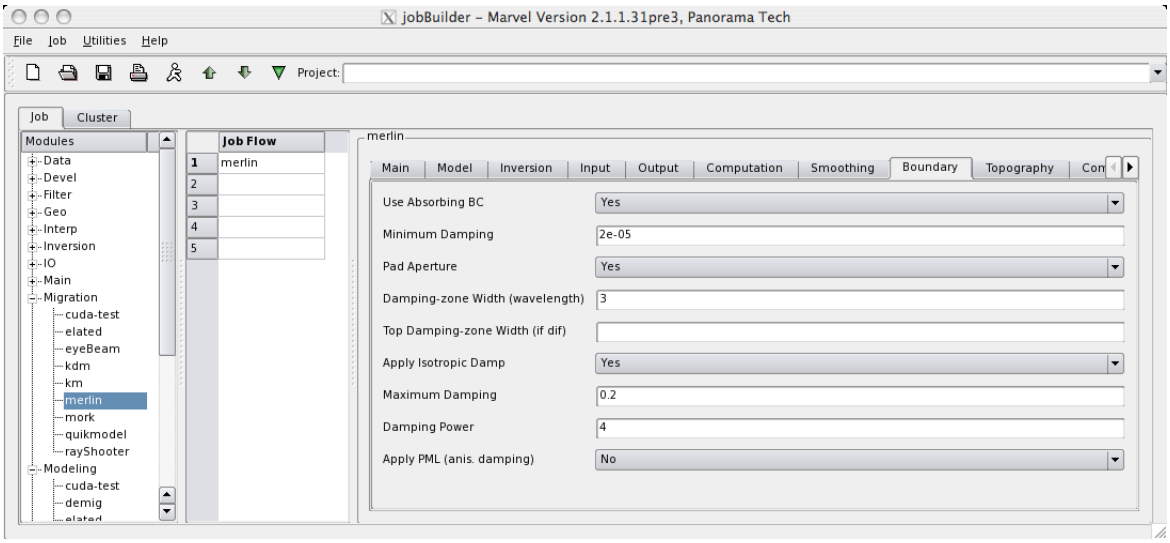


Table 87. MERLIN Boundary Panel Fields

Field	Description
Use Absorbing BC	Use absorbing boundary conditions? default: Yes
Minimum Damping	This is an isotropic damping factor applied everywhere, regardless of other settings. The default of $2 \cdot 10^{-5}$ should not produce much noticeable effect, but helps when other damping is used to avoid reflections.
Pad Aperture	This field has two possible values: *Yes*—Computation aperture is increased and damping is done outside the output zone. *No*—Damping is included in the output aperture.
Damping-zone Width (wavelength)	The damping thickness will be this number of wavelengths for the 'Peak Frequency' at the maximum velocity. The default of 3 should eliminate reflections sufficiently.
Apply Isotropic Damping	If 'Yes', use Isotropic damping in the damping zones.

continues on next page

Table 87. MERLIN Boundary Panel Fields–continued

Field	Description
Maximum Damping	The maximum damping factor to use. The default of 0.2 should be safe, while anything over 0.5 may be unstable, and anything over 1 is **very** unstable. (This field is only visible if Apply Isotropic Damping is set to Yes.)
Damping Power	Damping is varied from 0 to 'Maximum Damping' over the pad length, with a formula like $d = d_{max}(x/L)^p$, where d_{max} is *MaximumDamping*, x is the distance into the pad, L is the pad length, and p is this parameter. The default of 4 is a good choice to avoid reflections caused by damping. (This field is only visible if Apply Isotropic Damping is set to Yes.)
Apply PML (anis. damping)	PML, or 'Perfectly-Matched Layers' is designed to absorb one direction of propagation. **Note: This approach of anisotropic damping is much more costly than isotropic damping, and Panorama Technologies believes it does not work as well.**
Maximum PML Amp	This is analogous to *MaximumDamping*. This field is only visible if Apply PML is set to Yes.
PML Power	This is analogous to *DampingPower*. This field is only visible if Apply Isotropic Damping is set to Yes.

MERLIN Topography Panel

Figure 119. MERLIN Topography Panel

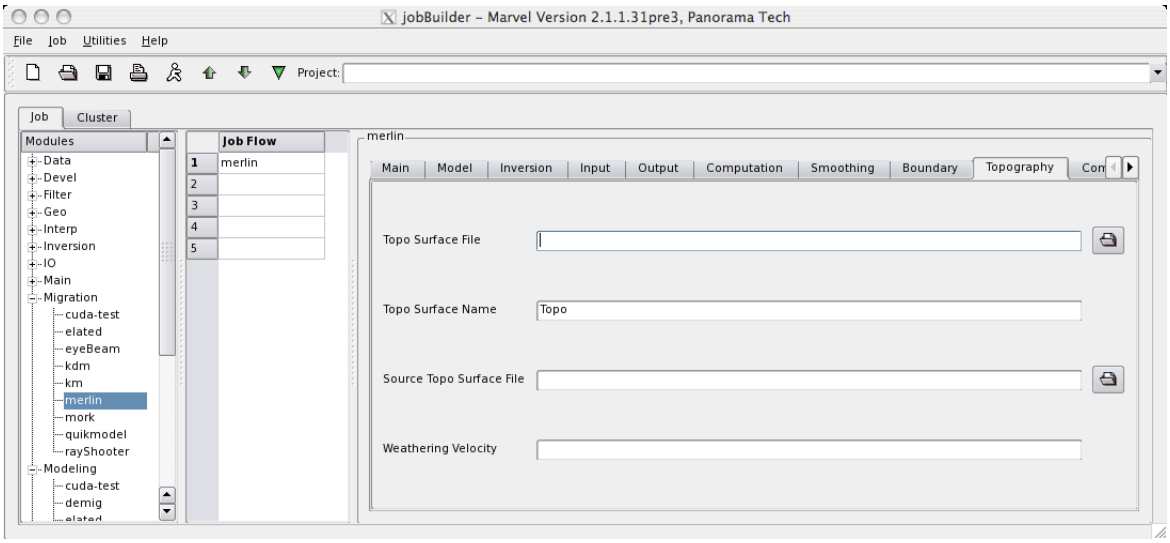


Table 88. MERLIN Topography Panel Fields

Field	Description
Topo Surface File	The path and name of the topographic surface file. If given, this specifies the acquisition topography (and if no Source Topo File is given, this is for both sources and receivers). This can be a MARVEL surface file, or a simple flat file defining the topography, with each line containing the line, crossline and depth values, for example: ep = 100 cdp = 500 z = 20
Topo Surface Name	The header key specifying where the topographic data are stored. A MARVEL surface file can have many surfaces. This is the name of the one to be used. default: Topo
Source Topo Surface File	The path and name of the source topographic surface file. If given, this specifies the source topography. This can be a MARVEL surface file, or a simple flat file defining the topography, with each line containing the line, crossline and depth values, for example: ep = 100 cdp = 500 z = 20
Weathering Velocity	The weathering velocity to use in the calculations.

MERLIN Compression Panel

Figure 120. MERLIN Compression Panel

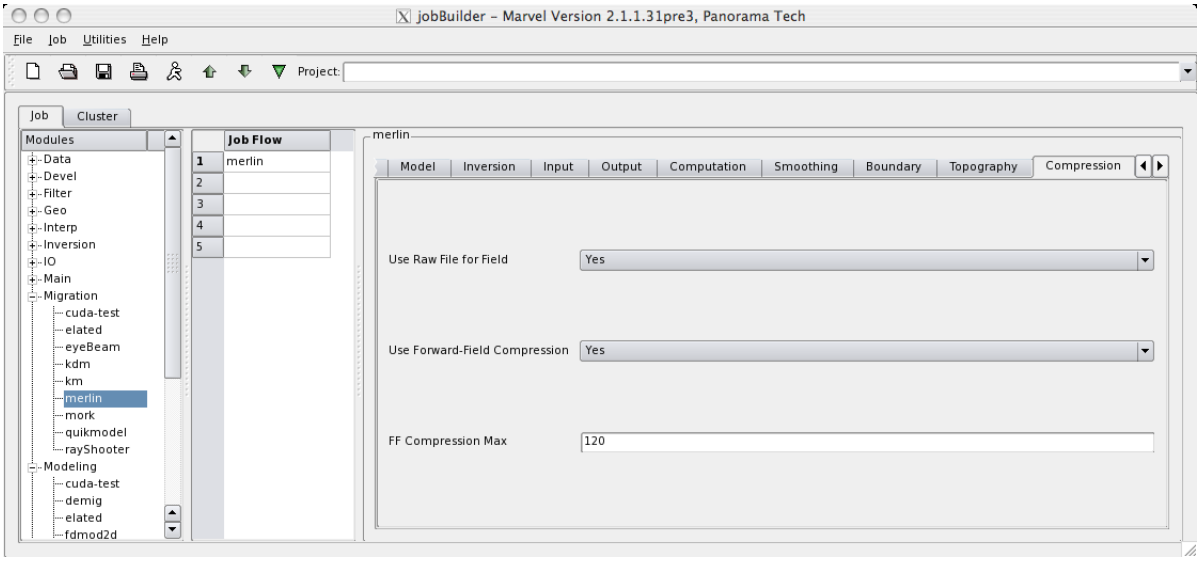


Table 89. MERLIN Compression Panel Fields

Field	Description
Use Raw File for Field	Necessary for compression. If No, stored source term is stored in SEG-Y files (SLOW).
Use Forward Field Compression	Turns compression for the source term on or off; uses a fast video compression technique. **Note:** This field is only available if the Mode field on the rtmodel Main panel is set to Migrate.
FF Compression Max	As part of the compression, this specifies the amplitude range used to store the samples. For most projects, the default of 120 produces good results, but for some projects, a more dynamic range may be needed. **Note:** This field is only available if the Mode field on the rtmodel Main panel is set to Migrate. default: 120

MERLIN Job Panel

Figure 121. MERLIN Job Panel

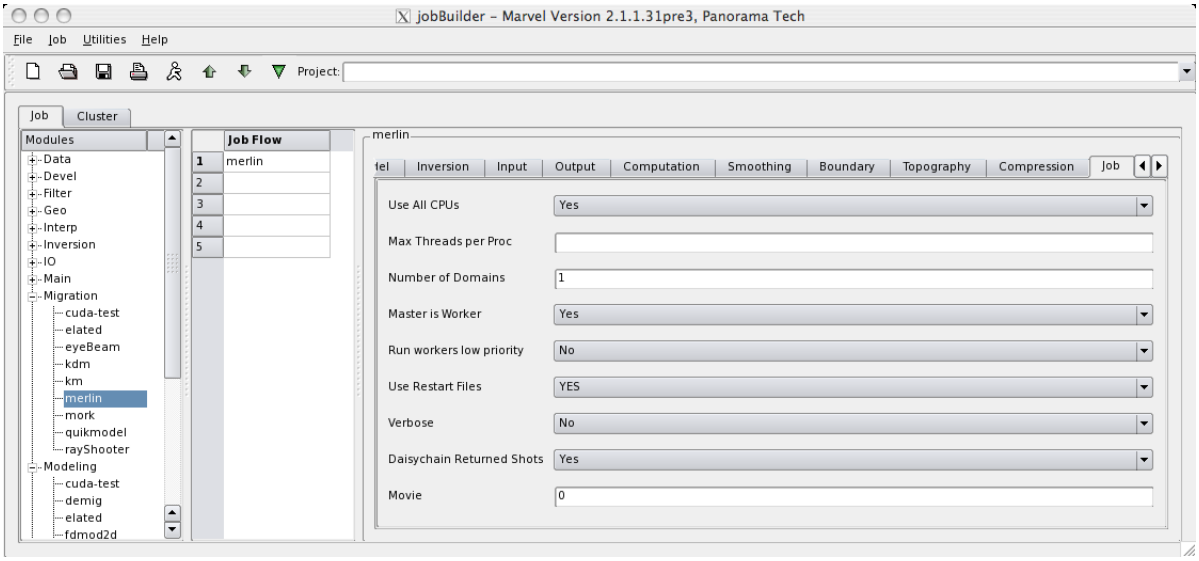


Table 90. MERLIN Job Panel Fields

Field	Description
Use All CPUs	This really means that each worker should use multiple threads. If No, then there will be one independent worker spawned for each CPU (or core) in the cluster. default: Yes
Max Threads per Proc	If *UseAllCPUs* is set to *Yes*, this field limits the number of CPUs (cores) that a single worker can use.
Number of Domains	The computation grid will be split up among this number of workers for each shot. default: 1
Master is Worker	Flag that controls whether the master I/O controller is also used for performing calculations. default: Yes
Run workers low priority	If Yes, workers will be spawned with reduced priority, although the master process will remain at high priority. This can be useful, especially when *MasterIsWorker* is set, so that one worker does not slow down collection or submission of shots for all of the others. default: No
Use Restart Files	If NO, the job ignores restart information and start from the beginning. default: Yes
Verbose	Switch for turning debug printing on and off. default: No

continues on next page

Table 90. MERLIN Panel Fields–continued

Field	Description
Daisychain Returned Shots	If *Yes*, multiple shots can be returned at once, and stacked along the way, before going out. This saves I/O time.
Movie	

MORK Module

This is Panorama Technologies' one-way migration module. When a seismic section is migrated, reflection events are repositioned so they are below their correct surface locations and have the proper corrected vertical reflection times. The MORK module is accessed under the Migration node of the jobBuilder module tree.

MORK Main Panel

This panel, Figure 122, enables you to define the basic parameters for the module. Table 91 describes the terms used on both panels.

Figure 122. MORK Module Main Panel

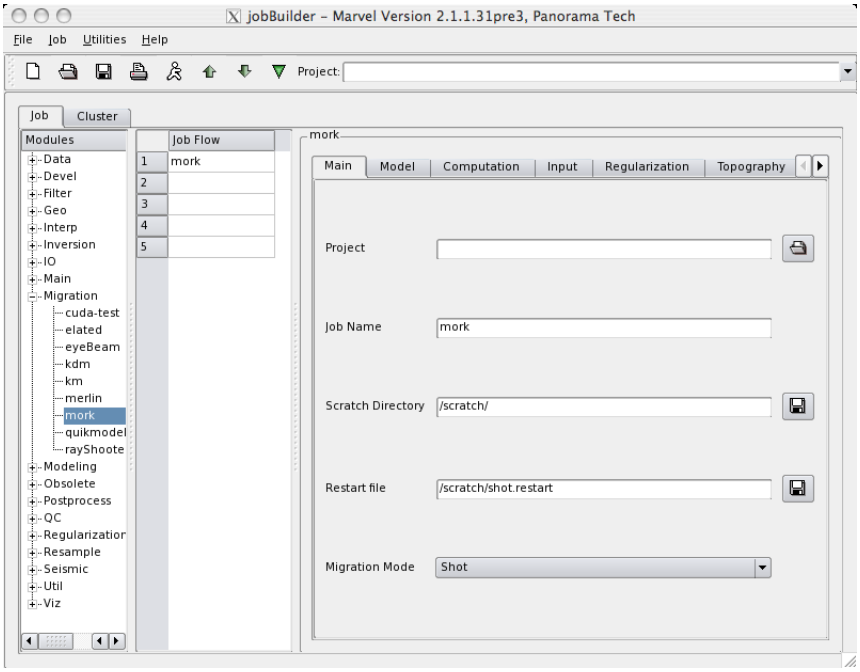


Table 91. MORK Module Main Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates.
Job Name	The name for this job. default: MORK

continues on next page

Table 91. MORK Module Main Panel Fields–continued

Field	Description
Scratch Directory	Name of the directory used for temporary files. default: */scratch/*
Restart File	The application keeps information about shots already processed in this file. It is usually best to put it in the same directory where your output files are located and to give it a similar name. default: */scratch/shot.restart*
Migration Mode	• Shot • Common Azimuth • Post-stack • Data Regularization (common azimuth) default: Shot

MORK Model Panel

This panel, Figure 123, enables you to define the basic parameters for the module. Table 92 describes the terms used on both panels.

Figure 123. MORK Model Panel

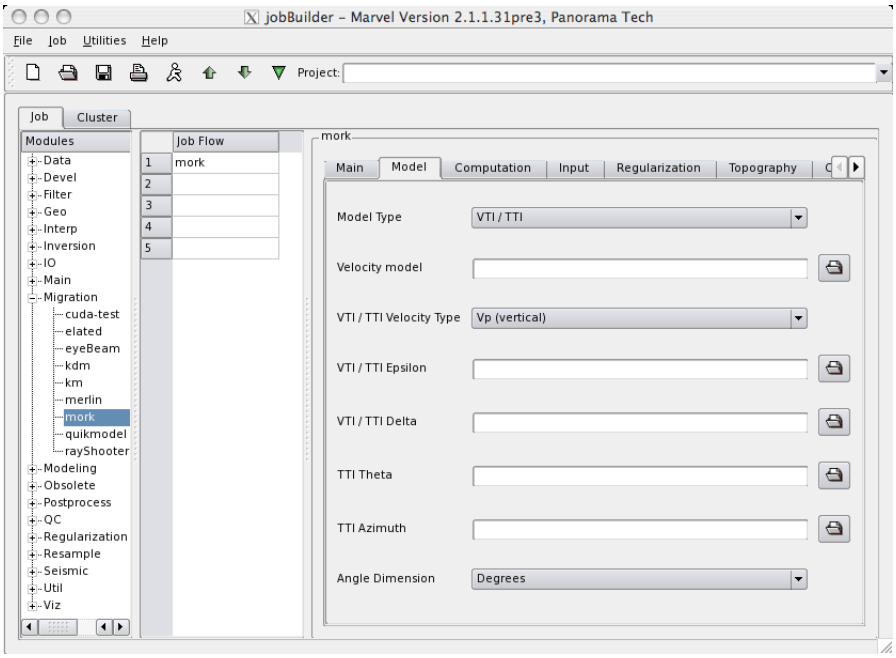


Table 92. MORK Model Panel Fields

Field	Description
Model Type	Constant-density Acoustic or VTI/TTI default: Constant-Density Acoustic
Velocity Model	The path and filename of the velocity model to be used in the calculations. This is a seismic file in any format MARVEL can read, typically, SEG-Y. The units are m/s, or ft/s, but can be anything else, depending on the choice of units in the seismic data.
VTI/TTI Velocity Type	Vp (vertical) or VNMO (vertical) (This field is only visible for VTI/TTI model types.) default: Vp (vertical)
VTI/TTI Epsilon	Thomsen's epsilon, ε, for the VTI/TTI medium. (This field is only visible for VTI/TTI model types.)
VTI/TTI Delta	Thomsen's delta, δ, for the VTI/TTI medium. (This field is only visible for VTI/TTI model types.)

continues on next page

Table 92. MORK Model Panel Fields–continued

Field	Description
TTI Theta	Thomsen's theta, θ, for the TTI medium. (This field is only visible for VTI/TTI model types.)
TTI Azimuth	(This field is only visible for VTI/TTI model types.)
Angle Dimension	Degrees or Radians (This field is only visible for VTI/TTI model types.) default: Degrees

MORK Computation Panel

This panel, Figure 124, enables you to define the parameters used in the computations for the module. Table 93 describes the terms used on both panels.

Figure 124. MORK Computation Panel

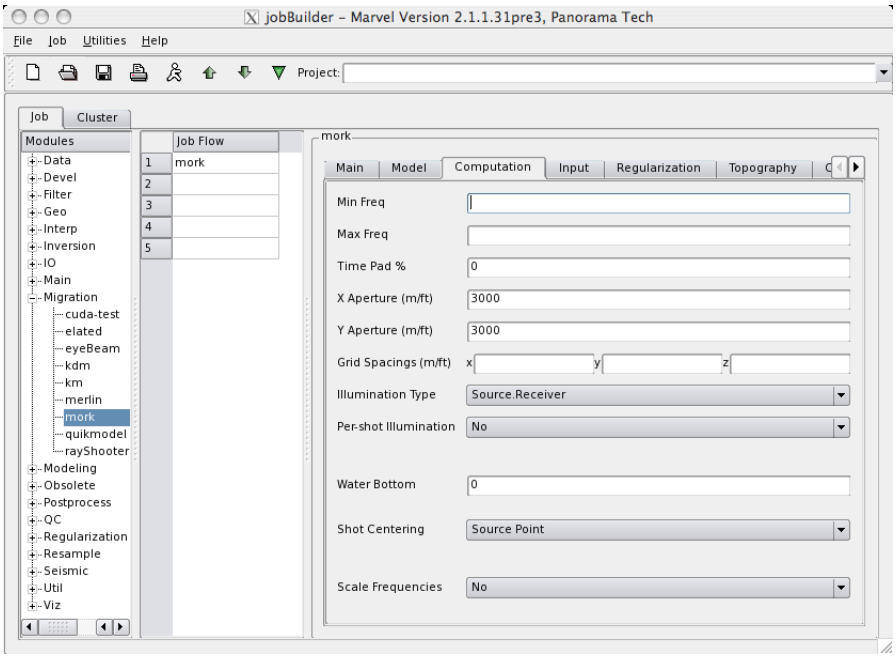


Table 93. MORK Computation Panel Fields

Field	Description
Min Freq	The minimum frequency to be allowed by filtering.
Max Freq	The maximum frequency to be allowed by filtering.
Time Pad	The percent padding to apply to input traces, where trace padding adds zero samples to the ends of the traces. default: 0
X Aperture (m/ft)	The length, in meters or feet, of the line direction aperture limit. default: 3000
Y Aperture (m/ft)	The length, in meters or feet, of the crossline (CDP) direction aperture limit. default: 3000
Grid Spacings	If left blank, these will be determined by the ‘Output Receiver Spacings’. Otherwise, these specify the spacings of the computation grid.

continues on next page

Table 93. MORK Computation Panel Fields–continued

Field	Description
Illumination Type	An illumination is produced. Generally, the default value of 'Source' should be used. In this case, the illumination is just the sum of the squared source field at each image point. default: Source.Receiver
Per Shot Illumination	Each shot image can be divided by the illumination separately. This tends to be noisier, but can help to image steep dips in some cases. default: No
Illumination cutoff	This field is only available if Per-Shot illumination is Yes. default: 0.05
Illumination Power	For a value of '1', the illumination is the squared source. This field is only available if Per-Shot illumination is Yes. default: 0.5
Water Bottom	
Shot Centering	For modeling, the only generally useful choices are: Source Point - computation aperture is centered on the source. Model - computation aperture is centered at the center of the model. Generally, the apertures should be at least half the dimensions of the model in this case. default: Source Point
Scale Frequencies	default: No

MORK Input Panel

This MORK Input panel enables you to set one parameter, *InputShotNormalization*, and this field is only displayed if you have selected *Shot* as the *MigrationMode* on the MORK Main panel, Figure 122.

InputShotNormalization: Normalization corrects for the amplitude effects of wavefront divergence and damping. It is also used when you apply a subsequent filter for eliminating the surface waves. If RMS, each input shot is divided by its RMS value before processing. Possible values: None, RMS; default: None

MORK Regularization Panel

Figure 125. MORK Regularization Panel

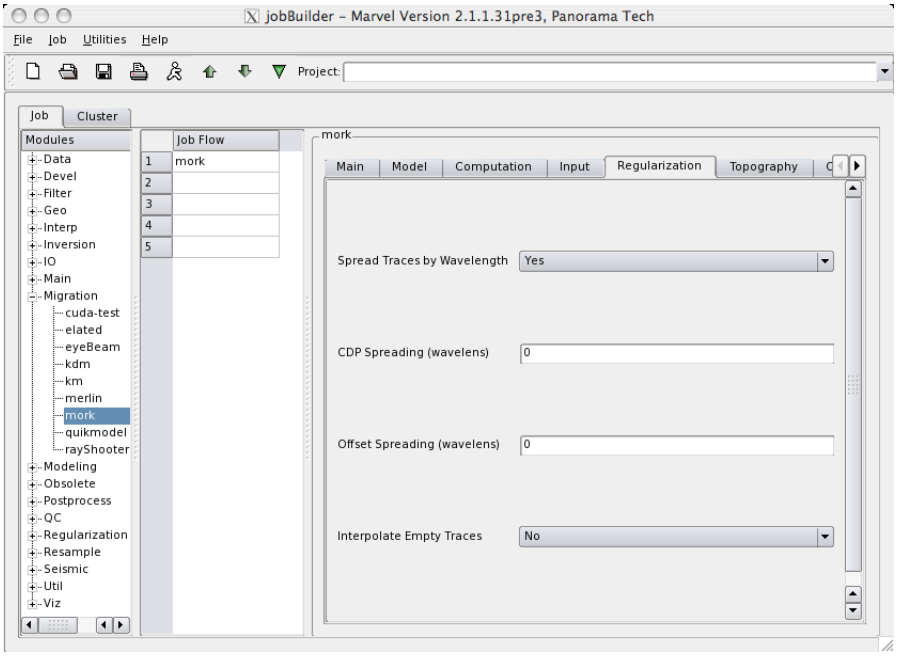


Table 94. MORK Regularization Panel Fields

Field	Description
Spread Traces by Wavelength	
CDP Spreading (wavelens)	
Offset Spreading (wavelens)	
Interpolate Empty Traces	

MORK Topography Panel

This panel enables you to define the basic topographic parameters for the module. There are only two parameters on the panel:

- Topo Surface File: The path and name of the topographic surface file. If given, this specifies the acquisition topography (and if no Source Topo File is given, this is for both sources and receivers). This can be a MARVEL surface file, or a simple flat file defining the topography, with each line containing the line, crossline and depth values, for example: ep = 100 cdp = 500 z = 20.

- Topo Surface Name: The header key specifying where the topographic data are stored. A MARVEL surface file can have many surfaces. This is the name of the one to be used. default: Topo

MORK Output Panel

This panel, Figure 126, enables you to define the basic parameters for the module. Table 95 describes the terms used on the panels.

Figure 126. MORK Output Panel

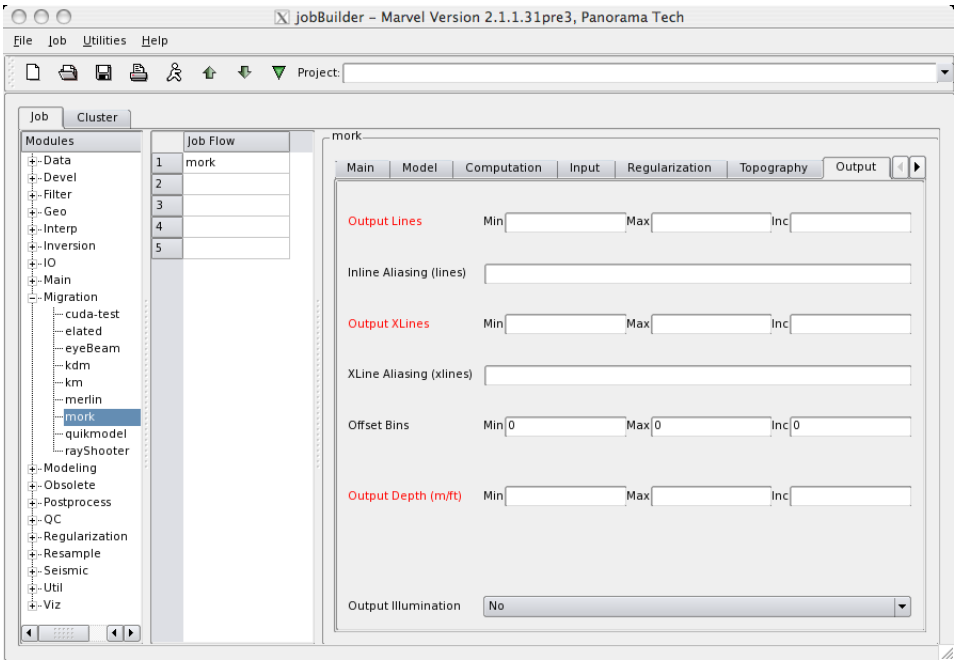


Table 95. MORK Output Panel Fields

Field	Description
Output Lines	The minimum, maximum and increment values for the output lines. **This is a REQUIRED entry.**
Inline Aliasing (lines)	Attempt to compensate for aliasing in the inline direction (units: lines). **Note:** This can be a costly operation.
Output XLines	The minimum, maximum and increment values for the output crosslines. **This is a REQUIRED entry.**
XLine Aliasing (xlines)	Attempt to compensate for aliasing in the crossline direction (units: lines). **Note:** This can be a costly operation.
Offset Bins	Specifies the offset bins in which to read the data. Enter the Minimum, Maximum and Increment values.

continues on next page

Table 95. MORK Output Panel Fields–continued

Field	Description
Output Depth (m/ft)	Specifies the depths to be used for output. Minimum, Maximum, Increment for output depths. **This is a REQUIRED entry.**
Output Illumination	Default: No

MORK Headers Panel

This panel, Figure 127, enables you to define the basic parameters for the module. Table 96 describes the terms used on both panels.

Figure 127. MORK Headers Panel

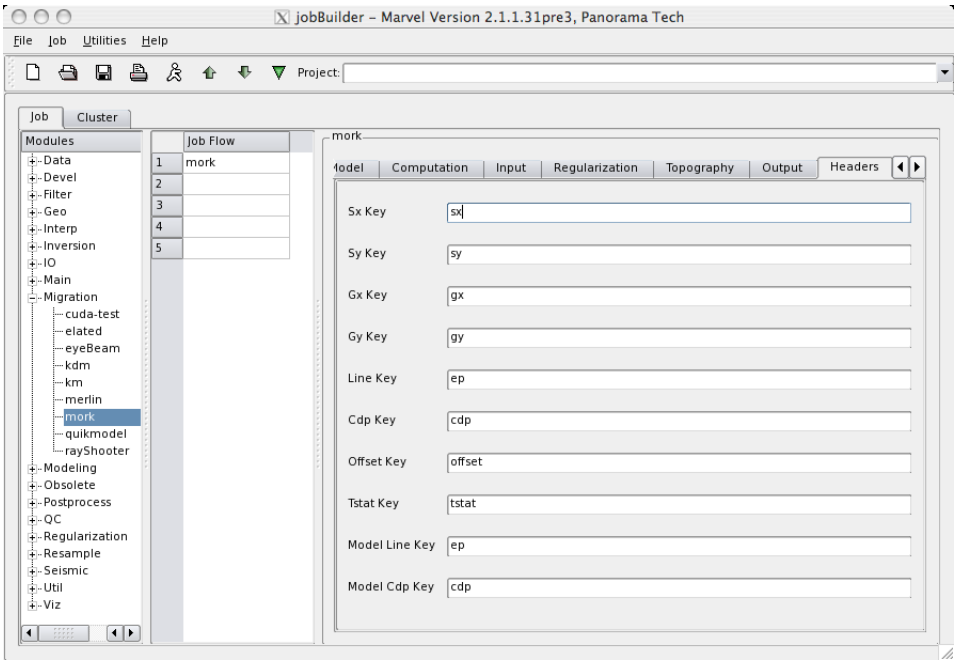


Table 96. MORK Headers Panel Fields

Field	Description
Sx Key	The header key specifying where line source data is stored in the trace. default: sx
Sy Key	The header key specifying where crossline source data is stored in the trace. default: sy
Gx Key	The header key specifying where inline geophone data is stored in the trace. default: gx
Gy Key	The header key specifying where crossline geophone data is stored in the trace. default: gy
Line Key	The header key specifying where line data is stored in the trace. default: ep

continues on next page

Table 96. MORK Headers Panel Fields–continued

Field	Description
Cdp Key	The header key specifying where CDP data is stored in the trace. default: cdp
Offset Key	The header key defining the offset field of the stacked trace. default: offset
Tstat Key	The header key for the total statics information. default: tstat
Model Line Key	The header word key for line information when the model is gridded. Use if different from the data. default: ep
Model Cdp Key	The header word key for CDP information when the model is gridded. Use if different from the data. default: cdp

MORK Job Panel

This panel, Figure 128, enables you to define the basic parameters for the module. Table 91 describes the terms used on both panels.

Figure 128. MORK Job Panel

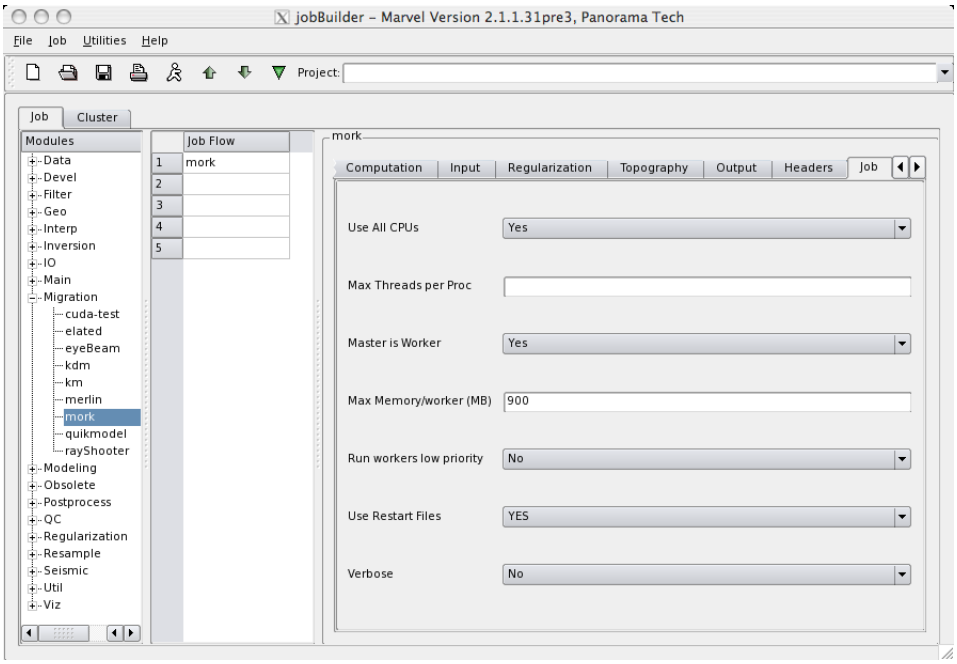


Table 97. MORK Job Panel Fields

Field	Description
Use All CPUs	This really means that each worker should use multiple threads. If No, then there will be one independent worker spawned for each CPU (or core) in the cluster. default: Yes
Max Threads Per Proc	If *UseAllCPUs* is set to *Yes*, this field limits the number of CPUs (cores) that a single worker can use.
Master is Worker	Flag that controls whether the master I/O controller is also used for performing calculations. default: Yes
Max Memory/worker (MB)	Maximum amount of memory to be used by MARVEL per MORK instance. default: 900

continues on next page

Table 97. MORK Job Panel Fields–continued

Field	Description
Run workers low priority	If Yes, workers will be spawned with reduced priority, although the master process will remain at high priority. This can be useful, especially when *MasterIsWorker* is set, so that one worker does not slow down collection or submission of shots for all of the others. default: No
Use Restart Files	If No, the job will ignore restart information and start from the beginning. default: Yes
Verbose	Switch for turning debug printing on and off. default: No

moveout Module

The moveout module either applies normal moveout (NMO) or the inverse of NMO to input traces. The moveout module is accessed under the Geo node of the jobBuilder module tree.

moveout Main Panel

This panel enables you to define the basic parameters for the moveout module. There are two different versions of the panel depending on the model type you use, Gridded (Figure 129) or RMS Picks. Table 98 describes the terms used on both panels.

Figure 129. moveout Main Panel–Model Type, Gridded

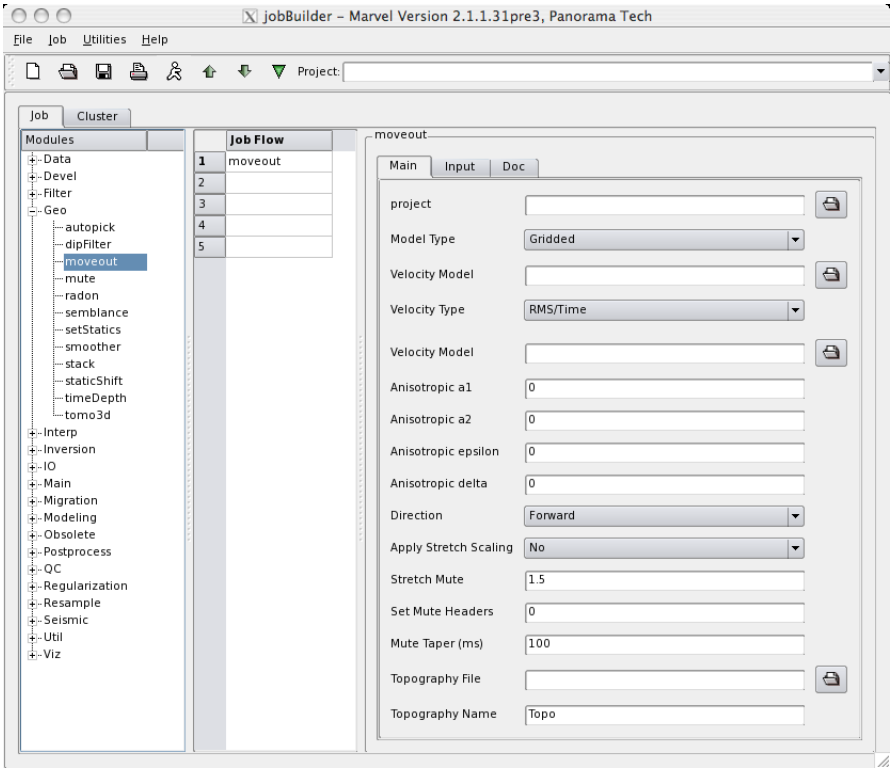


Table 98. moveout Module Main Panel Fields

Field	Description
project	The name of the project. The project file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates.
Model Type	The model type to be used for this run: Gridded or RMS Picks. default: Gridded
Velocity Model	The path and filename of the velocity model to be used in the calculations. This is a seismic file in any format MARVEL can read, typically, SEG-Y. The units are m/s, or ft/s, but can be anything else, depending on the choice of units in the seismic data. **This field is only displayed for a Gridded Model Type.**
Velocity Type	The type of velocity being used, that is, interval time, interval depth, or RMS/Time. **This field is only displayed for a Gridded Model Type.** default: RMS/Time
Anisotropic a1	
Anisotropic a2	
Anisotropic epsilon	Thomsen's P-wave anisotropy parameter, ε.
Anisotropic delta	Thomsen's P-wave anisotropy parameter, δ.
Picks	File containing the RMS picks model. **This field is only displayed for the RMS Picks Model Type.**
Direction	Specifies whether NMO or inverse NMO is used in the calculations. default: Inverse
Apply Stretch Scaling	If yes, divide output samples by stretch factor. default: No
Stretch Mute	The time, in seconds, defining when the stretch mute is applied. Samples that are larger than the stretch factor are muted. default: 1.5
Set Mute Headers	 default: 0
Mute Taper	The length of the mute taper, in milliseconds, where the mute taper avoids edge artifacts produced in any frequency domain processing due to abrupt start of data at the mute. default: 100

continues on next page

Table 98. moveout Main Panel Fields–continued

Field	Description
Topography File	The path and name of the topographic surface file. If given, this specifies the acquisition topography (and if no Source Topo File is given, this is for both sources and receivers). This can be a MARVEL surface file, or a simple flat file defining the topography, with each line containing the line, crossline and depth values, for example: ep = 100 cdp = 500 z = 20
Topography Name	The header key specifying where the topographic data are stored. A MARVEL surface file can have many surfaces. This is the name of the one to be used. default: Topo

moveout Input Panel

The moveout Input panel, Figure 130, enables you to define several data keys used in the input data. The fields are described in Table 99.

Figure 130. moveout Input Panel

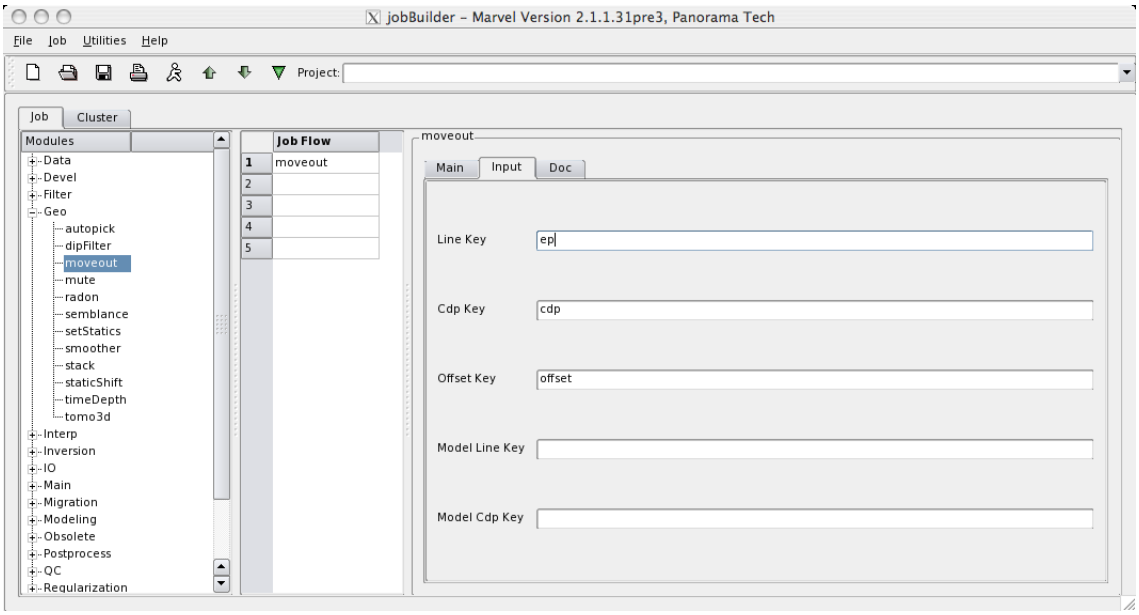


Table 99. moveout Input Panel Fields

Field	Description
Line Key	The header key specifying where line data is stored in the trace. default: ep
Cdp Key	Header key defining the location of the CDP data in the trace. default: cdp
Offset Key	Header key defining the location of the offset in the trace. default: offset
Model Line Key	The header word key for line information when the model is gridded. Use if different from the data. default: same as data
Model Cdp Key	The header word key for CDP information when the model is gridded. Use if different from the data. default: same as data

mute Module

The mute module mutes above, below, or along a linearly-interpolated curve whose width is defined by the times in the mute file, or by the mute X and T values. Mute values are extrapolated to the left by the smallest time sample on the trace, and they are extrapolated to the right by the last value given in the various mute arrays. (For the purposes of this program, above means shorter time and below means longer time, as would normally be seen on a seismic section.) The linear option allows you to define a corridor around a central line to remove air-blasts or other linear events from the gather. In this case, the mute is defined by the linear velocity parameter.

mute Main Panel

There are three mute Main panels that enable you to set parameter values used in the mute module depending on the location of the Mute Source, Figure 131, Figure 132 and Figure 133. The parameter fields are described in Table 100. The mute module is accessed under the Geo node of the jobBuilder module tree.

Figure 131. mute Main Panel, From Pickfile

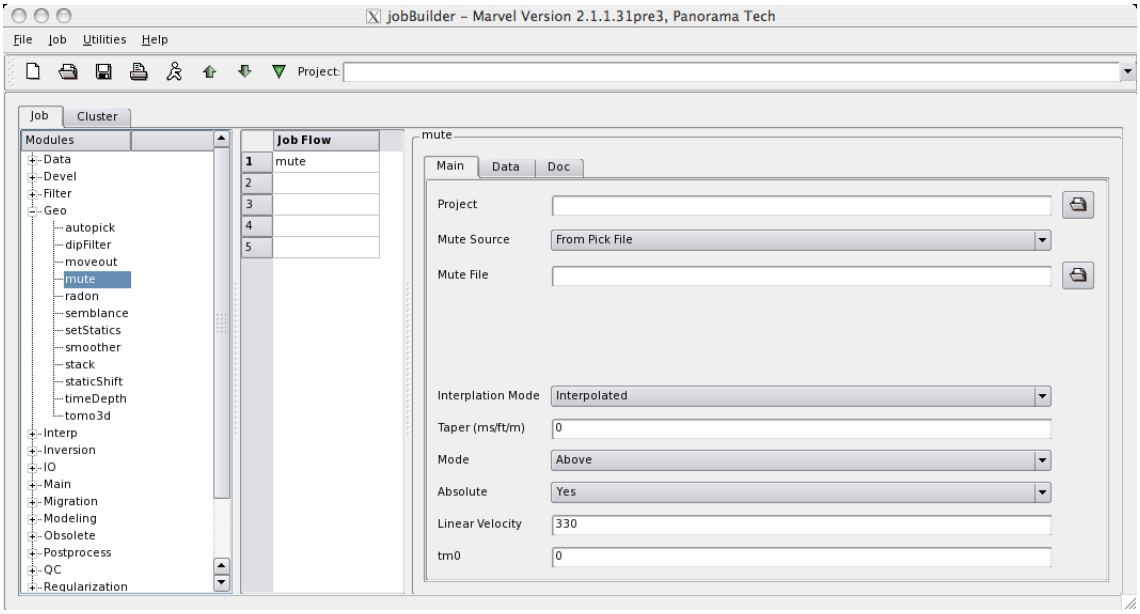


Figure 132. mute Main Panel, From Data Headers

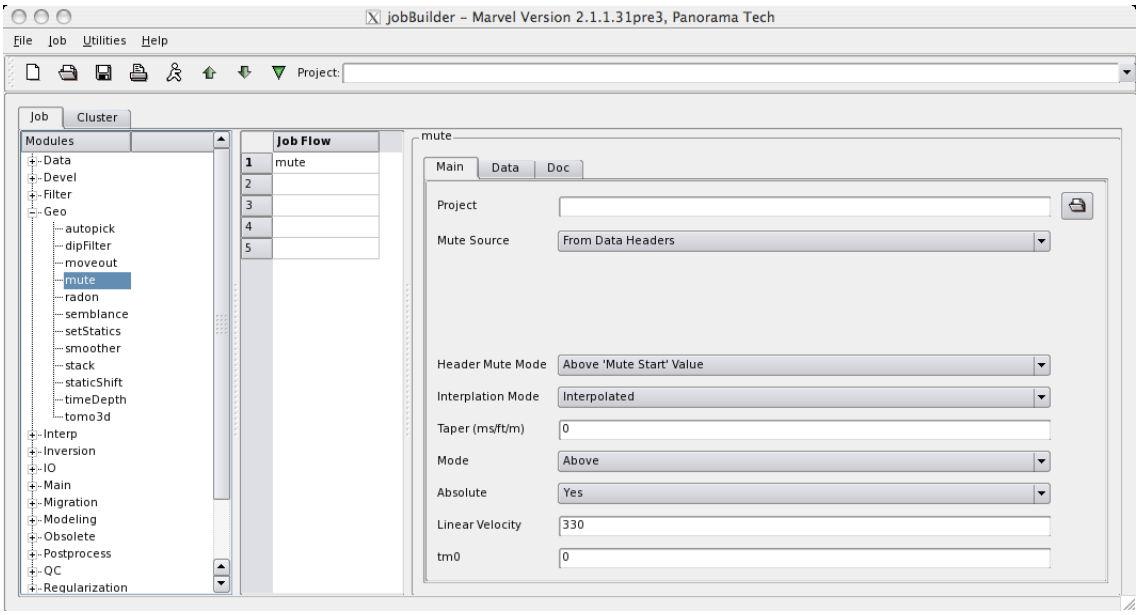


Figure 133. mute Main Panel, From Parameters

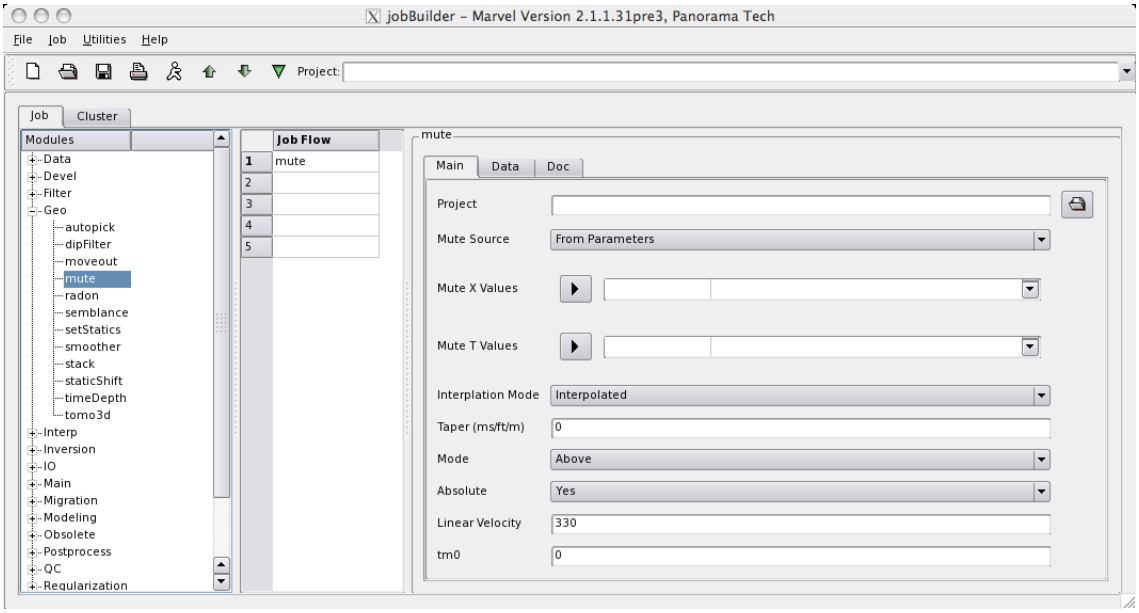


Table 100. mute Main Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates.
Mute Source	Identifies the source of mute information: From Pick File, From Data Headers, or From Parameters.
Mute File	A *.pick* file picked in the gathers program. This file can contain a large number of time-mute or depth-mute pairs for use in the muting process. **This field is only displayed if the Mute Source is From Pick File.**
Header Mute Mode	**This field is only displayed if the Mute Source is From Data Headers.** default: Above Mute Start Value
Mute X Values	**This field is only displayed if the Mute Source is From Parameters.**
Mute T Values	**This field is only displayed if the Mute Source is From Parameters.**
Interpolation Mode	Interpolation mode that is to be used: Interpolated or Exclusive, where exclusive means that traces without mutes are not passed. default: Interpolated
Taper	The number of samples to taper (using a sine-squared taper) before a hard mute, where traces are tapered to 0 to avoid edge effects. default: 0
Mode	Mute above, below, or along a linearly-interpolated curve whose width is defined by the times in the mute file. default: Above
Absolute	Defines whether or not the module uses the absolute value of the offset parameter. default: Yes
Linear Velocity	The linear or apparent velocity defining the arrival times of the air-blast when muting linear events. default: 330
tm0	The start time for the mute process. default: 0

mute Data Panel

The mute data panel, Figure 134, enables you to specify the keys used with the data. The key fields are described in Table 101.

Figure 134. mute Data Panel

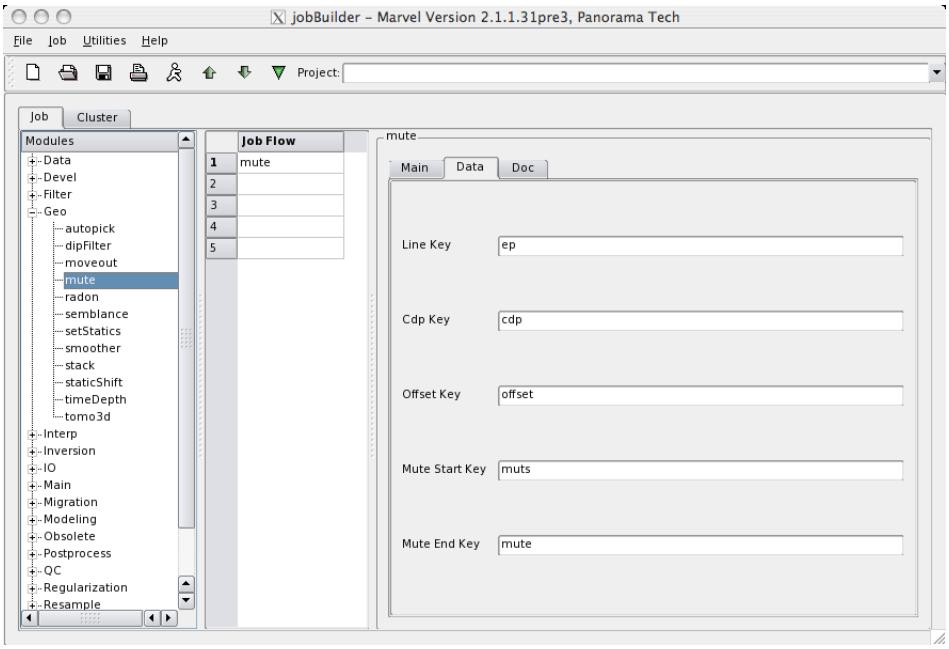


Table 101. mute Data Panel Fields

Field	Description
Line Key	Header key for the line number. default: ep
Cdp Key	Header key for the CDP number. default: cdp
Offset Key	Header key for the offset value. default: offset
Mute Start Key	Header key signifying the start of the mute values. default: muts
Mute End Key	Header key signifying the end of the mute values. default: mute

off2angle Module

The off2angle module is accessed under the Postprocess node of the jobBuilder module tree.

Figure 135. off2angle Panel

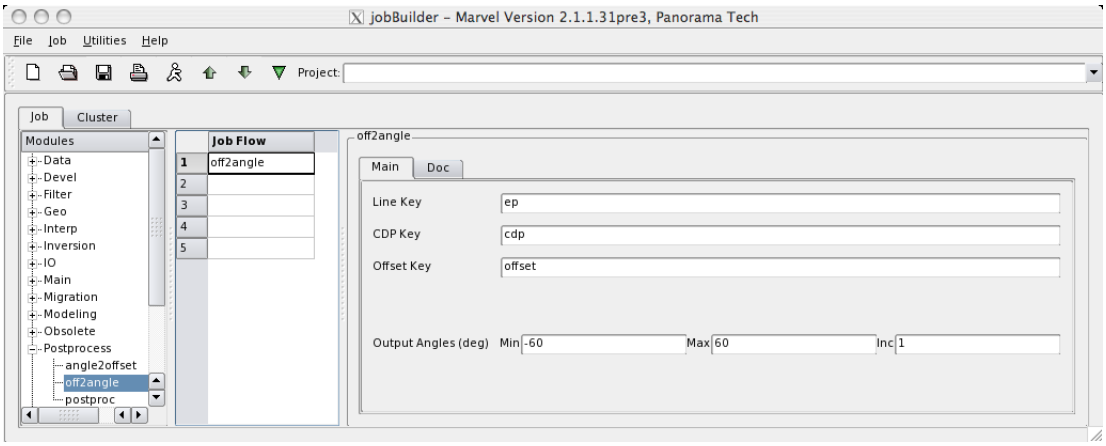


Table 102. off2angle Panel Fields

Field	Description
Line Key	Header key for the line number. default: ep
CDP Key	Header key for the CDP number. default: cdp
Offset Key	Header key for the offset. default: offset
Output Angles (deg)	min, max, increment default: -6, 60, 1

oned Module

The oned module is accessed under the Geo node of the jobBuilder module tree.

Figure 136. oned Main Panel

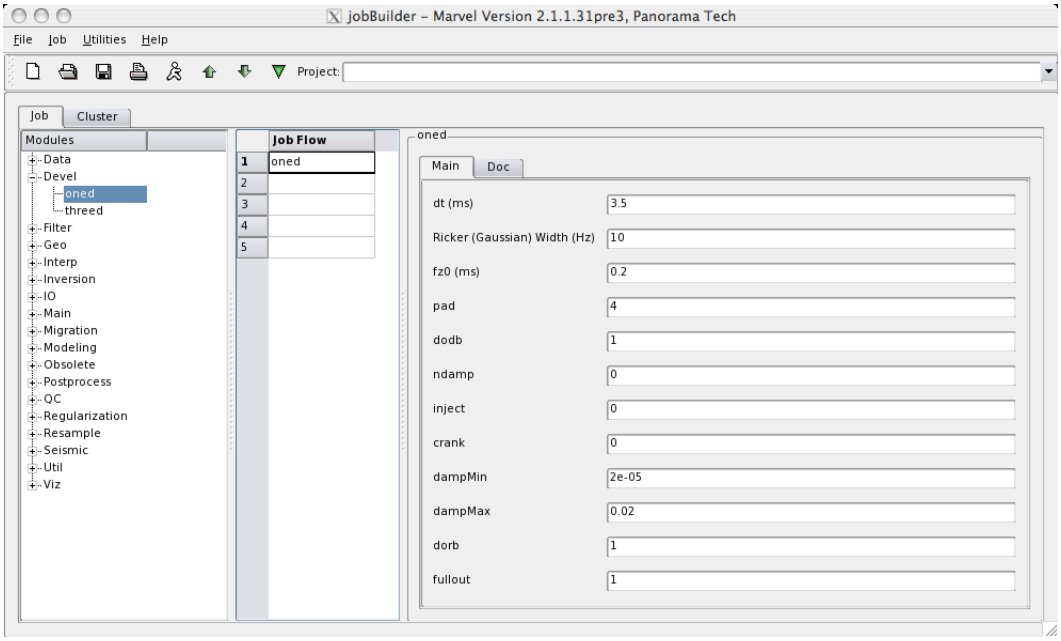


Table 103. oned Panel Fields

Field	Description
dt	default: 3.5
Ricker (Gaussian) Width (Hz)	The second derivative of a Gaussian is known as a R̈icker wavelet.T̈he width of this waveletis the time between the two side-lobes of the wavelet. default: 10
fz0 (ms)	default: 0.2
pad	default: 4
dodb	default: 1

continues on next page

Table 103. oned Panel Fields–continued

Field	Description
ndamp	default: 0
inject	default: 0
crank	default: 0
dampMin	default: 2e-05
dampMax	default: 0.02
dorb	default: 1
fullout	default: 1

parsim Module

The parsim module is accessed under the Obsolete node of the jobBuilder module tree.

Figure 137. parsim Main Panel, Stack Output Mode

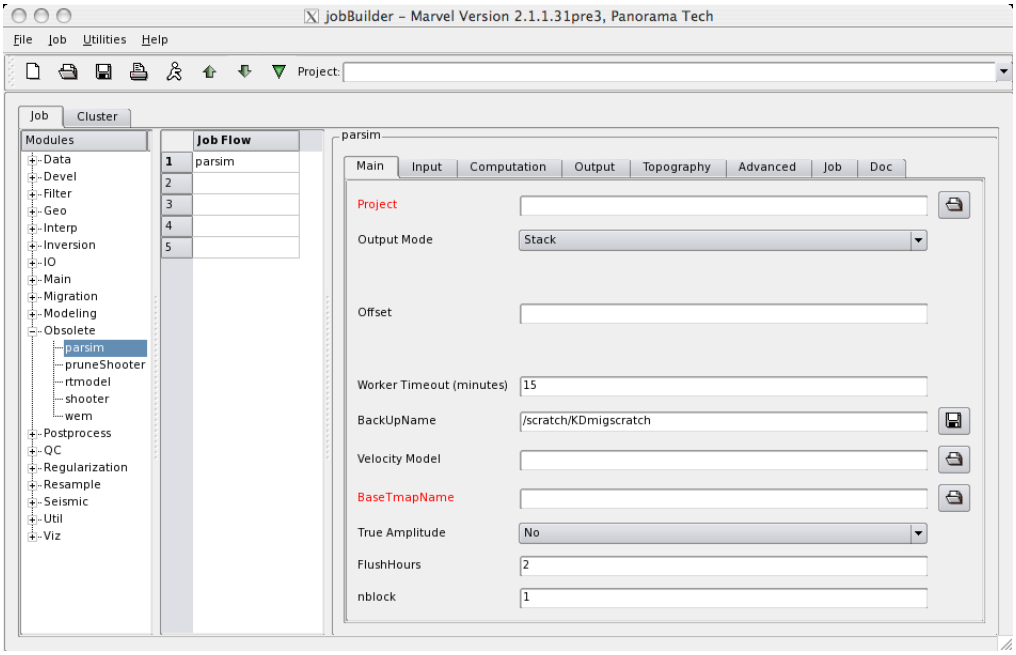


Figure 138. parsim Main Panel, Offsets Output Mode

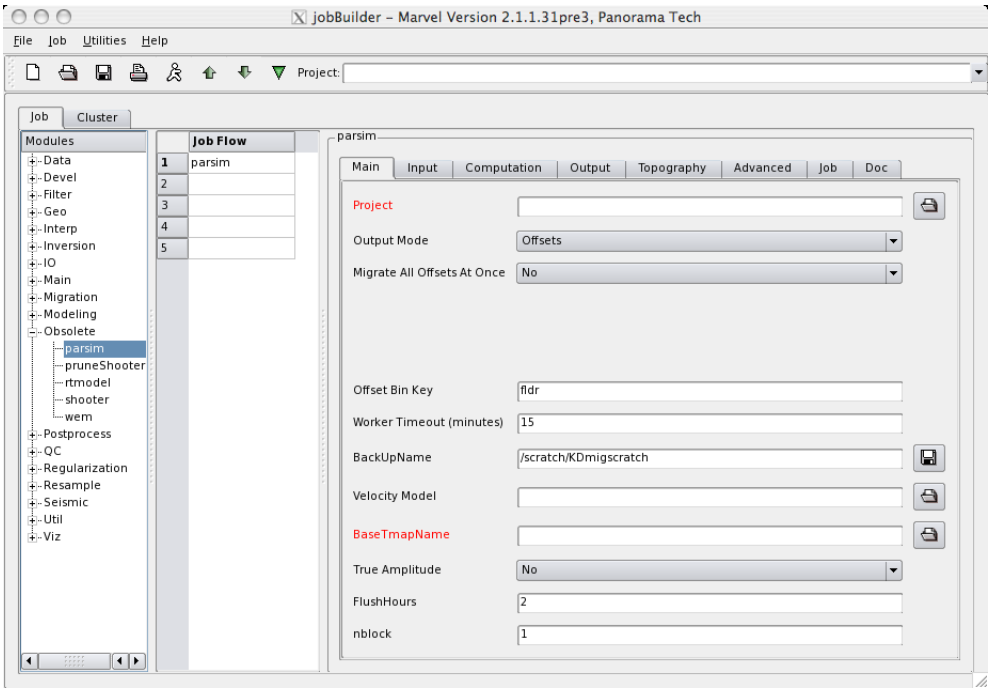


Table 104. parsim Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates. **This is a REQUIRED entry.**
Output Mode	The mode to write the files: Stack or Offsets.
Offset	
Migrate All Offsets At Once	Enables all offsets to be held in memory at one time. This is good for increasing I/O performance. **This field is only visible for Offsets Output Mode.** default: No
Offset Bin Key	The header key for the offset bin parameter. **This field is only visible for Offsets Output Mode.** default: fldr
Worker timeout (minutes)	Worker components that have not responded in this amount of time are assumed to be dead. default: 15
BackupName	The name of the file to contain backup data if a restart becomes necessary. default: */scratch/KDmigscratch* **Note: This file is not deleted when a job finishes successfully. You must delete the file manually.**
Velocity Model	The path and filename of the velocity model to be used in the calculations. This is a seismic file in any format MARVEL can read, typically, SEG-Y. The units are m/s, or ft/s, but can be anything else, depending on the choice of units in the seismic data.
BaseTmapName	Base name of the required traveltime data. This name is the tmap file name without the .tmap extension. **Note: This is a REQUIRED entry.**
True Amplitude	If set, apply true-amplitude calculation. Yes or No.
Flush Hours	The time, in hours, between backups. default: 2
nblock	The size of the trace block. default: 1

parsim Input Panel

Figure 139. parsim Input Panel

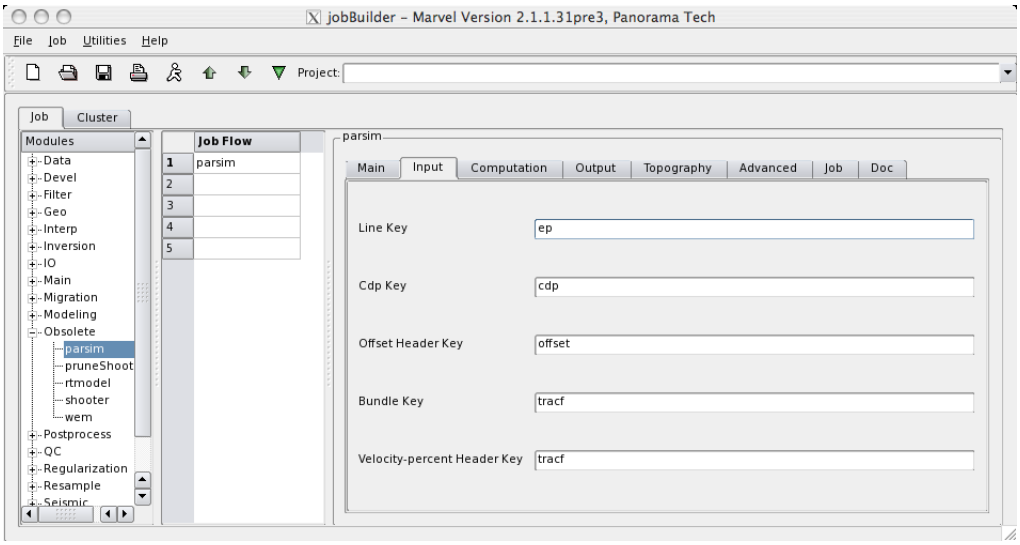


Table 105. parsim Input Fields

Field	Description
Line Key	Header key for the line number. default: ep
Cdp Key	Header key for the CDP number. default: cdp
Offset Header Key	The header key defining the offset field of the stacked trace. default: offset
Bundle Key	The header word location containing the unique value assigned to each patch. default: tracf
Velocity-percent Header Key	default: tracf

parsim Computation Panel

Figure 140. parsim Computation Panel

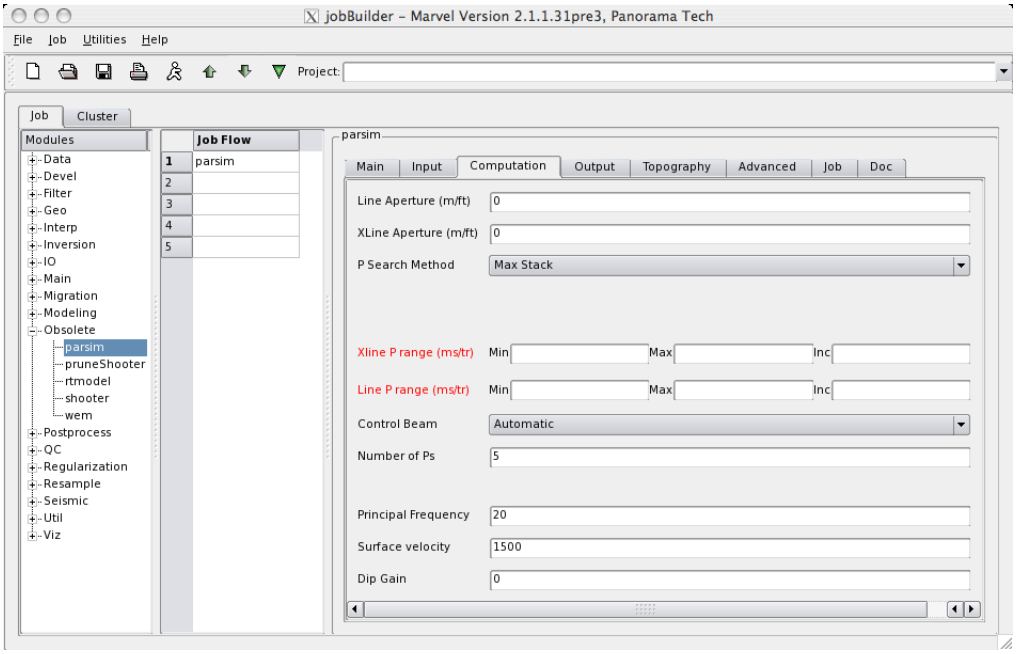


Table 106. parsim Computation Panel Fields

Field	Description
Line Aperture (m/ft)	The length, in meters or feet, in the line direction aperture limit. default: 0
XLine Aperture (m/ft)	The length, in meters or feet, in the crossline direction aperture limit. default: 0
P Search Method	Max Semblance or Max Stack
Semblance Window Length	The window length, in seconds, of the window to use in the semblance spectra. The window length should include a full wavelength. **This field is only visible for a P Search Method of Max Semblance.** default: 7
Semblance Threshold	**This field is only visible for a P Search Method of Max Semblance.** default: 0
Xline P range (ms/tr)	The max value and increment. The range is then defined from negative max to max. **This field is a REQUIRED entry.**

continues on next page

Table 106. parsim Computation Panel Fields–continued

Field	Description
Line P range (ms/tr)	The max value and increment. The range is then defined from negative max to max. **This field is a REQUIRED entry.**
Control Beam	• No Control • Fixed P Range • Automatic
Number of P's	default: 5
P spring range	**This field is only visible for a Fixed P Range value for the Control Beam.** default: 0.5
Principal Frequency	**This field is only visible for an Automatic value for the Control Beam.** default: 20
Surface Velocity	The near surface velocity in Equation 2 on page 27. **This field is only visible for an Automatic value for the Control Beam.** default: 1500
Dip Gain	Variable that enables you to control dip. The value can range from 0 through 100. default: 0, do not apply a gain

parsim Output Panel

Figure 141. parsim Output Panel

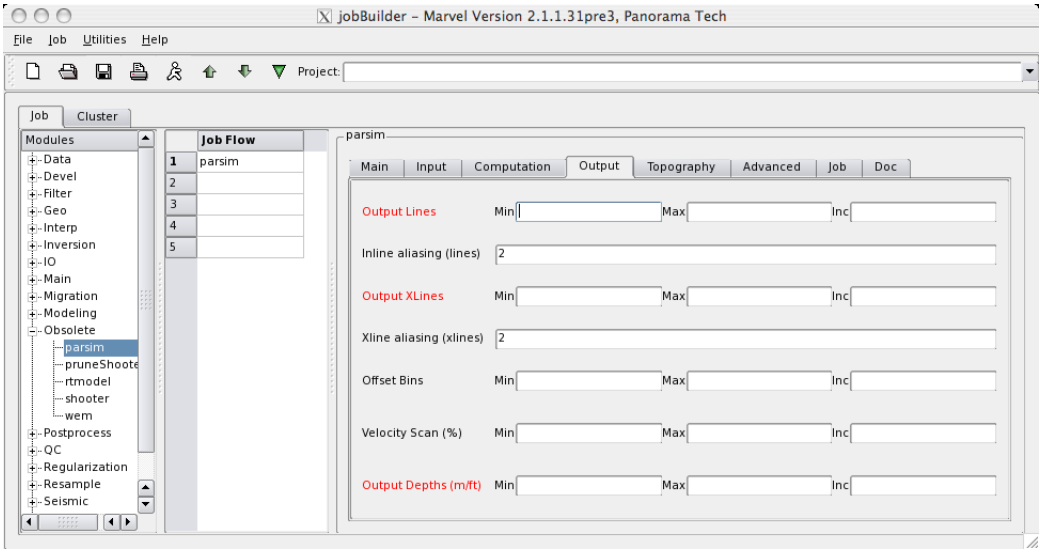


Table 107. parsim Output Panel Fields

Field	Description
Output Lines	Minimum, Maximum and Increment **This is a REQUIRED entry.**
Inline Aliasing (lines)	Attempt to compensate for aliasing in the inline direction (units: lines). **Note: This can be a costly operation.** **default: 2**
Output XLines	The minimum, maximum and increment values for the output crosslines. **This is a REQUIRED entry.**
Xline Aliasing (xlines)	Attempt to compensate for aliasing in the crossline direction in units of lines. **Note: This can be a costly operation.** **default: 2**
Offset Bins	Specifies the offset bins in which to read the data. Enter the Minimum, Maximum and Increment values.
Velocity Scan (%)	Setting the minimum, maximum, and increment provide the percentage range over which parsim should operate. For example, setting this range to 90, 110, 5 will produce output volumes using 90, 95, 100, 105, and 110 percent of the original velocity field.

continues on next page

Table 107. parsim Output Panel Fields–continued

Field	Description
Output Depths (m/ft)	Defines minimum, maximum, and increment for the each output trace. **This is a REQUIRED entry.**

parsim Topography Panel

Figure 142. parsim Topography Panel

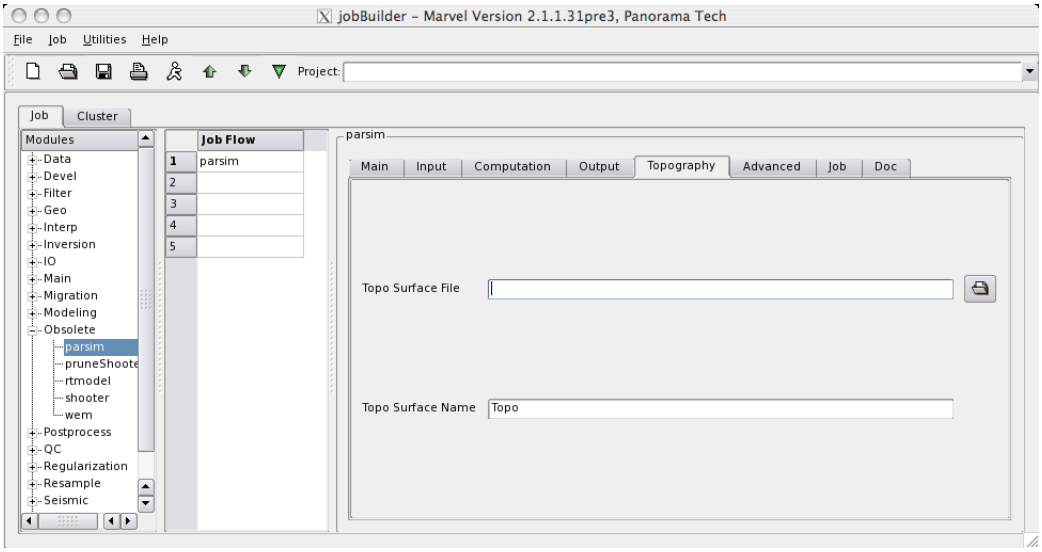


Table 108. parsim Topography Panel Fields

Field	Description
Topo Surface File	The path and name of the topographic surface file. If given, this specifies the acquisition topography (and if no Source Topo File is given, this is for both sources and receivers). This can be a MARVEL surface file, or a simple flat file defining the topography, with each line containing the line, crossline and depth values, for example: ep = 100 cdp = 500 z = 20
Topo Surface Name	The header key specifying where the topographic data are stored. A MARVEL surface file can have many surfaces. This is the name of the one to be used. default: Topo

parsim Advanced Panel

Figure 143. parsim Advanced Panel

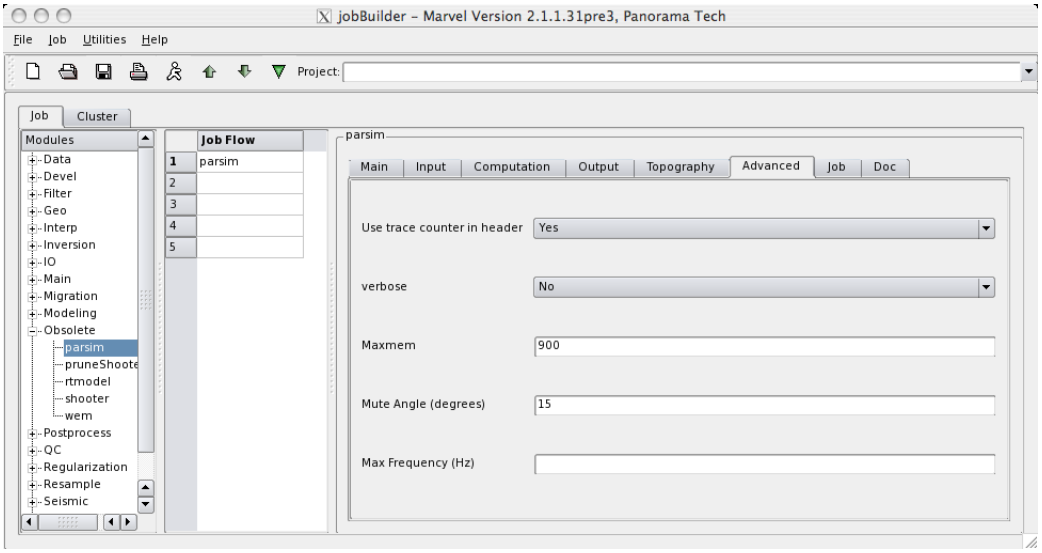


Table 109. parsim Advanced Panel Fields

Field	Description
Use trace counter in header	Flag indicating whether or not the trace counter that diskRead puts in the trace header will be used. default: Yes
verbose	Switch for turning debug printing on and off. default: No
Maxmem	Maximum amount of memory to be used by MARVEL per kdm instance. default: 900
Mute Angle	The angle, in degrees, measured down from the surface defining a cone limiting the near surface aperture. default: 15
Max Frequency	The maximum frequency allowed by the filtering process.

parsim Job Panel

Figure 144. parsim Job Panel

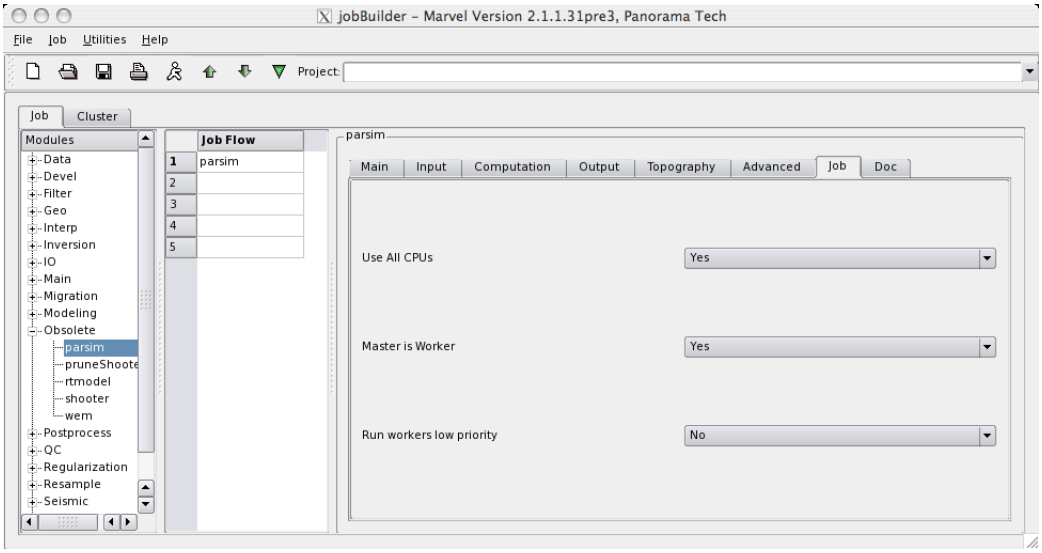


Table 110. parsim Job Panel Fields

Field	Description
Use All CPUs	This really means that each worker should use multiple threads. If *No*, then there will be one independent worker spawned for each CPU (or core) in the cluster.
Master is Worker	Yes—workers will be spawned on the master node of the job. No—workers will NOT be spawned on the master node of the job.
Run workers low priority	If *Yes*, workers will be spawned with reduced priority. although the master process will remain at high priority. This can be useful especially when *MasterIsWorker* is set to *Yes*, so that one worker does not slow down the collection or submission of shots for all of the others.

pef Module

The pef module is accessed under the Filter node of the jobBuilder module tree.

Figure 145. pef Main Panel

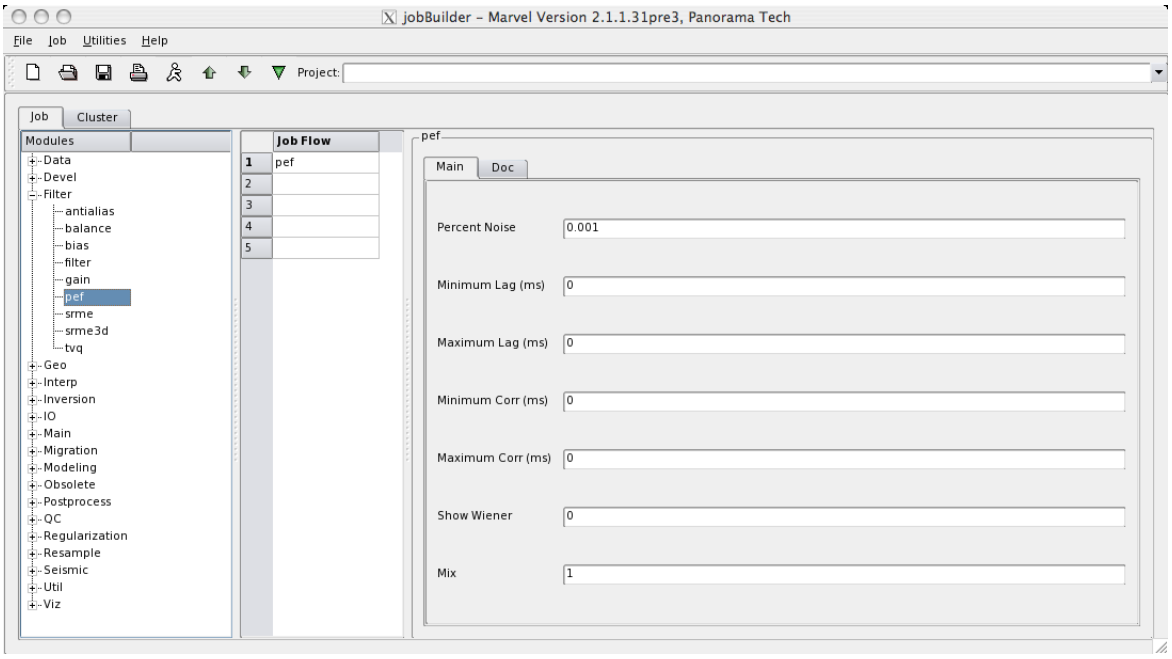


Table 111. pef Panel Fields

Field	Description
Percent Noise	default: 0.001
Minimum Lag (ms)	default: 0
Maximum Lag (ms)	default: 0
Minimum Corr (ms)	default: 0
Maximum Corr	default: 0
Show Wiener	default: 0

continues on next page

Table 111. pef Panel Fields–continued

Field	Description
Mix	default: 1

postproc Module

The postproc Module Main panel, Figure 146, enables you to set parameter values used in the postproc module. The parameter fields are described in Table 112. The postproc module is accessed under the Postprocess node of the jobBuilder module tree.

Figure 146. postproc Module Main Panel

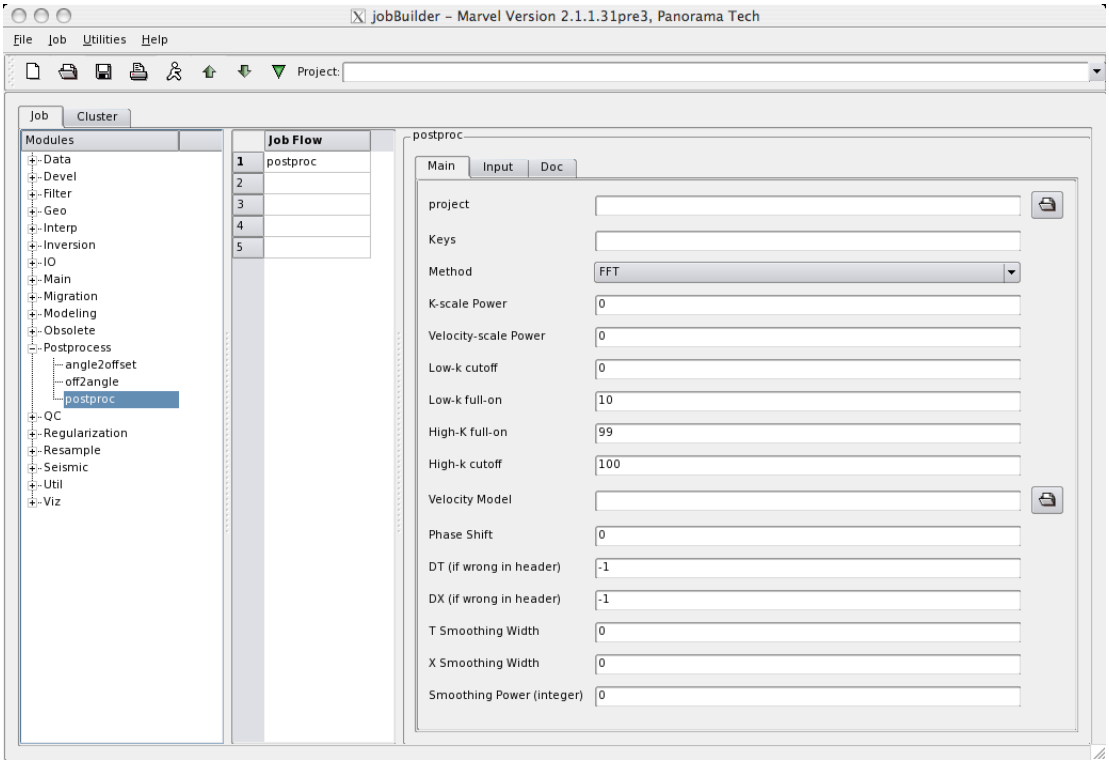


Table 112. postproc Module Main Panel Fields

Field	Description
project	The name of the project. The project file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates.
Keys	
Method	Bias, Laplace, Bias 2, FFT, FFT Deriv, None default: Bias
K-scale Power	default: 0
Velocity-scale Power	default: 0

continues on next page

Table 112. postproc Module Main Panel Fields–continued

Field	Description
Low-k cutoff	default: 0
Low-k full-on	default: 10
High-k full-on	default: 99
High-k cutoff	default: 100
Velocity Model	The path and filename of the velocity model to be used in the calculations. This is a seismic file in any format MARVEL can read, typically, SEG-Y. The units are m/s, or ft/s, but can be anything else, depending on the choice of units in the seismic data.
Phase Shift	**This field is only visible for the FFT and FFT Deriv methods.** default: 0
DT (if wrong in header)	default: -1
DX (if wrong in header)	default: -1
T Smoothing Width	default: 0
X Smoothing Width	default: 0
Smoothing Power (integer)	The number of times to smooth the volume. default: 0

postproc Input Panel

The postproc Module Input panel, Figure 147, enables you to set parameter values used in the postproc module. The parameter fields are described in Table 113.

Figure 147. postproc Module Input Panel

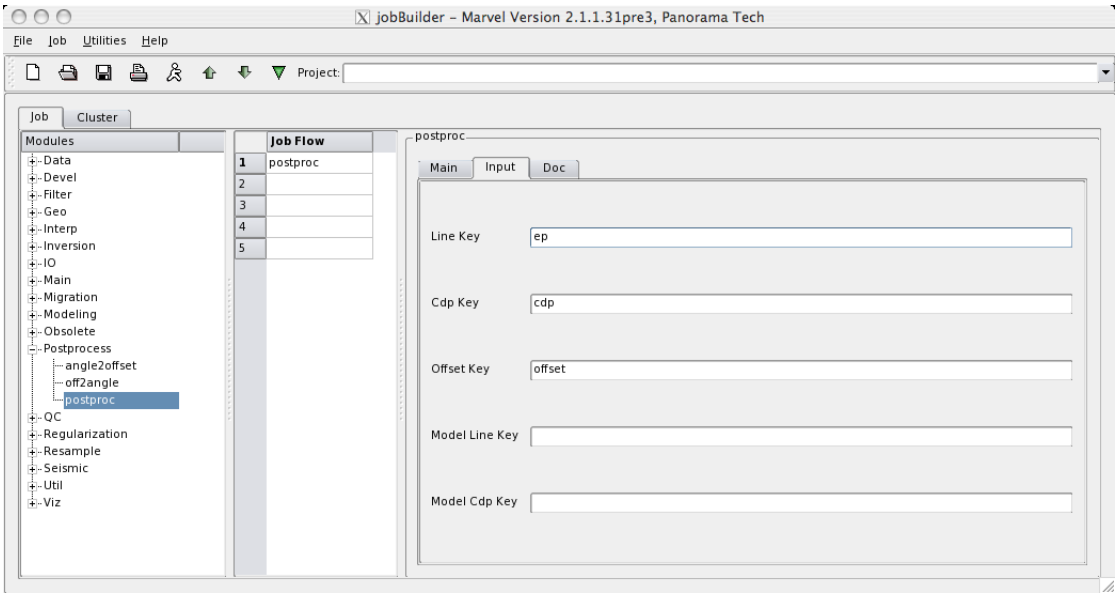


Table 113. postproc Module Input Panel Fields

Field	Description
Line Key	Header key for the line number. default: ep
Cdp Key	Header key for the CDP number. default: cdp
Offset Key	The header key defining the offset field of the stacked trace. default: offset
Model Line Key	The header word key for line information when the model is gridded. Use if different from the data.
Model Cdp Key	The header word key for CDP information when the model is gridded. Use if different from the data.

pruneShooter Module

The pruneShooter module is one of three MARVEL interfaces to a dynamic-anisotropic-maximum energy-travel-time generator. Although this module is still provided for compatibility purposes, its use has been deprecated. It is recommended that you now use the rayshooter module, instead, which combines both the pruneShooter and Shooter modules with more advanced features.

See also rayshooter Module.

pruneShooter Main Panel

Figure 148 enables you to specify basic information to be used by the module. The fields on the panel are described in Table 114. The pruneShooter module is accessed under the Obsolete node of the jobBuilder module tree.

Note:

If the output range is smaller then the aperture range, the output range is used to limit the size of the traveltime table.

Figure 148. pruneShooter Module Main Panel

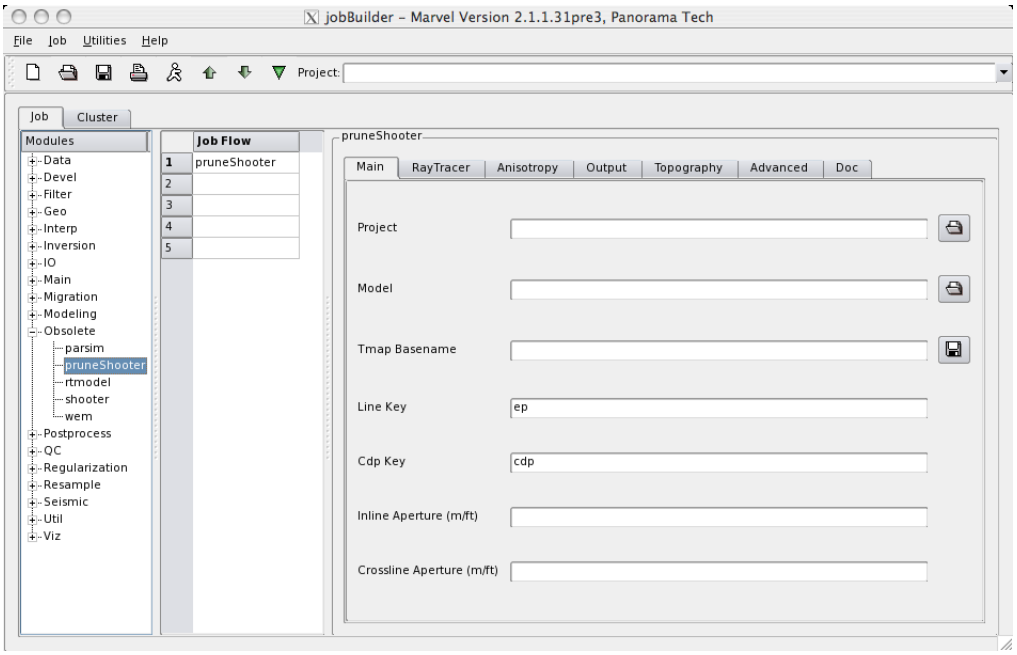


Table 114. pruneShooter Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates.
Model	The name of the input model.
Tmap Basename	The prefix used to produce the traveltime output files with suffix *.tmap*.
Line Key	The header key for the line number in the model file. default: ep
Cdp Key	The header key for the CDP number in the model file. default: cdp
Inline Aperture	The output aperture in the line direction.
Crossline Aperture	The output aperture, in meters or feet, of the crossline, or CDP, direction aperture limit.

pruneShooter RayTracer Panel

The pruneShooter module RayTracer panel, Figure 149, enables you to specify information that is to be used in ray tracing operations. The fields on the panel are described in Table 115.

Figure 149. pruneShooter Module RayTracer Panel

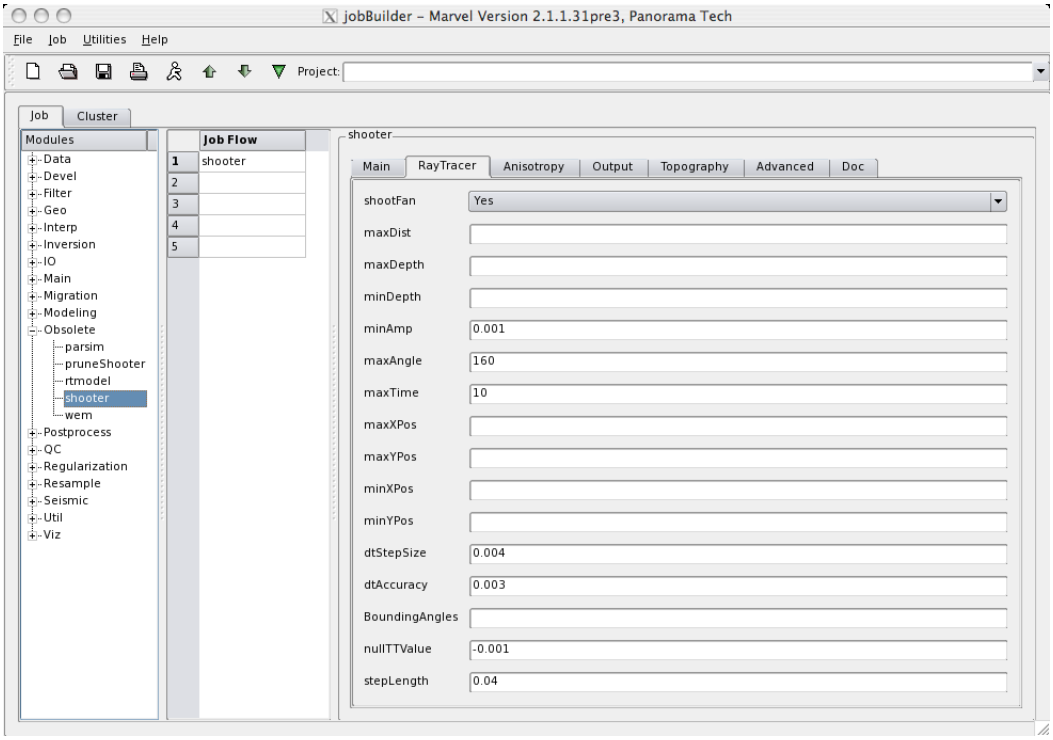


Table 115. pruneShooter Module RayTracer Panel Fields

Field	Description
shootFan	Selects the shooting direction: Yes causes rays to be shot toward deeper depths, while No causes rays to be shot upward toward shallower depths. default: Yes
maxDist	The maximum horizontal distance a ray can travel. If this parameter is defaulted to zero, the maximum distance a ray can travel is set to the maximum extent of the model.
maxDepth	The maximum depth a ray can travel. If this parameter is defaulted to 0, the maximum depth of a ray is set to the maximum depth of the model.

continues on next page

Table 115. pruneShooter Module RayTracer Panel Fields–continued

Field	Description
minDepth	The minimum depth a ray can travel. If this parameter is defaulted, the ray has no minimum depth.
minAmp	The cutoff amplitude of a ray. This value is in terms of *paraxialAmpxpathLengthxvelocity*. • In constant velocity, this value stays at 1.0 all along the ray. • For a linear velocity gradient starting with 5000 ft/sec at the surface and reaching 10000 ft/sec at a depth of 10000 feet, this value will be 0.66 at 10000 feet for a ray straight down. **Note: It is recommended that you set this value to about 0.10 so that only the very low amplitude rays are dropped. If you set the value to a large value, you will reduce run time at the expense of accuracy.** **default: 0.01**
maxAngle	The maximum angle a ray can attain. When set to 180 degrees, this can potentially cause the generation of turning rays and thus produce corresponding longer traveltimes. Generally, a reasonable compromise between speed and accuracy is to set this value in the neighborhood of 160 degrees. default: 160
maxTime	The maximum time a ray can travel. default: 10
maxXPos	The maximum line or crossline direction distance a ray end point can attain. This value can potentially override the maxDist parameter.
maxYPos	The maximum y or line direction distance a ray end point can attain. This value can potentially override the maxDist parameter.
minXPos	The minimum x or crossline direction distance a ray end point can attain. This value can potentially override the maxDist parameter.
minYPos	The minimum y or line direction distance a ray end point can attain. This value can potentially override the maxDist parameter.

continues on next page

Table 115. pruneShooter Module RayTracer Panel Fields–continued

Field	Description
dtStepSize	Ray tracing step length (in seconds) used for smoothing the velocity model. This is crucial for stability and for this routine to run quickly. The velocity is smoothed by $1.5 x averageVelocity x stepLength$. For a 60 Hz freq, the stepLength should be about 0.040 seconds. For velocities that average 7000 ft/sec, the smoothing is then 420 feet. **Note: Since ray tracing is adaptive, the smoothing value can actually be fairly small, but this is not recommended. In general, the velocity should be smoothed at least a few hundred feet and probably a few thousand.** **A value of 0.0 will turn off smoothing. If this value is not 0.0, but it is less than** $2.5 x MIN(dx, dy)$**, the value will be set to** $2.5 x MIN(dx, dy)$**.** **default: 0.004**
dtAccuracy	The desired accuracy of travel times. The recommended value is about $0.25 x 0.5 / maxFrequency$. Therefore, for 60 Hz data, dtAccuracy is 0.002 sec. default: 0.003
BoundingAngles	The take-off angles anglex1, anglex2, angley1 and angley2 that bound the initial ray fan, and define the direction cosines off vertical. The four values define an initial cone and provide a convenient method for limiting near surface apertures during the migration process. These four angles usually have values of about 70, -70, 70, -70. Examples: • anglex1 = -90, angley1 = 0 means horizontal in the negative x direction • anglex2 = 0, angley2 = 90 means horizontal in the positive y direction • anglex1 = 0,angley1 = 0 means a vertical ray.
nullTTValue	The value that is set inside a given zone where no rays have penetrated. This is a marker that tells the migration module not to image in these zones. default: -0.001
stepLength	The length of a time step along a ray. Because this value is adaptive, there is little reason to change the default value of .04 second. default: 0.04

pruneShooter Anisotropy Panel

The parameters in the pruneShooter module Anisotropy panel, Figure 150, define the various velocity model input options available for the acoustic and anisotropic raytracer. The fields on the panel are described in Table 116.

Note:

You must enter these files in the proper order. What the raytracer requires is enough information to define the *vvelfile* and *eta*. Thus, one and only one of following combinations must be entered:

- *epsilonfile*, *delfile*
- *vvelfile*, *etafile*
- *vvelfile*, *epsilon*
- *vvelfile*, *delfile*

Figure 150. pruneShooter Module Anisotropy Panel

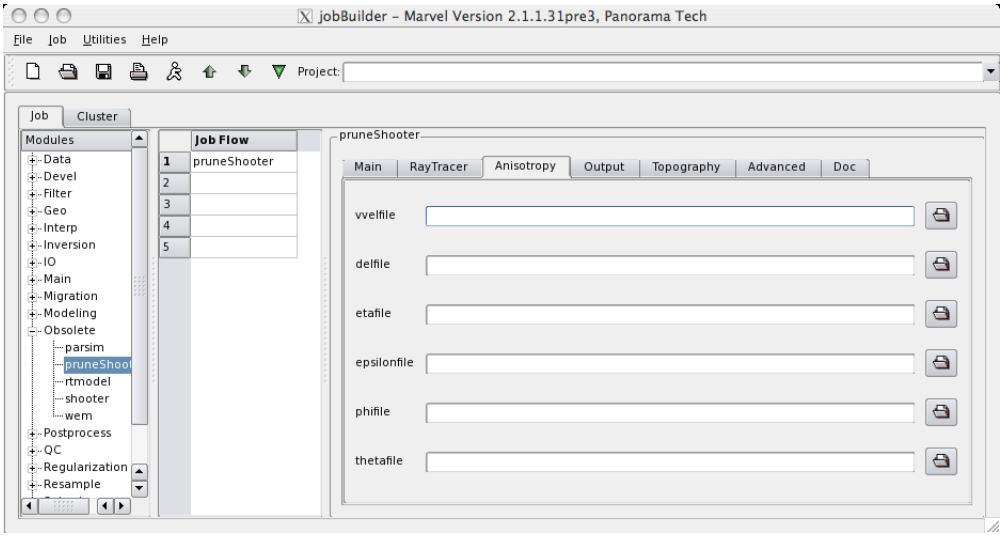


Table 116. pruneShooter Module Anisotropy Panel Fields

Field	Description
vvelfile	The name of the V_{nmo} file. This file is closely related to the vertical velocity field.
delfile	The name of the file containing Thomsen's delta, δ.
etafile	The name of the file containing Thomsen's eta, η.

continues on next page

Table 116. pruneShooter Module Anisotropy Panel Fields–continued

Field	Description
epsilonfile	The name of the file containing Thomsen's epsilon, ε.
phifile	The name of the file containing Thomsen's phi, φ.
thetafile	The name of the file containing Thomsen's theta, θ.

pruneShooter Output Panel

This panel, Figure 151, enables you to control the output from the pruneShooter module. Table 117 describes the fields on the panel.

Figure 151. pruneShooter Module Output Panel

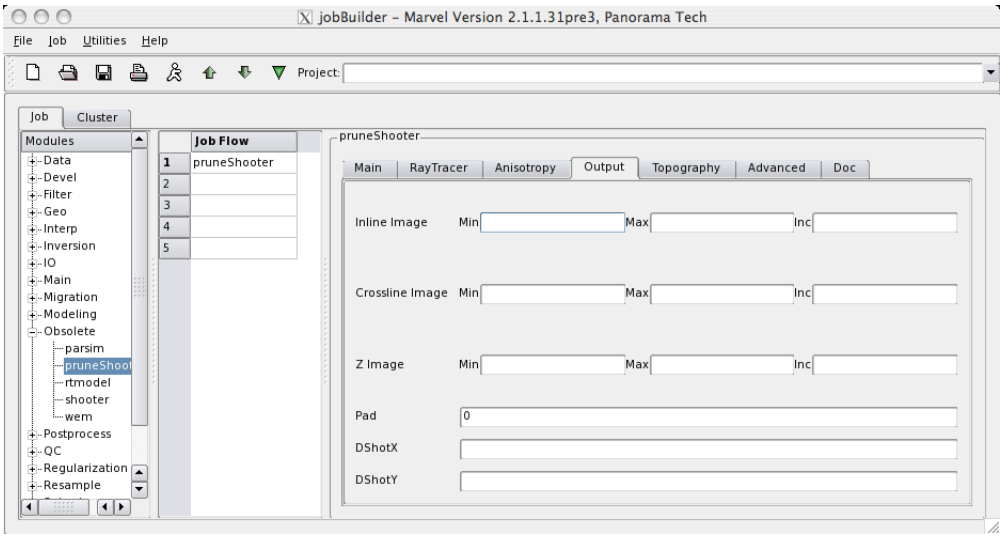


Table 117. pruneShooter Module Output Panel Fields

Field	Description
Inline Image	The minimum, maximum, and incremental line range of the shot locations of the output travel-time volumes.
Crossline Image	The minimum, maximum, and incremental CDP range of the shot locations of the output travel-time volumes.
Z Image	The minimum, maximum, and incremental depth of each travel-time volume.
Pad	The percent padding to apply to input traces, where trace padding adds zero samples to the ends of the traces. default: 0
DshotX	
DshotY	

pruneShooter Topography Panel

This panel, Figure 152, enables you to control the output from the shooter module. Table 118 describes the fields on the panel.

Figure 152. pruneShooter Module Topography Panel

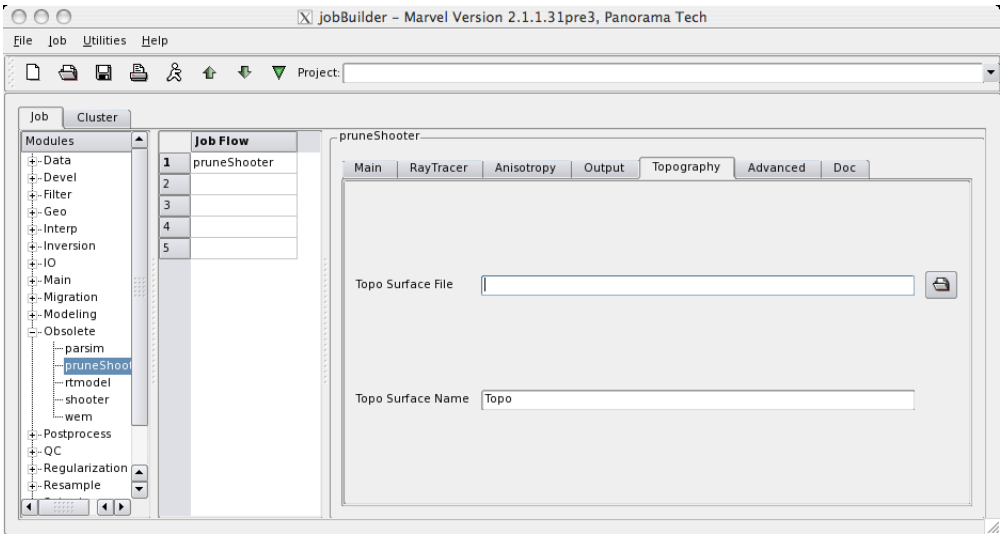


Table 118. pruneShooter Module Output Panel Fields

Field	Description
Topo Surface File	The path and name of the topographic surface file. If given, this specifies the acquisition topography (and if no Source Topo File is given, this is for both sources and receivers). This can be a MARVEL surface file, or a simple flat file defining the topography, with each line containing the line, crossline and depth values, for example: ep = 100 cdp = 500 z = 20
Topo Surface Name	The header key specifying where the topographic data are stored. A MARVEL surface file can have many surfaces. This is the name of the one to be used. default: Topo

pruneShooter Advanced Panel

The pruneShooter module displays two versions of the Advanced panel depending on your Compress selection; all fields are shown in Figure 153. The field values are described in Table 119.

Figure 153. pruneShooter Module Advanced Panel–Compress, No

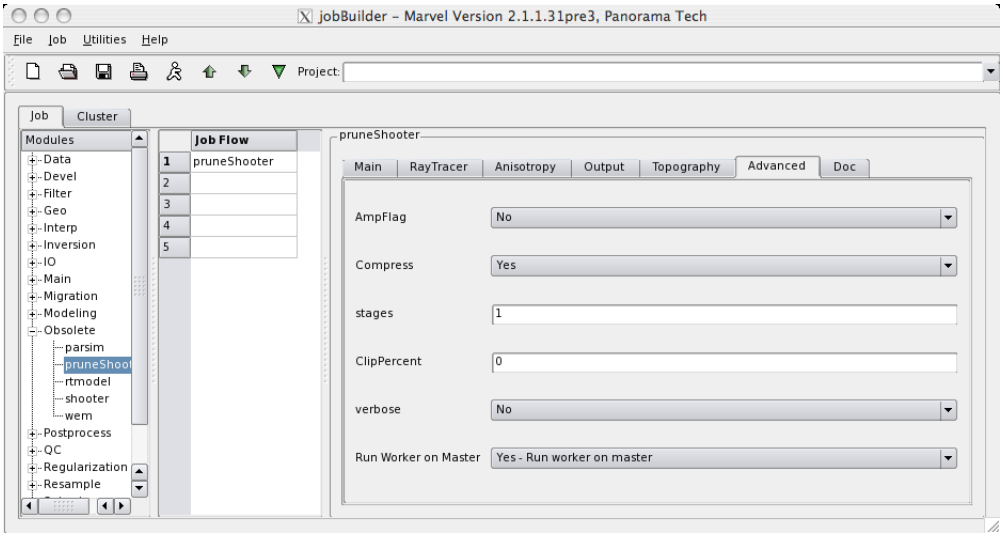


Table 119. pruneShooter Module Advanced Panel Fields

Field	Description
AmpFlag	Determines whether or not amplitudes are calculated and output. default: No
Compress	Determines whether or not traveltimes and amplitudes (if calculated) are compressed. default: Yes
stages	The number of stages to use in the wavelet-based compression scheme. This field is displayed only if *Compress* = *Yes* has been selected. default: 1
ClipPercent	The percentage of the maximum amplitude defining the threshold in the wavelet domain below which amplitudes are zeroed. While clipping can increase compression efficiency, it can also seriously reduce accuracy. This field is displayed only if *Compress* = *Yes* has been selected. default: 0
verbose	Switch for turning debug printing on and off. default: No

continues on next page

Table 119. pruneShooter Module Advanced Panel Fields–continued

Field	Description
Run Worker on Master	Determines whether or not the master is used in the computational process. default: Yes

quikmodel Module

The quikmodel module is accessed under both the Migration and Modeling nodes of the jobBuilder module tree.

Figure 154. quikmodel Panel

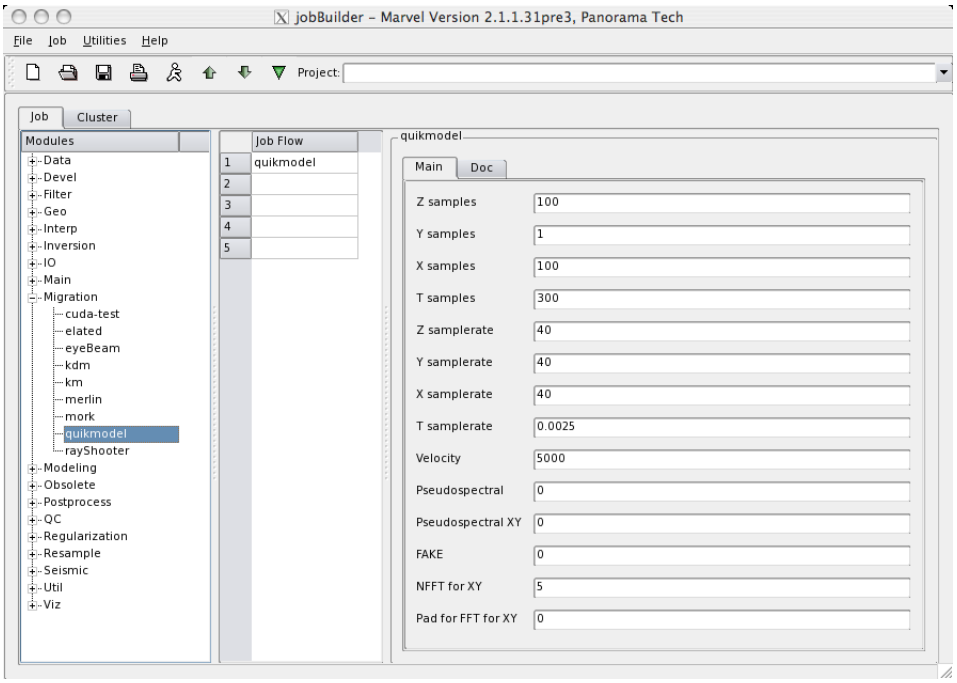


Table 120. quikmodel Panel Fields

Field	Description
Z samples	default: 100
Y samples	default: 1
X samples	default: 100
T samples	default: 300
Z sample rate	default: 40

continues on next page

Table 120. quikmodel Panel Fields–continued

Field	Description
Y sample rate	default: 40
X sample rate	default: 40
T sample rate	default: 0.0025
Velocity	default: 5000
Pseudospectral	default: 0
Pseudospectral XY	default:
FAKE	default: 0
NFFT for XY	default: 5
Pad for FFT for XY	default: 0

radon Module

The radon module is accessed under the Geo node of the jobBuilder module tree.

Figure 155. radon Main Panel

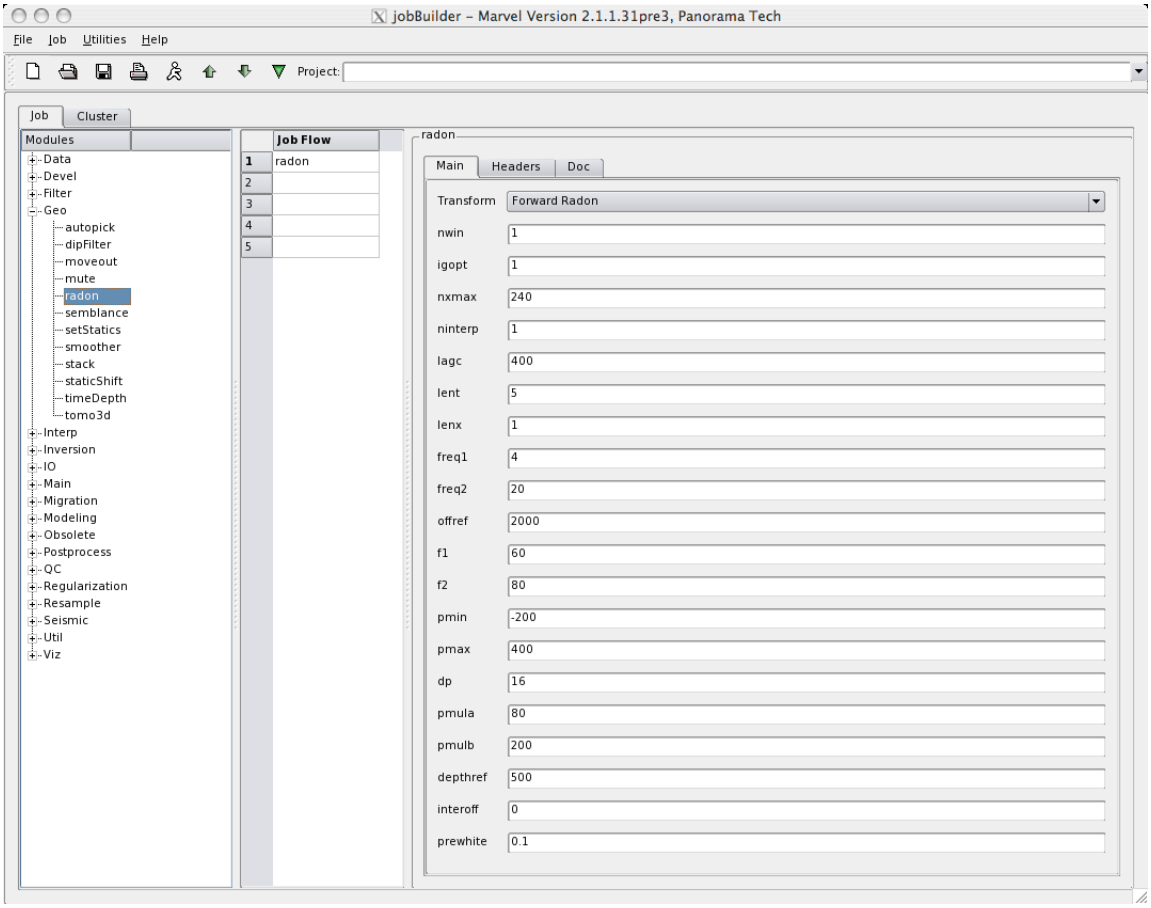


Table 121. radon Main Panel Fields

Field	Description
Transform	• Forward Radon • Data Minus Multiples • Estimate Multiples • Forward and Reverse Radon • Inverse Radon

continues on next page

Table 121. radon Main Panel Fields–continued

Field	Description
nwin	default: 1
igopt	default: 1
nxmax	default: 240
ninterp	default: 1
lagc	default: 400
lent	default: 5
lenx	default: 1
freq1	default: 4
freq2	default: 20
offref	default: 2000
f1	default: 60
f2	default: 60
pmin	default: -200
pmax	default: 400
dp	default: 16
pmula	default: 80

continues on next page

Table 121. radon Main Panel Fields–continued

Field	Description
pmulb	default: 200
depthref	default: 500
interoff	default: 0
prewhite	default: 0.01

radon Headers Panel

Figure 156. radon Headers Panel

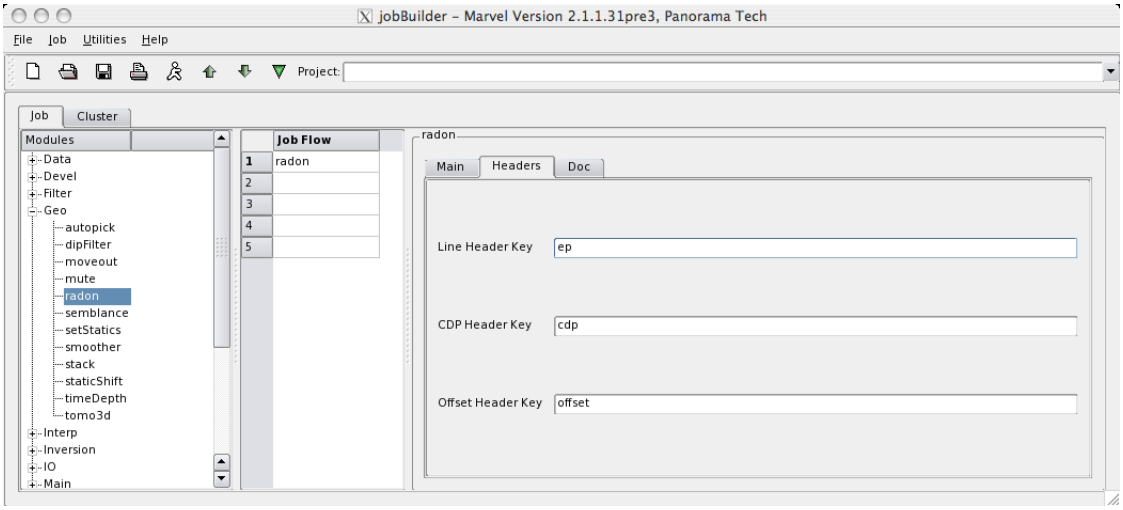


Table 122. radon Headers Panel Fields

Field	Description
Line Header Key	Header key containing line designators. MARVEL usually uses ep, which is a 4-byte integer at location 17 in SEG-Y files. default: ep
CDP Header Key	Header key containing CDP (crossline) designators. MARVEL usually uses cdp, which is a 4-byte integer at location 21 in SEG-Y files. default: cdp
Offset Header Key	The key word to be used for OFFSET in the MARVEL format. default: offset

rayshooter Module

The rayshooter module computes travel-time tables that are independent of output migration locations. Each such table or volume is centered on the shot location so when a sufficient number of shots have been computed, travel-time tables computed by this module are suitable for migrating to any output range. You should use this program when you expect to output a full volume, or when the targeted output may be arbitrarily defined. The rayshooter module combines the earlier pruneShooter and shooter modules together with more advanced features. Panorama Technologies recommends that you use the rayshooter module instead of either of the two other modules when possible.

rayshooter Main Panel

Figure 157 enables you to specify basic information to be used by the module. The fields on the panel are described in Table 123. The rayshooter module is accessed under the Migration node of the jobBuilder module tree.

Figure 157. rayshooter Module Main Panel

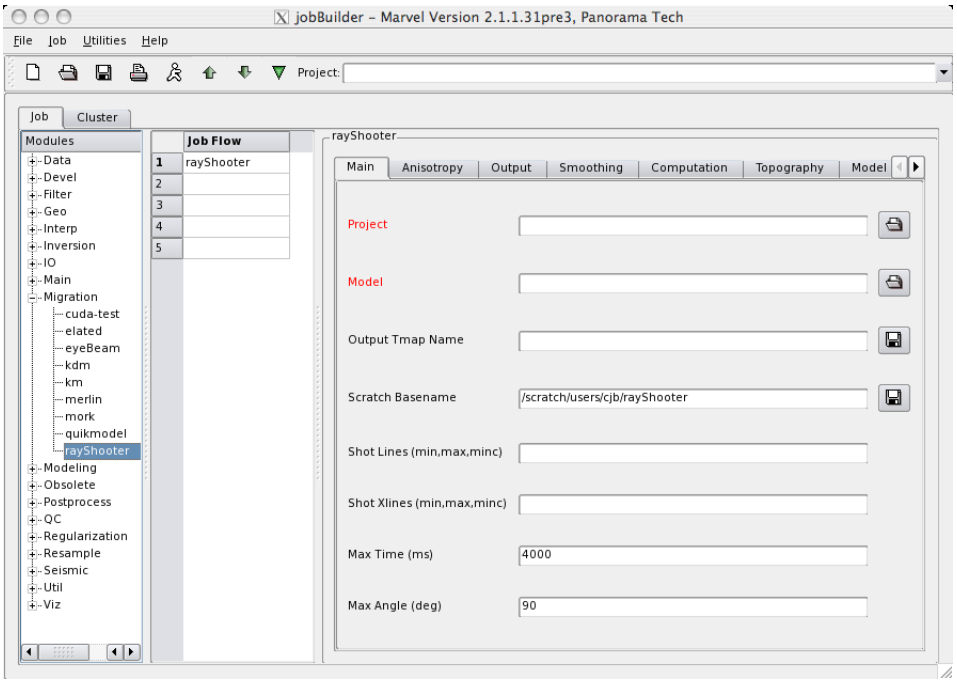


Table 123. rayshooter Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates. **This is a required entry.**
Model	The name of the input model. **This is a required entry.**
Output Tmap Name	The name of the traveltime output file.
Scratch Basename	The application needs temporary storage for acquired data, accumulated image, and others. All of these filenames will start with this prefix. default: */scratch/rayShooter*
Shot Lines	minimum, maximum and increment
Shot Xlines	minimum, maximum and increment
Max Time (ms)	default: 4000
Max Angle (deg)	default: 90

rayshooter Anisotropy Panel

Figure 158 enables you to specify basic information to be used by the module. The fields on the panel are described in Table 124.

Figure 158. rayshooter Anisotropy Panel

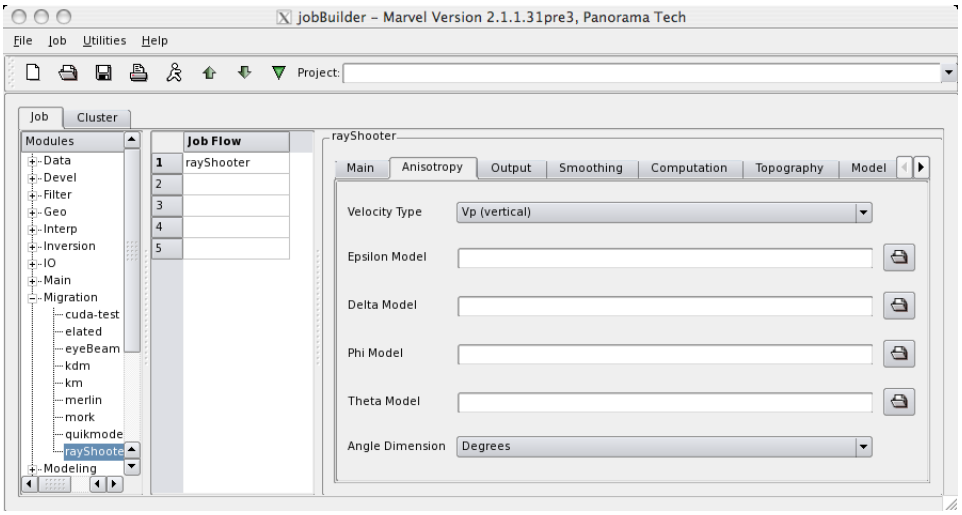


Table 124. rayshooter Anisotropy Panel Fields

Field	Description
Velocity Type	Vp (vertical) or VNMO (vertical)
Epsilon Model	File containing a model of Thomsen's epsilon, ε.
Delta Model	File containing a model of Thomsen's delta, δ.
Phi Model	File containing a model of Thomsen's phi, φ.
Theta Model	File containing a model of Thomsen's theta, θ.
Angle Dimension	Degrees or Radians

rayshooter Output Panel

Figure 159 and Figure 160 enable you to specify basic information to be used by the module. The fields on the panel are described in Table 125.

Figure 159. rayshooter Output Panel, Shot-Centered Mode

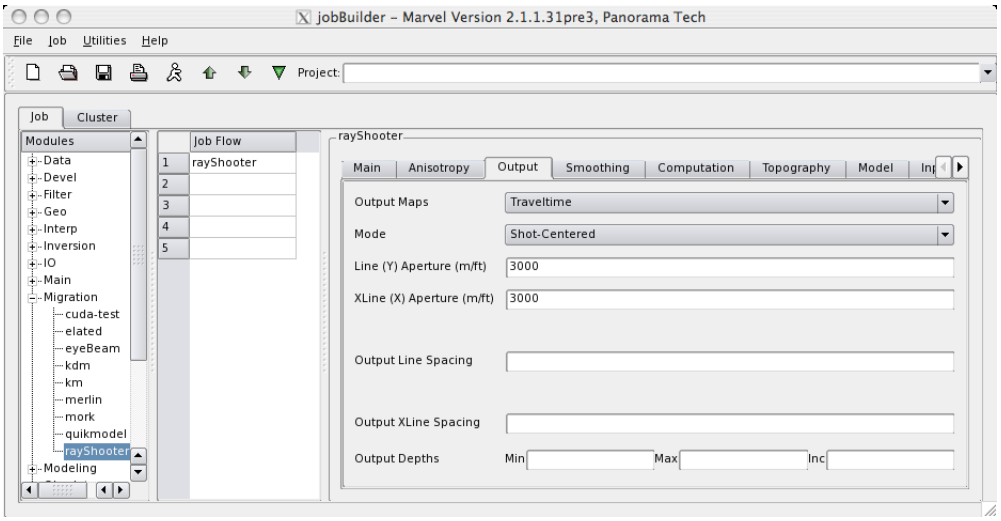


Figure 160. rayshooter Output Panel, Target-Volume Mode

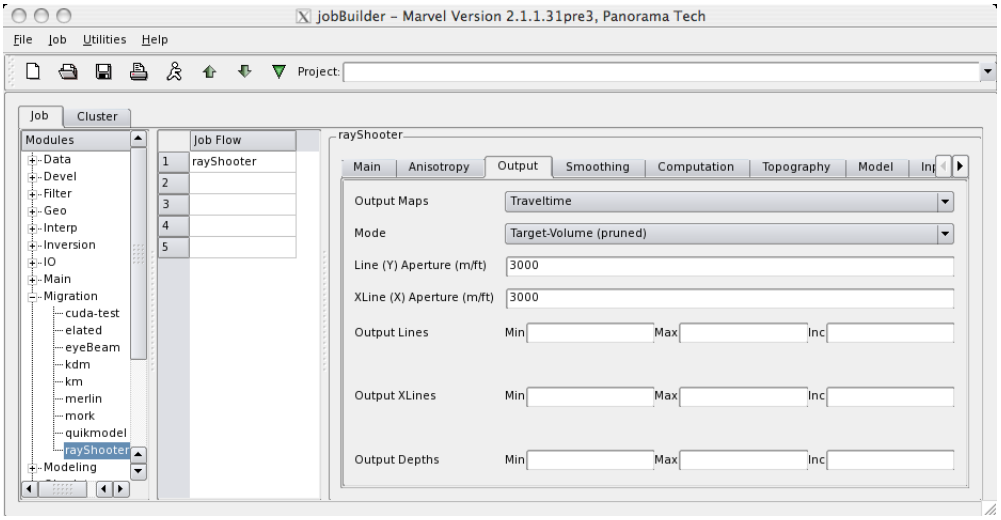


Table 125. rayshooter Output Panel Fields

Field	Description
Output Maps	• Traveltime • Traveltime/Amplitude • Traveltime/Takeoff Angle • Traveltime/Amplitude/Takeoff angle • Traveltime/Arrival Angle • Traveltime/Ampitude/Arrival angle • Traveltime/Takeoff/Arrival angle • Traveltime/Amplitude/Takeoff/Arrival angle default: Traveltime
Mode	Shot-Centered or Target Volume (pruned) default: Shot-Centered
Line (Y) Aperture (m/ft)	The length, in meters or feet, of the line direction aperture limit. default: 3000
XLine (X) Aperture (m/ft)	The length, in meters or feet, of the crossline (CDP) direction aperture limit. default: 3000
Output Lines	The Minimum, Maximum and Increment for the lines in the output. **This field is only displayed for Target-Volume Mode.**
Output XLines	The Minimum, Maximum and Increment for the crosslines in the output. **This field is only displayed for Target-Volume Mode.**
Output Line Spacing	The spacing for the output lines. **This field is only displayed for Shot-Centered Mode.**
Output XLine Spacing	The spacing for the output crosslines. **This field is only displayed for Shot-Centered Mode.**
Output Depths	Minimum, Maximum, Increment for output depths. Valid for both modes.

rayshooter Smoothing Panel

Figure 161 enables you to specify basic information to be used by the module. The fields on the panel are described in Table 126.

Figure 161. rayshooter Smoothing Panel

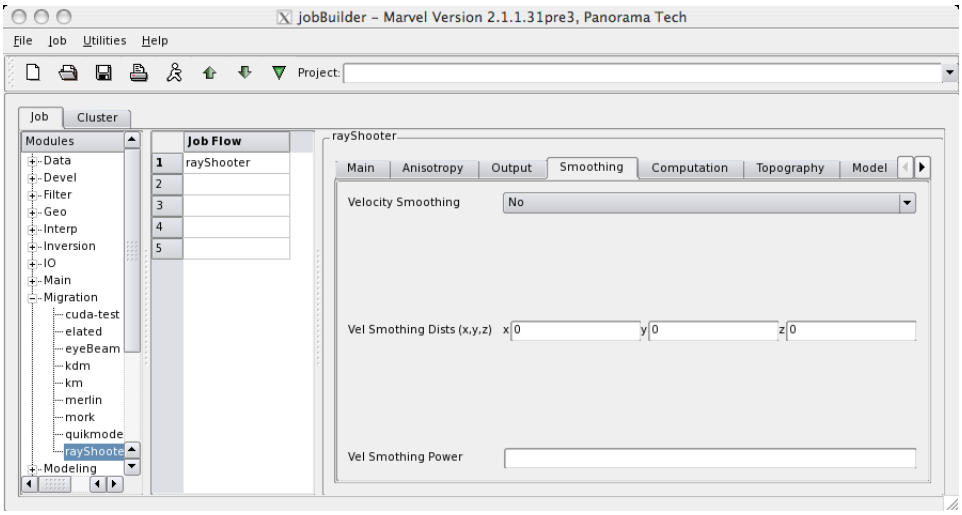


Table 126. rayshooter Smoothing Panel Fields

Field	Description
Velocity Smoothing	Turn the smoothing of the velocity (slowness) field used to propagate the source term *on* or *off*. This process can be useful for reducing artifacts.
Vel Smoothing Dists (x,y,z)	Gaussian widths for smoothing slowness in each direction. defaults: 0, 0, 0
Vel Smoothing Power	The number of times to smooth the volume.

rayshooter Computation Panel

Figure 162 enables you to specify basic information to be used by the module. The fields on the panel are described in Table 127.

Figure 162. rayshooter Computation Panel

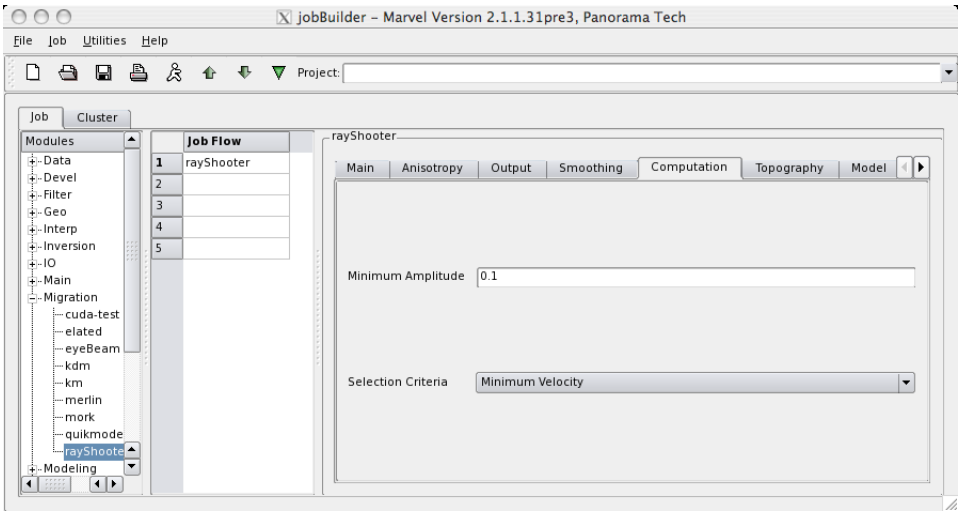


Table 127. rayshooter Computation Panel Fields

Field	Description
Minimum Amplitude	default: 0.1
Selection Criteria	Minimum Velocity, Minimum Distance, Maximum Amplitude default: Minimum Velocity

rayshooter Topography Panel

Figure 163 enables you to specify basic information to be used by the module. The fields on the panel are described in Table 128.

Figure 163. rayshooter Topography Panel

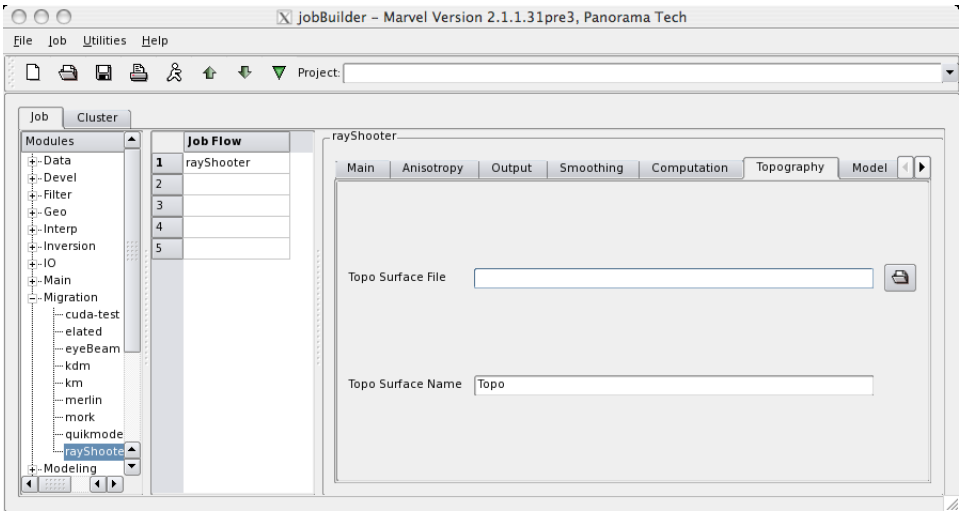


Table 128. rayshooter Topography Panel Fields

Field	Description
Topo Surface File	The path and name of the topographic surface file. If given, this specifies the acquisition topography (and if no Source Topo File is given, this is for both sources and receivers). This can be a MARVEL surface file, or a simple flat file defining the topography, with each line containing the line, crossline and depth values, for example: ep = 100 cdp = 500 z = 20
Topo Surface Name	The header key specifying where the topographic data are stored. A MARVEL surface file can have many surfaces. This is the name of the one to be used. defaults: Topo

rayshooter Model Panel

Figure 164 enables you to specify basic information to be used by the module. The fields on the panel are described in Table 129.

Figure 164. rayshooter Model Panel

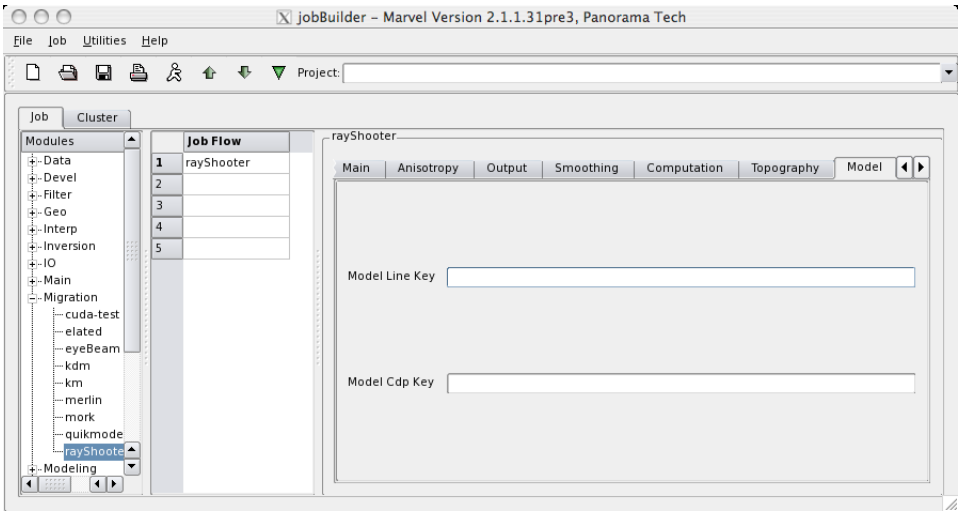


Table 129. rayshooter Model Panel Fields

Field	Description
Model Line Key	Header key for the line number in the model. Use if different from the data.
Model Cdp Key	Header key for the CDP number in the model. Use if different from the data.

rayshooter Input Panel

Figure 165 enables you to specify basic information to be used by the module. The fields on the panel are described in Table 130.

Figure 165. rayshooter Input Panel

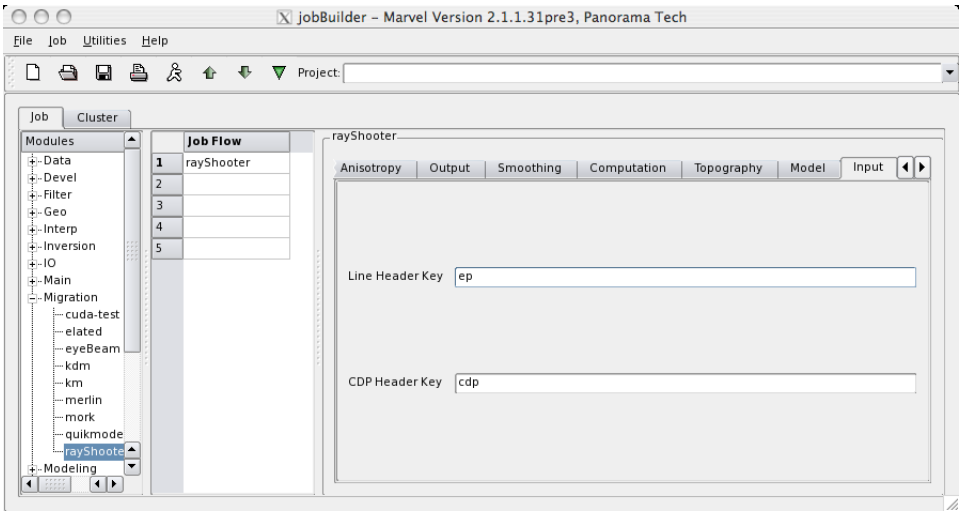


Table 130. rayshooter Input Panel Fields

Field	Description
Line Header Key	Header key containing line designators. MARVEL usually uses ep, which is a 4-byte integer at location 17 in SEG-Y files. default: ep
CDP Header Key	Header key containing CDP (crossline) designators. MARVEL usually uses cdp, which is a 4-byte integer at location 21 in SEG-Y files. default: cdp

rayshooter Job Panel

Figure 166 enables you to specify basic information to be used by the module. The fields on the panel are described in Table 131.

Figure 166. rayshooter Job Panel

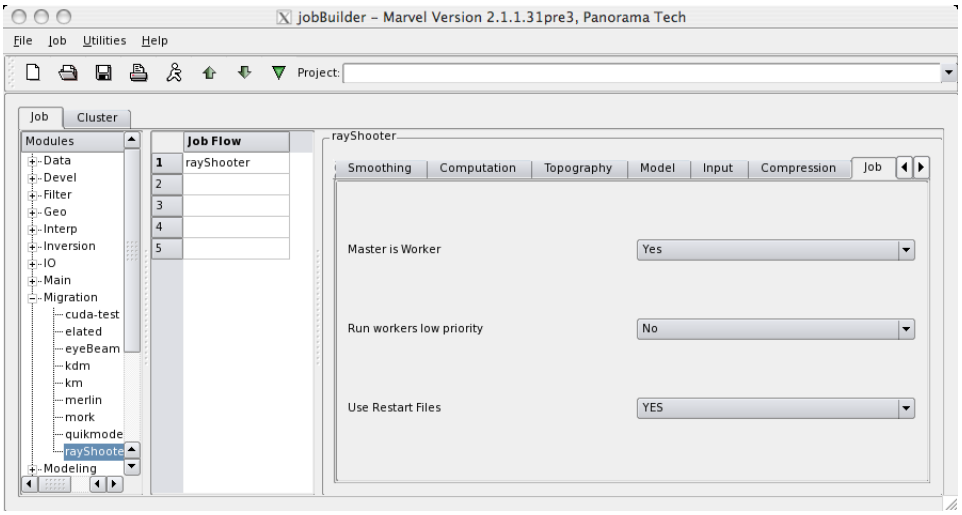


Table 131. rayshooter Job Panel Fields

Field	Description
Master is Worker	Flag that controls whether the master I/O controller is also used for performing calculations. default: Yes
Run Workers in Low Priority	If Yes, workers will be spawned with reduced priority. although the master process will remain at high priority. This can be useful especially when Master Is Worker is set, so that one worker does not slow down collection or submission of shots for all of the others. default: No
Use Restart Files	If NO, the job will ignore restart information and start from the beginning. default: Yes

resamp3d Module

The resamp3d module is accessed under the Resample node of the jobBuilder module tree.

Figure 167. resamp3d Panel

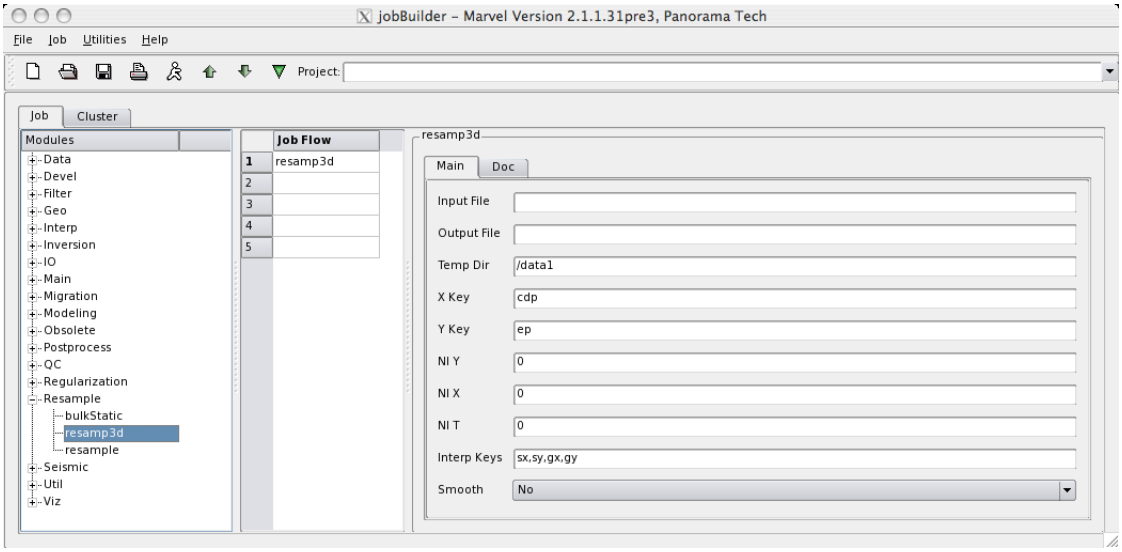


Table 132. resamp3d Panel Fields

Field	Description
Input File	
Output File	
Temp Dir	default: */data*1
X Key	The header key specifying where CDP data is stored. default: cdp
Y Key	The header key specifying where line data is stored. default: ep
NI Y	default: 0
NI X	default: 0
NI T	default: 0

continues on next page

Table 132. resamp3d Panel Fields–continued

Field	Description
Interp Keys	The header keys specifying where source line and crossline data are stored, and where geophone line and geophone crossline data are stored. default: sx, sy, gx, gy
Smooth	default: No

resample Module

The resample module is accessed under the Resample node of the jobBuilder module tree.

Figure 168. resample Panel

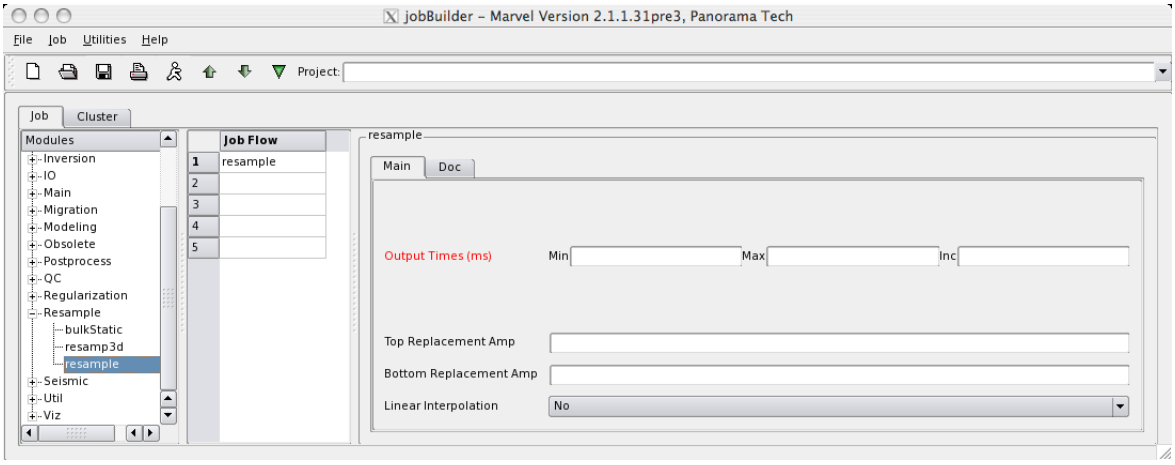


Table 133. resample Panel Fields

Field	Description
Output Times (ms)	Minimum, Maximum, Increment. **This is a REQUIRED entry.**
Top Replacement Amp	
Bottom Replacement Amp	
Linear Interpolation	default: No

rtmodel Module

The rtmodel provides an interface to the reverse time modeling module. The rtmodel module is accessed under the Obsolete node of the jobBuilder module tree.

Note:

Although migration can be performed by the application called **rtmodel**, this module has been replaced by a separate application, called MERLIN®.

Note:

Although modeling is currently performed by the application called **rtmodel**, this will eventually be a separate application, tentatively called MINDY™.

All the technologies in the module are based on propagation with the acoustic wave equation, Equation 6, where u is the wave field, c is the velocity, and ρ is the density.

Equation 6:

$$\partial_t^2 u(\mathbf{x}, t) = c^2 \rho \nabla \cdot \frac{1}{\rho} \nabla u$$

Normally, for migration, the density is treated as constant, and the reduced equation, Equation 7, is used. Another version, for anisotropic velocity, will be covered later.

Equation 7:

$$\partial_t^2 u(\mathbf{x}, t) = c^2 \nabla^2 u$$

The equation of motion for the field Equation 6 is solved in these applications using a high-order, centered-grid finite-difference time-domain (FDTD) approach. Boundaries are handled by a choice of tunable isotropic or anisotropic (PML) absorbers.

Typically, a modeling job will involve only this application and the diskWrite module to write the output to disk.

Note:

You will probably want to use the *Append* setting of the diskWrite module *Mode* parameter, so that restart jobs will not overwrite previous work (see diskWrite Module).

Modeling

A source wavelet is inserted at the specified location, and the field is recorded as traces specified locations.

Migration

This is a ‘Reverse-Time’ algorithm; the source field is a synthetic modeled shot, cross-correlated with back-propagated data.

rtmodel Main Panel

Figure 169 and Figure 170 enable you to specify basic information to be used by the module. The fields on the panel are described in Table 134.

Figure 169. rtmodel Module Main Panel

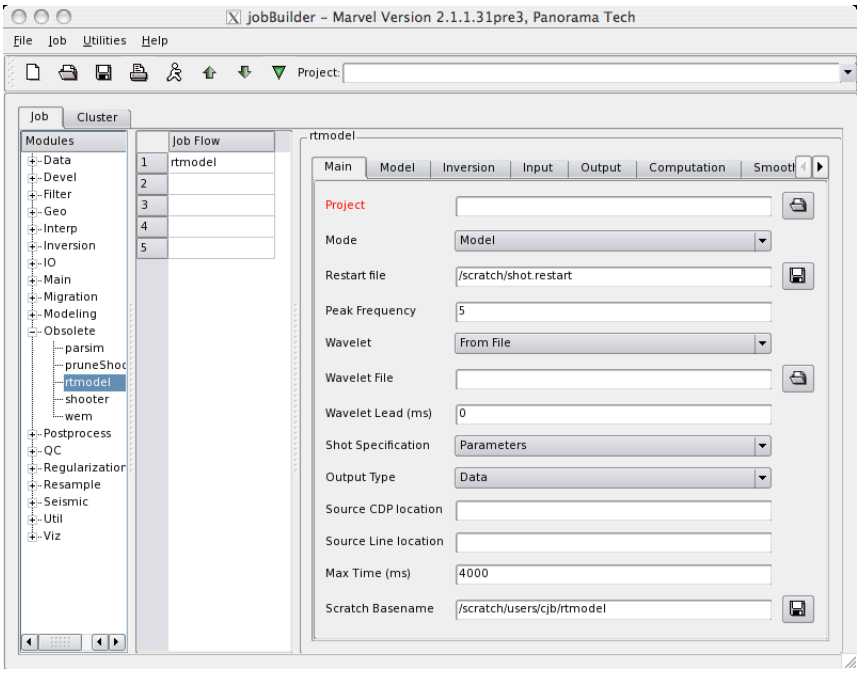


Figure 170. rtmodel Module Main Panel

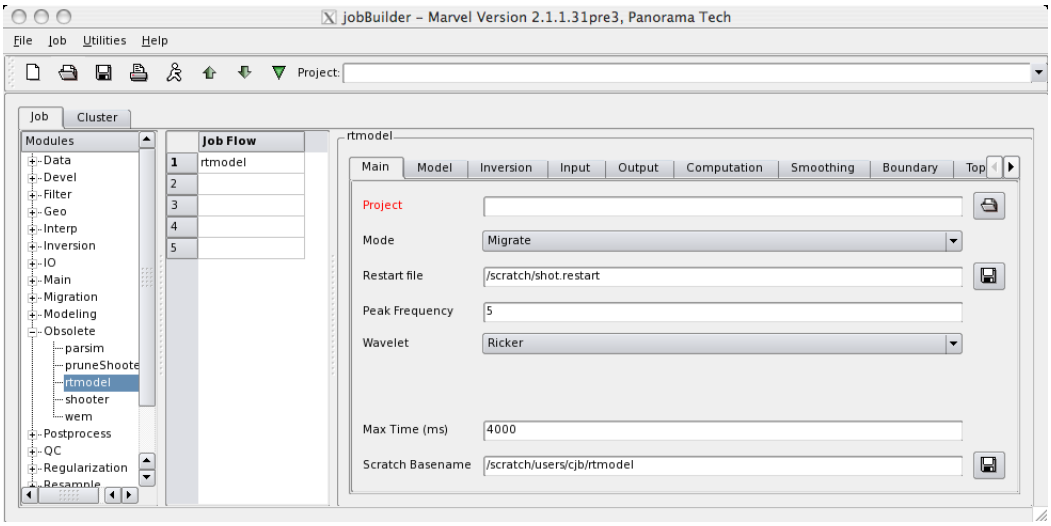


Table 134. rtmodel Module Main Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates.
Model	This is a seismic file in any format MARVEL can read; typically SEG-Y. The units are *m/s* or *ft/s*, but can be any other units, depending on the choice of units in the seismic data.
Mode	Model, Migrate, Model & Migrate. Setting this field to Migrate modifies the availability of fields in the rtmodel Compression Panel, rtmodel Computation Panels, and rtmodel Input Panel panels. default: Model
Restart file	This is where the application keeps information about shots already processed. It is usually best to put it where your output files are, and to give it a similar name. For example, if your output file basename is */home/projects/marmousi/input/marmousi – shots*, you might call the restart file */home/projects/marmousi/input/marmousi – shots.restart*. default: */scratch/shot.restart*

continues on next page

Table 134. rtmodel Module Main Panel Fields–continued

Field	Description
Peak Frequency	This field has a somewhat historical definition in units of Hz. The value is based on the definition of the default Ricker wavelet, and refers to the peak frequency of the defining Gaussian pulse (since the Ricker wavelet is the second derivative of the Gaussian pulse, its peak frequency is actually higher than the Gaussian pulse itself). The maximum produced frequency will be roughly 2.8 times this number. default: 5
Wavelet	The name of the wavelet convolved with a reflectivity trace to generate a synthetic seismogram: Ricker (zero-phase) or Spike (which is mostly useful for migration), or From File (where you specify your own wavelet). If you specify a wavelet, you must then specify two additional parameters: Wavelet File and Wavelet Lead. default: Ricker
Wavelet File	When you have specified that the wavelet is From File, this field allows a single trace to be read from a seismic input file to define the source wavelet.
Wavelet Lead (ms)	When you have specified that the wavelet is From File, the specified wavelet will be centered at this point.
Source CDP Location	Either a single value, or a range: minimum, maximum, and increment. This field is not visible for Migrate Mode.
Source Line Location	Either a single value, or a range: minimum, maximum, and increment. This field is not visible for Migrate Mode.
Max Time (ms)	Data will be acquired or migrated for this length of time. default: 4000
Scratch Basename	The application needs temporary storage for acquired data, accumulated image, and others. All of these filenames will start with this prefix.

rtmodel Model Panel

The rtmodel Model panel contains only two parameters that specify the header keys to be used if different from that specified in the input data.

- Model Line Key—Use this value if different from data (see 'Input' group).
- Model Cdp Key—Use this value if different from data (see 'Input' group).

rtmodel Input Panel

Figure 171 enables you to specify basic information to be used by the module. The fields on the panel are described in Table 135.

Figure 171. rtmodel Module Input Panel, Model Mode

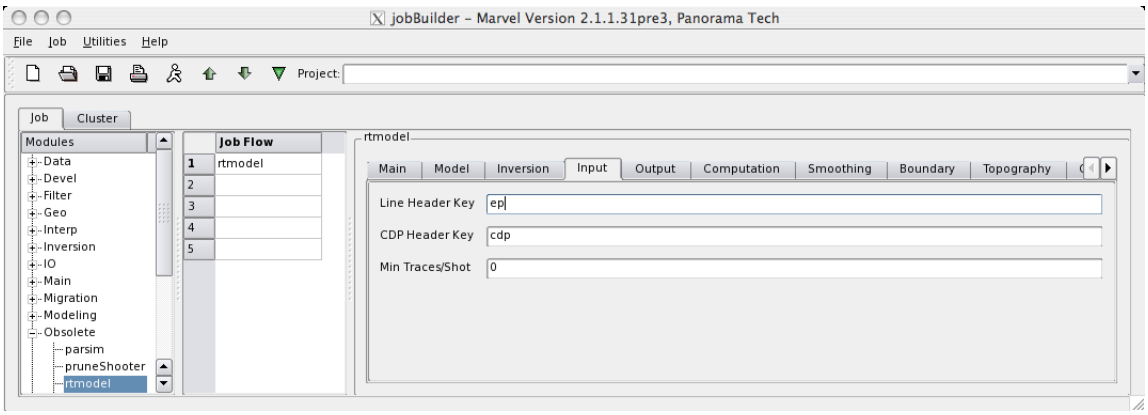


Table 135. rtmodel Module Input Panel Fields

Field	Description
Line Header Key	Header key containing line designators. MARVEL usually uses *ep*, which is a 4-byte integer at location 17 in SEG-Y files. default: ep
CDP Header Key	Header key containing line designators. MARVEL usually uses ep, which is a 4-byte integer at location 17 in SEG-Y files. default: cdp
Shot Centering	For modeling, the only generally useful choices are: Source Point - computation aperture is centered on the source. Model - computation aperture is centered at the center of the model. Generally, the apertures should be at least half the dimensions of the model in this case. default: Source Point

continues on next page

Table 135. rtmodel Module Input Panel Fields–continued

Field	Description
Input Shot Normalization	Normalization corrects for the amplitude effects of wavefront divergence and damping. It is also used when you apply a subsequent filter for eliminating the surface waves. If RMS, each input shot is divided by its RMS value before processing. Possible values: None or RMS. **Note: This field is visible only if the Mode field in the rtmodel Main Panel is set to Migrate.** **default: RMS**

rtmodel Output Panel

Figure 172 enables you to specify basic information to be used by the module. The fields on the panel are described in Table 136.

Figure 172. rtmodel Module Output Panel, Model

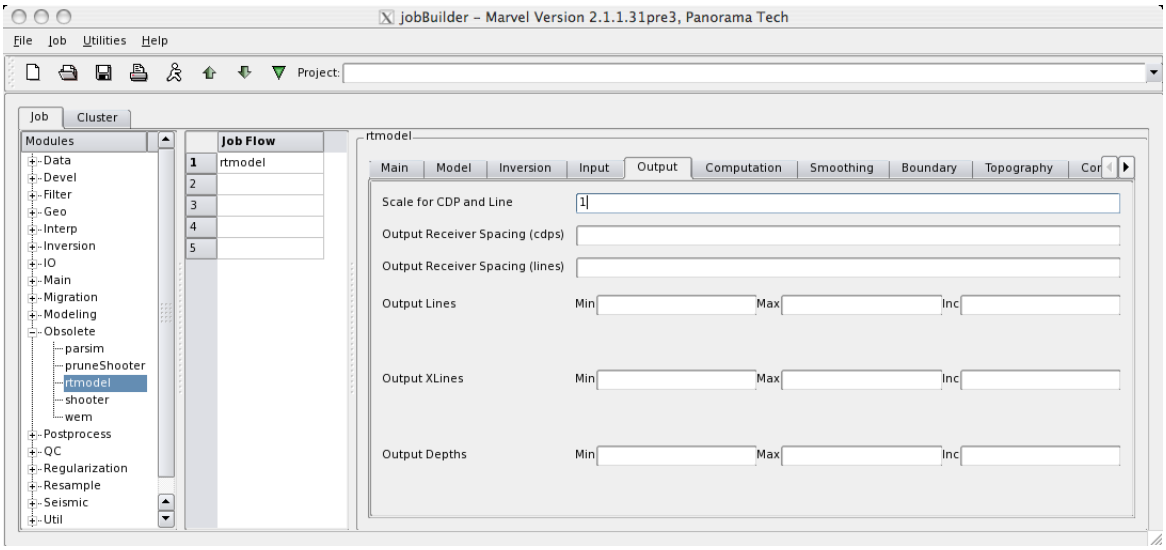


Table 136. rtmodel Module Output Panel Fields

Field	Description
Scale for CDP and Line	If the output spacings (see below) are set to odd numbers, the CDP and Line numbers will be fractional. Scaling them by 10 may help in viewing the output. MARVEL viewers do not use fractional CDP and line numbers.
Output Receiver Spacing (cdps)	Data will be acquired on a grid centered on the shot point, with this spacing along the CDP axis. *Used for modeling.*
Output Receiver Spacing (lines)	Data will be acquired on a grid centered on the shot point, with this spacing along the line axis. *Used for modeling.*
Output Lines	Min, max, and increment for lines in the output volume. *Used for migration.*
Inline Aliasing	Attempt to compensate for aliasing in the inline direction (units: lines). **Note: This can be a costly operation.** ***Used for migration.***

continues on next page

Table 136. rtmodel Module Output Panel Fields–continued

Field	Description
Output XLines	Min, max, and increment for xlines (cdps) in the output volume. *Used for migration.*
Xline Aliasing	Attempt to compensate for aliasing in the crossline direction (units: xlines). **Note: This can be a costly operation.** ***Used for migration.***
Output Depths	Min, max, and increment for depths (m/ft) in output volume. *Used for migration.*

rtmodel Computation Panels

There are six slightly different rtmodel Computation panels depending on your selections in the Mode field of the rtmodel Main panel (see Figure 169) and the Allow Surface Multiples field of the Computation panel. For simplicity, only two of these panels are shown, the others are based on these two panels. The fields on these panels are described in Table 137.

Figure 173. rtmodel Computation Panel, Model Mode and Allow Surface Multiples=Yes

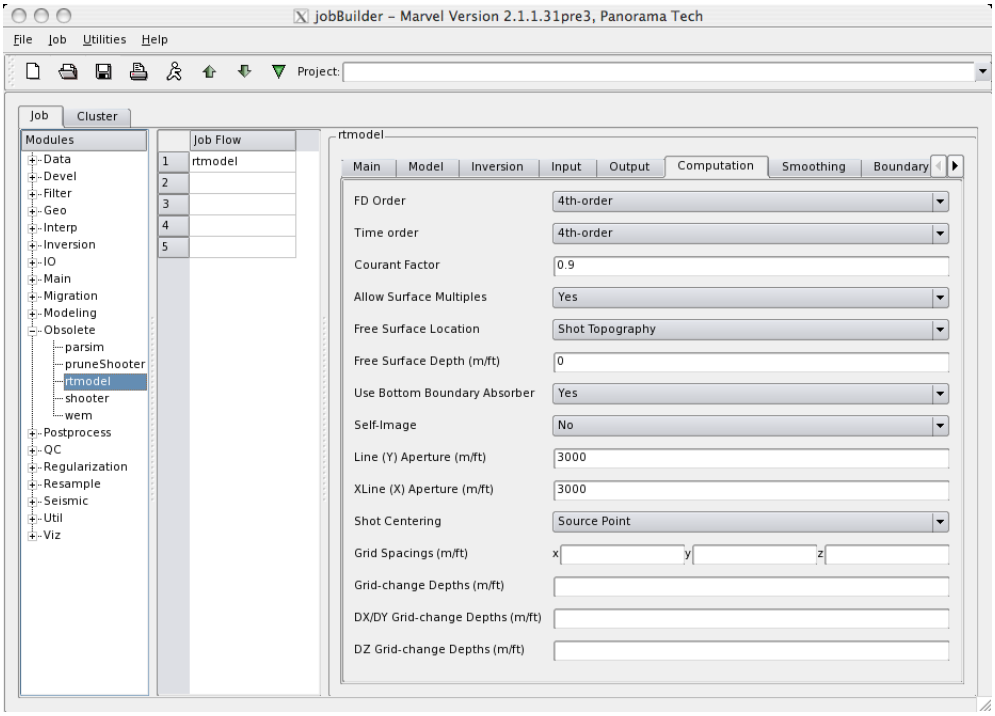


Figure 174. rtmodel Computation Panel, Migrate Mode and Allow Surface Multiples=Yes

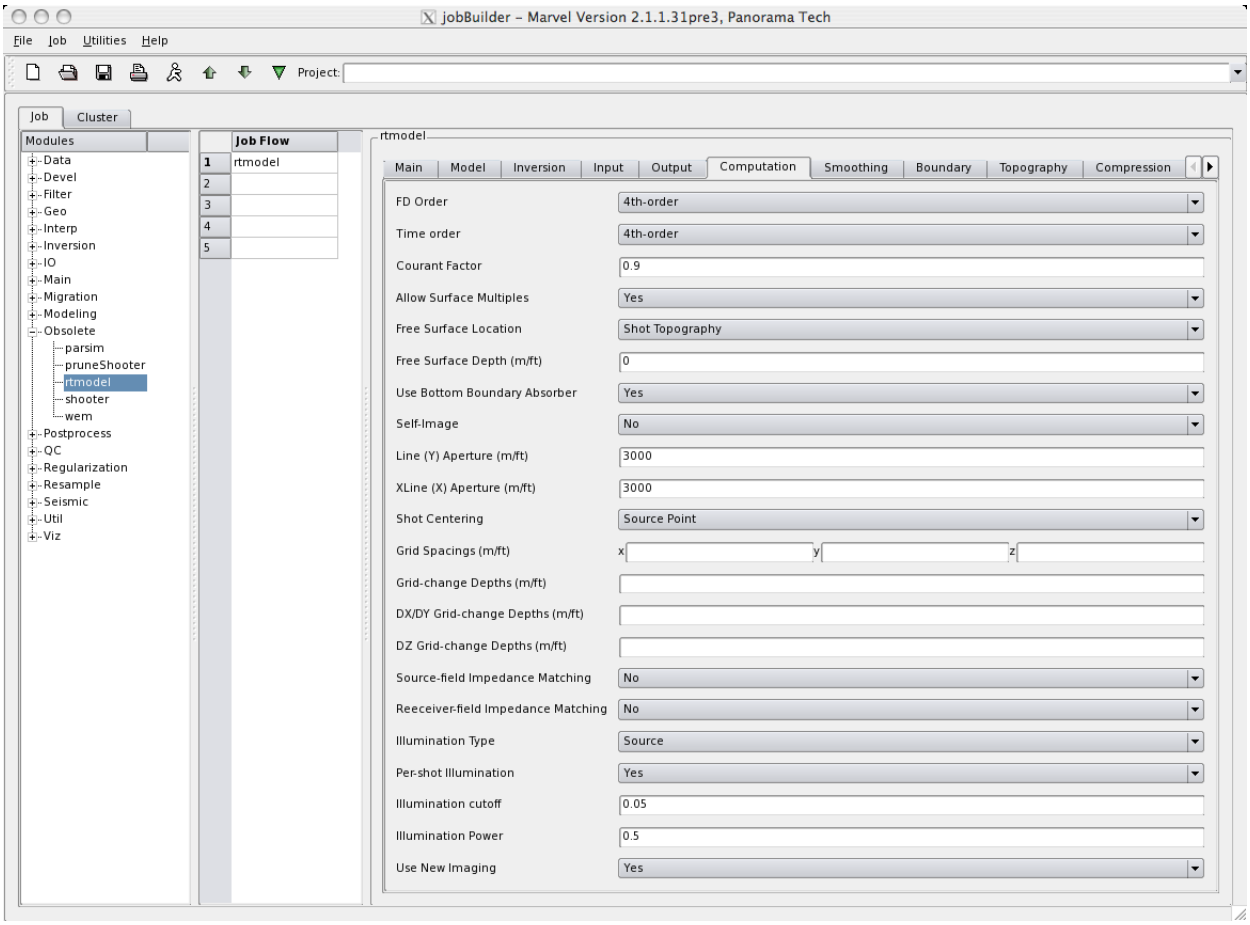


Table 137. rtmodel Module Computation Panel Fields

Field	Description
FD Order	This determines the order of accuracy of the spatial derivatives used in the simulation. For second-order, a second derivative is computed using 3 grid points. For 8^{th}-order,9 grid points are used, with 5 unique coefficients. This is usually the ideal combination for speed and accuracy. **Note: As of MARVEL version 2.1.1.28, orders higher than eight do not work on vectorized platforms; this includes 32-bit and 64-bit x86 architectures, as well as Cell/PPC.** **default: Fourth Order**

continues on next page

Table 137. rtmodel Module Computation Panel Fields–continued

Field	Description
Time order	2^{nd}-order time uses a three-point stepping algorithm. 4^{th}-order uses the wave equation to compensate for errors in the former approach (usually referred to in the industry as 'the Dablain trick').
Courant Factor	The internal time step is determined by the Courant stability condition, involving the grid spacing and the maximum velocity. For the default 4^{th}-order time, this code is stable with a factor of .9; for 2^{nd}-order time, a value of .85 is recommended. Slightly smaller values *may* result in slightly better output, but probably will not help.
Allow Surface Multiples	If this field is set to Yes, a free surface is modeled, and the wave field will reflect off the top, leading to multiples in the data. If the field is set to No, an absorbing zone will be placed at the top. default: Yes
Free Surface Location	This field is visible only if Allow Surface Multiples is set to Yes. There are three options to this field: • Shot Topography—Reflections occur at the topography defined for shots (see below) • Receiver Topography—Reflections occur at the topography defined for receivers (see below) • Fixed Depth—Free surface is at user-specified depth
Free Surface Depth (m/ft)	User-specified free-surface depth, when 'Fixed Depth' is chosen for 'Free Surface Location'. This field is visible only if Allow Surface Multiples is set to Yes.
Use Bottom Boundary Absorber	This field has two options: • Yes—Waves are absorbed at the bottom. • No—Waves can reflect off the bottom. This generally does little harm, and costs a bit less. default: Yes
Line (Y) Aperture (m/ft)	The computation for each shot is limited along the y axis to a range above and below the center of the shot. default: 3000
XLine (X) Aperture (m/ft)	The computation for each shot is limited along the x axis to a range above and below the center of the shot. default: 3000

continues on next page

Table 137. rtmodel Module Computation Panel Fields–continued

Field	Description
Shot Centering	• Source Point • Shot + Receiver Box • Avg Midpoint • Model default: Source Point
Grid Spacings (m/ft)	If left blank, these will be determined by the 'Output Receiver Spacings' (see above). Otherwise, these specify the spacings of the computation grid.
Grid-change Depths (m/ft)	
DX/DY Grid-change Depths (m/ft)	
DZ Grid-change Depths (m/ft)	
Source Field Impedance Matching	Use 'non-reflecting' wave equation for source propagation, and is an attempt to reduce artifacts. Costly, and not very effective. NOTE - probably broken in version 2.1.1.28. This field is visible only if the Mode field in the rtmodel Main Panel is set to Migrate. Default: No
Receiver-field Impedance Matching	Use 'non-reflecting' wave equation for receiver back-propagation in an attempt to reduce artifacts. Costly and not very effective. NOTE - probably broken in version 2.1.1.28. This field is visible only if the Mode field in the rtmodel Main Panel is set to Migrate. default: No
Illumination Type	An illumination is produced. Generally, the default value of 'Source' should be used. In this case, the illumination is just the sum of the squared source fields at each image point. This field is visible only if the Mode field in the rtmodel Main Panel is set to Migrate. default: Source.Receiver

continues on next page

Table 137. rtmodel Module Computation Panel Fields–continued

Field	Description
Per-Shot Illumination	Each shot image can be divided by the illumination separately. This tends to be noisier, but can help to image steep dips in some cases. This field is visible only if the Mode field in the rtmodel Main Panel is set to Migrate.
Illumination cutoff	This field is visible only if the Mode field in the rtmodel Main Panel is set to Migrate, and if Per-Shot illumination is Yes. default: 0.05
Illumination Power	For a value of ‘1’, the illumination is the squared source. This field is visible only if the Mode field in the rtmodel Main Panel is set to Migrate, and if Per-Shot illumination is Yes. default: 0.5

rtmodel Smoothing Panel

The Figure 175 panel enables you to specify basic information to be used by the smoothing calculations in the rtmodel module. The fields on the panel are described in Table 138.

Note:

The fields on the Smoothing panel are available only if the Mode field in the rtmodel Main panel is set to Migrate, see rtmodel Main Panel.

Figure 175. rtmodel Module Smoothing Panel, Migrate

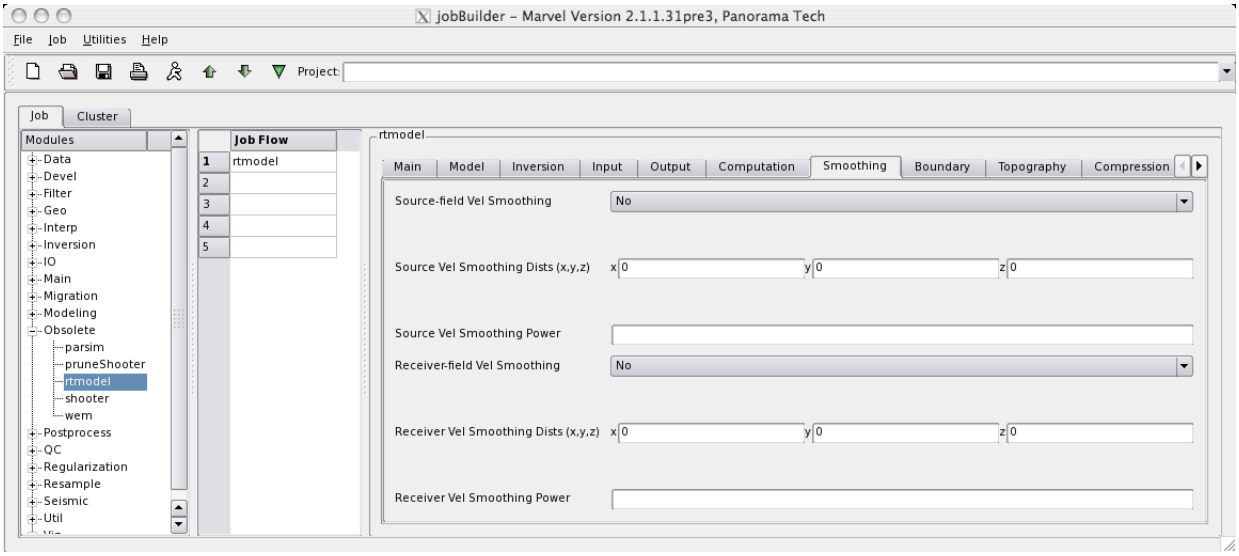


Table 138. rtmodel Module Smoothing Panel Fields

Field	Description
Source-field Vel Smoothing	Turn the smoothing of the velocity (slowness) field used to propagate the source term *on* or *off*. This process can be useful for reducing artifacts. **Note: This field is not available for Modeling or Modeling and Migration.** **default: No**
Source Vel Smoothing Dists (x,y,z)	Gaussian widths for smoothing slowness in each direction. **Note: This field is not available for Modeling or Modeling and Migration.** **default: 0**

continues on next page

Table 138. rtmodel Module Smoothing Panel Fields–continued

Field	Description
Source Vel Smoothing Power	The number of times to smooth the volume. **Note: This field is not available for Modeling or Modeling and Migration.**
Receiver-field Vel Smoothing	Turn the smoothing of the velocity (slowness) field used to propagate the receiver term *on* or *off*. This can be useful reducing artifacts. default: No
Receiver Vel Smoothing Dists (x,y,z)	Gaussian widths for smoothing slowness in each direction. default: 0
Receiver-field Vel Smoothing Power	The number of times to smooth the volume.

rtmodel Topography Panel

Figure 176 enables you to specify basic information to be used by the module. The fields on the panel are described in Table 139.

Figure 176. rtmodel Module Job Panel

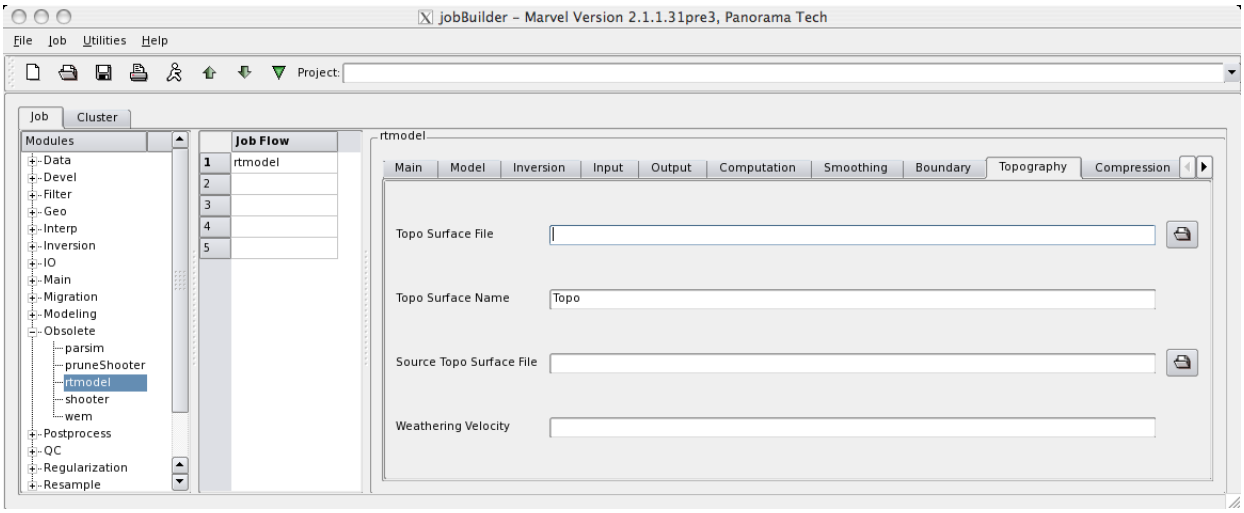


Table 139. rtmodel Module Job Panel Fields

Field	Description
Topo Surface File	The path and name of the topographic surface file. If given, this specifies the acquisition topography (and if no Source Topo File is given, this file is used for both sources and receivers). This can be a MARVEL surface file, or a simple flat file defining the topography, with each line containing the line, crossline and depth values, for example: ep=100 cdp=500 z=20
Topo Surface Name	A MARVEL surface file can have many surfaces. This is the name of the one to be used. default: Topo
Source Topo Surface File	The path and name of the source topographic surface file. If given, this specifies the source topography. This can be a MARVEL surface file, or a simple flat file defining the topography, with each line containing the line, crossline and depth values, for example: ep = 100 cdp = 500 z = 20
Weathering Velocity	The weathering velocity to use in the calculations.

rtmodel Compression Panel

Figure 177 and Figure 178 enables you to specify basic information to be used by the module. The fields on the panel are described in Table 140.

Figure 177. rtmodel Module Compression Panel

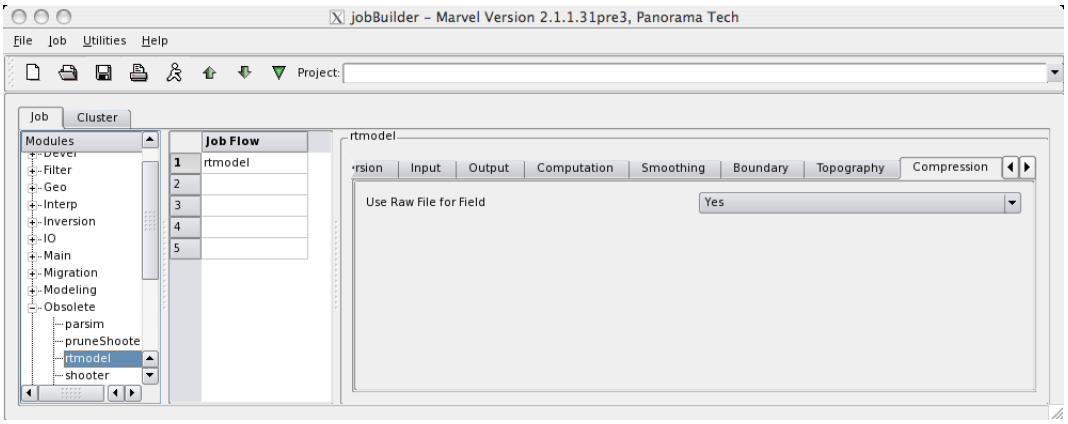


Figure 178. rtmodel Module Compression Panel

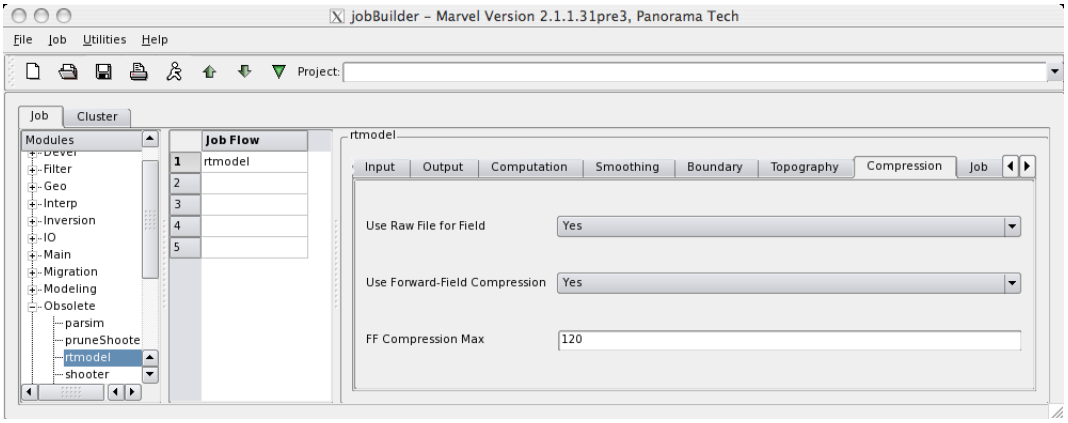


Table 140. rtmodel Module Compression Panel Fields

Field	Description
Use Raw File for Field	Necessary for compression. If No, stored source term is stored in SEG-Y files (SLOW).
Use Forward Field Compression	Turns compression for the source term on or off; uses a fast video compression technique. **Note:** This field is only available if the Mode field on the rtmodel Main panel is set to Migrate.

continues on next page

Table 140. rtmodel Module Compression Panel Fields–continued

Field	Description
FF Compression Max	As part of the compression, this specifies the amplitude range used to store the samples. For most projects, the default of 120 produces good results, but for some projects, a more dynamic range may be needed. **Note:** This field is only available if the Mode field on the rtmodel Main panel is set to Migrate. default: 120

rtmodel Job Panel

Figure 179 enables you to specify basic information to be used by the module. The fields on the panel are described in Table 141.

Figure 179. rtmodel Module Job Panel

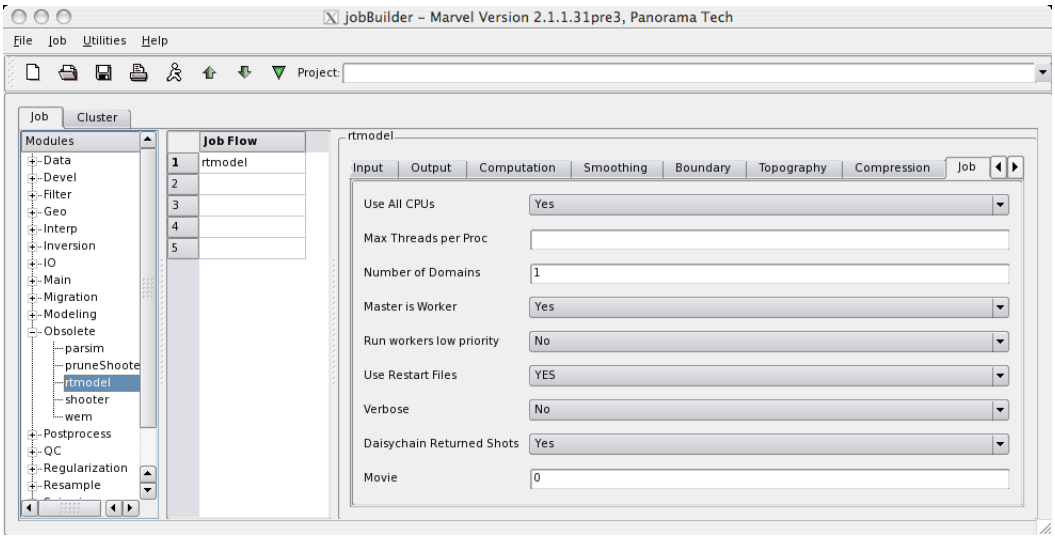


Table 141. rtmodel Module Job Panel Fields

Field	Description
Use All CPUs	This really means that each worker should use multiple threads. If *No*, then there will be one independent worker spawned for each CPU (or core) in the cluster.
Max Threads Per Proc	If *UseAllCPUs* is set to *Yes*, this field limits the number of CPUs (cores) that a single worker can use.
Number of Domains	The computation grid will be split up among this number of workers for each shot. default: 1
Master is Worker	Yes—workers will be spawned on the master node of the job. No—workers will NOT be spawned on the master node of the job.
Run workers low priority	If *Yes*, workers will be spawned with reduced priority. although the master process will remain at high priority. This can be useful especially when *MasterIsWorker* is set to *Yes*, so that one worker does not slow down the collection or submission of shots for all of the others.

continues on next page

Table 141. rtmodel Module Job Panel Fields–continued

Field	Description
Use Restart Files	If *No*, the job will ignore restart information and start from the beginning.
Verbose	Switch for turning debug printing on and off. default: 0
Daisychain Returned Shots	If *Yes*, multiple shots can be returned at once, and stacked along the way, before going out. This saves I/O time. *This field is not used for modeling.* default: 1
Movie	

samo Module

The samo module is accessed under the Regularization node of the jobBuilder module tree.

Figure 180. samo Main Panel

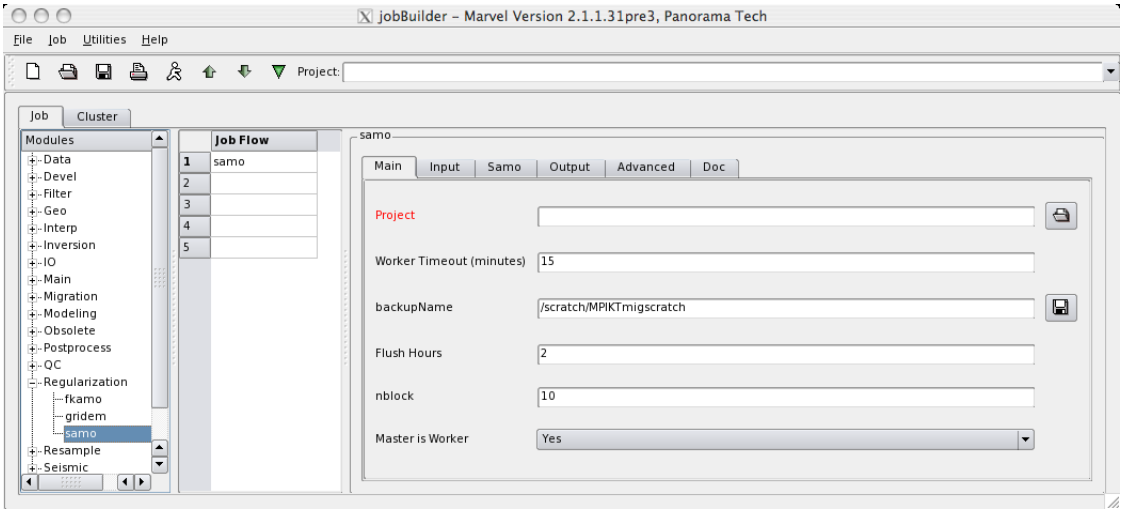


Table 142. samo Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates. **This is a REQUIRED entry.**
Worker Timeout (minutes)	Worker components that have not responded in this amount of time are assumed to be dead. default: 15 minutes
BackupName	The name of the file to contain backup data if a restart becomes necessary. default: */scratch/MPIKTmigscratch* **Note: This file is not deleted when a job finishes successfully. You must delete the file manually.**
Flush Hours	The time, in hours, between backups. default: 2
Flush Hours	The time, in hours, between backups. default: 2
nblock	The size of the trace block. default: 1 **Note: This parameter should not be set when using eyeBeam.**

continues on next page

Table 142. samo Main Panel Fields–continued

Field	Description
Master is Worker	Flag that controls whether the master I/O controller is also used for migrating data. default: Yes

samo Input Panel

Figure 181. samo Input Panel

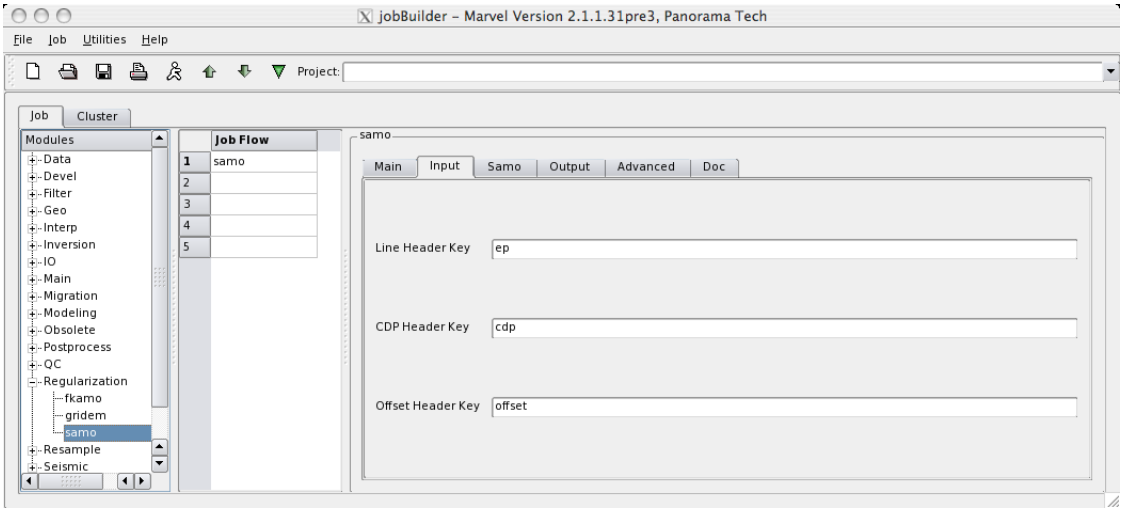


Table 143. samo Input Panel Fields

Field	Description
Line Header Key	Header key containing line designators. MARVEL usually uses ep, which is a 4-byte integer at location 17 in SEG-Y files. default: ep
CDP Header Key	Header key containing CDP (crossline) designators. MARVEL usually uses cdp, which is a 4-byte integer at location 21 in SEG-Y files. default: cdp
Offset Header Key	The key word to be used for OFFSET in the MARVEL format. default: offset

samo samo Panel

Figure 182. samo Samo Panel

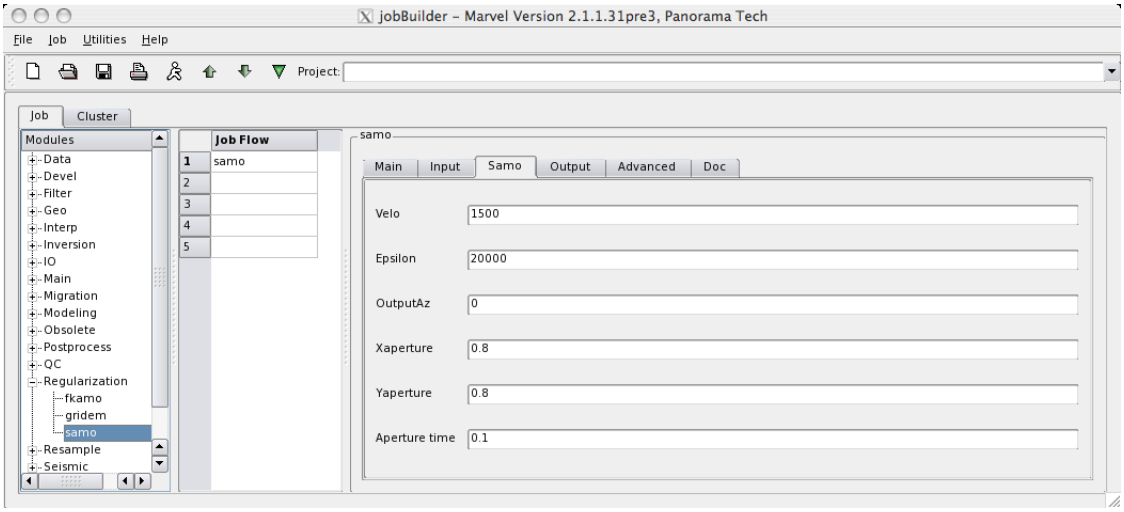


Table 144. samo Samo Panel Fields

Field	Description
Velo	default: 1500
Epsilon	default: 20000
OutputAz	default: 0
Xaperture	default: 0.8
Yaperture	default: 0.8
Aperture time	default: 0.1

samo Output Panel

Figure 183. samo Output Panel

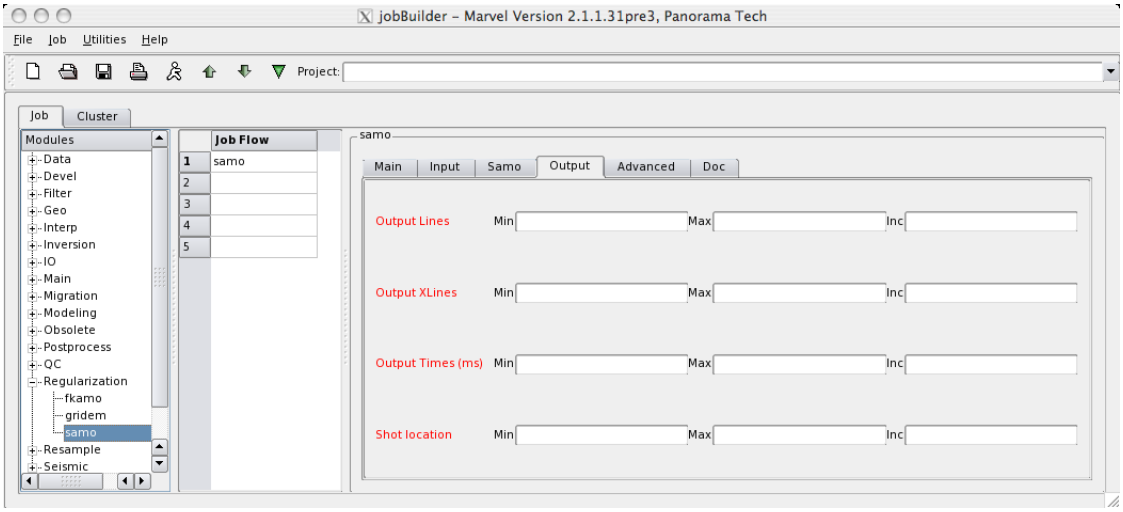
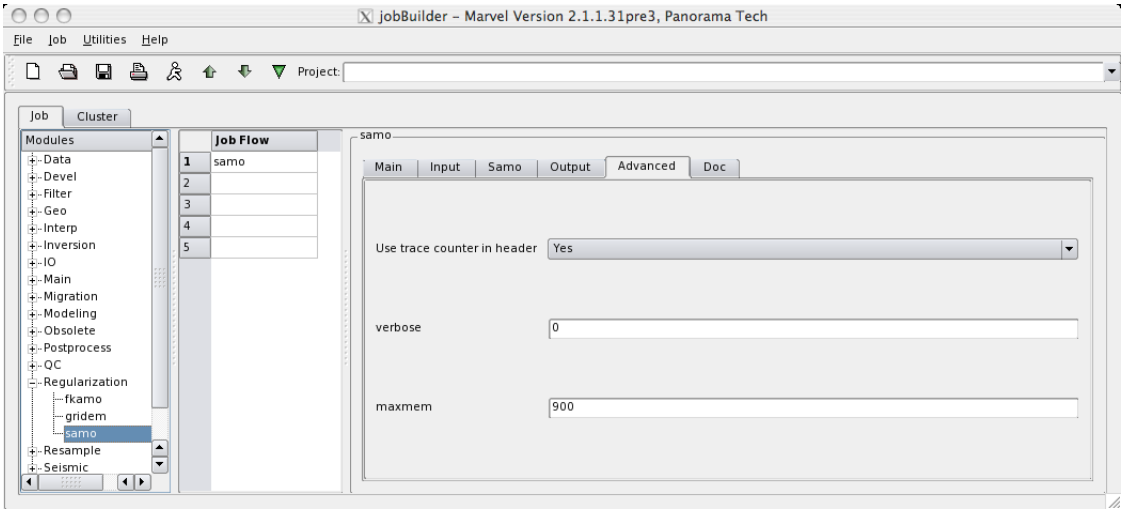


Table 145. samo Samo Panel Fields

Field	Description
Output Lines	The minimum, maximum, and increment values for output lines.
Output XLines	The minimum, maximum, and increment values for output crosslines.
Output Times	The minimum, maximum, and increment values for output times.
Shot location	

samo Advanced Panel

Figure 184. samo Advanced Panel



- Use trace counter in header—Flag indicating whether or not the trace counter that diskRead puts in the trace header will be used. default: Yes
- verbose—Switch for turning debug printing on and off. default: No
- Maxmem—Maximum amount of memory to be used by MARVEL per eyeBeam instance. default: 900

scan Module

The scan module, Figure 185, scans and thresholds input traces and outputs various statistical quantities, as described in Table 146. The scan module is accessed under the QC node of the jobBuilder module tree.

Figure 185. scan Panel

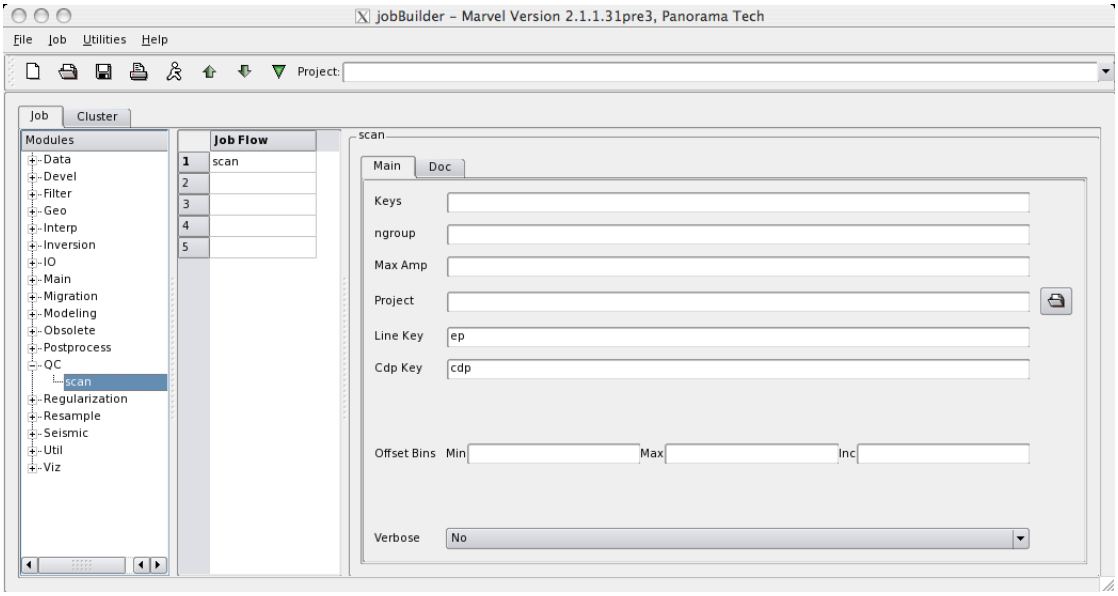


Table 146. scan Panel Fields

Field	Description
Keys	The keys defining an ensemble for reporting.
ngroup	Number of traces per ensemble. This parameter is ignored if Keys is set.
Max Amp	The maximum threshold amplitude.
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates.
Line Key	The header key specifying where line data is stored. default: ep
Cdp Key	The header key specifying where CDP data is stored. default: cdp
Offset Bins	Specifies the offset bins in which to read the data.
Verbose	Switch for turning debug printing on and off. default: No

semblance Module

The semblance module is accessed under the Geo node of the jobBuilder module tree.

Theory

The semblance module computes the semblance panel for a given CDP gather. Velocity analysis is usually a two-dimensional process for determining the optimal values of the vertical two-way travel-time and stacking velocity. When the travel-time curve deviates extensively from hyperbolic, the quartic term of the travel-time series must be part of the computations. In its simplest form (with $a2 = 0$), the optimization of all parameters becomes three dimensional. Repeating a conventional two-dimensional scan for each change of the quartic term produces the desired 3D time-velocity-anisotropy volume. The traveltime function for a scan of this type is defined by Equation 8. The coefficients *a1* and *a2* are assumed to be small and, consequently, deviation from hyperbolic arrival is also small. Triplications are beyond the scope of this program.

Equation 8:

$$t^2 = t_0^2 + \frac{h^2}{4v^2} - \frac{a_1 x^4}{1 + a_2 x^2}$$

Semblance is defined by Equation 9, where *n* is the number of non-zero samples after muting, and *d(t,j)* is the jth trace in the input ensemble. Both the numerator and denominator are smoothed prior to the computation of this quotient.

Equation 9:

$$s(t) = \left[\frac{\left(\sum_0^{n-1} d(t,j) \right)^2}{\sum_0^{n-1} d(t,j)^2} \right]^{pwr}$$

When the *pwr* factor is greater than 1, it acts as both a compressor and expander, with the upper range of the semblance expanded and the lower range compressed. This tends to decrease the number of large values and makes picking an easier process.

Conversely, when the *pwr* factor is less than 1, this increases the number of large values and makes picking more difficult.

Main Panel

Note:

This module expects input data to be in CDP order.

Figure 186 shows a semblance Module panel, and Table 147 describes the fields on the panel.

Figure 186. semblance Main Panel

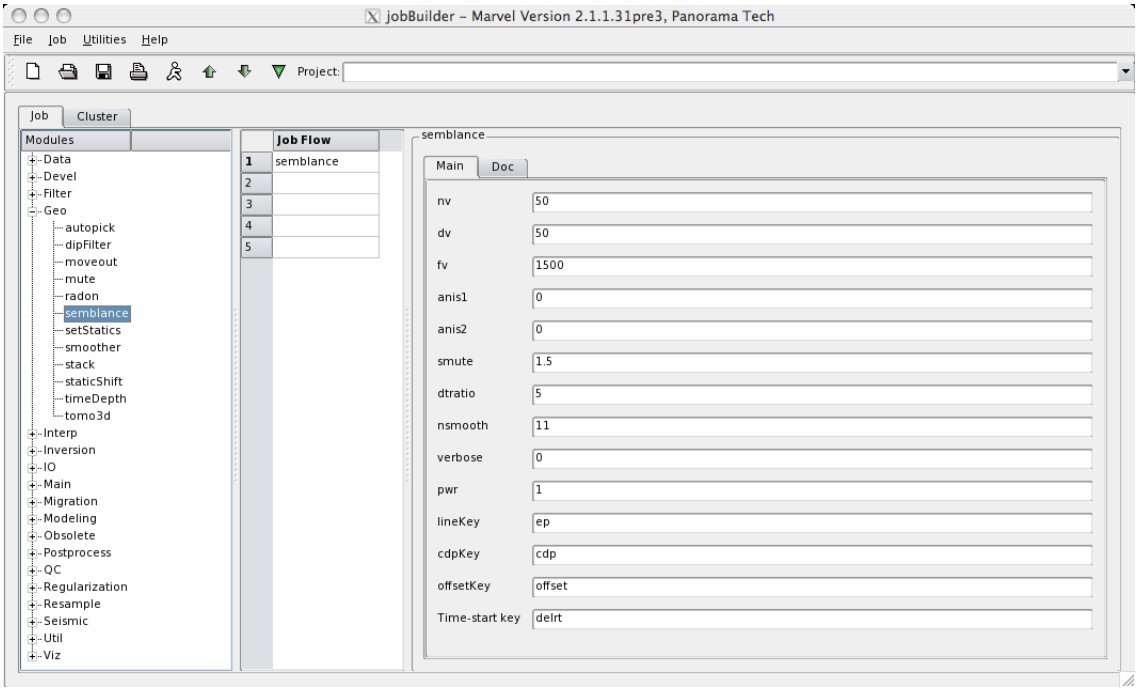


Table 147. semblance Main Panel Fields

Field	Description
nv	The number of velocities in any given scan. default: 50
dv	The velocity increment. default: 50
fv	The first velocity value. default: 1500
anis1	The anisotropy factor in the numerator in Equation 8, that is, *a1*. default: 0

continues on next page

Table 147. semblance Main Panel Fields–continued

Field	Description
anis2	The anisotropy factor in the denominator in Equation 8, that is, *a2*. default: 0
smute	The stretch mute value. default: 1.5
dtratio	The ratio of output to input time samples. default: 5
nsmooth	The number of samples to smooth the denominator and numerator in the semblance calculations. default: 11
verbose	Switch for turning debug printing on and off. default: 0
pwr	The power on the semblance function. default: 1
lineKey	The header key where line information is stored. default: ep
cdpKey	The header key where CDP information is stored. default: cdp
offsetKey	The header key where offset information is stored. default: offset
Time-start key	The header key specifying where the initial time of the trace is stored. default: deirt

setStatics Module

The setStatics module is accessed under the Geo node of the jobBuilder module tree.

Figure 187. setStatics Panel

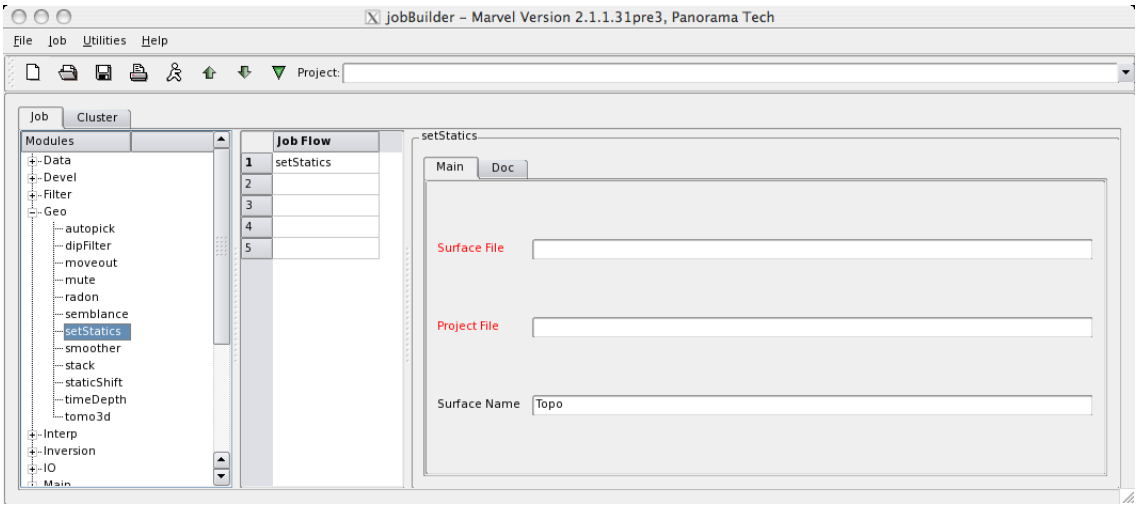


Table 148. setStatics Panel Fields

Field	Description
Surface File	The path and name of the topographic surface file. If given, this specifies the acquisition topography (and if no Source Topo File is given, this is for both sources and receivers). This can be a MARVEL surface file, or a simple flat file defining the topography, with each line containing the line, crossline and depth values, for example: ep = 100 cdp = 500 z = 20 **This is a required entry.**
Project File	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates. **This is a required entry.**
Surface Name	The header key specifying where the topographic data are stored. A MARVEL surface file can have many surfaces. This is the name of the one to be used. default: Topo

shooter Module

Note:

Although this module is still provided for compatibility purposes, its use has been deprecated. It is recommended that you use the rayshooter module, instead.

The shooter module is accessed under the Obsolete node of the jobBuilder module tree.

See also rayshooter Module.

shooter Main Panel

Figure 188 enables you to specify basic information to be used by the module. The fields on the panel are described in Table 149.

Note:

If the output range is smaller then the aperture range, the output range is used to limit the size of the traveltime table.

Figure 188. shooter Main Panel

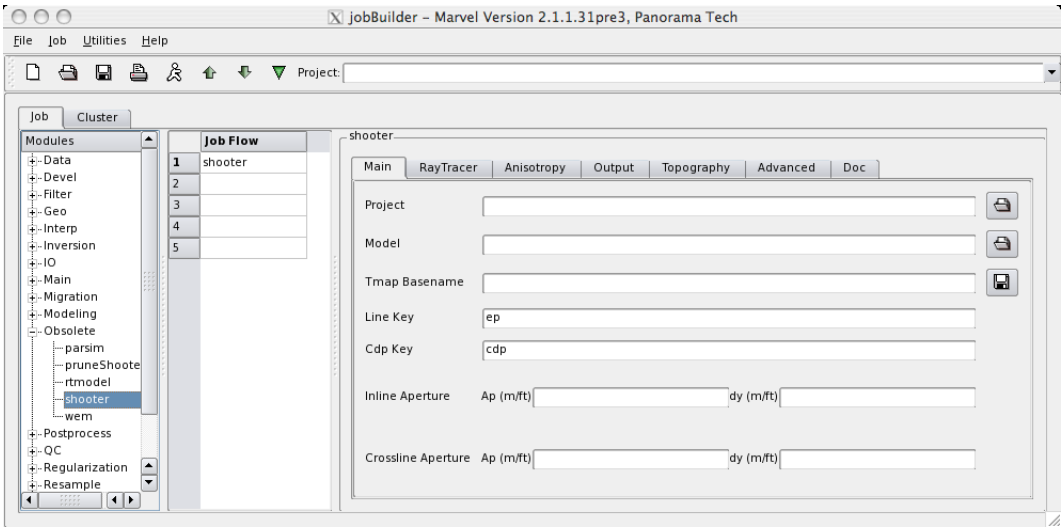


Table 149. shooter Main Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates.
Model	The name of the input model.
Tmap Basename	The prefix used to produce the traveltime output files with suffix .tmap.
Line Key	The header key for the line number in the model file. default: ep
Cdp Key	The header key for the CDP number in the model file. default: cdp
Inline Aperture	The length, in meters or feet, in the line direction aperture limit.
Crossline Aperture	The length, in meters or feet, of the crossline, or CDP, direction aperture limit.

shooter RayTracer Panel

The shooter RayTracer panel, Figure 189, enables you to specify information that is to be used in ray tracing operations. The fields on the panel are described in Table 150.

Figure 189. shooter RayTracer Panel

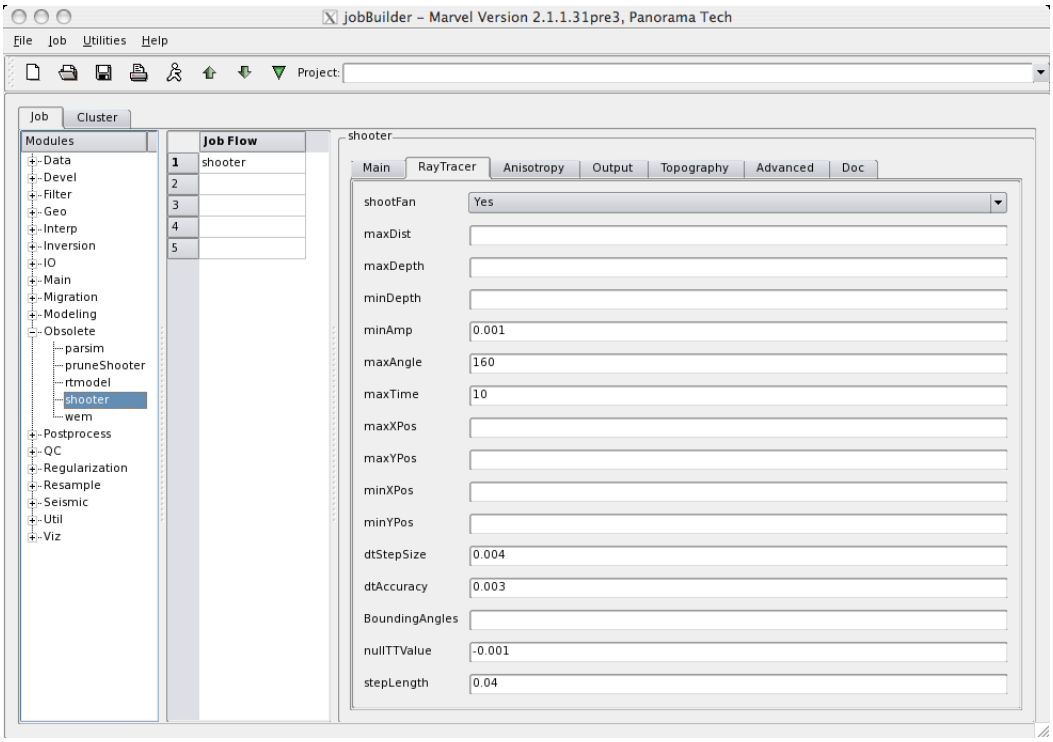


Table 150. shooter RayTracer Panel Fields

Field	Description
shootFan	Selects the shooting direction: Yes causes rays to be shot toward deeper depths, while No causes rays to be shot upward toward shallower depths. default: Yes
maxDist	The maximum horizontal distance a ray can travel. If this parameter is defaulted to zero, the maximum distance a ray can travel is set to the maximum extent of the model.
maxDepth	The maximum depth a ray can travel. If this parameter is defaulted to 0, the maximum depth of a ray is set to the maximum depth of the model.

continues on next page

Table 150. shooter RayTracer Panel Fields–continued

Field	Description
minDepth	The minimum depth a ray can travel. If this parameter is defaulted the ray has to minimum depth.
minAmp	The cutoff amplitude of a ray. This value is in terms of paraxialAmp x pathLength x velocity. • In constant velocity, this value stays at 1.0 all along the ray. • For a linear velocity gradient starting with 5000 ft/sec at the surface and reaching 10000 ft/sec at a depth of 10000 feet, this value will be 0.66 at 10000 feet for a ray straight down. **Note:** It is recommended that you set this value to about 0.10 so that only the very low amplitude rays are dropped. If you set the value to a large value, you will reduce run time at the expense of accuracy. default: 0.01
maxAngle	The maximum angle a ray can attain. When set to 180 degrees, this can potentially cause the generation of turning rays and thus produce corresponding longer traveltimes. Generally, a reasonable compromise between speed and accuracy is to set this value in the neighborhood of 160 degrees. default: 160
maxTime	The maximum time a ray can travel. default: 10
maxXPos	The maximum x or crossline direction distance a ray end point can attain. This value can potentially override the maxDist parameter.
maxYPos	The maximum y or line direction distance a ray end point can attain. This value can potentially override the maxDist parameter.
minXPos	The minimum x or crossline direction distance a ray end point can attain. This value can potentially override the maxDist parameter.
minYPos	The minimum y or line direction distance a ray end point can attain. This value can potentially override the maxDist parameter.

continues on next page

Table 150. shooter RayTracer Panel Fields–continued

Field	Description
dtStepSize	Ray tracing step length (in seconds) used for smoothing the velocity model. This is crucial for stability and for this routine to run quickly. The velocity is smoothed by 1.5 x averageVelocity x stepLength. For a 60 Hz freq, your stepLength should be about 0.040 seconds. For velocities that average 7000 ft/sec, the smoothing is then 420 feet. **Note:** Since the ray tracing is adaptive, the smoothing value can actually be fairly small, but this is not recommended. In general, your velocity should be smoothed at least a few hundred feet anyway, probably a few thousand. A value of 0.0 will turn off smoothing. If this value is not 0.0, but it is less than 2.5 x MIN(dx,dy), the value will be set to 2.5 x MIN(dx,dy). default: 0.004
dtAccuracy	The desired accuracy of travel times. The recommended value of about 0.25 x 0.5/maxFrequency. For for 60 Hz data, dtAccuracy is 0.002 sec. default: 0.003
BoundingAngles	The take-off angles anglex1, anglex2, angley1 and angley2 that bound the initial ray fan, and define the direction cosines off vertical. The four values define an initial cone and provide a convenient method for limiting near surface apertures during the migration process. These four angles usually have values of about 70, -70, 70, -70. Examples: • anglex1 = -90, angley1 = 0 means horizontal in the negative x direction • anglex2 = 0, angley2 = 90 means horizontal in the positive y direction • anglex1 = 0,angley1 = 0 means a vertical ray.
nullTTValue	The value that is set inside a given zone where no rays have penetrated. This is a marker that tells the migration module not to image in these zones. default: -1
stepLength	The length of a time step along a ray. Because this value is adaptive, there is little reason to change the default value of .04 second. default: 0.04

shooter Anisotropy Panel

The parameters in the shooter module Anisotropy panel, Figure 190, define the various velocity model input options available for the acoustic and anisotropic raytracer. The fields on the panel are described in Table 151.

Note:

You must enter these files in the proper order. What the raytracer requires is enough information to define the vvelfile and eta. Thus, one and only one of following combinations must be entered:

- epsilonfile, delfile
- vvelfile, etafile
- vvelfile, epsilon
- vvelfile, delfile

Figure 190. shooter Anisotropy Panel

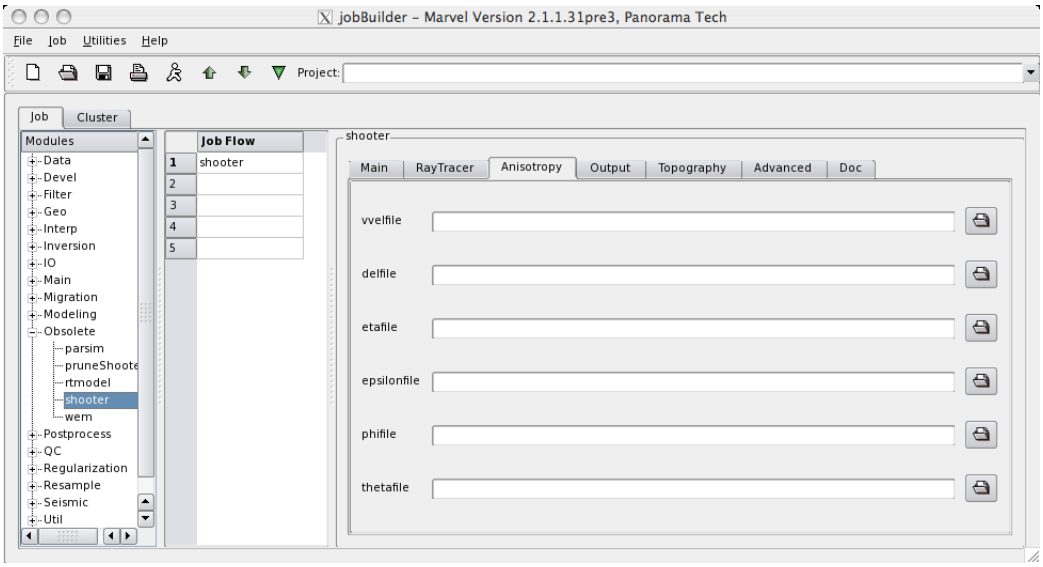


Table 151. shooter Anisotropy Panel Fields

Field	Description
vvelfile	The name of the V_{nmo} file. This file is closely related to the vertical velocity field.
delfile	The name of the file containing Thomsen's delta values, δ.

continues on next page

Table 151. shooter Anisotropy Panel Fields–continued

Field	Description
etafile	The name of the file containing Thomsen's eta values, η.
epsilonfile	The name of the file containing Thomsen's epsilon values, ε.
phifile	The name of the file containing Thomsen's phi values, φ.
thetafile	The name of the file containing Thomsen's theta values, θ.

shooter Output Panel

The output panel, Figure 191, enables you to control the output from the shooter module. Table 152 describes the fields on the panel.

Figure 191. shooter Output Panel

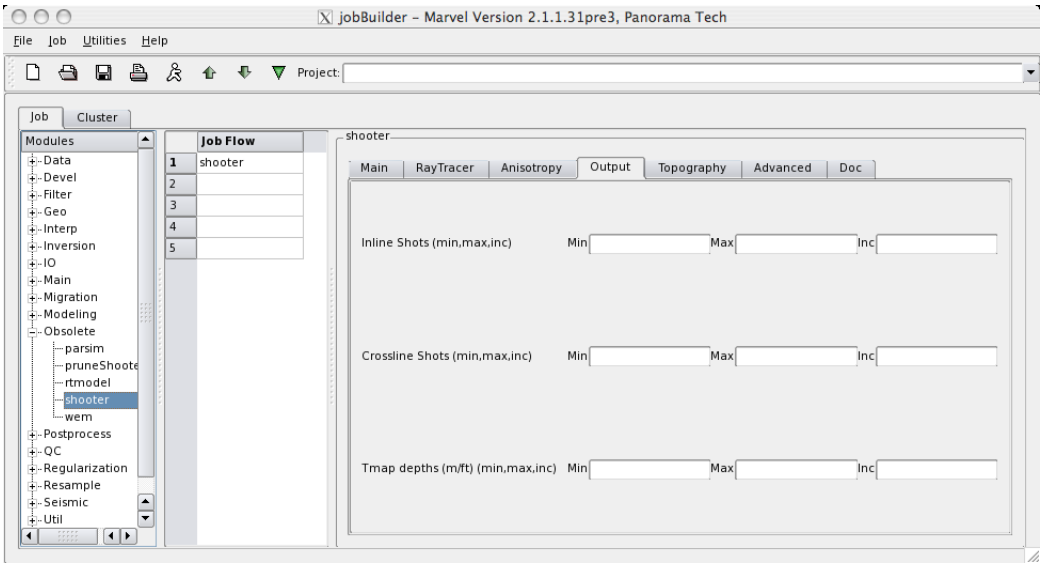


Table 152. shooter Output Panel Fields

Field	Description
Inline Shots	The Minimum, maximum, and incremental line range of the shot locations of the output travel-time volumes.
Crossline Shots	The Minimum, maximum, and incremental CDP range of the shot locations of the output travel-time volumes.
Tmap Depths	The minimum, maximum, and increment depth of each travel-time volume.

shooter Topography Panel

This panel, Figure 192, enables you to control the output from the shooter module. Table 153 describes the fields on the panel.

Figure 192. shooter Topography Panel

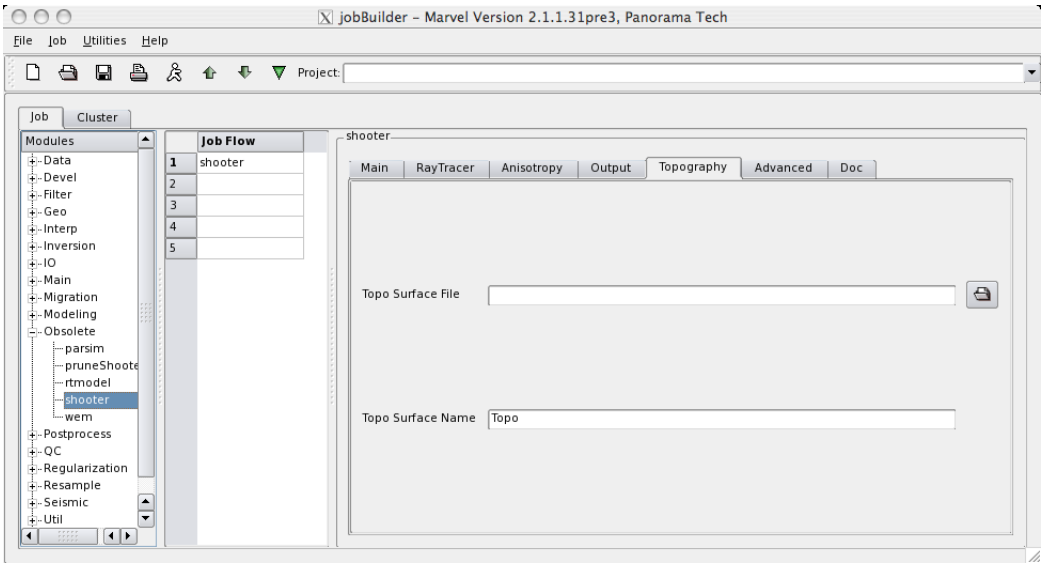


Table 153. shooter Output Panel Fields

Field	Description
Topo Surface File	The path and name of the topographic surface file. If given, this specifies the acquisition topography (and if no Source Topo File is given, this is for both sources and receivers). This can be a MARVEL surface file, or a simple flat file defining the topography, with each line containing the line, crossline and depth values, for example: ep = 100 cdp = 500 z = 20
Topo Surface Name	The header key specifying where the topographic data are stored. A MARVEL surface file can have many surfaces. This is the name of the one to be used. default: Topo

shooter Advanced Panel

The shooter module displays two versions of the Advanced panel depending on your Compress selection, shown in Figure 193 and Figure 194. The field values are described in Table 154.

Figure 193. shooter Advanced Panel–Compress, No

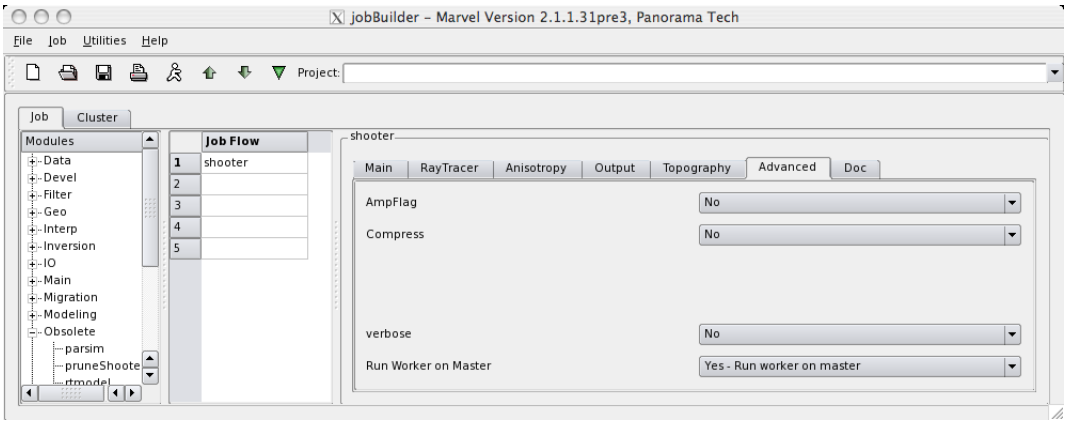


Figure 194. shooter Advanced Panel–Compress, No

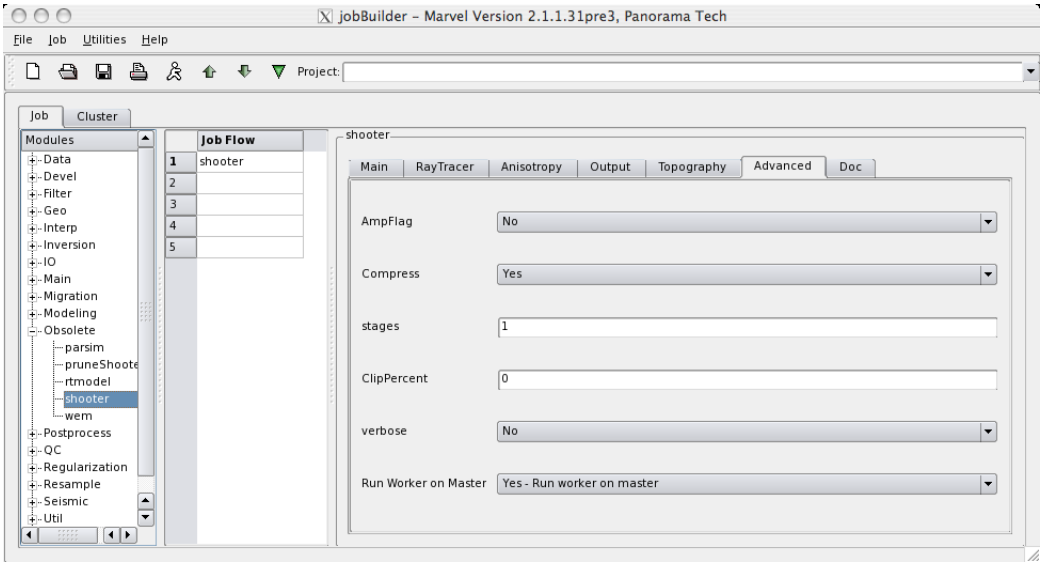


Table 154. shooter Module Advanced Panel Fields

Field	Description
AmpFlag	Determines whether or not amplitudes are calculated and output. default: No

continues on next page

Table 154. shooter Advanced Panel Fields–continued

Field	Description
Compress	Determines whether or not traveltimes and amplitudes (if calculated) are compressed. default: Yes
stages	The number of stages to use in the wavelet-based compression scheme. This field is displayed only if *Compress = Yes* has been selected. default: 1
ClipPercent	The percentage of the maximum amplitude defining the threshold in the wavelet domain below which amplitudes are zeroed. While clipping can increase compression efficiency, it can also seriously reduce accuracy. This field is displayed only if Compress = Yes has been selected. default: 0
verbose	Switch for turning debug printing on and off. default: No
Run Worker on Master	Determines whether or not the master is used in the computational process. default: Yes

smoother Module

The smoother module, Figure 195, enables you to control the smoothing operation performed on the output data. The fields on the panel are described in Table 155. The smoother module is accessed under the Geo node of the jobBuilder module tree.

Figure 195. smoother Panel

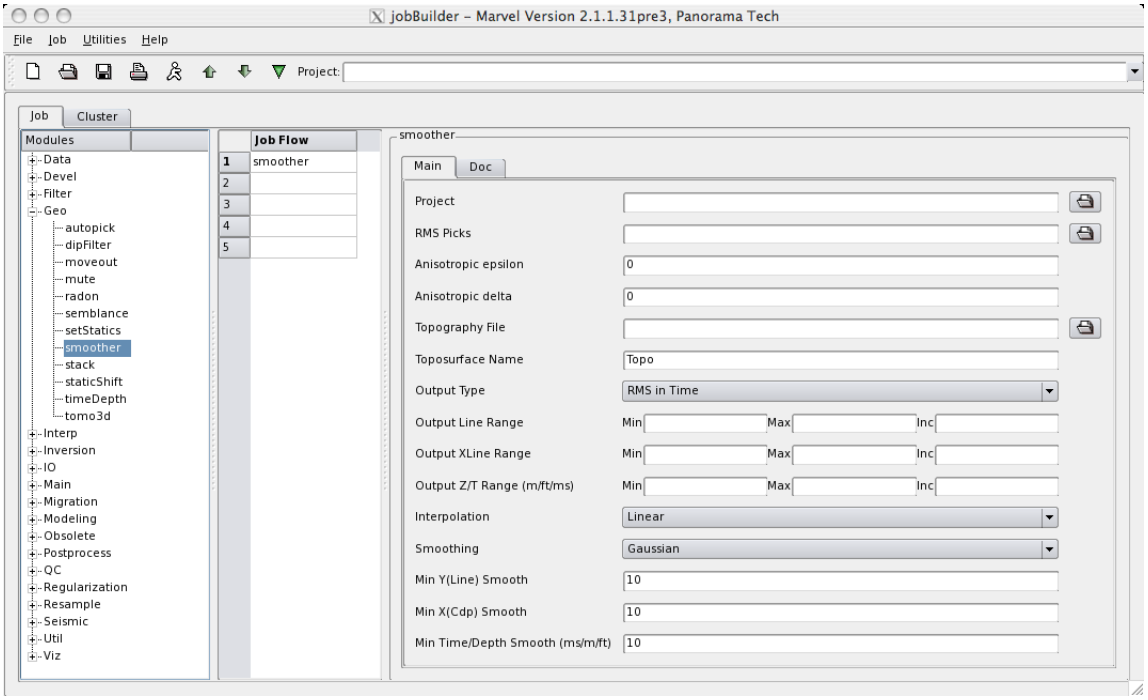


Table 155. smoother Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates.
RMS Picks	File containing the RMS picks model.
Anisotropic epsilon	Thomsen's anisotropic epsilon, ε. default: 0
Anisotropic delta	Thomsen's anisotropic delta, δ. default: 0

continues on next page

Table 155. smoother Panel Fields–continued

Field	Description
Topography File	The path and name of the topographic surface file. If given, this specifies the acquisition topography (and if no Source Topo File is given, this is for both sources and receivers). This can be a MARVEL surface file, or a simple flat file defining the topography, with each line containing the line, crossline and depth values, for example: ep = 100 cdp = 500 z = 20
Toposurface Name	The header key specifying where the topographic data are stored. A MARVEL surface file can have many surfaces. This is the name of the one to be used. default: Topo
Output Type	Interval in Depth, or RMS in Time. default: RMS in Time
Output Line Range	Minimum, maximum and increment values for output lines.
Output XLine Range	Minimum, maximum and increment values for output crosslines.
Output Z/T Range (m/ft/ms)	Minimum, maximum and increment values for output Depth/Time values.
Interpolation	Gaussian Spray + Interpolation, or Linear default: Gaussian Spray + Interpolation
Smoothing	Gaussian, or Boxcar (Linear). This field is only visible if the Interpolation method is Linear. default: Gaussian
Min Y(Line) Smooth	Minimum Y (line) smoothing. Default: 10
Min X(Cdp) Smooth	Minimum X (CDP) smoothing. Default: 10
Min Time/Depth Smooth (ms/m/ft)	Default: 10

srme Module

The srme module is accessed under the Filter node of the jobBuilder module tree.

Figure 196. srme Main Panel

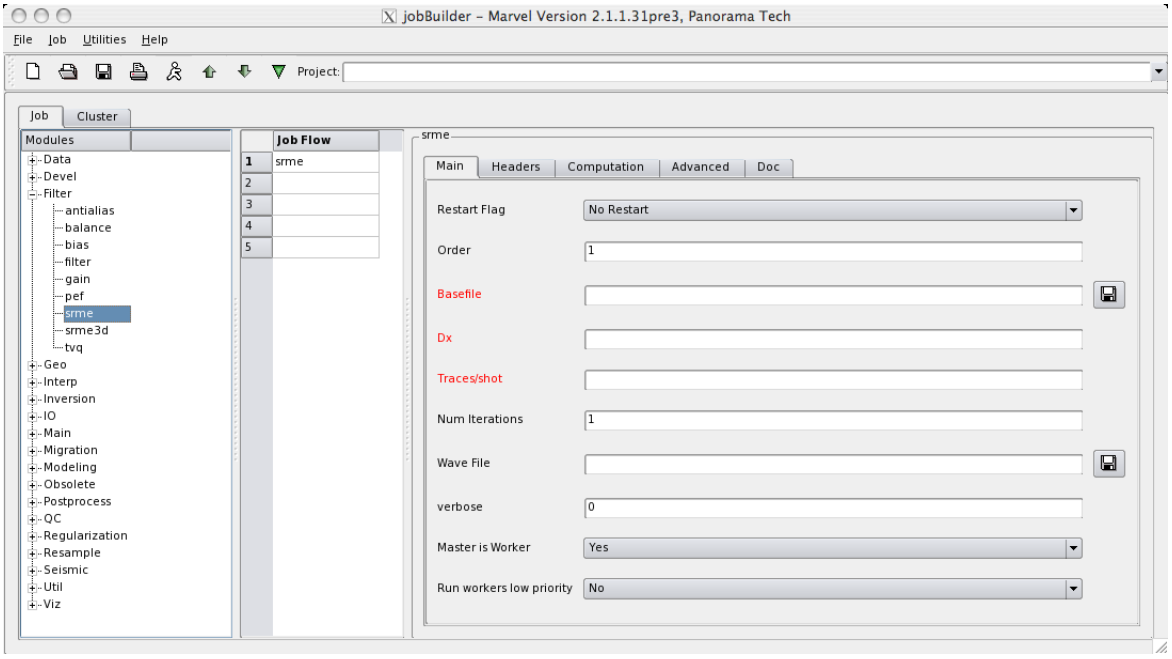


Table 156. srme Main Panel Fields

Field	Description
Restart Flag	Restart, No Restart, Cleanup
Order	default: 1
Basefile	**This is a required entry.**
Dx	Defines the CDP spacing. **This is a required entry.**
Traces/shot	**This is a required entry.**
Num Iterations	
Wave File	
Verbose	Switch for turning debug printing on and off. default: No

continues on next page

Table 156. srme Main Panel Fields–continued

Field	Description
Master is Worker	Flag that controls whether the master I/O controller is also used for performing calculations. default: Yes
Run workers low priority	If Yes, workers will be spawned with reduced priority, although the master process will remain at high priority. This can be useful, especially when *MasterIsWorker* is set, so that one worker does not slow down collection or submission of shots for all of the others. default: No

srme Headers Panel

Figure 197. srme Headers Panel

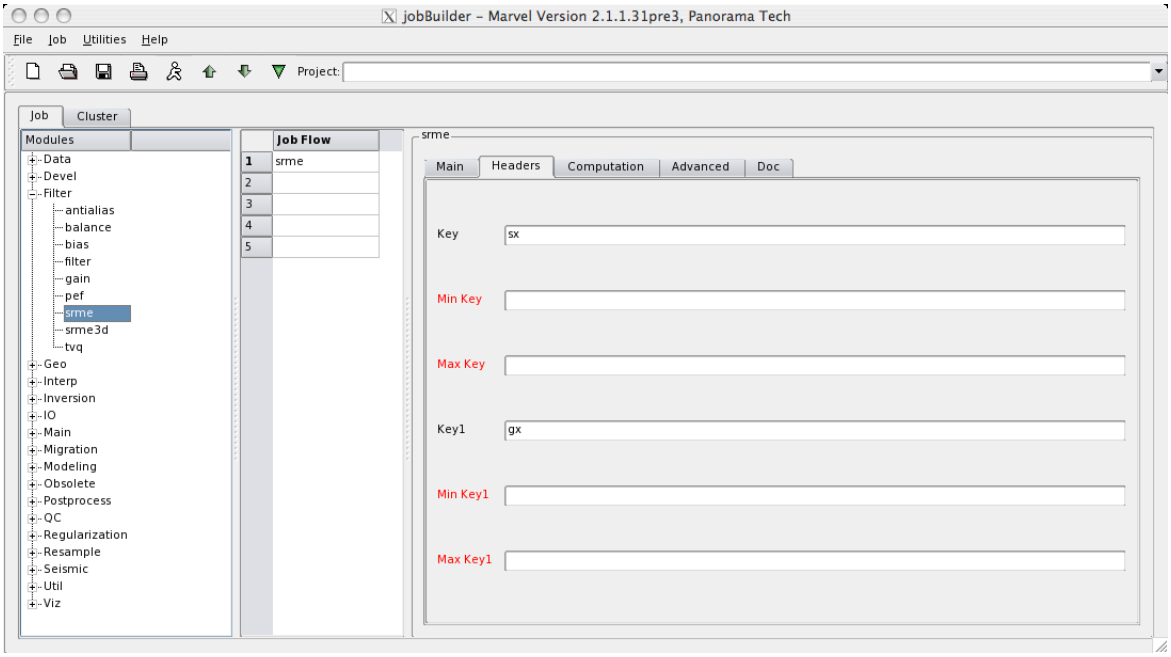


Table 157. srme Headers Panel Fields

Field	Description
Key	default: sx
Min Key	**This is a required entry.**
Max Key	**This is a required entry.**
Key1	default: gx
Min Key1	**This is a required entry.**
Max Key1	**This is a required entry.**

srme Computation Panel

Figure 198. srme Computation Panel

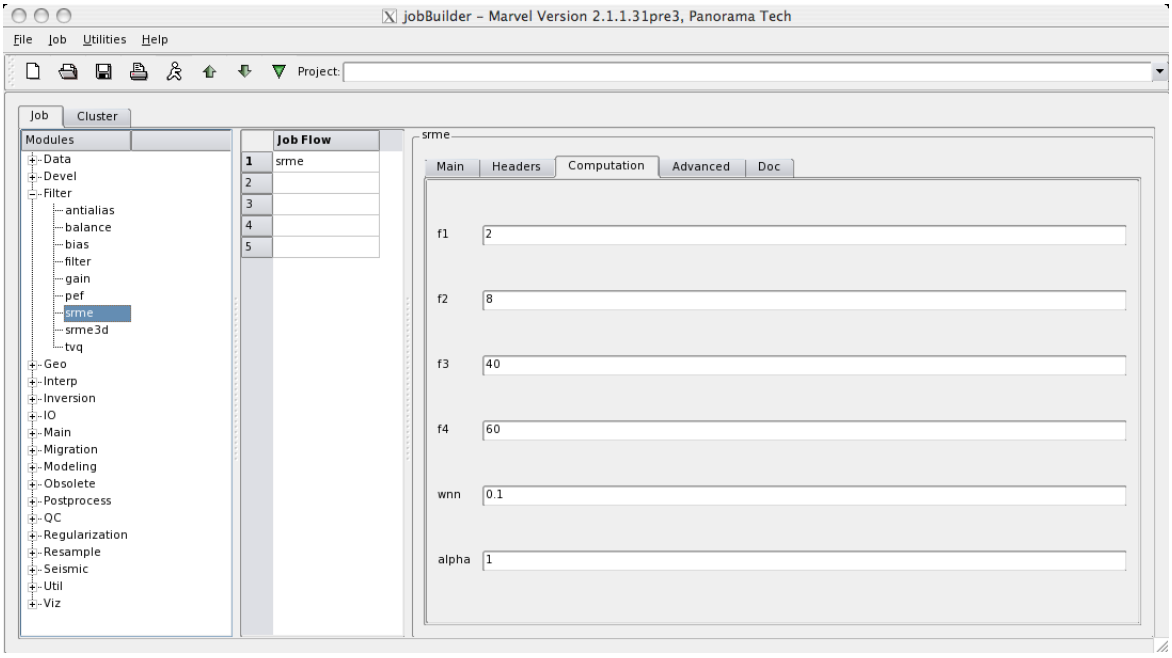


Table 158. srme Computation Panel Fields

Field	Description
f1	default: 2
f2	default: 8
f3	default: 40
f4	default: 60
wnn	default: 0.1
alpha	default: 1

srme Advanced Panel

Figure 199. srme Advanced Panel

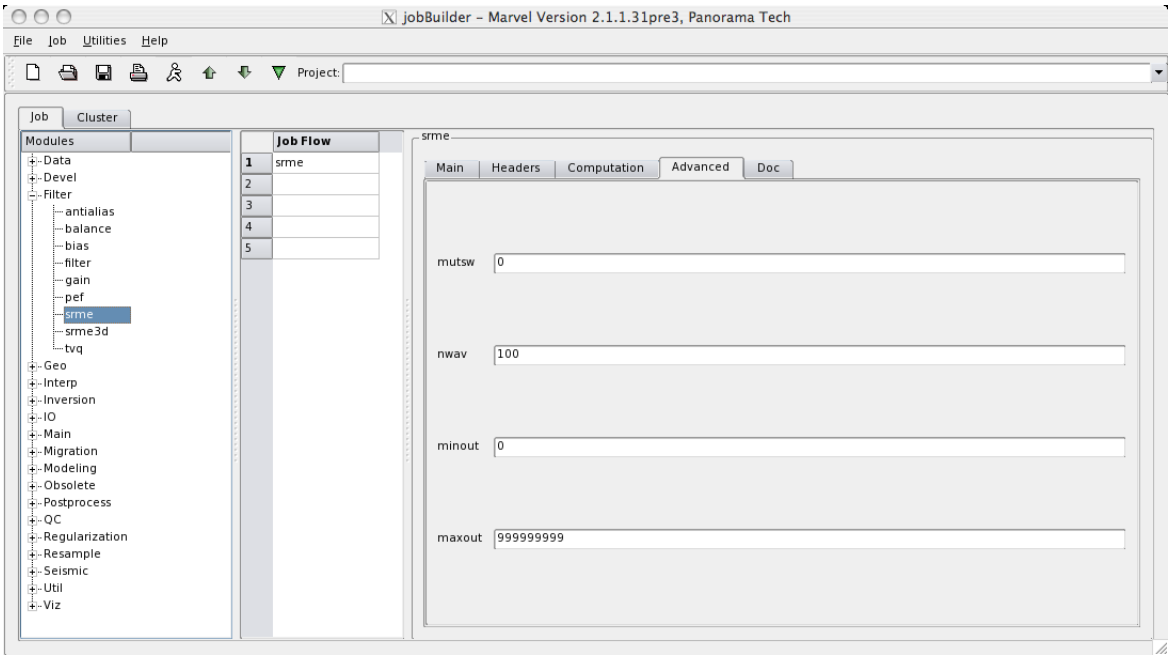


Table 159. srme Advanced Panel Fields

Field	Description
mutsw	default: 0
nwav	default: 100
minout	default: 0
maxout	default: 999999999

srme3d Module

Appendix C explains the parameters defining Panorama Technologies' 3D Surface Related Multiple Elimination algorithm (SRME3D) and provides a brief explanation of the assumptions underlying the process. These assumptions essentially define the optimum acquisition scheme to assure the best possible results.

The srme3d module is accessed under the Filter node of the jobBuilder module tree.

Figure 200. srme3d Main Panel

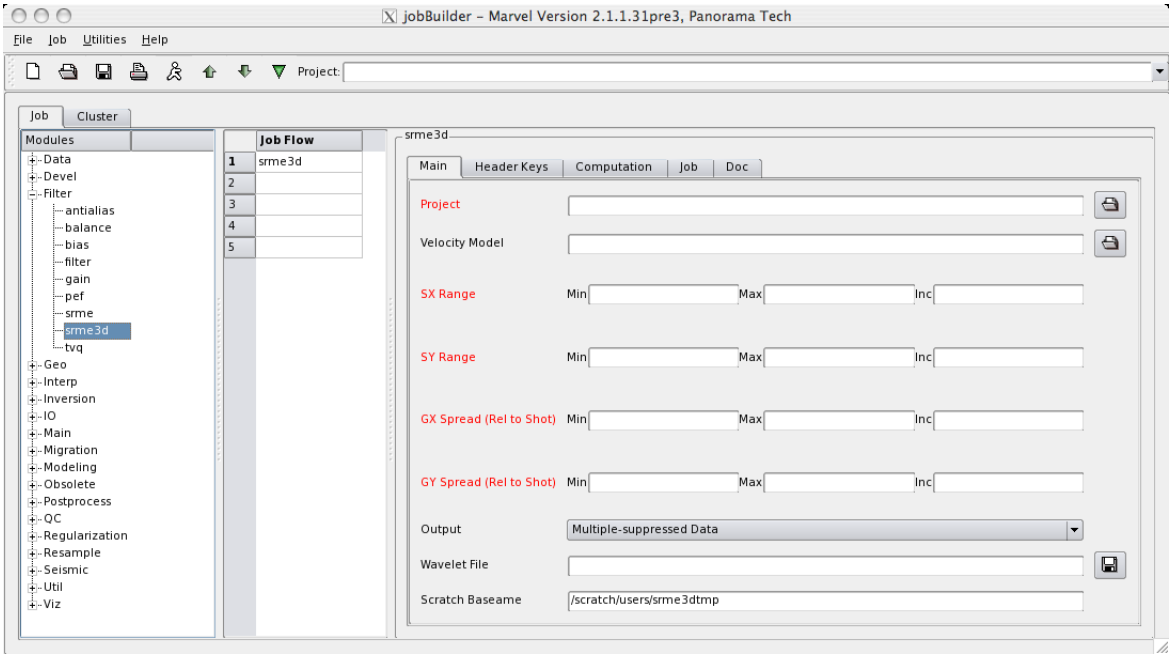


Table 160. srme3d Main Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates. **This is a required entry.**
Velocity Model	Name of the file containing the Vint/z velocity model. If the model is not given, MARVEL tries to get the model from the project.
SX Range	**This is a required entry.**
SY Range	**This is a required entry.**

continues on next page

Table 160. srme3d Main Panel Fields–continued

Field	Description
GX Spread	**This is a required entry.**
GY Spread	**This is a required entry.**
Output	• Multiple-supressed Data • Multiples • Regularized Data Only
Wavelet File	
Scratch Basename	default: /scratch/users/srme3dtmo

srme3d Header Keys Module

Figure 201. srme3d Header Keys Panel

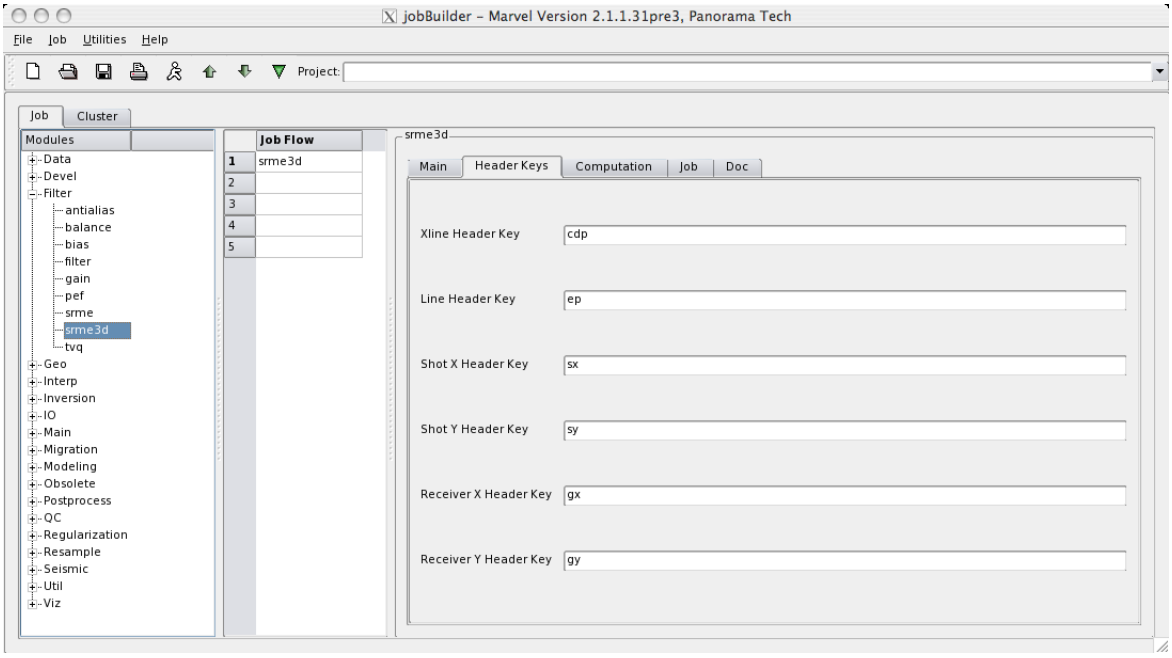


Table 161. srme3d Header Keys Panel Fields

Field	Description
XLine Header Key	Header key specifying where crossline data is stored in the trace. default: cdp
Line Header Key	Header key specifying where line data is stored in the trace. default: ep
Shot X Header Key	Header key specifying where line source data is stored in the trace. default: sx
Shot Y Header Key	Header key specifying where crossline source data is stored in the trace. default: sy
Receiver X Header Key	Header key specifying where inline geophone data is stored in the trace. default: gx
Receiver Y Header Key	Header key specifying where crossline geophone data is stored in the trace. default: gy

srme3d Computation Module

Figure 202. srme3d Computation Panel

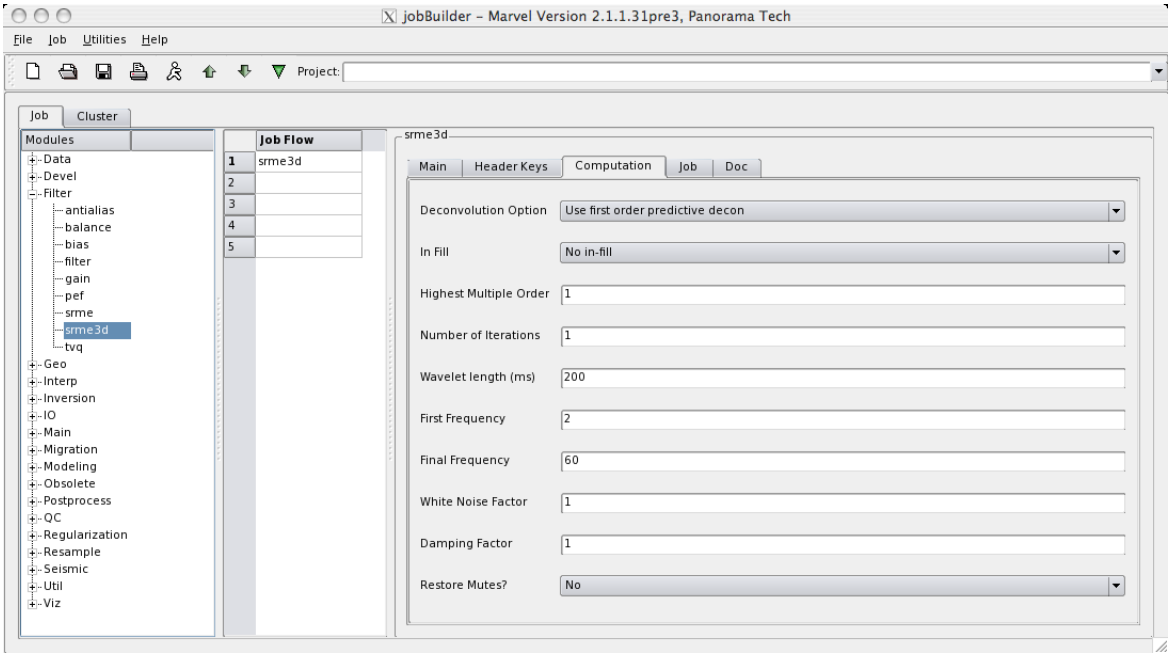


Table 162. srme3d Computation Panel Fields

Field	Description
Deconvolution Option	Use first order predictive decon OR Use first order GHN
In Fill	• No in-fill • Nearest neighbor in-fill • NMO in-fill (slow!)
Highest Multiple Order	default: 1
Number of Iterations	default: 1
Wavelet Length (ms)	default: 200

continues on next page

Table 162. srme3d Computation Panel Fields–continued

Field	Description
First Frequency	default: 2
Final Frequency	default: 60
White Noise Factor	default: 1
Damping Factor	default: 1
Restore Mutes	default: No

srme3d Job Panel

Figure 203. srme3d Job Panel

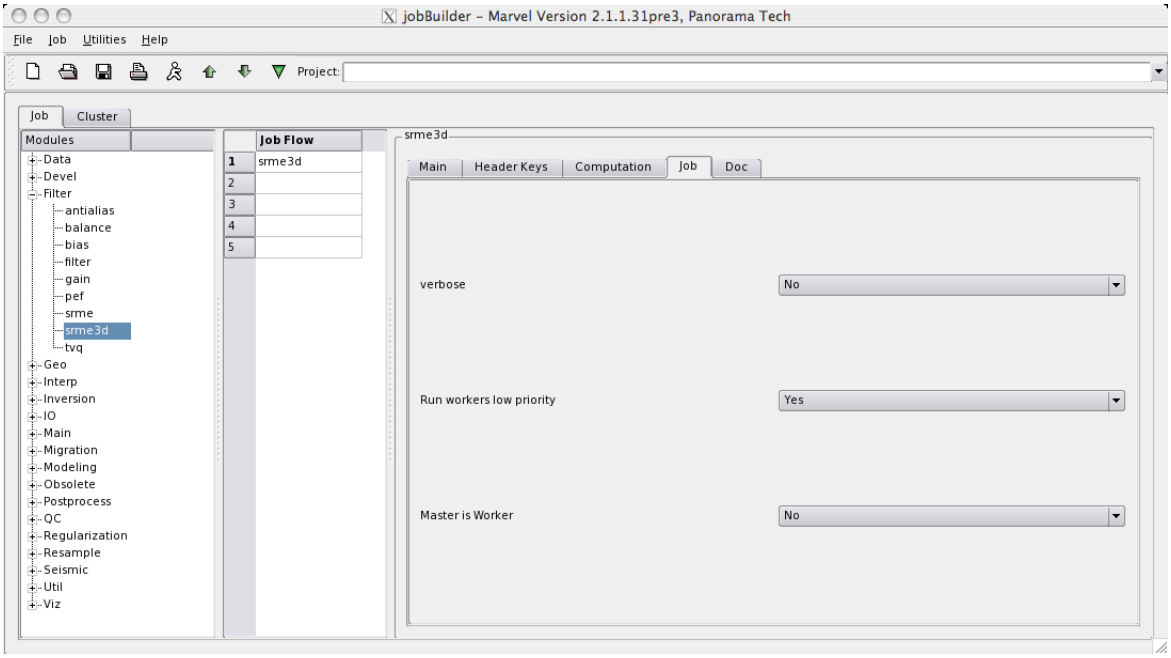


Table 163. srme3d Job Panel Fields

Field	Description
Verbose	Switch for turning debug printing on and off. default: No
Run workers low priority	If Yes, workers will be spawned with reduced priority, although the master process will remain at high priority. This can be useful, especially when *MasterIsWorker* is set, so that one worker does not slow down collection or submission of shots for all of the others. default: No
Master is Worker	Flag that controls whether the master I/O controller is also used for performing calculations. default: Yes

stack Module

The stack module, Figure 204, controls how the module stacks all traces in a given gather. The fields on the panel are described in Table 164. The stack module is accessed under the Geo node of the jobBuilder module tree.

Figure 204. stack Panel

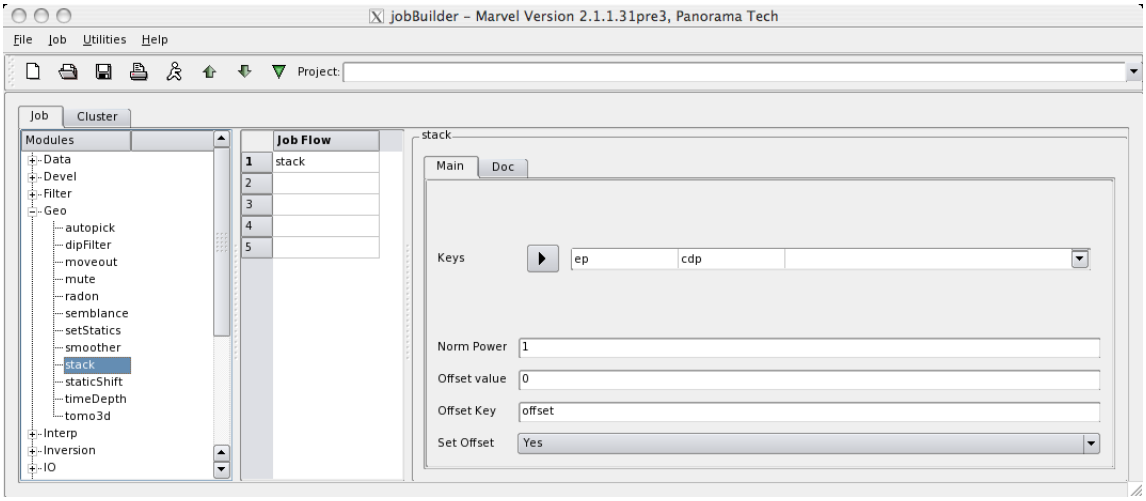


Table 164. stack Panel Fields

Field	Description
Keys	The header keys defining a gather or ensemble to stack. defaults: ep, cdp
Norm Power	Defines whether or not the stack is to be normalized by the number of non-zero values at each fixed time. When Norm Power is zero, normalization is not performed. default: 1
Offset value	The value stored in the offset field of the stacked trace. default: 0
Offset Key	The header key defining the offset field of the stacked trace. default: offset
Set Offset	The switch for setting or not setting the offset value in the header. default: Yes

staticShift Module

The staticShift module is accessed under the Geo node of the jobBuilder module tree.

Theory

The staticShift module calculates and applies elevations statics. The statics can be calculated from information stored in the trace headers, or the module can simply apply a single static shift already stored in an appropriate header location. The module assumes that appropriate elevations are already stored in the trace headers.

The input field *sut* is assumed measured in milliseconds. The basic formulas are:

Equation 10:

$$outputfieldsstat = sdel - \frac{(selev + sdepth)}{swevel}$$

Equation 11:

$$outputfieldgstat = sstat - \frac{sut}{1000.}$$

Equation 12:

$$outputfieldtstat = sstat + gstat + \frac{(selev - gelev)}{wevel}$$

Table 165. staticShift Variable Definitions

Field	Description
sstat	The static time shift for the weathering layer below the source.
gstat	The static time shift for the weathering layer below the receiver.
sdel	The datum elevation at the source.
selev	The source elevation from sea level.
sdepth	The source depth.
sut	The uphole time in milliseconds.
swevel	The subweathering velocity.
wevel	The weathering velocity.

staticShift Main Panel

The staticShift Main panel, Figure 205, controls the static shift module. The fields are described in Table 166.

Figure 205. staticShift Main Panel

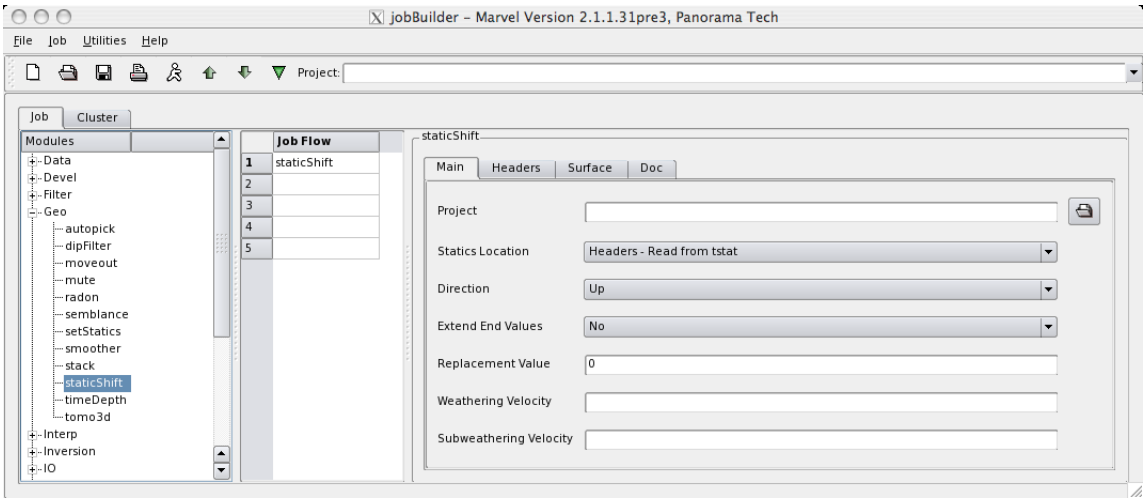


Table 166. staticShift Main Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates.
Statics Location	Where to find the statics data, read headers from *tstat*, or calculate using the methodology given in staticShift Module, or read from a surface file. If you select Surface, enter the surface information in the staticShift Surface Panel. Determines how to get the weathering velocity and the subweathering velocity. default: Headers—Read from tstat
Direction	The direction of the shift: Down or Up. Down means to shift to longer times, while Up means to shift to shorter times. default: Up
Extend End Values	
Replacement Value	default: 0

continues on next page

Table 166. staticShift Main Panel Fields–continued

Variable	Description
Weathering Velocity	The actual weathering velocity to use.
Subweathering Velocity	The actual subweathering velocity to use. The subweathering velocity is the velocity of the main top layer.

staticShift Headers Panel

The staticShift module headers panel, Figure 206, enables you to specify the headers used for the static shift module. The fields on the panel are described in Table 167.

Figure 206. staticShift Module Headers Panel

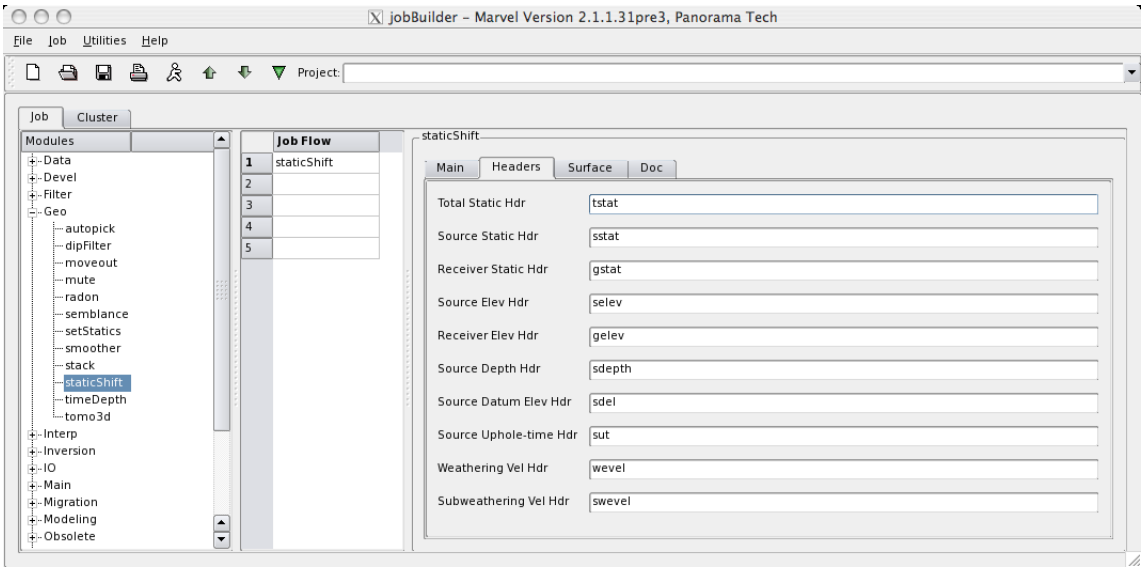


Table 167. staticShift Module Headers Panel Fields

Field	Description
Total Static Hdr	The keyword specifying the value of the total static correction for this trace. default: tstat
Source Static Hdr	The keyword specifying the value of the source static correction. default: sstat
Receiver Static Hdr	The keyword specifying the value of the receiver static correction. default: gstat
Source Elev Hdr	The keyword specifying the value of the source elevation. default: selev
Receiver Elev Hdr	The keyword specifying the value of the receiver elevation. default: gelev
Source Depth Hdr	The keyword specifying the value of the source depth. default: sdepth

continues on next page

Table 167. staticShift Module Headers Panel Fields–continued

Field	Description
Source Datum Elev Hdr	The keyword specifying the value of the datum elevation. default: sdel
Source Uphole-time Hdr	The keyword specifying the value of the source uphole time. default: sut
Weathering Vel Hdr	The keyword specifying the value of the weathering velocity. default: wevel
Subweathering Vel Hdr	The keyword specifying the value of the subweathering velocity. default: swevel

staticShift Surface Panel

The staticShift Surface panel enables you to specify the headers used for the staticShift module. There are only two fields on this panel, and they are only displayed if you select Surface for the Statics Location on the staticShift Main panel. These two fields are:

Surface File—The path and name of the topographic surface file. If given, this specifies the acquisition topography (and if no Source Topo File is given, this is for both sources and receivers). This can be a MARVEL surface file, or a simple flat file defining the topography, with each line containing the line, crossline and depth values, for example: ep = 100 cdp = 500 z = 20

Surface Name—The header key specifying where the topographic data are stored. A MARVEL surface file can have many surfaces. This is the name of the one to be used. default: Topo

threed Module

timeDepth Module

The timeDepth module converts time-to-depth values and depth-to-time values. The timeDepth module is accessed under the Geo node of the jobBuilder module tree.

timeDepth Main Panel

There are two different Main panels depending on the model type, Gridded (Figure 208) or Single Function (RMS) (Figure 207), the terms are defined in Table 168.

Figure 207. timeDepth Main Panel–Model Type, Single Function (RMS)

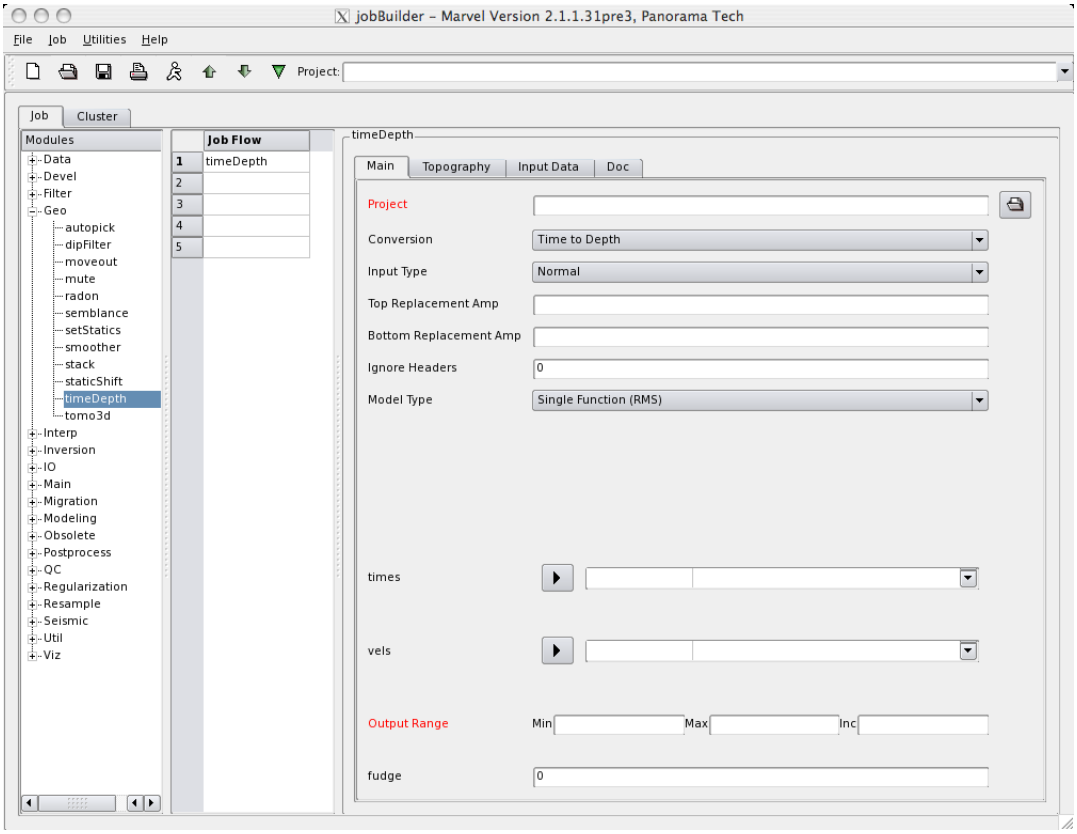


Figure 208. timeDepth Main Panel–Model Type, Gridded

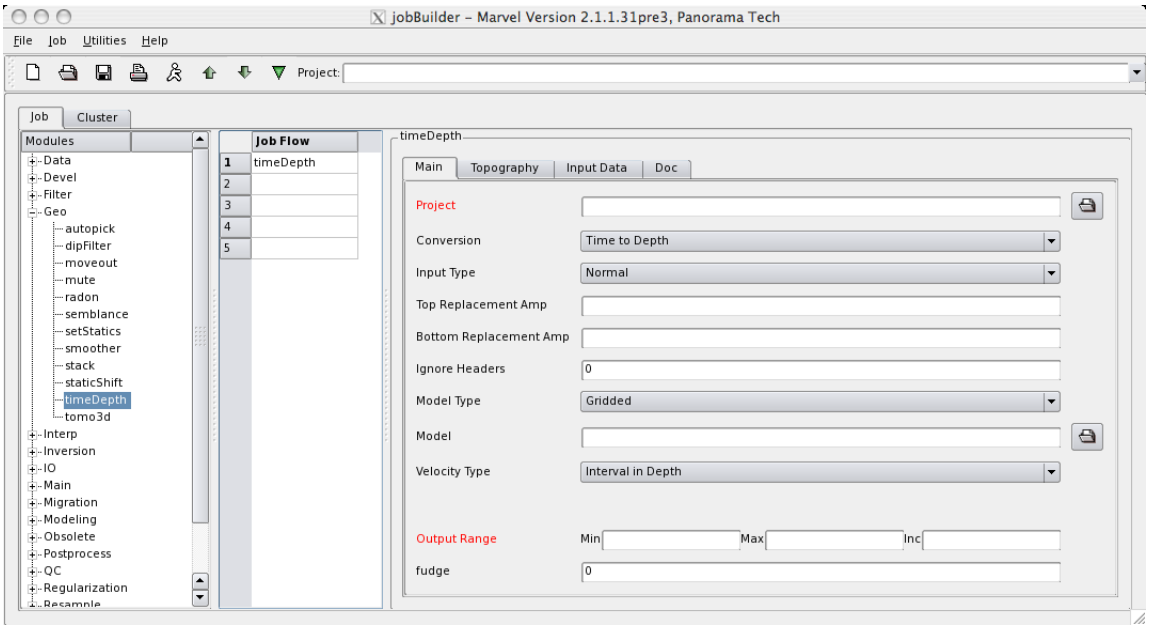


Table 168. timeDepth Main Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates. **This is a required entry.**
Conversion	Flag indicating whether the conversion is to be performed Depth to Time, or Time to Depth. default: Time to Depth
Input Type	Flag indicating whether the data is a PSTM from Topography, or a Normal conversion. default: Normal
Top Replacement Amp	
Bottom Replacement Amp	
Ignore Headers	default: 0

continues on next page

Table 168. timeDepth Main Panel Fields–continued

Variable	Description
Model Type	Flag indicating whether the model is Gridded, or Single Function (RMS). default: Gridded
Model	The filename of the input model. **This field is only displayed for the Gridded Function Type.**
Velocity Type	Flag indicating whether the velocity is Interval in Depth or RMS in Time. **This field is only displayed for the Gridded Function Type.** default: Interval in Depth
Output Range	Provides the minimum time/depth, maximum time/depth, and incremental time/depth values. **This is a REQUIRED entry.**
times	Pick times for a (single) velocity function. **This field is only displayed for the Single Function Function Type.**
vels	Pick velocities for a (single) velocity function. **This field is only displayed for the Single Function Function Type.**
Output Range	Provides the minimum time/depth, maximum time/depth, and incremental time/depth values. **This is a REQUIRED entry.**
fudge	

timeDepth Topography Panel

The timeDepth topography data panel, Figure 209, enables you to specify the header keys used with the timeDepth module. The fields in the panel are described in Table 169.

Figure 209. timeDepth Topography Panel

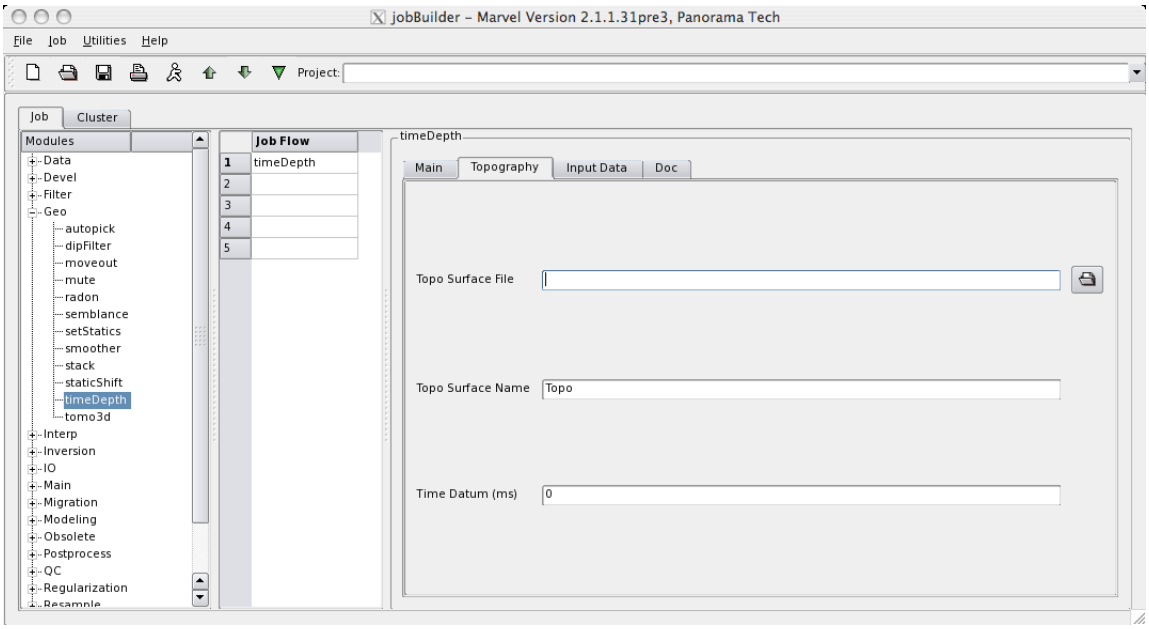


Table 169. timeDepth Input Data Panel Fields

Field	Description
Topo Surface File	The path and name of the topographic surface file. If given, this specifies the acquisition topography (and if no Source Topo File is given, this is for both sources and receivers). This can be a MARVEL surface file, or a simple flat file defining the topography, with each line containing the line, crossline and depth values, for example: ep = 100 cdp = 500 z = 20 default: *ep*
Topo Surface Name	The header key specifying where the topographic data are stored. A MARVEL surface file can have many surfaces. This is the name of the one to be used. default: *Topo*
Time Datum (ms)	

timeDepth Input Data Panel

The timeDepth input data panel, Figure 210, enables you to specify the header keys used with the timeDepth module. The fields in the panel are described in Table 170.

Figure 210. timeDepth Input Data Panel

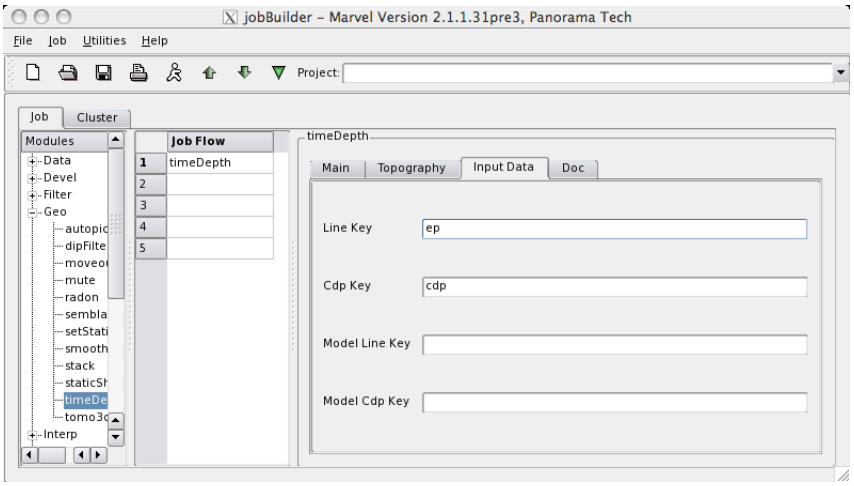


Table 170. timeDepth Input Data Panel Fields

Field	Description
Line Key	The header key specifying where line data is stored. default: ep
Cdp Key	The header key specifying where CDP data is stored. default: cdp
Model Line Key	The header word key for line information when the model is gridded. Use if different from the data. **This field is only displayed if you select a Model Type of Gridded in the timeDepth Main panel.**
Model Cdp Key	The header word key for CDP information when the model is gridded. Use if different from the data. **This field is only displayed if you select a Model Type of Gridded in the timeDepth Main panel.**

tomo3d Module

The 3D tomography module, tomo3d, is accessed under the Geo node of the jobBuilder module tree.

Figure 211. tomo3d Main Panel

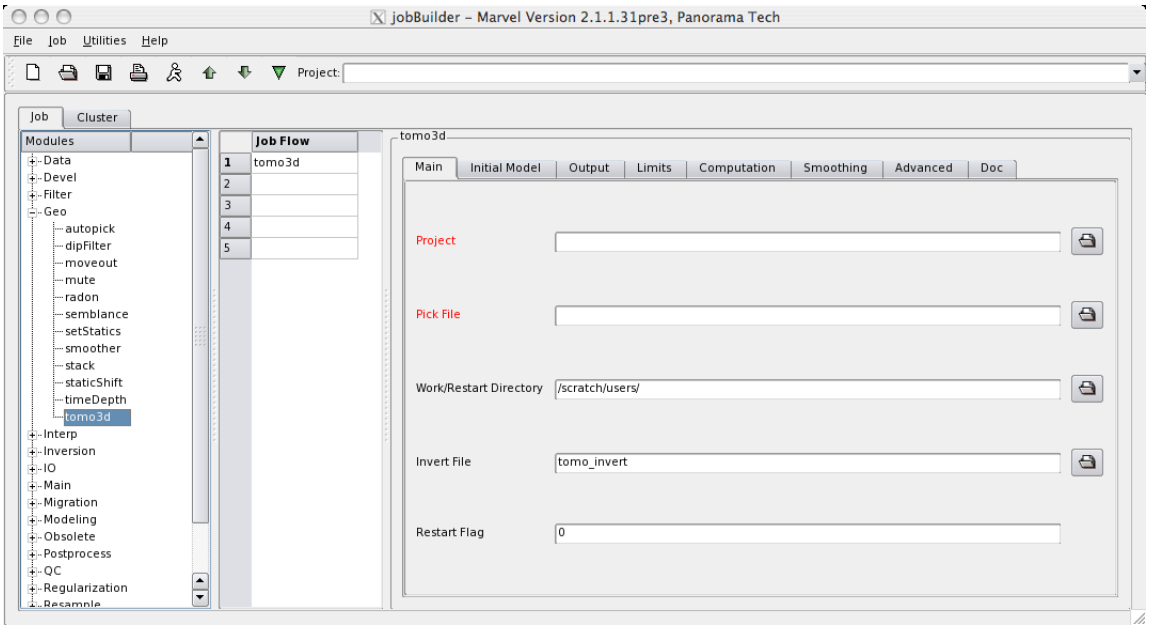


Table 171. tomo3d Main Panel Fields

Field	Description
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates. **This is a required entry.**
Pick File	File containing time-velocity pairs in Panorama Technologies format. **This is a required entry.**
Work/Restart Directory	default: */scratch/users*
Invert File	default: *tomo_invert*
Restart Flag	

tomo3d Initial Model Panel

Figure 212. tomo3d Initial Model Panel

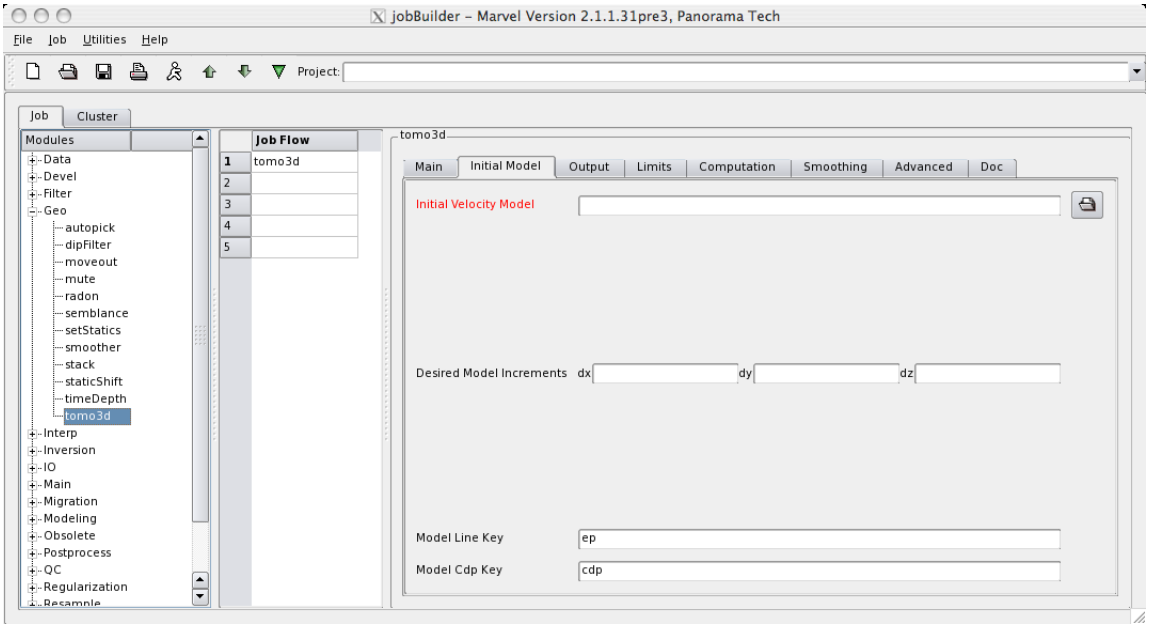


Table 172. tomo3d Initial Model Panel Fields

Field	Description
Initial Velocity Model	**This is a required entry.**
Desired Model Increments	dx, dy, dz
Model Line Key	The header word key for line information. Use if different from the data. default: ep
Model Cdp Key	The header word key for CDP information. Use if different from the data. default: cdp

tomo3d Output Panel

Figure 213. tomo3d Output Panel

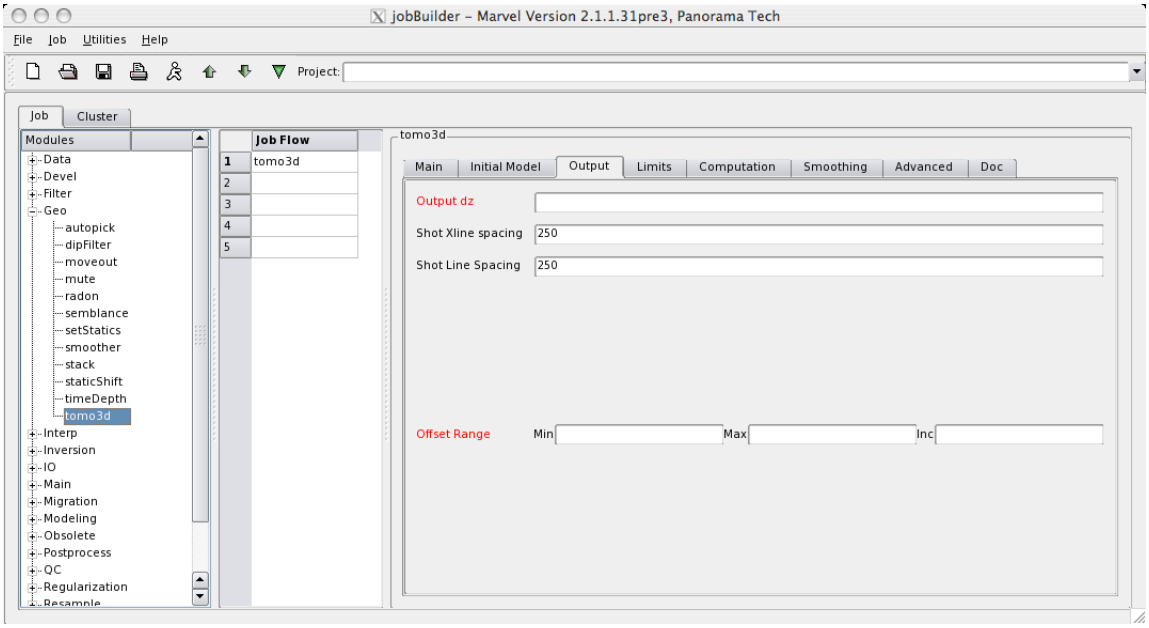


Table 173. tomo3d Output Panel Fields

Field	Description
Output dz	**This is a required entry.**
Shot Xline spacing	Spacing between shots in the crossline direction. default: 250
Shot Line Spacing	Spacing between shots in the line direction. default: 250
Offset Range	Min, Max, Inc **This is a required entry.**

tomo3d Limits Panel

Figure 214. tomo3d Limits Panel

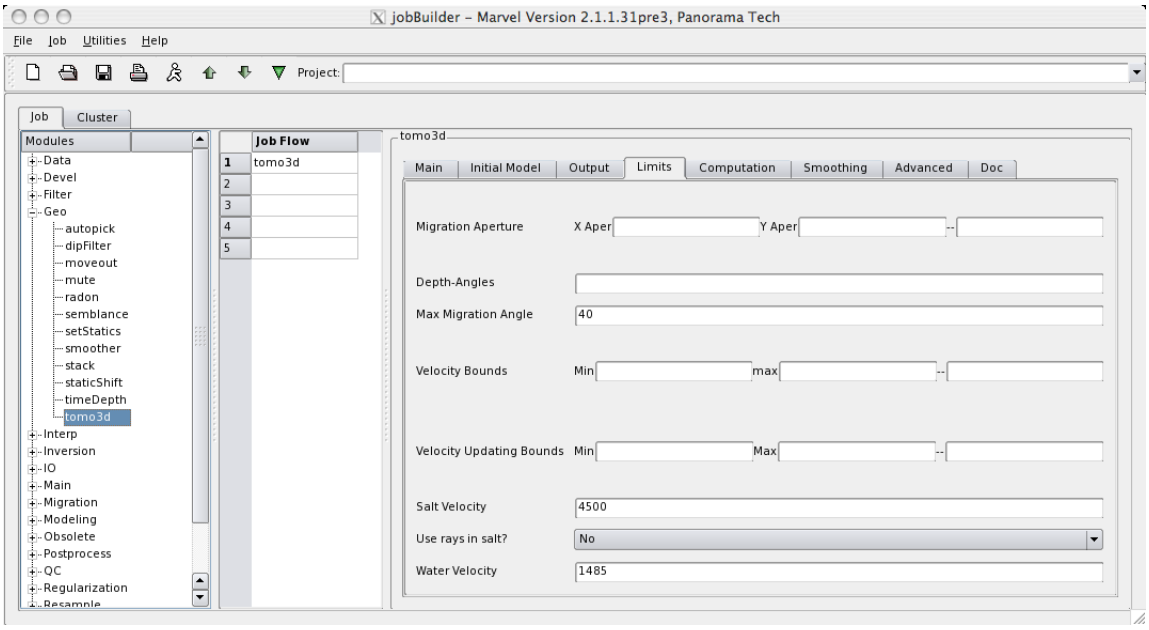


Table 174. tomo3d Limits Panel Fields

Field	Description
Migration Aperture	X Aper, Y Aper, –
Depth Angles	
Max Migration Angle	default: 40
Velocity Bounds	Min, Max, –
Velocity Updating Bounds	Min, Max, –
Salt Velocity	Speed of sound in salt, in meters per second. default: 4500
Use rays in salt?	
Water velocity	Speed of sound in water, in meters per second. default: 1485

tomo3d Computation Panel

Figure 215. tomo3d Computation Panel

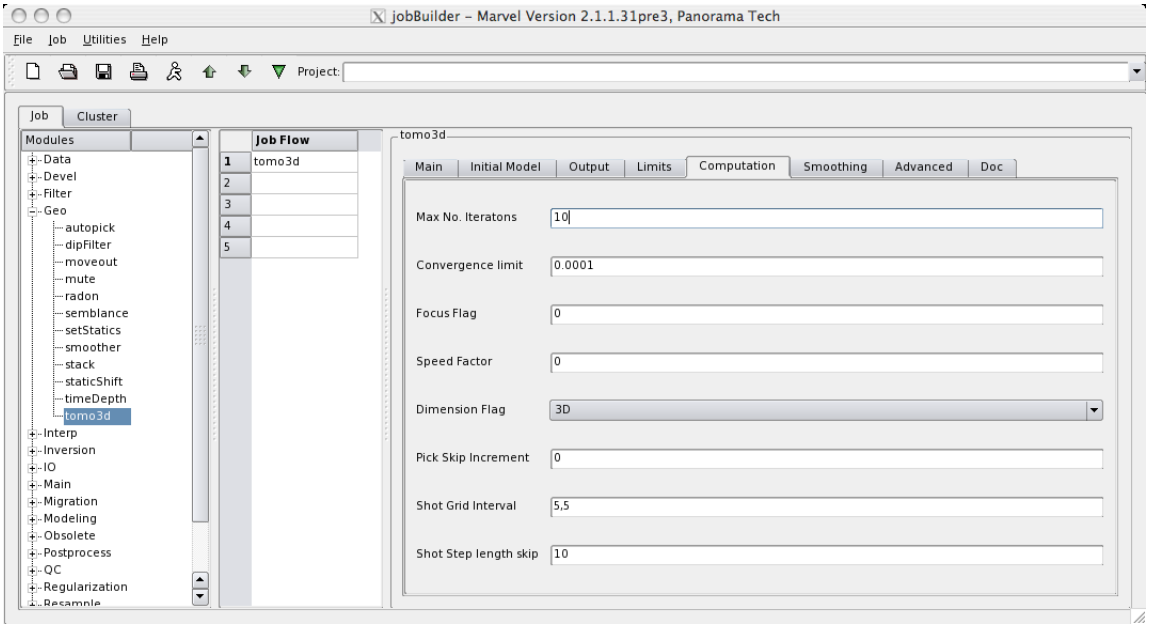


Table 175. tomo3d Computation Panel Fields

Field	Description
Max No. Iterations	default: 10
Convergence Limit	default: 0.0001
Focus Flag	default: 0
Speed Factor	default: 0
Dimension Flag	default: 3D
Pick Skip Increment	default: 0
Shot Grid Interval	default: 5.5

continues on next page

Table 175. tomo3d Computation Panel Fields–continued

Field	Description
Shot Step length skip	default: 10

tomo3d Smoothing Panel

Figure 216. tomo3d Smoothing Panel

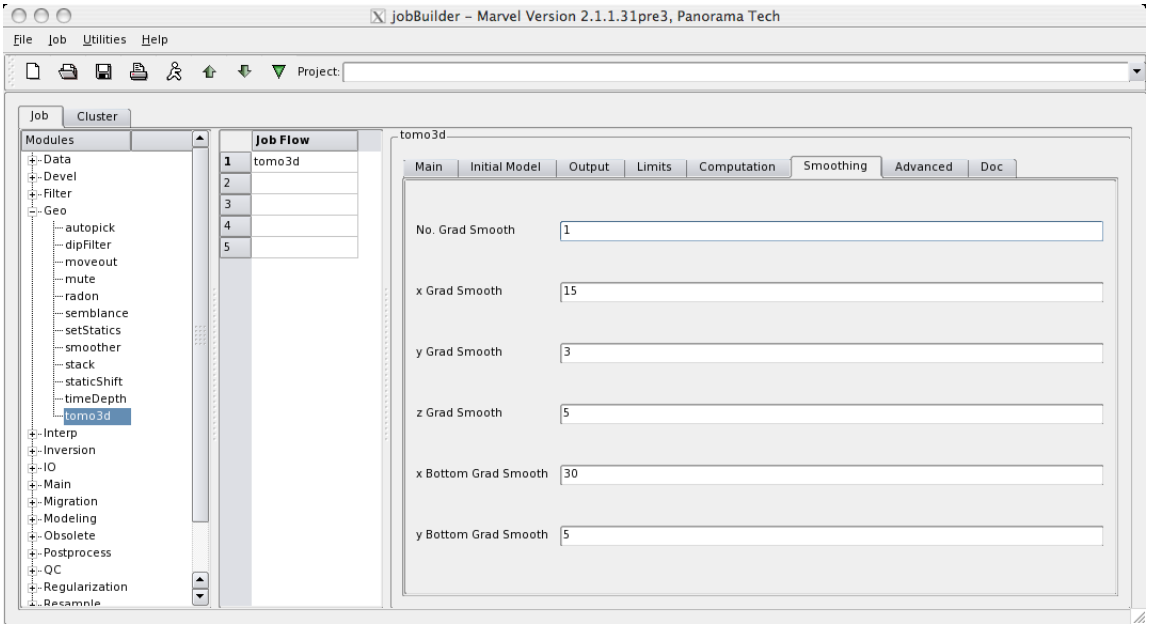


Table 176. tomo3d Smoothing Panel Fields

Field	Description
No. Grad Smooth	default: 1
x Grad Smooth	default: 15
y Grad Smooth	default: 3
z Grad Smooth	default: 5
x Bottom Grad Smooth	default: 30
y Bottom Grad Smooth	default: 5

tomo3d Advanced Panel

Figure 217. tomo3d Advanced Panel

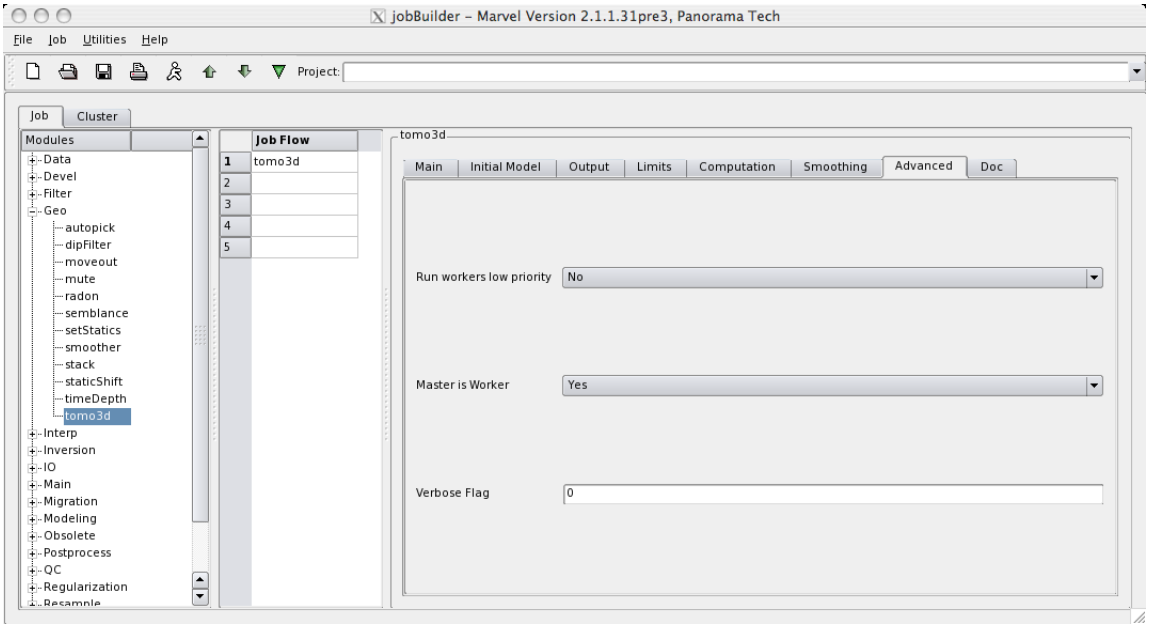


Table 177. tomo3d Advanced Panel Fields

Field	Description
Run workers low priority	If Yes, workers will be spawned with reduced priority, although the master process will remain at high priority. This can be useful, especially when *MasterIsWorker* is set, so that one worker does not slow down collection or submission of shots for all of the others. default: No
Master is Worker	Flag that controls whether the master I/O controller is also used for performing calculations. default: Yes
Verbose Flag	Switch for turning debug printing on and off. default: No

trSum Module

The trSum module enables you to perform basic operations on the input data stream. Figure 218, enables you to specify several control parameters used in the module, and the parameters are described in Table 178. The trSum module is accessed under the IO node of the jobBuilder module tree.

Figure 218. trSum Panel

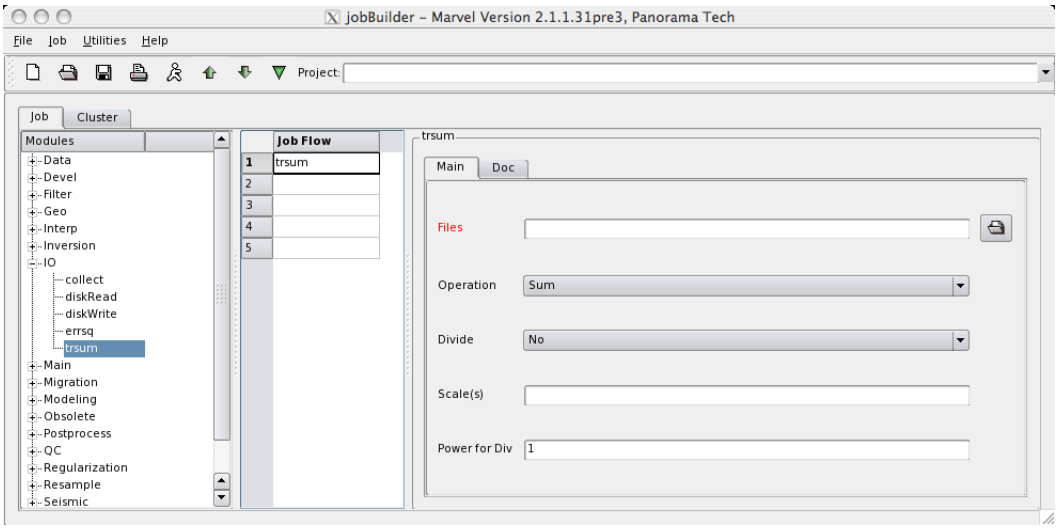


Table 178. trSum Panel Fields

Field	Description
Files	**This is a required entry field.**
Operation	Sum, Subtract, Multiply, or Divide
Divide	Yes, or No
Scale(s)	
Power for Div	default: 1

trWindow Module

The trWindow module performs a spatial windowing operation on the input data stream. The trWindow panel, Figure 219, enables you to specify several control parameters used in the module. The parameters are described in Table 179. The trWindow module is accessed under the Data node of the jobBuilder module tree.

Figure 219. trWindow Panel

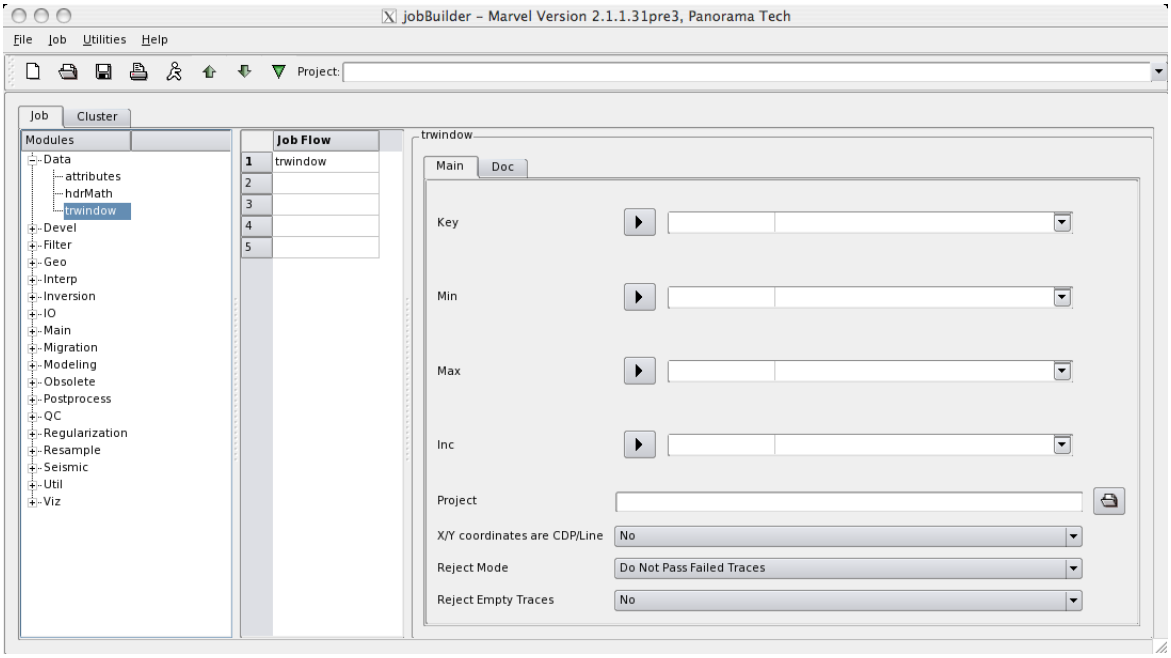


Table 179. trWindow Panel Fields

Field	Description
Key	The header word key specifying the value on which to window.
Min	The minimum value to pass.
Max	The maximum value to pass.
Inc	The increment to pass. For example, if you set Inc to 2, then alternating traces with the indicated header word will be passed
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates.
X/Y corrdinates are CDP/Line	Yes or No

continues on next page

Table 179. trWindow Panel Fields–continued

Variable	Description
Reject Mode	• Do Not Pass Failed Traces • Pass Only Failed Traces • Zero Failed Traces • Zero Good Traces
Reject Empty Traces	Yes or No

tvq Module

The tvq module is accessed under the Filter node of the jobBuilder module tree.

Figure 220. tvq Panel

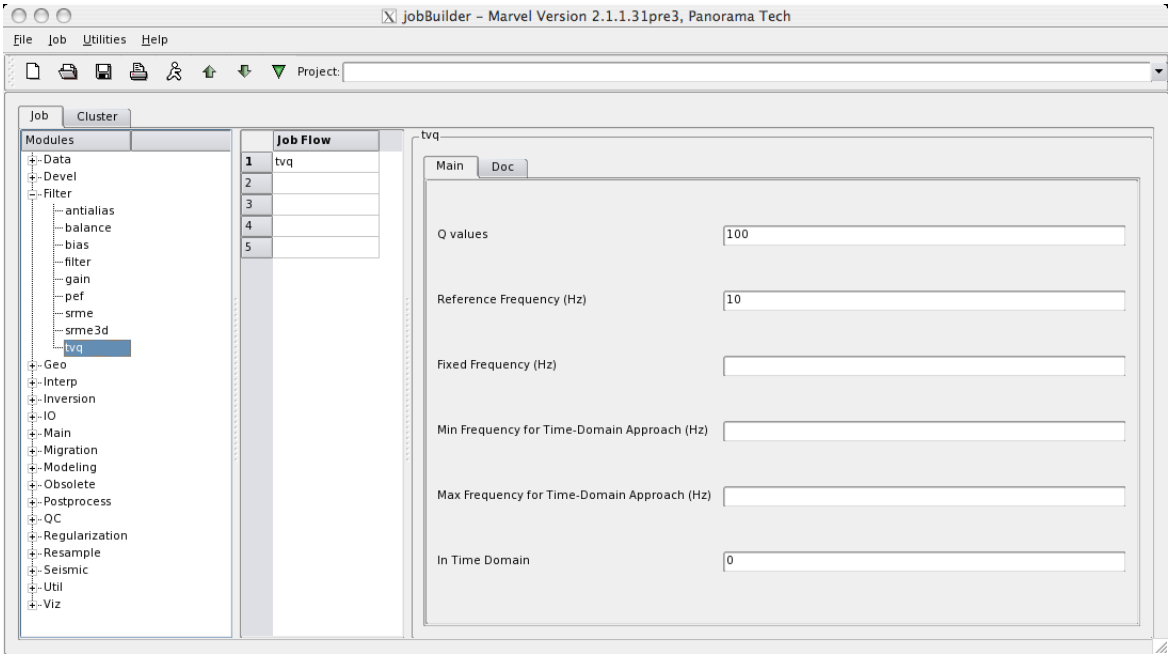


Table 180. tvq Panel Fields

Field	Description
Q Values	default: 100
Reference Frequency (Hz)	default: 10
Fixed Frequency (Hz)	
Min Frequency for TIme-Domain Approach (Hz)	
Max Frequency for TIme-Domain Approach (Hz)	
In Time Domain	default: 0

wem Module

The wem module is accessed under the Obsolete node of the jobBuilder module tree.

The wem module is Panorama Technologies' wave-equation migration module. This program can run in either the common-shot mode for prestack shot-profile migrations, or it can run in the poststack mode for poststack migrations. Regardless of which mode is selected, this is a one-way phase panel method.

A typical migration job has the following job flow: diskRead ⇒ wem ⇒ collect

For faster restarts, the Mode option in the diskRead module should be set to Shot Migration (see diskRead Module).

Note:

You should be sure the Restart File parameter is in sync with the wem module. If you edit the one in wem, the one in diskRead will be updated.

Note:

The collect module is designed to stack output from migrations. By default, it does this first-come, first-served, and the output files will be unsorted. Choose the Preallocate Volume option in the collect module to avoid this behavior (see collect Module). As with the Restart File option in the diskRead module, make sure the output parameters to collect are in sync with those in wem.

wem Main Panel

There are two different Main panels depending on the mode, Common-shot (Figure 221) and Poststack (Figure 222). The parameters are described in Table 181.

Figure 221. wem Main Panel, Common-shot Mode

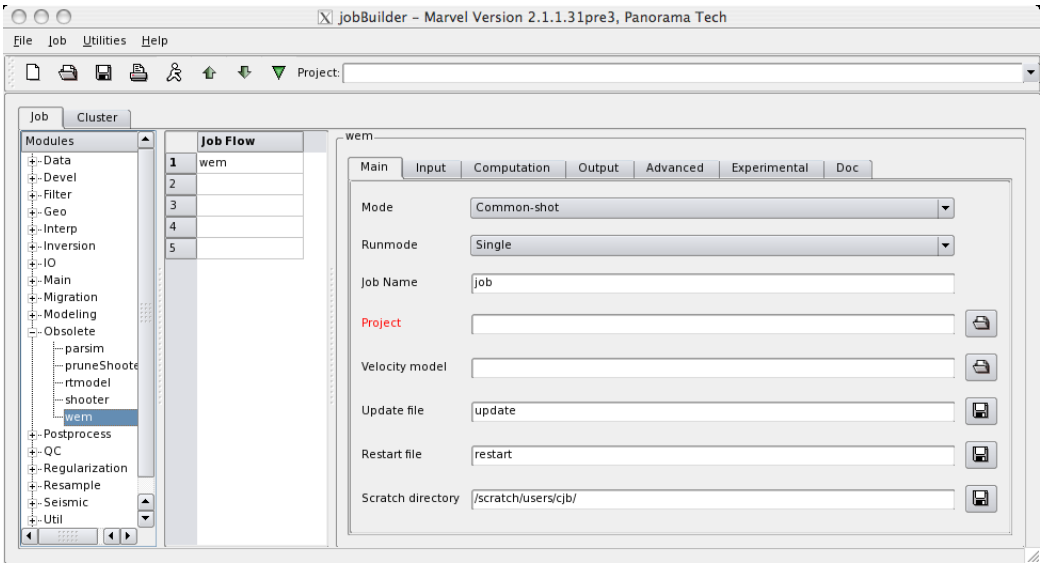


Figure 222. wem Main Panel, Poststack Mode

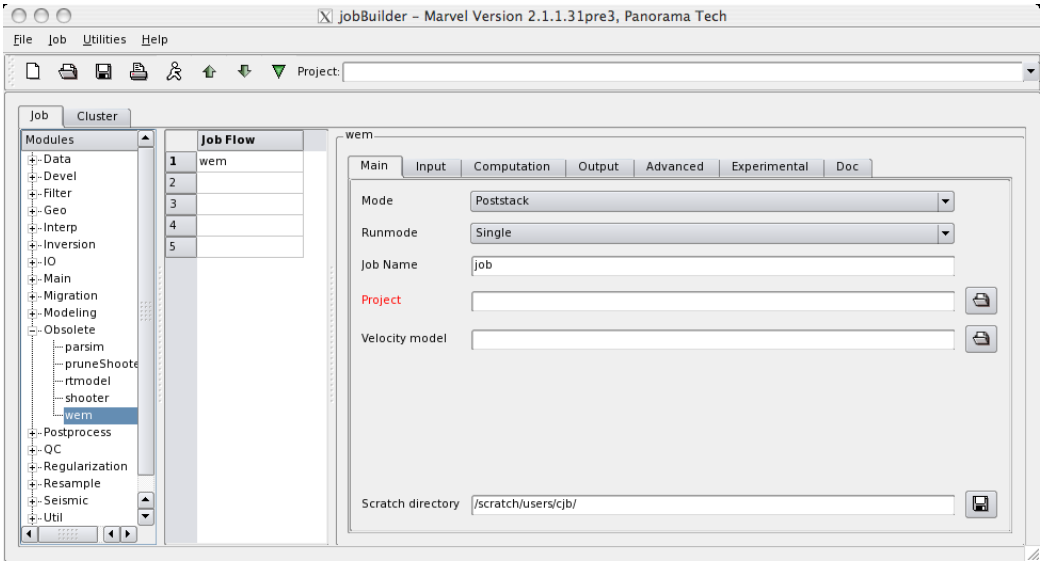


Table 181. wem Module Main Panel Fields

Field	Description
Mode	Specifies the mode in which the job is run, common-shot mode for prestack shot-profile migrations, or post-stack mode for post-stack migrations. default: Common-shot
Runmode	Is the job being run as Master in a cluster, or as Single processor? default: Single
Job Name	Name of the job to be run. default: job
Project	The path and name of the project file. This file describes the coordinate system, and how line, crossline and CDP data relate to the x and y coordinates. **This is a REQUIRED entry.**
Velocity Model	Name of the file containing the Vint/z velocity model. If the model is not given, MARVEL tries to get the model from the project.
Update file	Name of a temporary file to update as shots come in. **This field is only displayed for Common-Shot Mode.** default: update
Restart file	The application keeps information about shots already processed in this file. It is usually best to put it in the same directory where your output files are located and to give it a similar name. **This field is only displayed for Common-Shot Mode.** default: restart
Scratch directory	Name of the directory where the scratch files will be located. default: */scratch/users/cjb*

wem Input Panel

This panel enables you to specify the keys used with the web module.

Figure 223. wem Input Panel

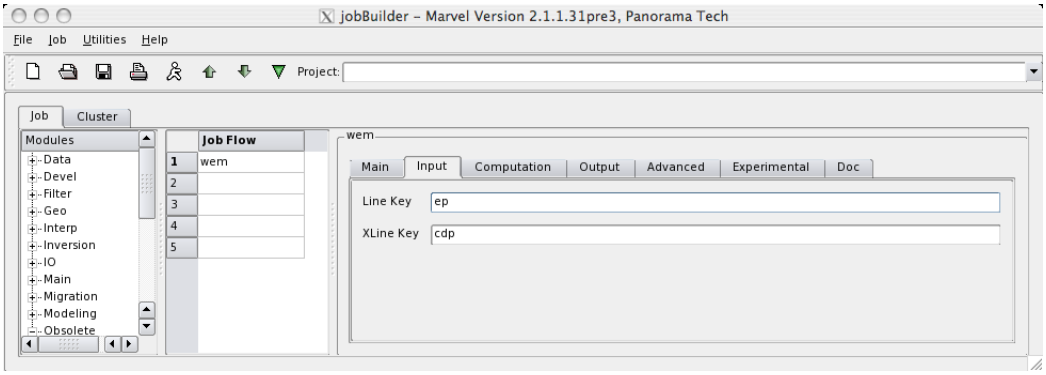


Table 182. wem Input Panel Fields

Field	Description
Line Key	Header key in which to find the line number. default: ep
XLine Key	Header key in which to find the crossline number. default: cdp
Min sx	
Min sx	
Min sy	
Min sy	

wem Computation Panel

The wem computation panel, Figure 224, enables you to specify several parameters used in the wave-equation migration calculations. These parameters are described in Table 183.

Figure 224. wem Computation Panel

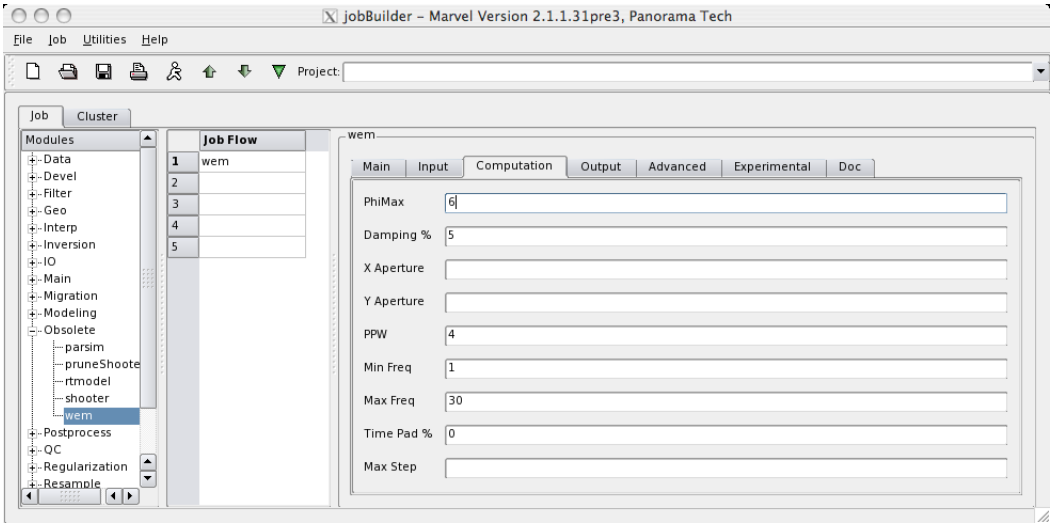


Table 183. wem Computation Panel Fields

Field	Description
PhiMax	Maximum phase-shift difference to tolerate for background velocities. default: 6
Damping	Transverse damping given as a percent of the maximum full aperture. default: 5
X Aperture	The full aperture in the x, or line, direction.
Y Aperture	The full aperture in the y, or crossline, direction.
PPW	Maximum depth step to take, specified as points per wavelength. default: 4
Min Freq	Minimum frequency to be allowed by filtering. default: 1
Max Freq	Maximum frequency to be allowed by filtering. default: 30
Time Pad	The percent padding to apply to input traces, where trace padding adds zero samples to the ends of the traces. default: 9

continues on next page

Table 183. wem Computation Panel Fields–continued

Variable	Description
Max Step	

wem Output Panel

The wem ouput panel, Figure 225, enables you to specify various module output parameters. These parameters are described in Table 184.

Figure 225. wem Output Panel

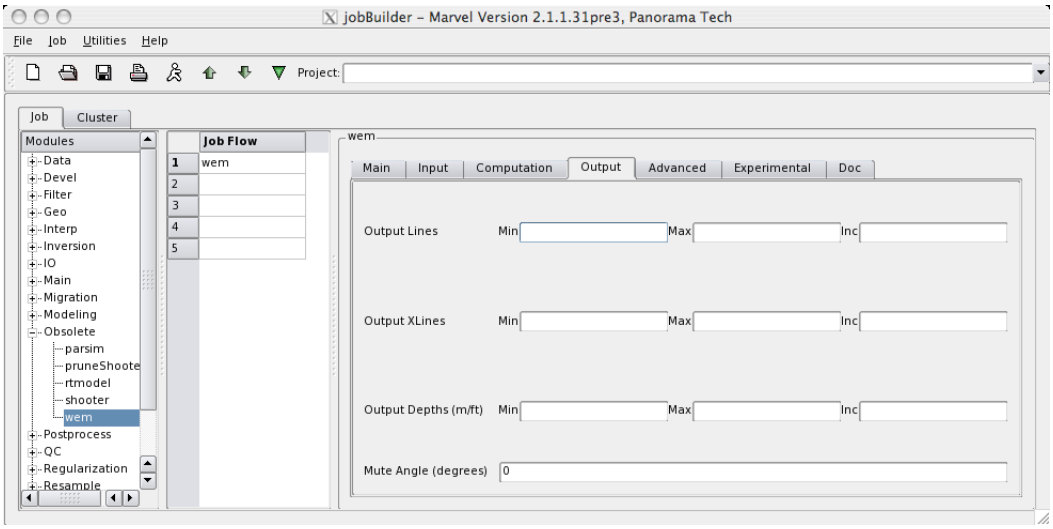


Table 184. wem Output Panel Fields

Field	Description
Output Lines	The minimum, maximum, and increment values for output lines. default: values in the model
Output XLines	The minimum, maximum, and increment values for output crosslines. default: values in the model
Output Depths	The minimum, maximum, and increment values for output times. default: values in the model
Mute Angle	The angle, in degrees, measured down from the surface defining a cone limiting the near surface aperture. default: 0

wem Advanced Panel

The wem advanced panel, Figure 226, enables you to set special operating parameters, which are described in Table 185.

Figure 226. wem Advanced Panel

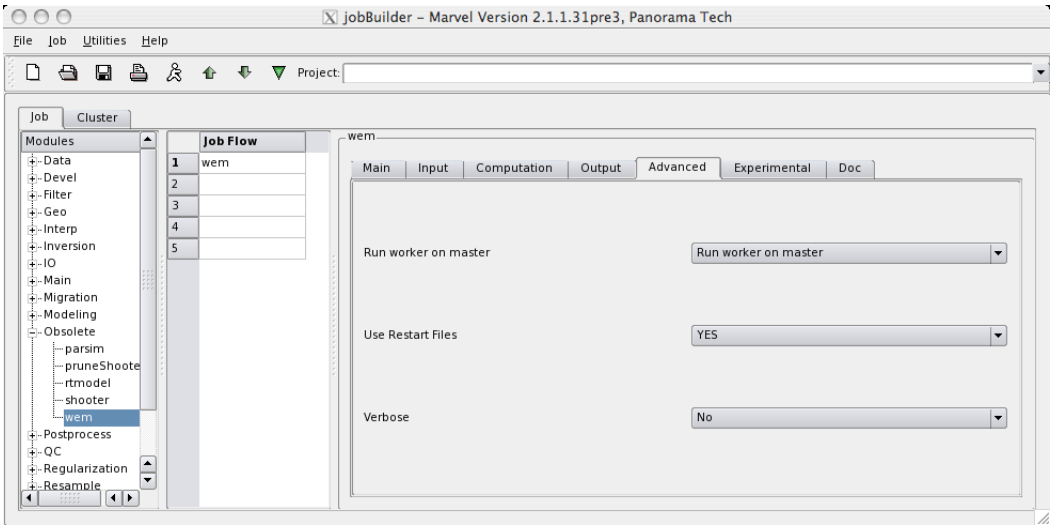


Table 185. wem Advanced Panel Fields

Field	Description
Run worker on master	Determines whether or not the master is used in the computational process. default: Run master on worker
Use Restart Files	If NO, the job will ignore restart information and start from the beginning. default: Yes
Verbose	Switch for turning debug printing on and off. default: No

wem Experimental Panel

The wem module experimental panel, Figure 227, enables you to specify various special operating parameters, which are described in Table 186.

Figure 227. wem Module Experimental Panel

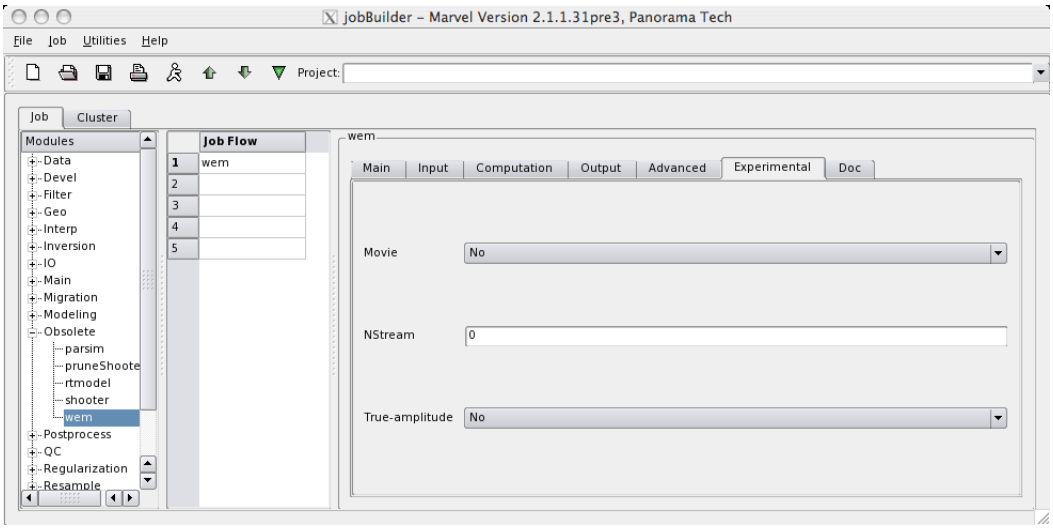


Table 186. wem Module Experimental Panel Fields

Field	Description
Movie	If set, runs movie of the depth slices as calculations progress. (This field is experimental, and probably does not work correctly.) default: No
NStream	Specifies the number of depth steps to take before streaming output to a viewer. default: 0
True amplitude	If set, apply true-amplitude calculation. (This field is experimental, and does not work correctly.) default: No

Chapter 4

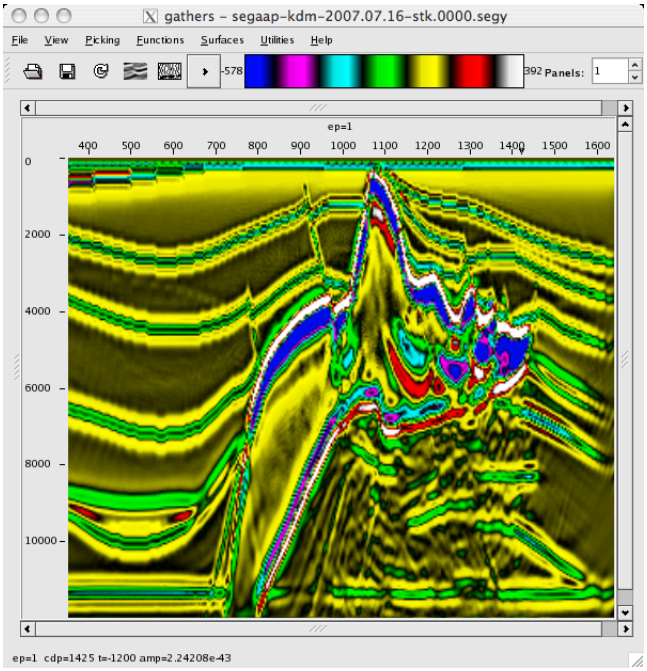
Inline Section Operations

Inline Section Operations allow you to visually inspect and interact with line-oriented data. When operating in this mode, you are able to pick or define time or depth horizons and surfaces for use in subsequent velocity model building procedures.

gathers Module

The Gathers module is the velocity analysis module supplied by Panorama Technologies. Figure 228 shows an example of the gathers window displaying the SEG AA′ 2D model.

Figure 228. Gathers Panel



gathers Menus

The gathers window has seven menus: File, View, Picking, Functions, and Surfaces, Utilities and Help. They are described in this section.

File Menu

Figure 229. File Menu

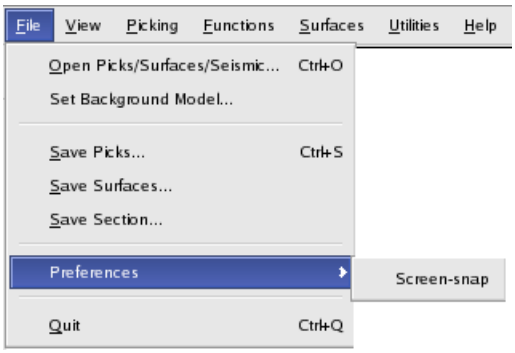


Table 187. Inline Section File Menu

Command	Description
Open Picks/Surfaces...	Displays an Open dialog box enabling you to select a picks file, or surfaces, datasets or projects, with extensions (.pick, .surface, .segy, .dataset, or .project).
Set Background Model...	Displays an Open dialog box enabling you to select a model file (extension .model) to be used as... . default: model.model
Save Picks...	Displays a Save As dialog box enabling you to save the current picks. default: picks.picks
Save Surfaces...	Displays a Save As dialog box enabling you to save the current surfaces information. default: surfaces.surfaces
Save Section...	Displays a Save As dialog box enabling you to save the current section. default: seismic.segy
Preferences	Displays a submenu enabling you to ...
Quit	Closes the gathers dialog box.

View Menu

Figure 230. View Menu

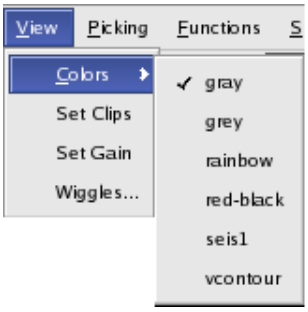


Table 188. Inline Section View Menu

Command	Description
Colors	Displays a submenu that enables you to select the color pattern used for displaying the gathers. • grey–white: white troughs to black peaks • gray–black: black troughs to white peaks • rainbow: full color spectrum • red–black: • seis1: standard seismic display colors • vcontour:
Set Clips	Displays window enabling you to set upper and lower boundaries for filtering the data being displayed, see Gathers Settings Window on page 333.
Set Gain	Displays window enabling you to set the gain for the display, see Gathers Settings Window.
Wiggles...	Displays the Wiggles View Parameters window, see Wiggle View Parameters Window on page 335.

Picking Menu

Figure 231. Picking Menu

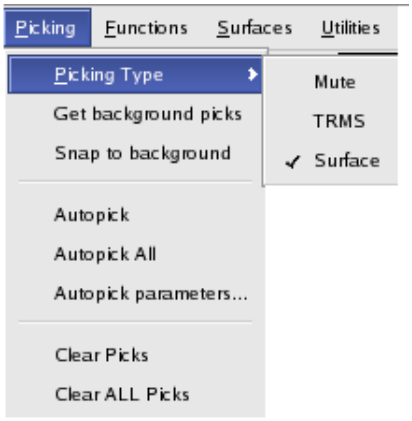


Table 189. Inline Section Picking Menu

Command	Description
Picking Type	Displays a submenu that enables you to select the type of picking to be used in the autopicking procedure. • Mute • TRMS • Surface Default: Surface
Get Background Picks	
Snap to Background	
Autopick	Autopicks the displayed panels.
Autopick All	Autopicks all ensembles in the project.
Autopick parameters....	Displays a window that enables you to set the parameters controlling the autopick process.
Clear Picks	Deletes the picks in the displayed panels.
Clear ALL Picks	Deletes all picks in the project.

Functions Menu

Figure 232. Functions Menu

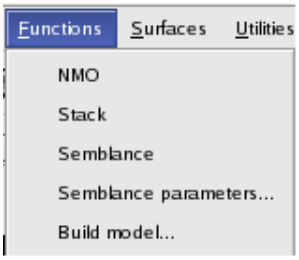


Table 190. Inline Section Functions Menu

Command	Description
NMO	Performs a normal moveout on the data.
Semblance	Performs a semblance on the data.
Semblance parameters...	Displays a panel that enables you to set the parameters associated with semblance, see Semblance Parameters Window on page 340.
Build model...	Displays a panel that enables you to set the parameters associated with building a model, see Build Model Window on page 338.

Surfaces Menu

Figure 233. Surfaces Menu



Table 191. Inline Section Surfaces Menu

Command	Description
New surface...	Displays a panel that enables you to create a new surface in the project.
Extract surface...	
Grid surface...	
Delete surface...	
Delete current surfaces	Deletes the current surfaces.
Select Surface	Displays a submenu that enables you to select a surface from a list of the currently defined surfaces.

Gathers Settings Window

Figure 234 shows the Gathers Settings window. This window enables you to... It contains four tabs: Gain, Data, Cursor/Zoom, and Topography. The fields on the windows are defined in Table 192.

Figure 234. Gathers Settings Window

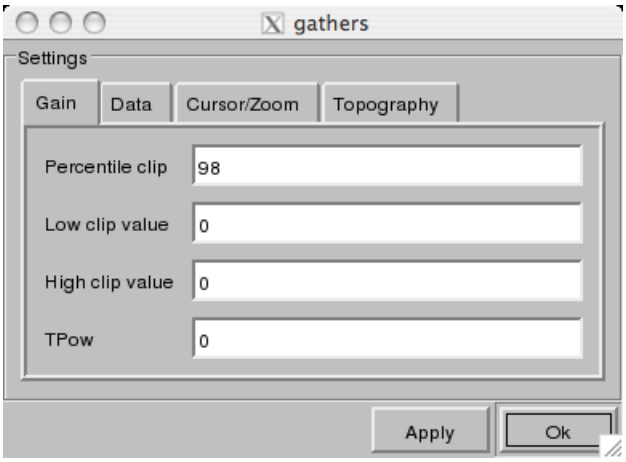


Table 192. Gathers Settings Window Fields

Tab	Field	Description
Gain	Percentile clip	default: 98
	Low clip value	default: 0
	High clip value	default: 0
	Tpow	Scale traces by time raised to a power. default: 0
Data	Data-sort Mode	• Inline • Crossline • CDP • Shot • Offsets • Semblance

continues on next page

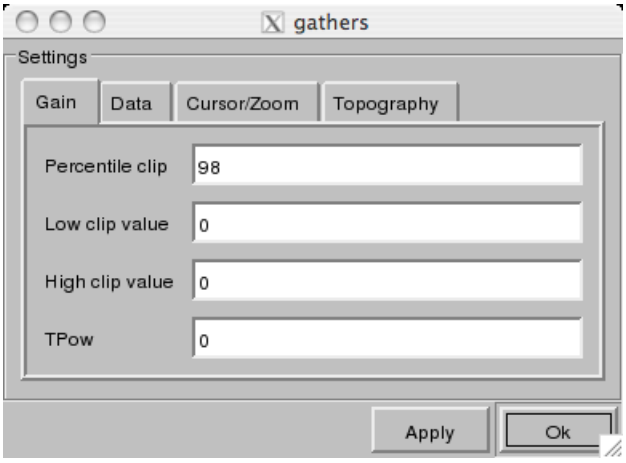
Table 192. Gathers Settings Window Fields–continued

Tab	Field	Description
Cursor/Zoom	Export Cursor	
	Follow Cursor	
	Export Zoom	
	Follow Zoom	
Topography	Topo File	The path and name of the topographic surface file. If given, this specifies the acquisition topography. This can be a MARVEL surface file, or a simple flat file defining the topography, with each line containing the line, crossline and depth values, for example: ep = 100 cdp = 500 z = 20.
	Weathering Velocity	The propagation velocity of seismic waves through the heterogeneous surface layer. default: 4000
	Subweathering Velocity	The propagation velocity through a layer between the surface and the datum. default: 4000

Clips Window

For information about fields on this window, see Gathers Settings Window on page 333.

Figure 235. Clips Window



Wiggle View Parameters Window

Figure 236. Wiggle View Parameters Window



The only two parameters on the window are: Wiggle Overlap and Clip Wiggles.

- Wiggle Overlap–
- Clip Wiggles–

Autopicking Parameters Window

Figure 237 enables you to change the values of several parameters used in the autopicking process, Table 193.

See autopick Module on page 27 for detailed information about how MARVEL performs autopicking.

Figure 237. Autopicking Parameters Window

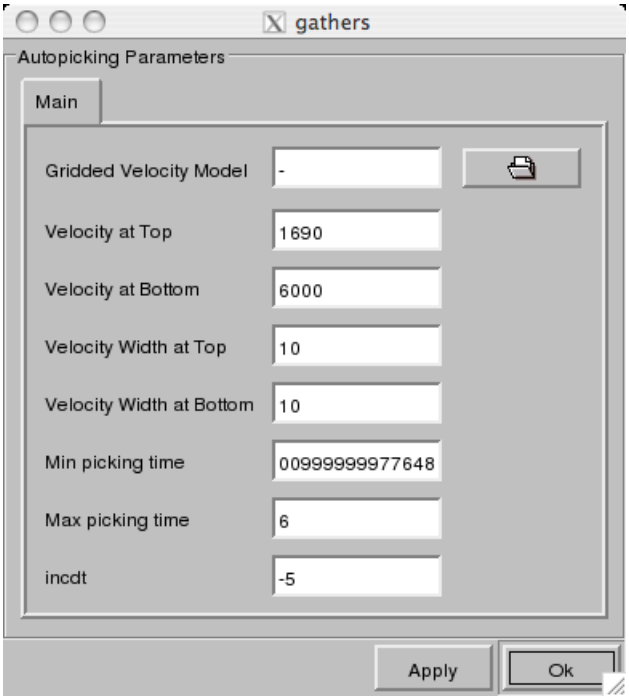


Table 193. Autopicking Parameters Window Fields

Field	Description
Gridded Velocity Model	
Velocity at Top	default: 1690
Velocity at Bottom	default: 6000
Velocity Width at Top	default: 10
Velocity Width at Bottom	default: 10

continues on next page

Table 193. Autopicking Parameters Window Fields–continued

Field	Description
Min picking time	default: 0.25
Max picking time	An override time at which picking stops and the reference function is used to define velocities. Normally, this is set to the maximum trace time. default: 6
incdt	Increment for the dt value. incdt should always be negative. default: -5

Build Model Window

The Build Model window, Figure 238, enables you to control the model building operation performed on the output data. The fields on the panel are described in Table 194.

Figure 238. Build Model Window

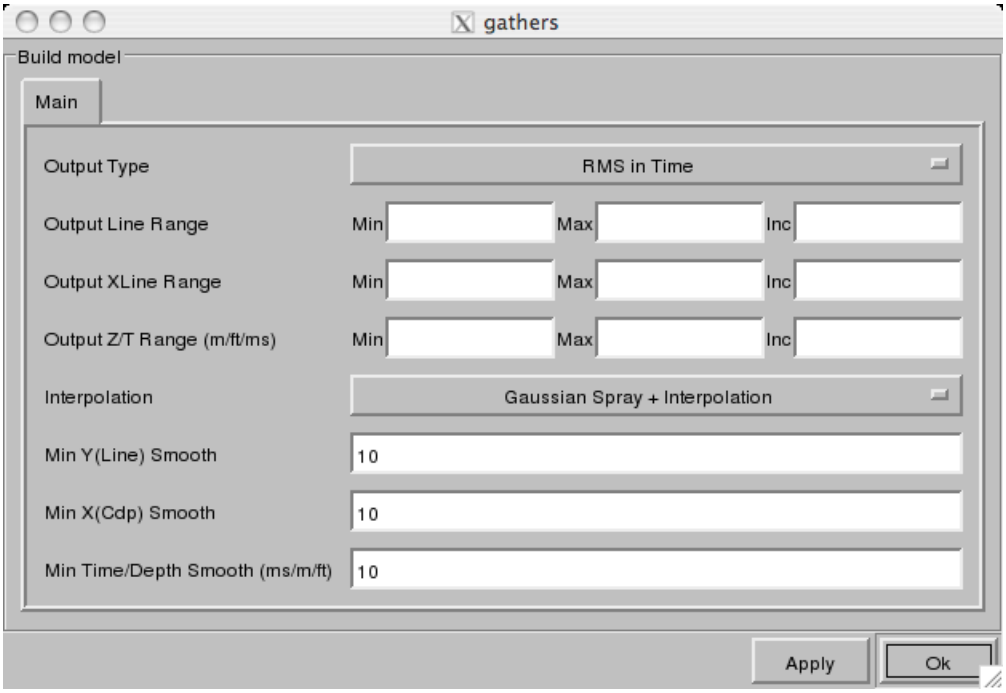


Table 194. Build Model Window Fields

Field	Description
Output Type	Interval in Depth, or RMS in Time. default: RMS in Time
Output Line Range	Minimum, maximum and increment values for output lines.
Output XLine Range	Minimum, maximum and increment values for output crosslines.
Output Z/T Range	Minimum, maximum and increment values for output Depth/Time values.
Interpolation	Gaussian Spray + Interpolation, or Linear default: Gaussian Spray + Interpolation

continues on next page

Table 194. Build Model Window Fields–continued

Field	Description
Min Y(Line) Smooth	Minimum Y (line) smoothing. Default: 10
Min X(Cdp) Smooth	Minimum X (CDP) smoothing. Default: 10
Min Time/Depth Smooth (ms/m/ft)	Minimum time and depth smoothing. Default: 10

Semblance Parameters Window

Figure 239 shows a semblance Module window, and Table 195 describes the fields on the window.

See semblance Module for detailed information about how MARVEL performs a semblance.

Figure 239. Semblance Parameters Window

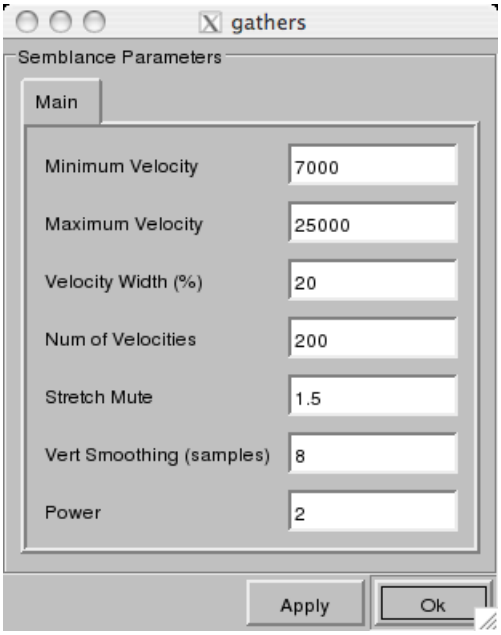


Table 195. semblance Module Window Fields

Field	Description
Minimum Velocity	default: 7000
Maximum Velocity	default: 25000
Velocity Width (%)	default: 20
Num of Velocities	default: 200
Stretch Mute	The time, in seconds, defining when the stretch mute is applied. Samples that are larger than the stretch factor are muted. default: 1.5

continues on next page

Table 195. semblance Module Panel Fields–continued

Field	Description
Vert Smoothing (samples)	default: 8
Power	default: 2

Set Background Model Window

Figure 240. Set Background Model Window

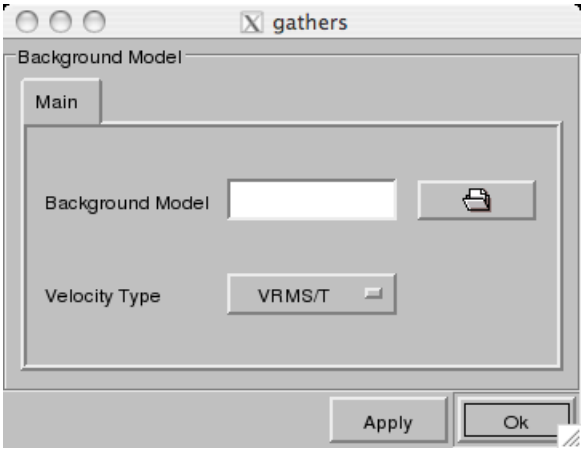


Table 196. Set Background Model Window Fields

Field	Description
Background Model	
Velocity Type	VRMS/T or VINT/Z default: VRMS/T

Gathers Toolbar

Figure 241. Gathers Toolbar



Table 197. Toolbar Commands

Symbol	Description
	Opens a project dataset.
	Saves the project using the current project name.
	Reloads and redisplays the dataset.
	Toggles variable density display.
	Toggles wiggles display as either right-filled wiggles or standard wiggles.
	Displays the next panel.

Chapter 5

XLine Operations

Crossline Section operations allow you to visually inspect and interact with crossline oriented data. When operating in this mode, you are able to pick or define time or depth horizons and surfaces for use in subsequent velocity model building procedures.

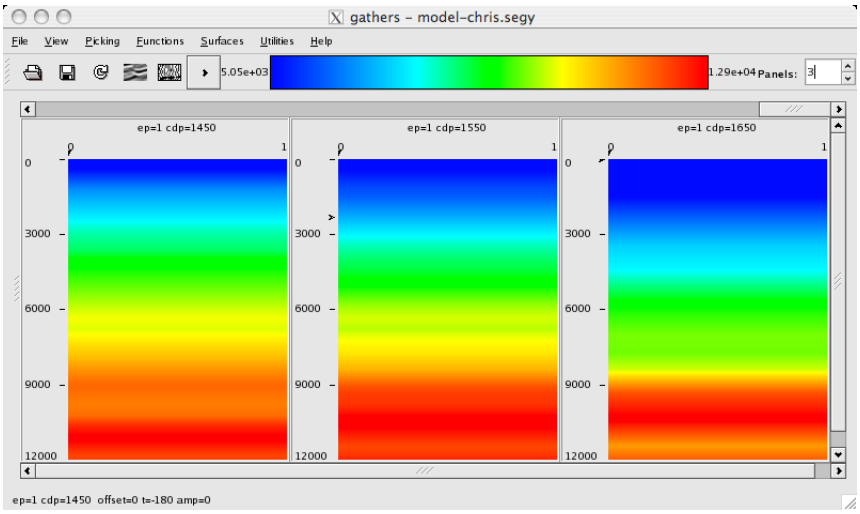
Refer to Inline Section Operations on page 327 for information.

Chapter 6

CDP Gathers Operations

CDP Gathers Operations enable you to visually inspect and interact with display data. You can also pick time-velocity pairs and time-mute pairs manually, or enable MARVEL to pick time-velocity pairs automatically. You can also select the range of gathers on which you want to work. See Figure 242 for an example of the CDP Gathers panel.

Figure 242. CDP Gathers Panel



Chapter 7

Shot Gathers Operations

Shot Gathers Operations enable you to visually inspect and interact with display data. You can also pick time-velocity pairs and time-mute pairs manually, or enable Marvel to pick time-velocity pairs automatically. You can also select the range of gathers you on which you want to work.

Refer to CDP Gathers Operations on page 347 for information.

Chapter 8

eyeGlass Cluster Monitor Operations

Panorama Technologies' cluster monitor technology is named eyeGlass™. eyeGlass enables you define the cluster on which distributed jobs will be executed and monitor the current CPU status for each node in that cluster. Figure 243 shows an eyeGlass display of a cluster. Table 198.

Figure 243. eyeGlass Panel

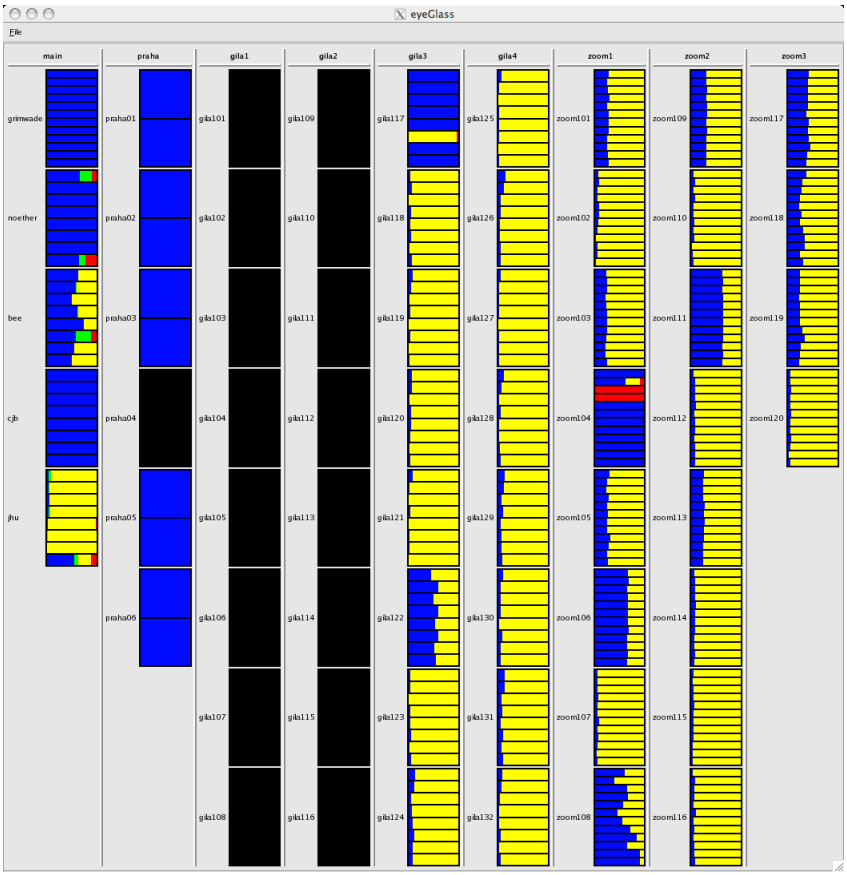


Table 198. eyeGlass Panel Descriptions

Field	Description

The size of any given output volume, together with the amount of memory available in a given node, determines the number of nodes required to hold the output volume in memory without swapping. In the example in Figure 243, MARVEL requires four single CPU nodes to hold the

output volume in memory, and there are four such groups. If the output volume was smaller, the same system could be set up as eight groups, each containing two CPUs.

Within each group, the output volume is distributed over CDPs to minimize load balancing problems. Data is distributed so that each group only processes one-quarter of the input. This means that, given a sufficient number of nodes, you can process extremely large output volumes in a single job.

Appendix A

jobBuilder Tree Structure

Table 199. jobBuilder Module Groupings

Group	Module
Data	attributes hdrMath trwindow
Devel	oned threed
Filter	antialias balance bias filter gain pef srme srme3d tvq

continues on next page

Table 199. jobBuilder Groups–continued

Module	Grouping
Geo	autopick dipFilter moveout mute radon semblance setStatics smoother stack staticShift timeDepth tomo3d
Interp	interp2d interpShot interpVolume
Inversion	inv2d
IO	collect diskRead diskWrite errsq trsum
Main	importGrid
Migration	elated eyeBeam kdm km merlin mork quikmodel rayshooter
Modeling	demig elated fdmod2d kmodel merlin model2d quikmodel

continues on next page

Table 199. jobBuilder Groups–continued

Module	Grouping
Obsolete	parsim pruneShooter rtmodel shooter wem
Postprocess	angle2offset off2angle postproc
QC	scan
Regularization	fkamo gridem samo
Resample	bulkStatic resamp3d resample
Seismic	autoMute
Util	importVtp suwrap
Viz	gathers

Appendix B

Topographic Migration Velocity Analysis

This appendix provides a work flow on which topographic migration velocity analysis can be based. As such, the focus is on the direct estimation of a reasonable first velocity volume from datum-corrected data, followed by a general recipe for the subsequent velocity analysis from the true, or nearly true, topographic surface.

Appendix C shows how MARVEL can be used to perform a topographic migration velocity analysis.

Generalized Topographic Migration Analysis

Introduction

It is necessary to migrate seismic data from the Earth's surface in areas of significant elevation variation. Proper application of this technology has two necessary requirements:

- The topographic surface of elevations must be part of the migration algorithm. Whether performing prestack-time or prestack-depth migrations, travel times must be calculated from this surface rather than from datum.
- The topographic surface represents time zero, and, as such, all velocity analysis must be performed from this surface.

This second statement is true regardless of whether or not migration is part of the analysis procedure. Rough topographic surfaces generally make the initial velocity analysis difficult or impossible, and as a result, velocity estimation is usually based on data to which elevation statics have been applied. While this method frequently produces an acceptable image, velocities estimated in this way are not normally useful in a migration from topography. Consequently, when the initial model is estimated from data at the datum, the image must be shifted back to the true topographic surface to be useful in the migration velocity analysis stage.

After a reasonable initial model is available, subsequent migration from topography velocity analysis can update the initial model to improve the image until differences between neighboring iterations are negligible. Thus, a major problem with migration from topography is not how to perform the process, but, instead, how to estimate a reasonable starting velocity to start the iterative process that determines a reasonable final imaging velocity volume.

Table 200 identifies the terms used in the equations in the rest of this appendix.

Table 200. Equation Terms Used in the Appendix

Term	Description
selev	source elevation
sdepth	source depth
gelev	receiver elevation
wevel	weathering velocity
swevel	sub weathering velocity
sdel	datum elevation

continues on next page

Table 200. Equation Terms Used in the Appendix–continued

Variable	Description
sut	source up hole time
sstat	source static (time)
gstat	receiver static (time)
tstat	total static (time)
τ	time from datum

Elevation Statics

There are three simple equations for computing elevation statics. These equations are:

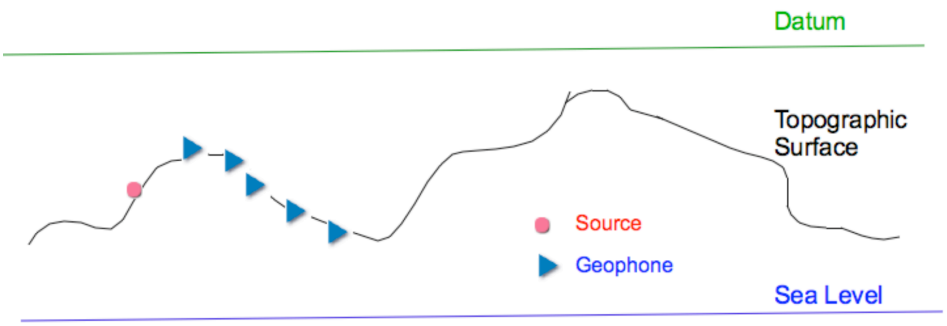
Equation 13:
$$sstat = \frac{sdel - (selev - sdepth)}{swevel}$$

Equation 14:
$$gstat = sstat - sut$$

Equation 15:
$$tstat = sstat + gstat + \frac{selev - gelev}{wevel}$$

To fully understand this process, consider Figure 244, where you can see all of the features of a typical land or ocean bottom cable acquisition. It is a simple topographic schematic with sources and receiver on the topographic surface. There is a zero datum or sea level, a datum that is above all source and receiver elevations, and a topographic surface on which the data is actually recorded. Normally, the datum would be set equal to the highest source or receiver elevation, but this is purely a matter of choice. In fact, the datum could be chosen anywhere on the model. It could even be below sea level, but this is rarely done.

Figure 244. Simple Topographic Schematic



Elevation static correction consists of two basic steps. As shown in Figure 245, the first step vertically shifts all of the receivers so they are theoretically aligned on the source. The second step simply shifts this entire shot profile to the desired datum.

Figure 245. Simple Topographic Schematic After Correction to Source Position

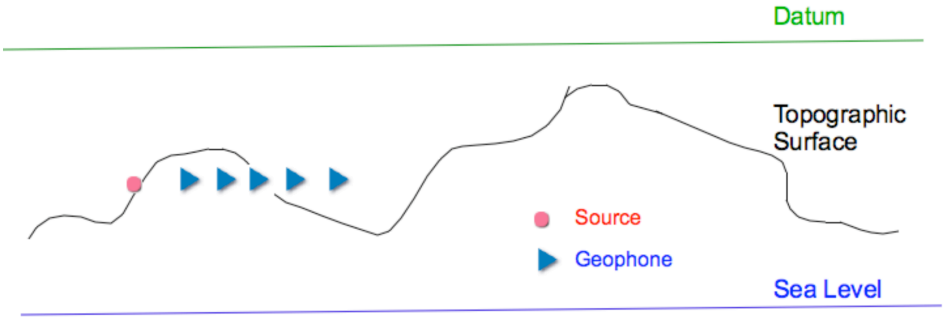
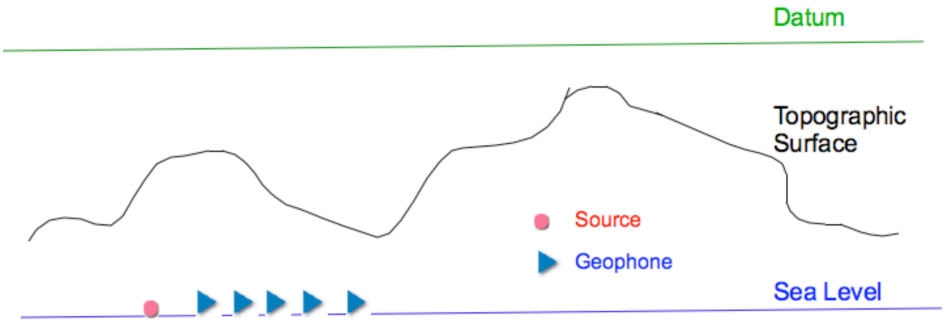


Figure 246 shows what happens if you set the datum elevation to zero, that is, sea level.

Figure 246. Simple Topographic Schematic After Correction to Sea Level



In this case, the term $\frac{selev-gelev}{wevel}$ shifts the trace samples so that, in effect, both source and receiver are at the same level. Then, Equation 16 shifts the trace samples so that the sources and receivers now lie on the surface representing zero datum or sea level.

Equation 16:

$$sstat + gstat = 2.0\left[\frac{sdel - (selev - sdepth)}{swevel} - sut\right]$$

After the trace has been shifted so that it resides at sea level, the datum elevations term, *sdel* in Equation 13 takes over and shifts the traces so that sources and receivers are now essentially on the datum surface. This is illustrated in Figure 247.

Figure 247. Simple Topographic Schematic After Correction to Datum Elevation

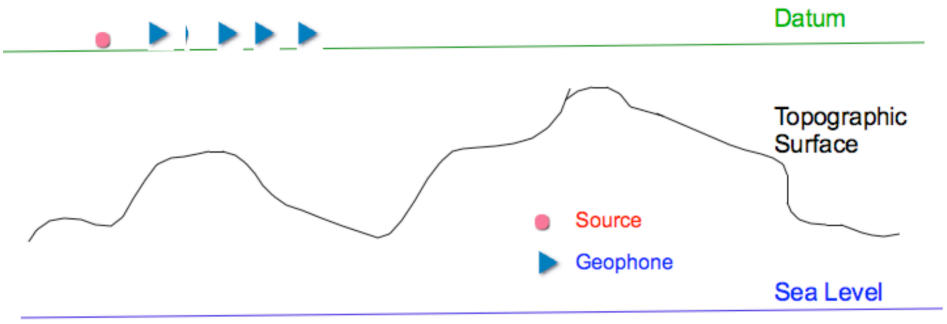
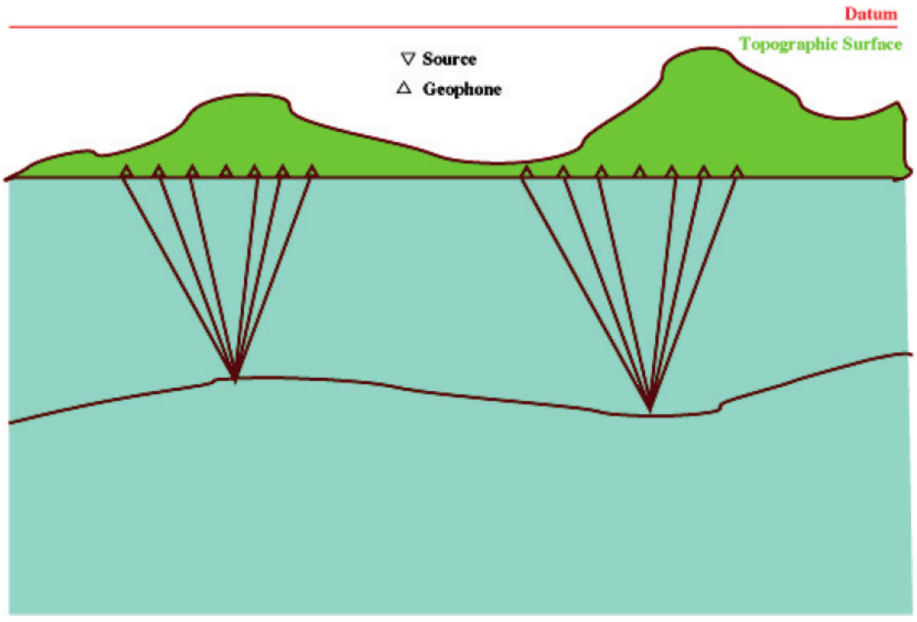


Figure 248 represents how data just prior to the beginning of the imaging or migration part of the processing sequence. At this point, you will probably be able to make reasonable estimates of an initial velocity volume. The area above the flat datum is assigned a constant velocity, while velocities are estimated using traditional-style, hyperbolic-arrival assumptions below the datum.

Figure 248. Building an initial velocity model from topography using a single datum



Initial Velocity Models

It is important to note that velocity analysis can only take place when and if the midpoints of each trace within a given CDP are located on the same level. As Figure 248 and Figure 249 show, elevation static corrections can be applied trace-by-trace to produce a data set for which each CDP has this property. Figure 248 shows data that are shifted to a flat datum. In this

figure, the datum is at the minimum topographic elevation, but as indicated in Figure 249 any datum, including the true topographic surface, will suffice.

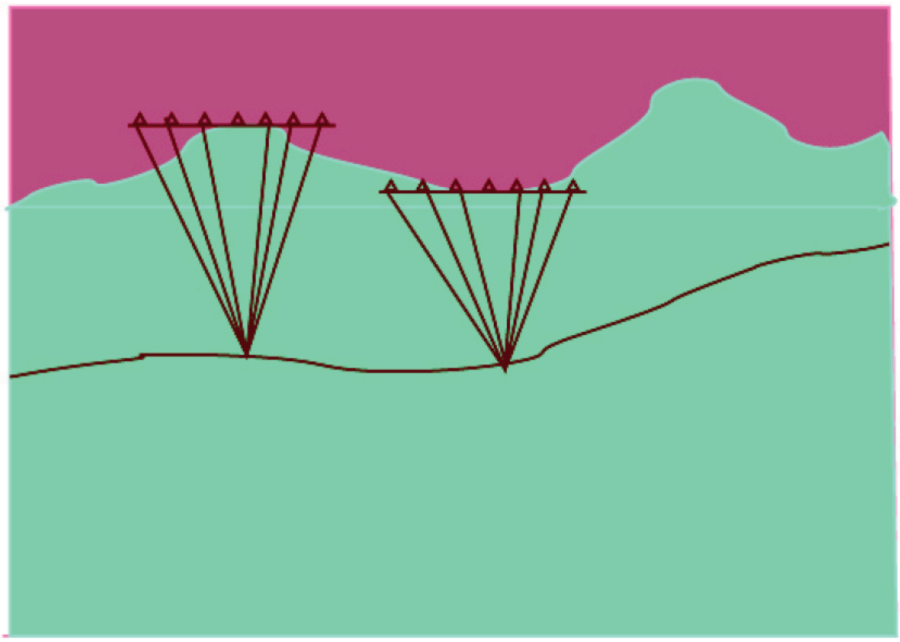
Of course, you should chose *swevel* and *wevel* as close to the true weathering and subweathering velocities as possible, but the real objective is to produce CDP's with arrivals that are as close to hyperbolic as you can achieve. If *swevel* and *wevel* satisfy this requirement, arrivals will be sufficiently hyperbolic so that traditional velocity analysis can proceed, at least in the short-offset case. Moreover, if you choose the CDP-by-CDP shift properly (in other words, to the right surface), this suggests that the initial velocities will be more accurate than those estimated from datum.

Thus, it is clear that to obtain a reasonable initial velocity field, you must first shift the input data to a suitably chosen horizon.

To make this as simple for you as possible, Panorama Technologies has chosen to shift all the traces automatically within any given CDP to whatever you specify as the 'true' topographic surface.

Thus, assuming that appropriate values are in proper header locations, the Gathers module, which is the velocity analysis module supplied by Panorama Technologies, performs the shift automatically to be consistent with Figure 249. You should recognize that, although this is seldom done, you can allow *swevel* and *wevel* to vary across the entire midpoint range.

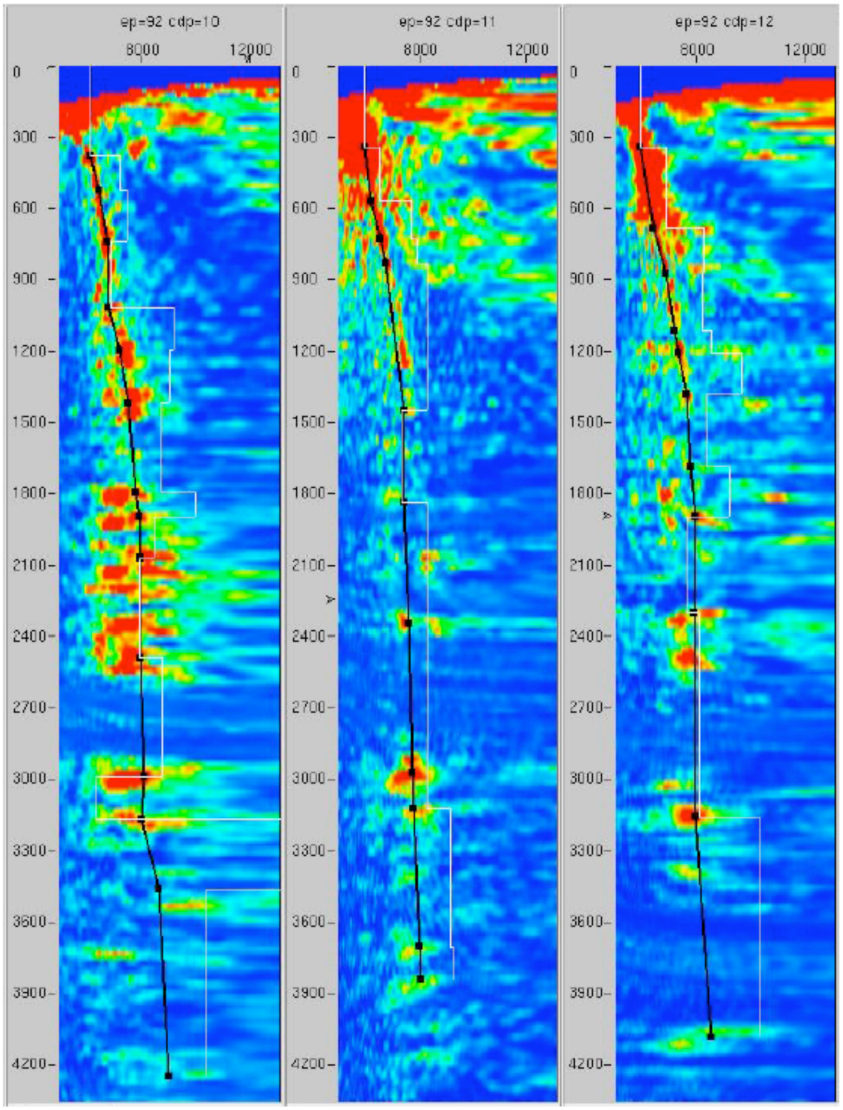
Figure 249. Initial Velocity Model



After the data headers have been set properly, the initial velocity analysis is straightforward. Semblance panels are analyzed and picked in exactly the same manner as you do when the topographic elevation variations are negligible. The picking process, as illustrated in Figure 250, is exactly the same as in a normal processing mode. If the topographic variation

within a CDP is relatively small, this process should work well. Note that you will not see the shift to a topographic surface.

Figure 250. Picking an initial velocity model from topography



Migrating from Topography

Before you migrate from topography, you need to make sure that the observed seismic data are shifted to their original time zero locations. This means that sources and receivers must be at the topographic surface as indicated in Figure 244.

If the input data is hung from datum, you must first apply the appropriate static shift module to place the data back at the correct surface elevations. Since the Gathers module automatically applies the proper static shifts to the data on input, it is also necessary that data trace headers

be set correctly. When these objectives have been met, the application of the Panorama Technologies time and depth migration modules in topographic mode is quite simple.

The time migration module handles all topographic variations automatically, and calculates the proper travel times from the given topographic model. To produce accurate travel times, Panorama Technologies' most energetic raytracer must be provided with a suitable topographic model and surface. On successful execution of the either of the three raytrace modules, shooter, pruneshooter or raytracer, the resulting travel time tables contain all of the necessary information for an accurate migration of the input data.

Migration Velocity Analysis

Migration velocity analysis from topography proceeds through a normal iterative process. Since migration has the net effect of producing coincident source and receiver data, you can think of the migration output as having been topographically shifted as indicated in Figure 249, which shows building an initial velocity model from topography using multiple datums. Note that at each midpoint, the datum is exactly equal to the midpoint's elevation. In this case, velocity estimation is directly *from topography*. Thus, migration velocity analysis proceeds in exactly the same manner as it did for the initial stacking velocity analysis of the preceding section. The only serious concern is that you have to perform all of these tasks without error.

Workflow

The following simple workflow provides a procedure for migrating from topography. The sequence is as follows:

1. Prepare the data so that header locations corresponding to *selev*, *sdepth*, *gelev*, *wevel*, *swevel*, *sdel*, *sut*, *sstat*, *gstat*, and *tstat* are set correctly.

2. Remove any elevation statics that may have been applied to the data. Residual statics need not be removed, but refraction statics must not have been applied.

3. Perform an initial stacking velocity analysis to determine an initial migration velocity model. (Make sure that the Gathers module is in topographic mode.)

4. If running a depth migration, generate travel times from topography.

5. Migrate using the current velocity model.

6. Repeat the migration velocity analysis until you obtain suitable results.

Topographic Migration Velocity Analysis in MARVEL

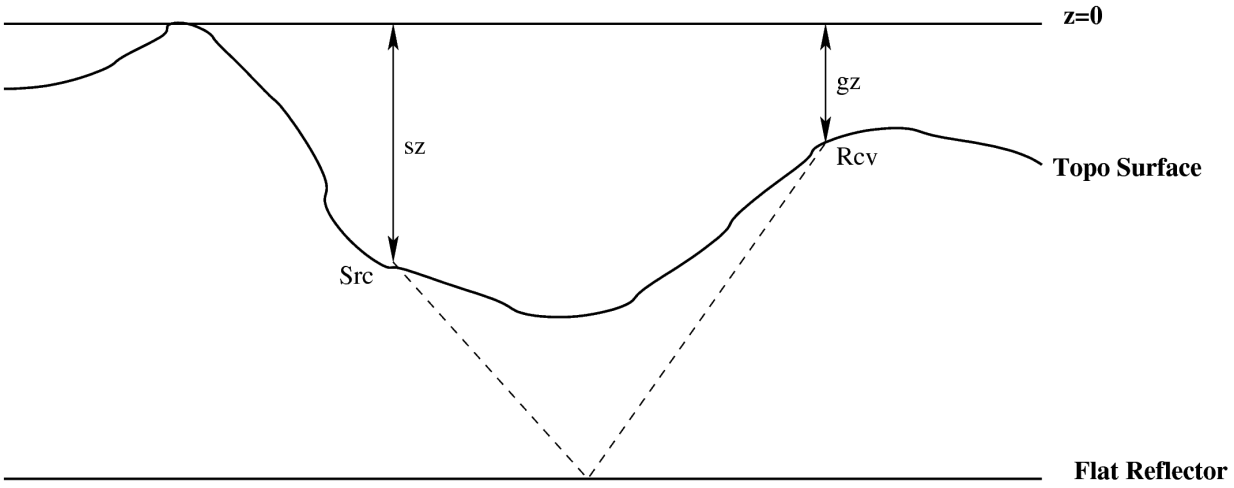
While Appendix B presents a generalized analysis of how topographic migration velocity analysis is performed, this appendix shows how MARVEL can be used to perform such an analysis.

Imaging, modeling, and velocity analysis in the presence of topography often leads to confusion on the part of the user. This confusion is partly due to the varying approaches used by different software packages, and partly because a better understanding of the general techniques is needed to make the transition to non-flat surfaces.[1] This appendix explains the approach used in the MARVEL package. The key is that the MARVEL migrations calculate traveltimes directly from the $3D$ surface to the output locations.

Depth Migration from Topography

In Figure 251, the sources and receivers are all on the topographic surface, while there is a single flat reflector beneath the surface. The real surface is the curved line in the figure, while the top flat line is the highest point on the surface. We have arbitrarily labeled this elevation, which is everywhere above the surface, as $z = 0$. As we continue, we will be interested in building a model of the earth's velocity beneath the surface. Although we will include "velocities" between $z = 0$ and the surface to create a regularly gridded model, there is no relationship between these velocities and the real medium in those positions, *and we do not use these velocities in the calculations*.

Figure 251. Topographic Acquisition

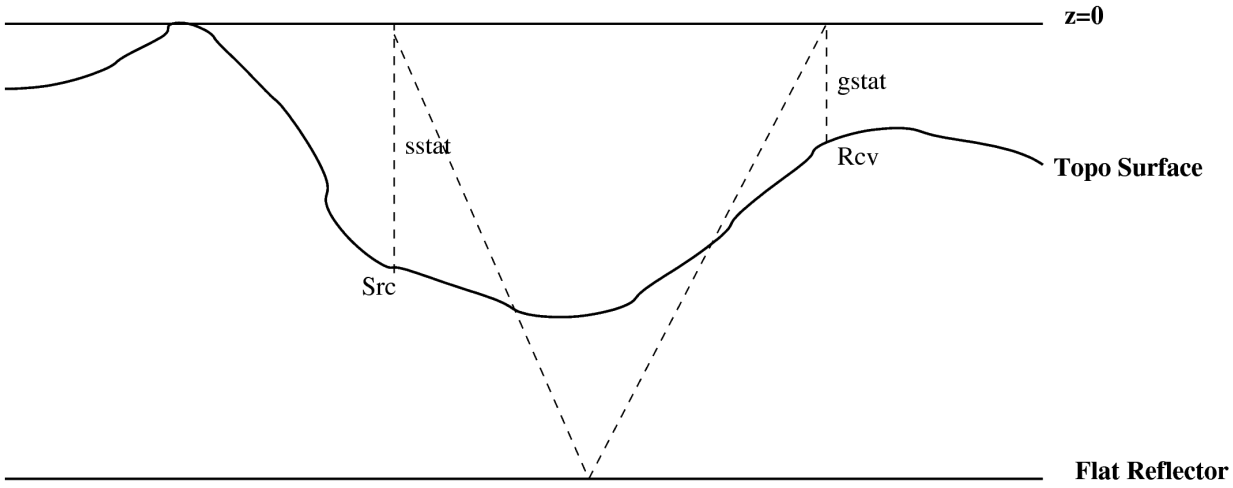


The acquisition is shown schematically for one trace in Figure 251. The source is at depth sz and the receiver is at depth gz. Static shifts, $sstat$ and $gstat$, will be applied to the trace.

[1] Stanislaw Ulam said "using a term like nonlinear science is like referring to the bulk of zoology as the study of non-elephant animals." In a similar vein, "non-flat surfaces" can also be compared in importance to "non-elephant animals".

Before discussing the method MARVEL uses to migrate directly from topography, it is worth looking at something you may already be using in other packages. In some packages, an artificial "replacement velocity" is used everywhere above the surface, and a static shift, $sstat + gstat = (sz + gz)/v_{repl}$, is applied to the traces to try to synthesize data acquisition from the fixed datum, as shown in Figure 252.

Figure 252. Fixed-datum migration.



Note that:

1. This type of shift cannot produce a trace that will image correctly in more than one place.
2. A velocity model built to get a good image with this method will not match the real medium.

From Figure 251, you can see that to image this trace, you just need the traveltime from the source to the output location and from the receiver to the output location. To calculate traveltimes for depth migration, you only need to know the source and receiver positions (including depth) and the velocities beneath the surface. Once you know these values, you can sweep the trace out to the correct output locations using a model that matches the real velocities of the medium.

In MARVEL, traveltimes are computed directly from the topographic surface down into the model. Naturally, there are no traveltimes computed above the surface. For the most part, the Kirchhoff pre-stack depth migration (PSDM) can then migrate as usual, ignoring topography (except in interpolating traveltimes).

Depth To Time Conversion

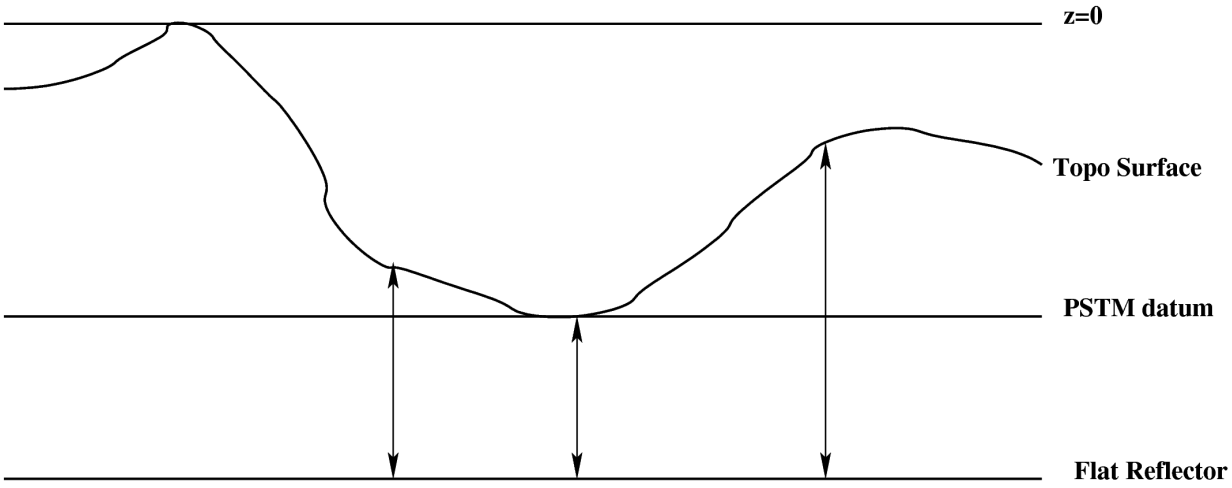
To convert a stacked section from depth to time, it is just necessary to agree on the mapping of one reference depth datum to one reference time datum. In the absence of topography, it is normal for $z = 0$ to correspond to $t = 0$, while, everywhere else, the connection between depth

and time depends on the local velocity function. With topography, it is not necessarily best to make this same connection, since we don't really have velocities above the surface, and any attempt to make the connection requires an artificial velocity in that location. Thus, the most sensible thing to do is to connect the lowest depth on the surface to a specific time.

The PSDM stores the output maximum depth of the surface in the header *sdepth*. The depth-to-time conversion can then continue using the maximum depth of the surface and a time datum.

For conversion from depth to time, we only have velocity information from the surface down. We can compute the time from the surface down to any output depth, but for stacking, of course, we would like to have the traces shifted properly to account for the topography. The best way to do this is to identify a depth which is everywhere at least as deep as the surface (ideally, this depth can be equal to the maximum depth), and to tie that depth to a specific time. This depth is labeled "PSTM datum" in Figure 253.

Figure 253. Depth to Time Conversion



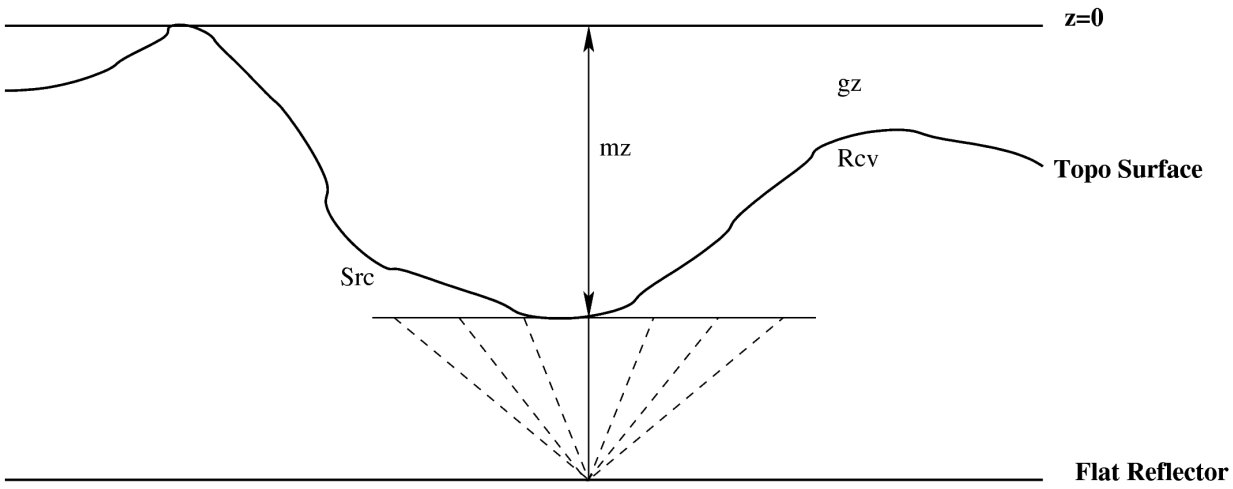
To preserve all output data, the time used should be at least the maximum (two-way) traveltime from the surface down to the depth we have chosen. For a constant subsurface velocity, this will be the time from the highest point on the surface down to the reference depth. For more complicated velocities, it will have to be calculated. Note that this process effectively redefines the surface in time, using only subsurface velocities.

The MARVEL **timeDepth** module takes a VINT/depth model and a topographic surface (provided either separately or in the model *tstat* header) and calculates a time section, as needed, with the reference depth stored in *sdepth* and the maximum time from surface to *sdepth* stored in *laga*.

Depth Velocity Update from Topography

To back out velocities for updating, you need to consider what information to use. After migration is complete, only the depth of the surface at the midpoint is important. The data must first be shifted up by the depth of the surface at the midpoint, and then depth-to-time conversion and NMO can be performed using the valid velocities below the surface. After picking velocities, topography can be used to build a model with $z = 0$ at the top.

Figure 254. Statics for backout



Note that the MARVEL model builder, **smoother**, will not insert a replacement velocity above the surface in depth, but will simply smooth subsurface velocities into that region. This is by far the safest approach for all migration, time/depth and moveout operations to ensure that no “wild” velocities are used in calculations.

Data Preparation

To perform topographic migration velocity analysis, the data should be acquired and the surface built using the methods described in this section.

Fixed Datum versus Real Surface

It should be noted that the previous discussion assumes the input data are in an “as-acquired” state; that is, static corrections were not used to move the data to a datum, as in Figure 252, either floating or static. If static corrections have been performed, these shifts must be removed from the data before MARVEL migrations are performed. MARVEL migrations make no use of “replacement velocities” above the surface; these are only needed if they have been used to shift the data to a datum.

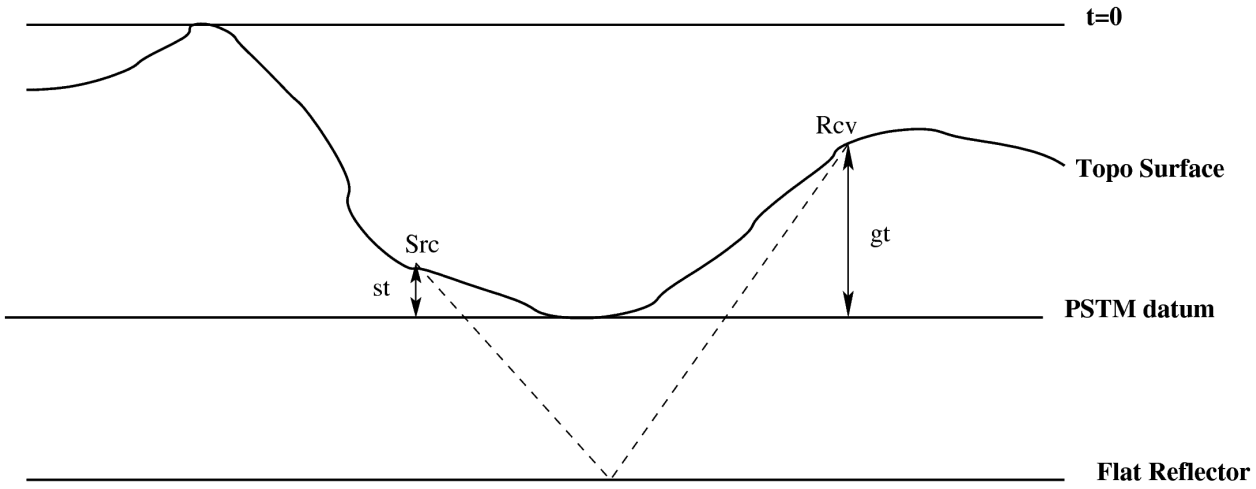
Building the Actual Surface

To create the surface needed for various processing steps, the data should either come with a separate surface specification, or the surface may be stored in trace headers, for example, *selev* and *gelev*. These are usually specified as elevations of source and receiver relative to sea level. The migration and other modules expect to have a measurement down from some arbitrary elevation which is everywhere above the real surface. For example, if you choose your fixed datum to be d, where $d \geq \{selev, gelev\}$, the surface for MARVEL should be defined as $d - \{selev, gelev\}$. A **buildSurface** module will be provided to scan data to build this surface [2], and to shift it, should you choose to move the fixed datum.

Time Migration from Topography

The situation is more difficult in time migration since topography is naturally described in terms of depth. To translate topography into time, only subsurface velocities may be used; any artificial replacement velocity above the surface is irrelevant (except, of course, that it may be necessary to remove a to-datum shift as described previously). Figure 255 shows topographic acquisition as seen by pre-stack time migration (PSTM).

Figure 255. Topographic Acquisition As Seen by PSTM



For time migration, it is important to ensure that the traveltimes from the surface down to the reflector are adjusted for the difference in time from the surface down to a fixed reference. The safest way to do this is:

1. Find the maximum depth of the surface, z_{max}.
2. For each point on the surface, compute the time down to z_{max}.
3. Use this to define the surface in time.

[2] At the time of this writing, version 2.1.1 of MARVEL does not include this module.

All of this is done internally by the MARVEL PSTM.

Thus, a flat reflector near the bottom of the surface will be as well-imaged as possible. Note, however, that the position *in time* of the bottom of the surface will change depending on the model. Note also that the highest point of the surface *in time* is not necessarily the highest point *in depth*, and can also change depending on the model.

The output of MARVEL's PSTM is always such that the highest point of the surface *in time* appears at $t = 0$, and z_{max} appears across the section at time t_{max}.

Depth Estimation for PSTM Topography Output

To convert time to depth for output of MARVEL PSTM with topography, you will need to know values and functions you can get the easy way or the hard way:

The easy way:

1. The location of the surface on the output section, *tstat*. This is stored in the trace headers by the PSTM.

2. The velocity function from *tstat* down to the output location:
   - If using an RMS model with "t = 0 is surface", this is the function from 0 to $t_{out} - tstat$.
   - If using a VINT/DEPTH model, this is the velocity function from the (depth) topographic surface down.

or,

The hard way:

1. The maximum depth of the surface, z_{max}.
2. The value t_{max} corresponding to z_{max} on the output section.
3. The velocity function from t_{max} down to the output location.

Time Velocity Update from Topography

Since the output of the PSTM does not need to be converted to time, this makes for somewhat less effort in backing out velocities. A **staticShift** with default parameters will shift the data back to the surface, and NMO, picking, and other operations may be done then.

Note:

When working with RMS/TIME models, it is best to leave the model such that $t = 0$ corresponds to the topographic surface. When working with INT/DEPTH models, it is currently necessary to build the model with topography, since the raytracers will need it in this form. The MARVEL **smoother** module will place the velocity functions correctly to follow the topography.

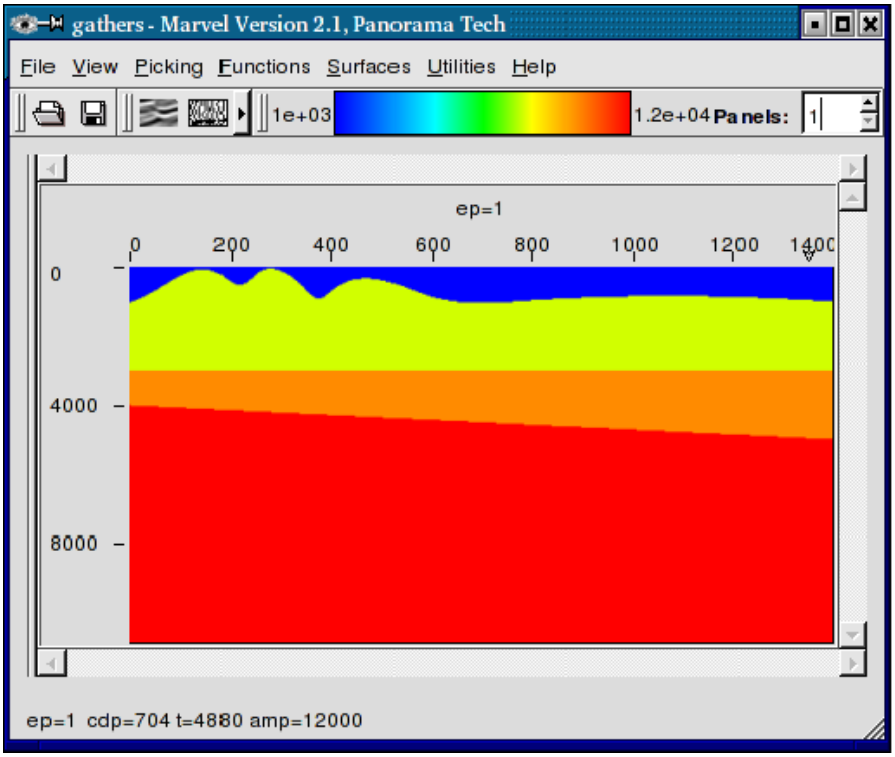
In general, when working with topography, it is best to work with VINT/DEPTH models.

Example: The NewTopo Project

The NewTopo project provides an example and test of migration from topography in MARVEL.

The model shown in Figure 256 is fairly simple and has only four layers. Data have been acquired with sources and receivers resting on the top surface (between blue and yellow), and there are three reflectors (only two can be seen on the model). A MARVEL topographic surface file is provided, along with the model and data.

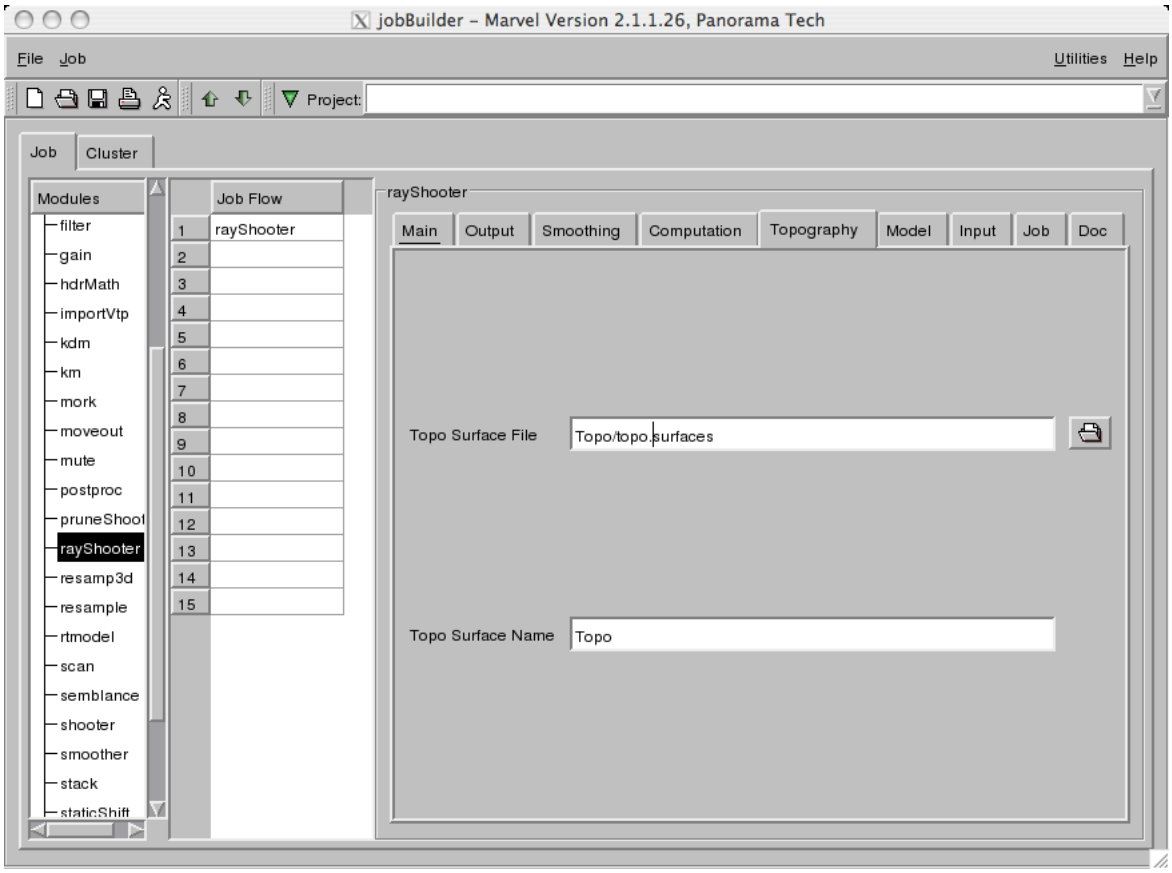
Figure 256. Simple Topographic Model



Depth Migration

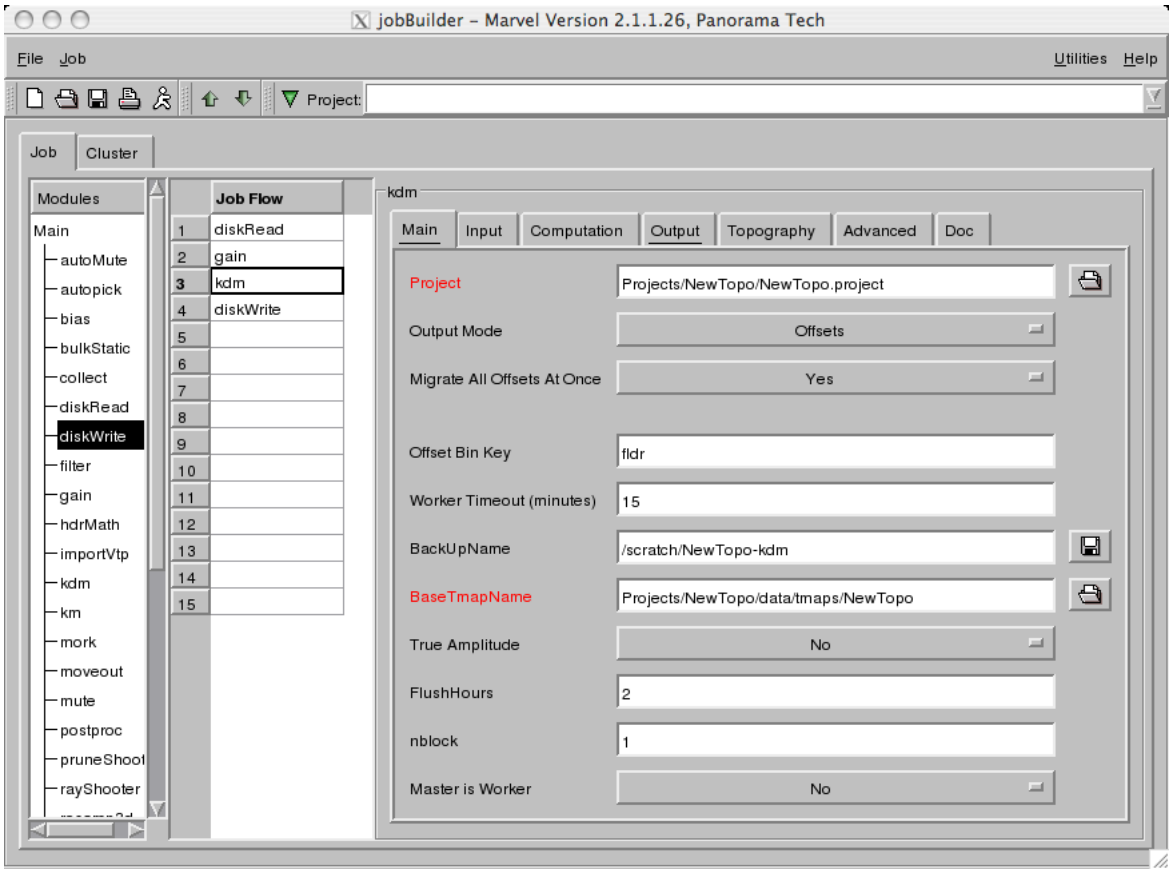
For depth migration, you must first run the raytracer using module **rayShooter** with the proper topographic information, as shown in Figure 257. All you need to provide is the topographic information, while the other parameters are as usual.

Figure 257. Raytracer (rayShooter) Job Setup for Topography.



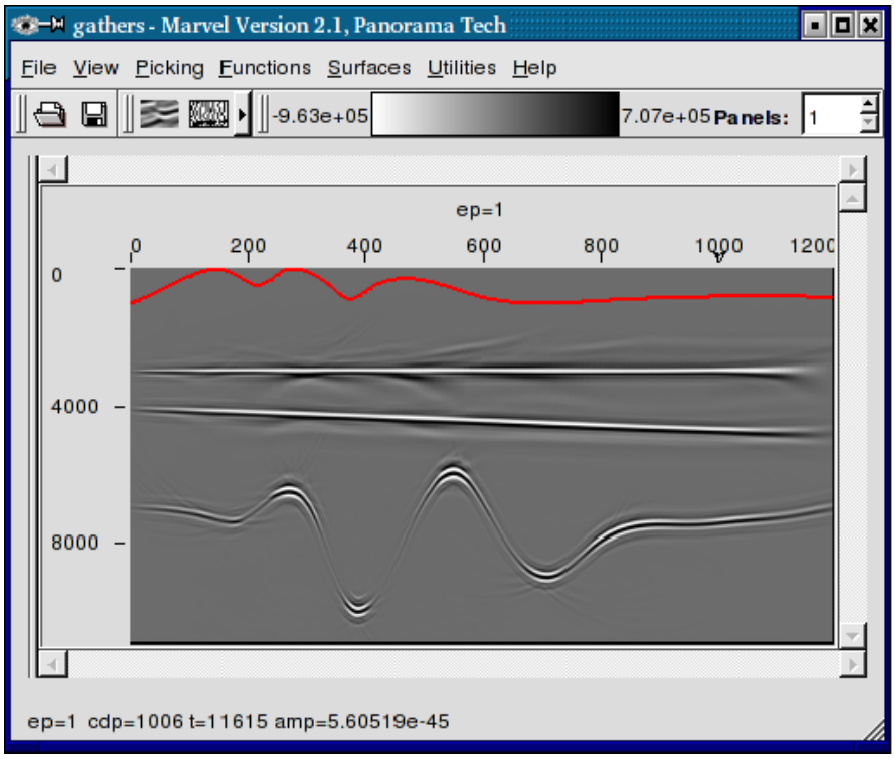
With the *tmaps* available, you can actually just run the depth migration, **kdm** as normal (see Figure 258), without any indication of topography, and you should be able to get a reasonable result (much of the topography is stored in the *tmaps*). However, for best results, and to set output headers correctly, you should include the topographic surface in the Topography tab; otherwise, this is the same as running the module without topography. Note in particular that **kdm** will do a much better job of interpolating traveltimes if it has the topographic surface.

Figure 258. kdm Job Setup for Topography.



For this project, the stacked result should look like that in Figure 259. The topographic surface shown in red is included in the headers, and was extracted in *gathers* with the Extract Surface menu (see Surfaces Menu on page 332 in Inline Section Operations).

Figure 259. Stacked Kirchhoff Depth Migration (kdm) of Data



Depth-to-Time Conversion and Stack

To produce an image shifted to match the output of the time migration for conversion from depth to time, the **timeDepth** module will also need the topographic surface; other parameters are shown in Figure 260. The results are shown in Figure 261, and should match the PSTM results.

Figure 260. Job Setup for timeDepth with Topography

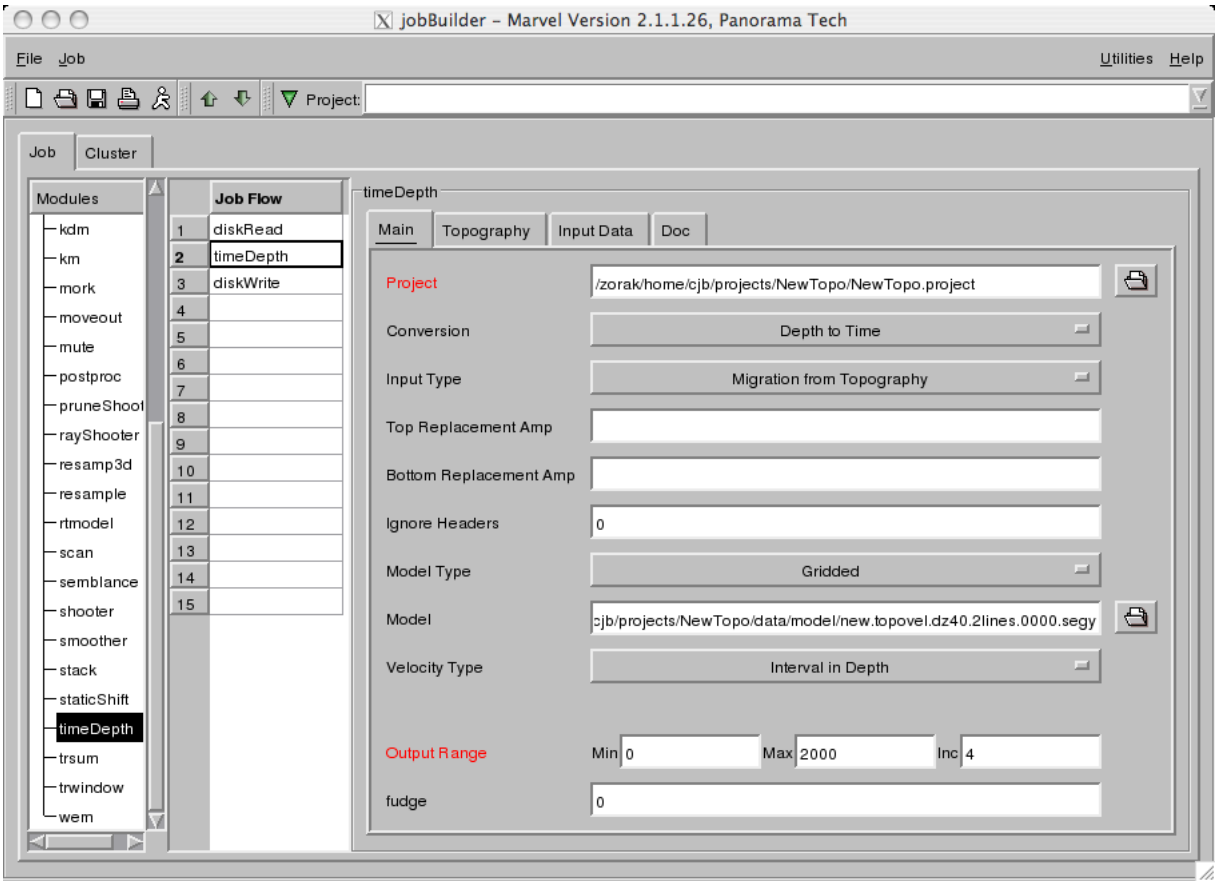
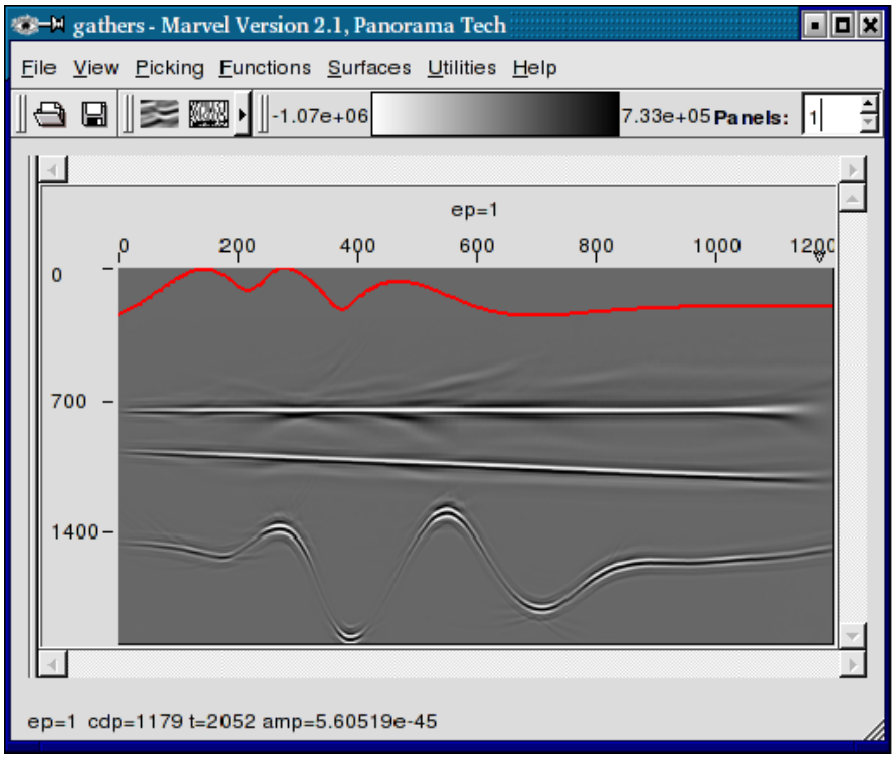


Figure 261. Stacked Kirchhoff Depth Migration (kdm) of Data, Converted to Time (Note: Surface Also Converted).



Appendix C

3D Surface Related Multiple Elimination

This appendix explains the parameters defining Panorama Technologies' 3D Surface Related Multiple Elimination algorithm (SRME3D) and provides a brief explanation of the assumptions underlying the process. These assumptions essentially define the optimum acquisition scheme to assure the best possible results.

Auto Convolution

The underlying concepts embodied in SRME3D are quite simple, and this is especially true in one-dimension. If we assume a one-dimensional Earth with a free acquisition surface, then the time of the first multiple is easily predicted by a simple convolution of the recorded trace with itself. If the first arrival occurs at t_0, the first arrival of the convolution is at the arrival of the first order multiple, that is, $2t_0$. If we perform a second convolution using the original recorded trace and the first convolution, the result is a trace where the first arrival is at $3t_0$, which is the time of the second multiple. Continuing this process as many times as desired results in a series of traces containing the first order multiples, the second order multiples, the third order multiples, and so on. While the time of each multiple trace is exact, the amplitude and phase of the actual multiple sequence is incorrect. Nevertheless, the sequence of multiple traces can be match filtered to suppress, or, in some cases, completely eliminate, the free surface generated multiples.

In three dimensions, the *nth* order multiple data series $d_n(\vec{x}_s, \vec{x}_r, \omega)$ is predicted from a de-ghosted, obliquity-corrected and first-break-muted version of the original shot data, $d_0(\vec{x}_s, \vec{x}_r, \omega)$, through the auto-convolution given by Equation 17.

Equation 17:

$$d_n(\vec{x}_s, \vec{x}_r, \omega) = \int\int d_0(\vec{x}_s, \vec{x}, \omega) d_{n-1}(\vec{x}, \vec{x}_r, \omega) d\vec{x}$$

Note that this process only utilizes the surface acquired data. It does not require any knowledge of the subsurface, and, as far as the obliquity factor is concerned, only superficially requires knowledge of the velocity in the water column. For each multiple order, the process also produces a completely new set of shots and receivers.

Multiple Suppression

Data available after computing the multiple sequence described in Equation 17 consists of the data, $d_0(\vec{x}_s, \vec{x}_r, \omega)$, and the multiple estimates, $d_m(\vec{x}_s, \vec{x}_r, \omega)$.

For each source and receiver, the demultipled data, $d_m(\vec{x}_s, \vec{x}_r, \omega)$, satisfies a series of the form shown in Equation 18, where $W(\omega) = W(\vec{x}_s, \vec{x}_r, \omega)$ is a special wavelet designed to optimally correct the phase and amplitudes of the estimated multiples to optimize the suppression.

Equation 18:
$$d_m(\vec{x}_s, \vec{x}_r, \omega) = d_0(\vec{x}_s, \vec{x}_r, \omega) - W(\omega) d_1(\vec{x}_s, \vec{x}_r, \omega) - W^2(\omega) d_2(\vec{x}_s, \vec{x}_r, \omega) - \ldots$$

Wavelet Estimation

In the current version of SRME3D, the wavelets $W(\vec{x}_s, \vec{x}_r, \omega)$ are estimated by solving a set of time domain normal equations of the form shown in Equation 19.

Equation 19:
$$\begin{pmatrix} r_0 & r_{-1} & \cdots & r_{-nw+1} \\ r_1 & r_0 & \cdots & r_{-nw+2} \\ . & . & . & . \\ . & . & . & . \\ . & . & . & . \\ r_{nw-1} & r_{nw-2} & \cdots & r_0 \end{pmatrix} \begin{pmatrix} w_0 \\ w_1 \\ . \\ . \\ . \\ w_{nw-1} \end{pmatrix} = \begin{pmatrix} c_0 \\ c_1 \\ . \\ . \\ . \\ c_{nw-1} \end{pmatrix}$$

In this equation, nw is the number of time domain coefficients in the wavelet, $w_n = w(\vec{x}_s, \vec{x}_r, n\Delta t)$ is the discrete wavelet, r_n are the multiple autocorrelation coefficients, and c_n are the coefficients determined by cross correlation of the original data and the estimated first order multiple. One such wavelet is estimated for each source in the input data set.

Parameterization

Panorama Technologie's 3D SRME has the parameters listed in Table 201:

Table 201. SRME 3D Parameters

Term	Description
Required Parameters	
Project	project name used for this data set
ShotXRange	min,max,inc
ShotYRange	min,max,inc
ReceiverXRange	range relative to shot: min,max,inc
ReceiverYRange	range relative to shot: min,max,inc
Optional Parameters	
waveletfile	(blank)
pathname	default: /scratch/users
cdpKey	CDP location in header default: cdp
lineKey	line location in header default: ep
sxKey	shot X location in header default: sx
syKey	shot Y location in header default: sy
gxKey	receiver X location in header default: gx
gyKey	receiver Y location in header default: gy
*f*1	lowest frequency to process default: 0.0
*f*4	highest frequency to process default: 60.0
norder	Highest multiple order to compute default: 1
niter	Number of wavelet optimization iterations default: 1

continues on next page

Table 201. SRME 3D Parameters–continued

Variable	Description
nwav	Length of the wavelet in ms default: 200
wnn	White Noise factor in percent default: 1
alpha	Time domain damping factor (1)
nfill	infill option default: 0–no infill
mutsw	restore mute switch default: 0–no restore
nice	run in Nice mode default: yes
MasterisWorker	Flag that controls whether the master I/O controller is also used for performing calculations. default: no

Data Assumptions

All inverse-scattering based multiple suppression techniques assume that the input data has full source-receiver reciprocity. This is a very stringent constraint that most, if not all, current acquisition schemes fail to produce. The most important aspect of this assumption is the sub-requirement that each shot in the input data stream contain a trace at zero offset. In many cases, the traces in a short offset DMO-corrected stack can be used to fulfill this requirement. Traces at other offsets may be obtained through a careful application of differential moveout. In most cases, high quality results can only be achieved through a careful regularization of the input data.

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