

# Generating a 2-D Shear-Wave Velocity ( $V_s$ ) Cross Section

– Working with Sample Data ("DippingBedrock.dat") –

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## About the Sample Data Set ("DippingBedrock.dat")

This sample data set is an output from seismic modeling using the reflectivity method that is also part of the PS software (available under "Modeling" in the main menu). This data set is used to demonstrate how to produce a 2-D cross shear-wave velocity ( $V_s$ ) section. Because it is an output from PS, the data set is already in PS format, not in SEG-2 format. Other types of sample data are explained in the PS User Guide ["Sample Data."](#)

This sample data set consists of twenty (20) field records of 24-channel acquisition (Figure 1) with a 1-ms sampling interval ( $dt$ ) and 1024 samples of recording (i.e., recording time,  $T$ , is 1.024 sec). Each of these records is modeled with a 2-layer earth model (overburden and bedrock) that increases its bedrock depth systematically so that the resultant effect is a "dipping" bedrock (Figure 1). Shear-wave velocities of overburden and bedrock were arbitrarily set to 200 m/sec and 1000 m/sec, respectively. Corresponding Poisson's ratios were set to 0.45 and 0.33, respectively. A constant density of 2 gm/cc was used for both overburden and bedrock.

The velocity ( $V_s$ ) model shown below indicates the ideal image of the cross section that can be obtained by properly processing this sample data set. The source/receiver (SR) configuration chart displayed below shows relative SR location for each record within the surveyed surface distance. It shows the receiver spacing ( $dx$ ) of 1.5-m was used with the source offset ( $X_1$ ) of 9-m ( $6dx$ ). It also shows the entire SR configuration moved by 9 meters ( $6dx$ ) each time after acquiring a record at one location.

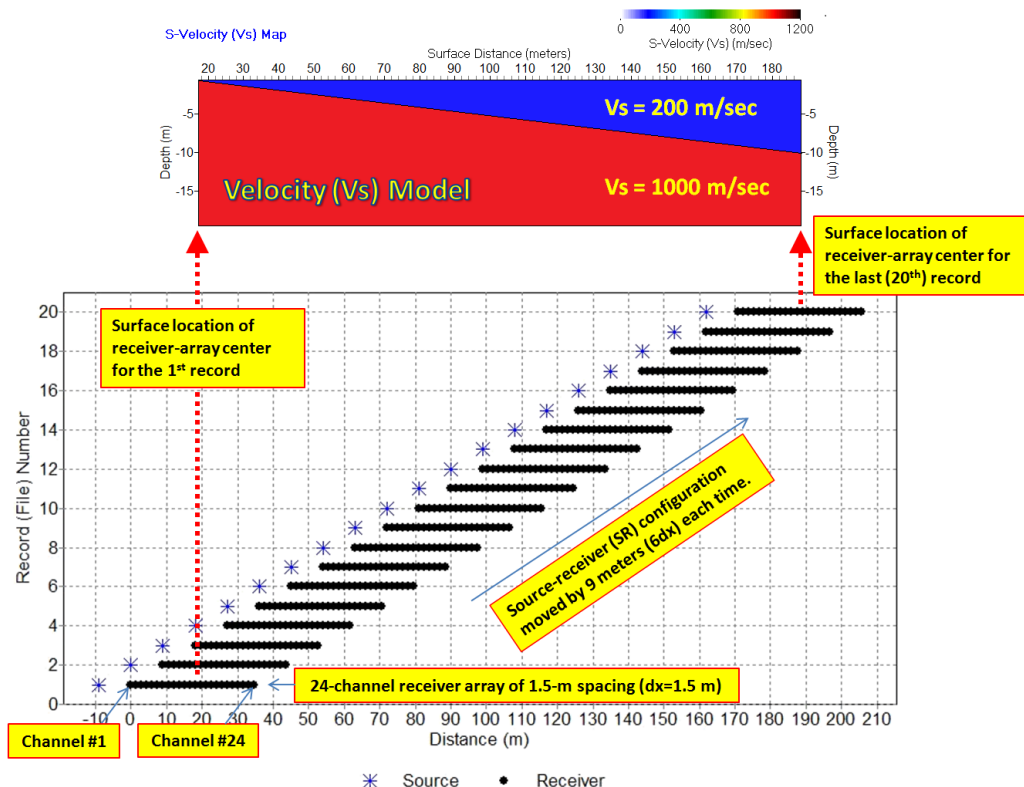


Figure 1. Velocity ( $V_s$ ) model used produce the sample data set ("DippingBedrock.dat") and its source/receiver (SR) configuration used during the modeling.

## Data Processing Steps — Overview

By treating this sample data set as a typical field data set from an MASW survey to produce a 2-D shear-wave velocity ( $V_s$ ) cross section, the typical data-processing procedure is demonstrated by following the steps outlined below. The sample data set consists of twenty (20) field records in PS format. The only difference in comparison to a real case would be the data format. In a real situation, there would be multiple individual field files ("records") saved in SEG-2 format at the end of a survey; for example, "1.dat", "2.dat", "3.dat", etc. You would then have to import (open) all of them at the same time at the beginning of data-processing flow ("Step 1" below), where they all would be combined within the program memory in the order of file (record) number to make one file right after they are imported. The sample data set is like the real data set at this point after combining. However, because the PS software will convert all SEG-2 files into the PS format internally upon importing them, the demonstrated procedure outlined here is virtually identical to a real situation.

### Step 1: Source/Receiver (SR) Setup

Relative locations of seismic source and receivers are encoded into the header of each channel's data set ("trace"). The critical parameters of receiver spacing (dx), source offset (X1), movement of source and/or receivers, distance within the survey line of source and receivers, station numbers, etc., are inserted into the proper headers. In reality, these parameters are usually set at the beginning of the survey. If that is the case, then PS will inform it at the beginning of the SR setup so that the user can visually examine the encoded information in a manner similar to the chart displayed in Figure 1. If the user confirms the displayed setup is correct, then SR setup is skipped. If the user finds the original field data set did not have proper information encoded, then this SR setup is crucial and cannot be skipped.

The sample data set does not have such information encoded. Therefore, you have to input the source/receiver setup before moving to the next step. Output from this step will have the same extension as the input seismic data (".DAT") with a post fix of "(SR)" at the end of the file name; for example, "DippingBedrock(SR).DAT." Explanations about the general use of the SR setup are provided in the PS User Guide "[Source-Receiver \(SR\) Setup](#)."

### Step 2: Dispersion Imaging

Once SR setup is complete, the next step is to generate dispersion images; one dispersion image per field record. Because the input seismic data file has twenty (20) records, the output dispersion image file will also have 20 images. These dispersion "images" are actually another instance of numerical data similar to seismic data, and different from the ordinary graphical images (for example, BMP or JPG files). In fact, they have the same numeric data format as used in the seismic data (i.e., PS format) and therefore can be displayed using the seismic data display module (however, there is a dedicated module to display dispersion images).

There are many parameters related to the dispersion imaging process, which is basically a wavefield transformation operation that converts seismic wavefields in offset-time (x-t) domain into those in phase velocity-frequency (Pv-f) domain. These parameters can influence the quality and size of the image. However, in most cases, the program will set them to optimal

values through many internal automated analysis steps. Output will have the same extension as input seismic data (".DAT") with a post fix of "(ActiveOT)" at the end of the file name; for example, "DippingBedrock(SR)(ActiveOT).DAT." Explanations about the general use of this part of the analysis are provided in the PS User Guide "[Dispersion Image Generation](#)."

### Step 3: Dispersion Curve Extraction

This step extracts and saves one fundamental-mode (M0) dispersion curve from each dispersion image generated from previous step. Generated dispersion image data, [\*(ActiveOT).DAT], will be displayed by a dedicated module. First it will be necessary to visually examine the image and make an interpretation for the M0 trend. This interpretation is usually simple and easy when there is only one obvious trend of coherent energy, which is the case in most overburden/bedrock settings (except for "too" shallow bedrock). Once this identification has been made, then you can define the approximate trend of M0 by clicking multiple points (e.g., 5-10) along the identified image trend. The program will draw both lower and upper bound curves within which it will try to extract the most probable M0 curve by examining energy levels at each frequency. You can freely change these curves to refine the zone of examination.

Each extracted dispersion curve will be saved as a text file of its own format with an extension of ".DC" and a post fix of the record number in parentheses [e.g., "DippingBedrock(SR)(ActiveOT)(1).DC"]. There will be a total of twenty (20) files saved at the end of this step. General description of this part of analysis can be found in the PS User Guide "[Dispersion Curve Extraction \(2-D Cross Section\)](#)."

### Step 4: Inversion for 2-D Shear-Wave Velocity (Vs) Cross Section

This step will generate one 1-D (i.e., depth variation) shear-wave velocity (Vs) profile from one input M0 dispersion curve (\*.DC), and then through a proper interpolation produce a 2-D (i.e., depth and surface) Vs cross section from multiple 1-D Vs profiles.



There are many parameters that can influence the reliability of inversion output. Among them the most important is the maximum depth (Zmax) of output, which is the depth to the half space (i.e., depth to the top of the last layer of infinite thickness, the half space). Zmax is determined by the program based on the minimum (Xmin) and maximum (Xmax) distance of receivers from the source that were used during the survey. You can always modify Zmax according to your own experience and knowledge. Other inversion parameters such as number of layers and searching-algorithm related parameters are set to default values by the program although they can always be manually changed by the user. During the inversion process, the program will display both measured and modeled dispersion curves to indicate how closely they match for the solution found by the program. The overall matching variation from one file (\*.DC) to another (\*.DC) will also be displayed.

There will at least three (3) output files saved at the end of an inversion process, all in text files (\*.TXT)—a 2-D Vs cross section file [\*(2DVs).TXT], a 2-D Vs confidence file [\*(2DConf).TXT], and the processing history file [\*(HST).TXT]. The Vs cross section file will show 2-D distribution of shear-wave velocity (Vs) within the surveyed surface distance and maximum investigation depth (Zmax) set during the inversion, and the confidence file will show distribution of relative

reliability (%) of analyzed velocity (Vs) values within the cross section. This confidence concept is closely related to the sensitivity of modeled dispersion curves  $[(Model).DC]$  to the velocity (Vs) change by a certain amount (e.g.,  $\pm 10\%$ ) at the corresponding part of the cross section. Therefore, it purely reflects the relative reliability level (0-100%) in the solution seeking process provided that the input (measured) M0 curve is error free. The history file will contain all parameters set at the beginning of the inversion process as well as some parameters related to output Vs values, such as the matching degree (%) of the two M0 curves. Some other types of output can be chosen at the beginning of the inversion process as secondary outputs. They may include modeled dispersion curves  $[(Model).DC]$  and 1-D Vs profile  $[(Model).LYR]$  for each input (measured) M0 curve. Variation of the match between the two M0 curves  $[(Match).DC]$  can also be saved with the same file format as dispersion curve so that it can be displayed by using the dispersion-curve display module. Variation of average 1-D Vs confidence can also be saved as a file  $[(AveConf).DC]$  so that it can also be displayed by using the same display module.

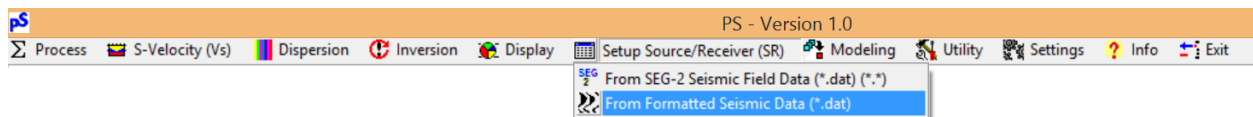
Both Vs cross section  $[(2DVs).TXT]$  and confidence  $[(2DConf).TXT]$  maps will be displayed at the end of the inversion process. General description of this part of the analysis can be found in the PS User Guide "[Inversion \(2-D Cross Section\)](#)."

### Processing "DippingBedrock.dat"

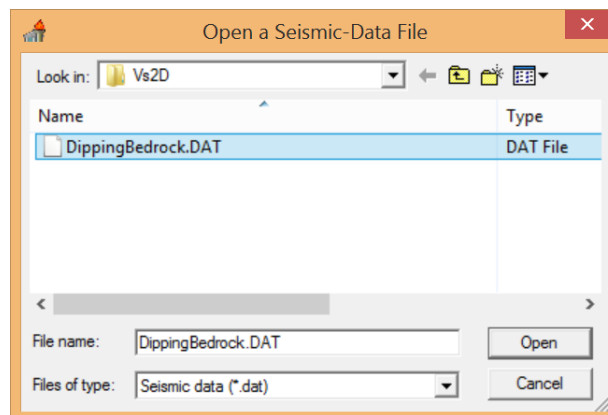
The entire data-processing procedure with the sample data set, "DippingBedrock.DAT", is explained below. A yellow arrow  in the figure indicates a mouse click on the selected place, and a red arrow  indicates places and items that need attention.

#### Step 1: Source/Receiver (SR) Setup

From main menu, "Setup Source/Receiver (SR)" → "From Formatted Seismic Data (\*.dat)"

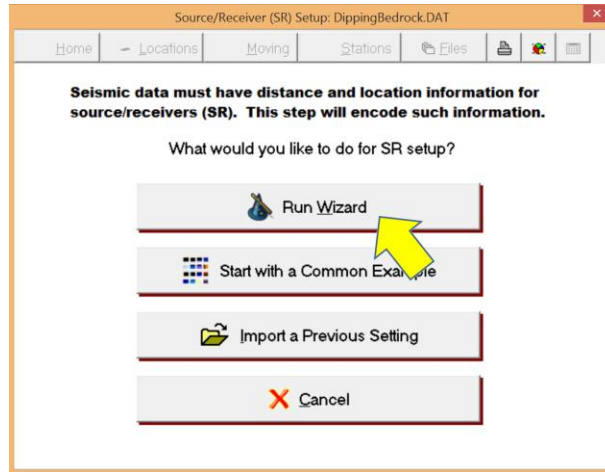


Open "DippingBedrock.DAT."

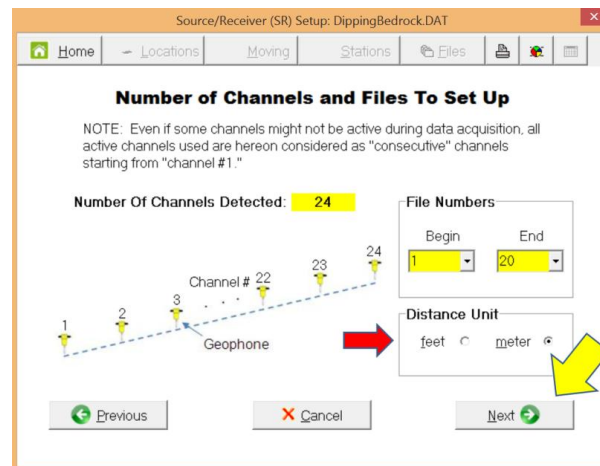


## PS - Generating 2-D Shear-Wave Velocity ( $V_s$ ) Cross Section

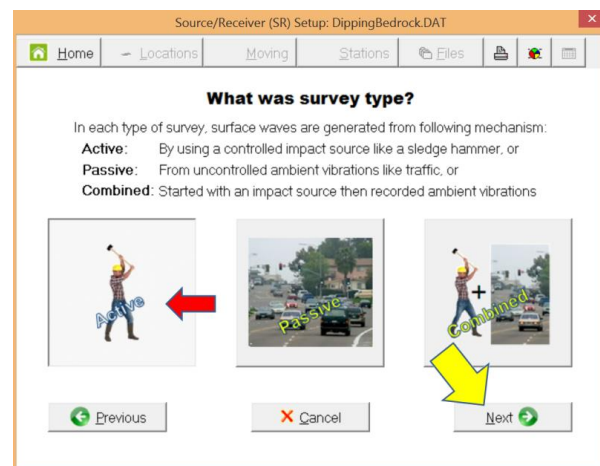
Select and click the "Run Wizard" button.



Check and select distance unit ("meter") and then click "Next".



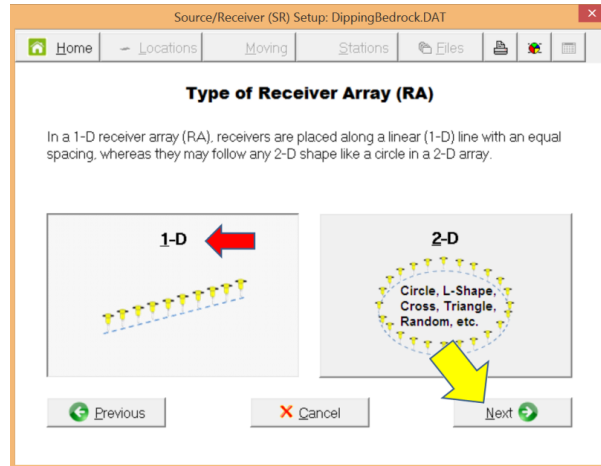
Select "Active" and then click "Next".



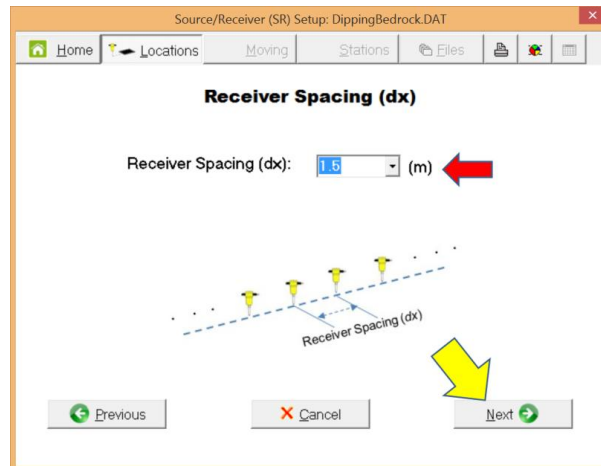


## PS - Generating 2-D Shear-Wave Velocity ( $V_s$ ) Cross Section

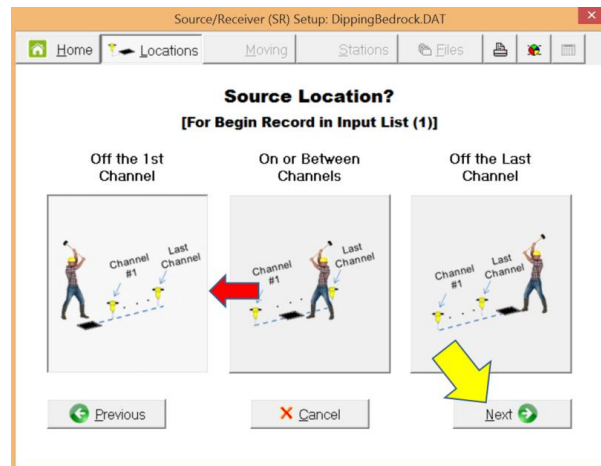
Select "1-D" and then click "Next".



Enter "1.5" for receiver spacing and then click "Next".



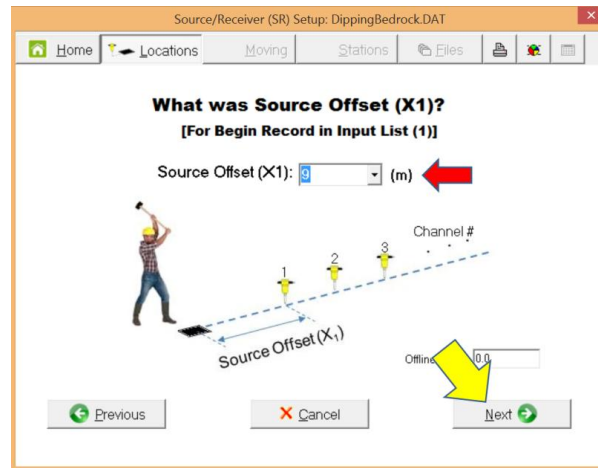
Select "Off the 1st Channel" and then click "Next".



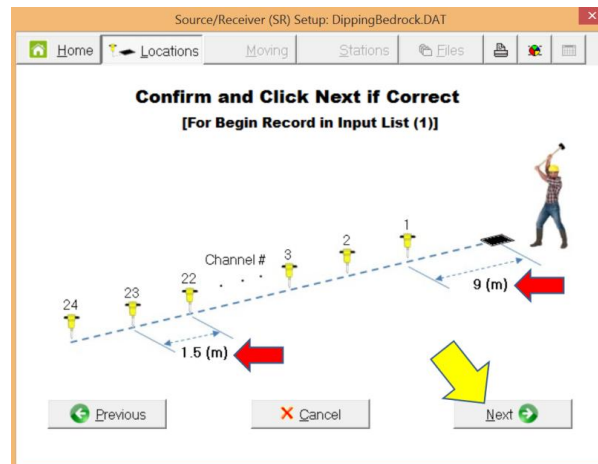


## PS - Generating 2-D Shear-Wave Velocity ( $V_s$ ) Cross Section

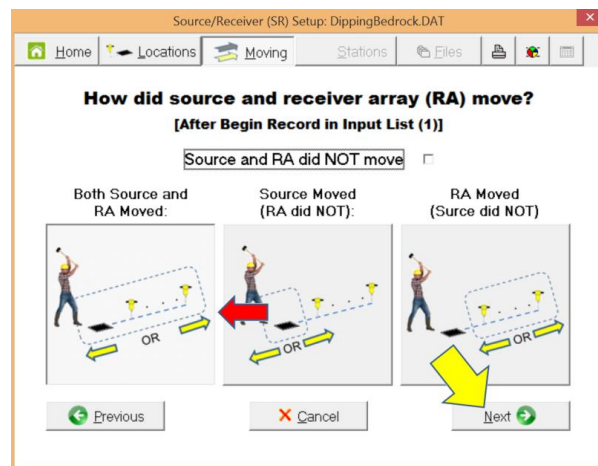
Enter "9" for source offset ( $X_1$ ) and then click "Next".



Check and confirm receiver spacing ( $dx$ ) and source offset ( $X_1$ ). Click "Next".



Select "Both Source and RA Moved" and then click "Next".



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Enter "9" for Move Interval, and then click "Next".

Source/Receiver (SR) Setup: DippingBedrock.DAT

Home Locations Moving Stations Files

**How did SOURCE and RECEIVERS move?**

To RECEIVERS To SOURCE

Move Interval (in m): 9 Stations: 6

Before Move # of recording: 1

Previous Cancel Next

Enter "0.0" for "Ref. Distance" and then "1.5" for next distance.

"Ref. Distance" is an arbitrary surface distance coordinate used as a reference point, so it can be any number. The distance for the next channel should be offset (+ or -) by one receiver spacing ( $dx$ ). Enter "1001" and "1002" for the station numbers for the first two channel positions. Click "Next". These are arbitrary "station" numbers that must be consecutive. The general convention for station numbering is "1001, 1002, etc." for line 1, and "2001, 2002, etc." for line 2, and so on. They can also decrease instead of increase.

Source/Receiver (SR) Setup: DippingBedrock.DAT

Home Locations Moving Stations Files

**Confirm and Enter Surface Coordinates**  
[For Begin Record in Input List (1)]

Ref. Distance 0.0 Distance 1.5 Station # 1001 1002 1021 1022 1023

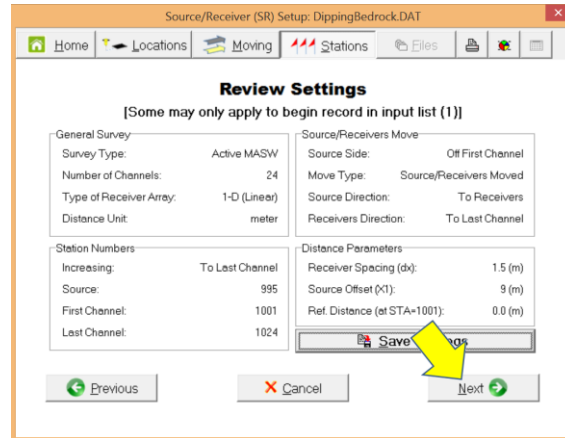
Channel # 1 2 3 22 23 24

Move Interval (stations) 6

Previous Cancel Next

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Review and click "Next".



The "Review Settings" window displays configuration parameters for the SR setup. It includes sections for General Survey, Station Numbers, Source/Receivers Move, and Distance Parameters. A yellow arrow points to the "Next" button at the bottom right.

General Survey	
Survey Type:	Active MASW
Number of Channels:	24
Type of Receiver Array:	1-D (Linear)
Distance Unit:	meter

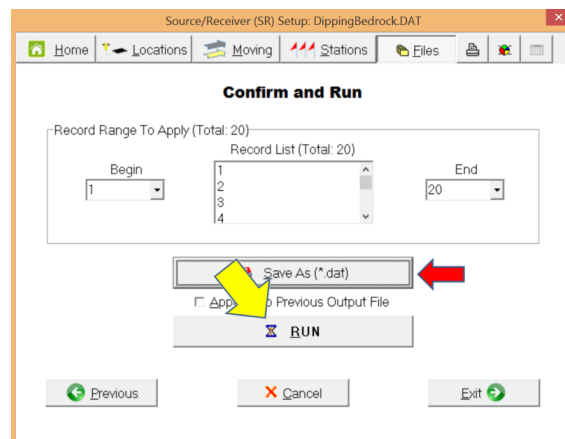
Station Numbers	
Increasing:	To Last Channel
Source:	995
First Channel:	1001
Last Channel:	1024

Source/Receivers Move	
Source Side:	Off First Channel
Move Type:	Source/Receivers Moved
Source Direction:	To Receivers
Receivers Direction:	To Last Channel

Distance Parameters	
Receiver Spacing (dx):	1.5 (m)
Source Offset (x1):	9 (m)
Ref. Distance (at STA=1001):	0.0 (m)

Buttons: Previous, Cancel, Next (highlighted with yellow arrow), Save (disabled)

Click "Run" to launch the SR setup process. It will ask for the output file name first. The default output file name is "DippingBedrock(SR).DAT."



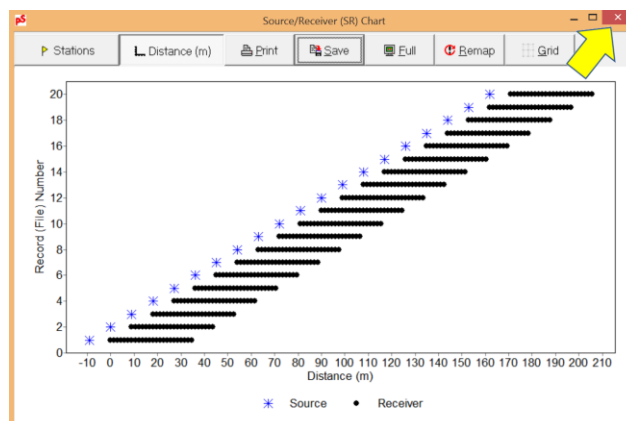
The "Confirm and Run" window shows the record range to apply (Total: 20) and a record list. A yellow arrow points to the "Run" button at the bottom center.

Record Range To Apply (Total: 20): Begin: 1, End: 20

Record List (Total: 20): 1, 2, 3, 4, ...

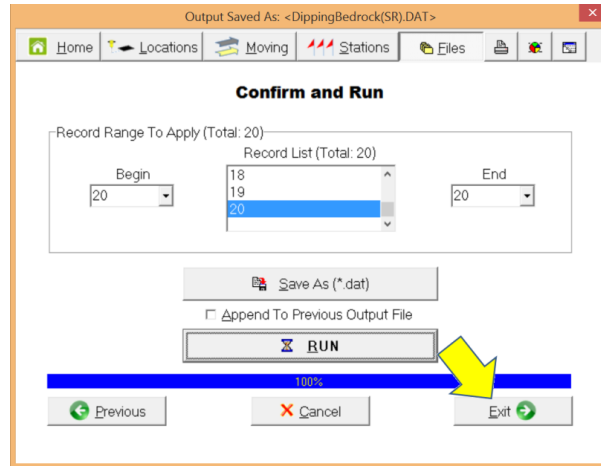
Buttons: Previous, Cancel, Run (highlighted with yellow arrow), Exit, Save As (\*.dat) (highlighted with red arrow), Apply to Previous Output File (disabled)

At the end of the process, the SR configuration chart will be displayed that shows relative location of source and receivers within the entire distance of the survey. The configuration can also be displayed in stations by clicking the "Stations" button on the top menu. Close the chart.

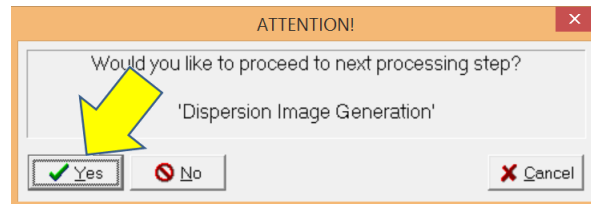


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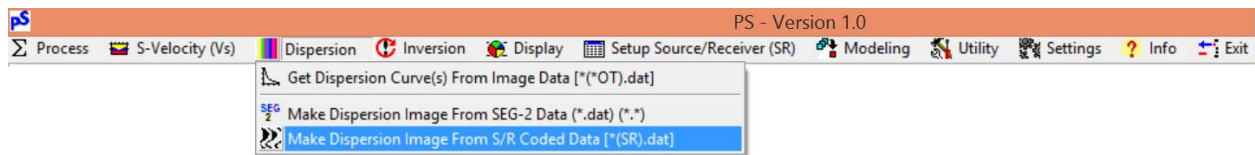
Click "Exit". It will show the file name that saves all the setup parameters so that you can import them by opening the file at the beginning of the SR setup process next time.



Click "Yes" to move to next step, "Dispersion Image Generation" ("Step 2"). The output file saved previously ("DippingBedrock(SR).DAT") will be automatically transferred to the next step.



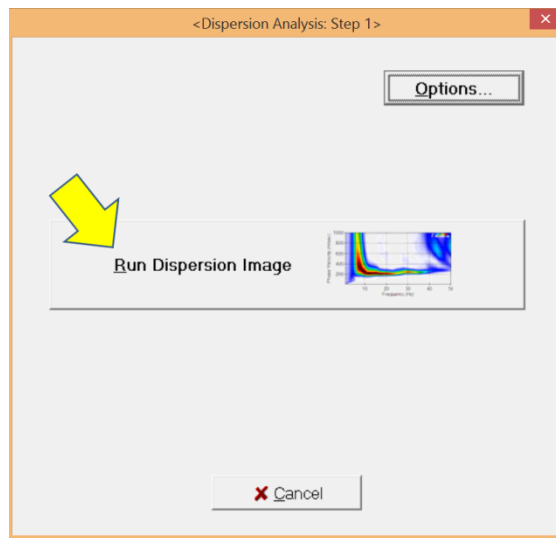
In case you need to manually import the SR-encoded file [\*(SR).dat] to generate dispersion images, you can do so by going to "Dispersion" in the main menu, and then selecting "Make Dispersion Image From S/R Coded Data [\*(SR).dat]" as shown below.



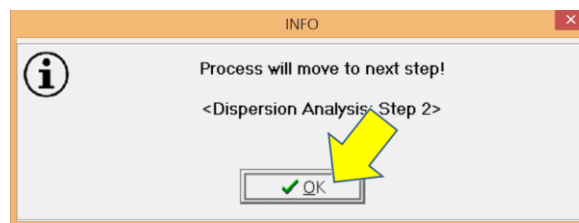
## Step 2: Dispersion Imaging

The following dialog will be displayed at the beginning of this step. Although there are many control parameters that can be accessed by clicking "Options..." button on top, it is usually sufficient to proceed with default values determined by the program based on its own wavefield detection algorithm.

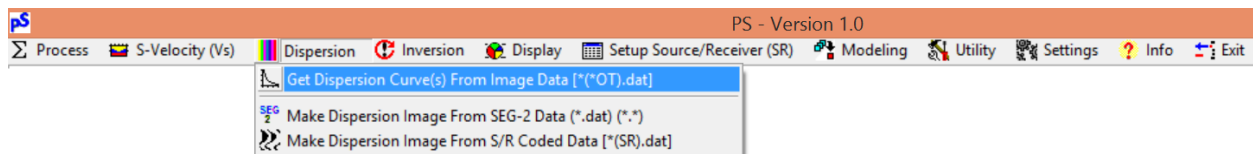
Click "Run Dispersion Image" to launch the process.



Once the process is complete, the output file of dispersion image data will be saved as "DippingBedrock(ActiveOT).dat" and will be automatically transferred to next step ("Step 3: Dispersion Curve Extraction") when you click "OK".



In case you need to manually import the dispersion image file [\*(ActiveOT).dat] to extract dispersion curves, you can do so by going to "Dispersion" in the main menu, and then selecting "Get Dispersion Curve(s) From Image Data [\*(OT).dat]" as shown below.

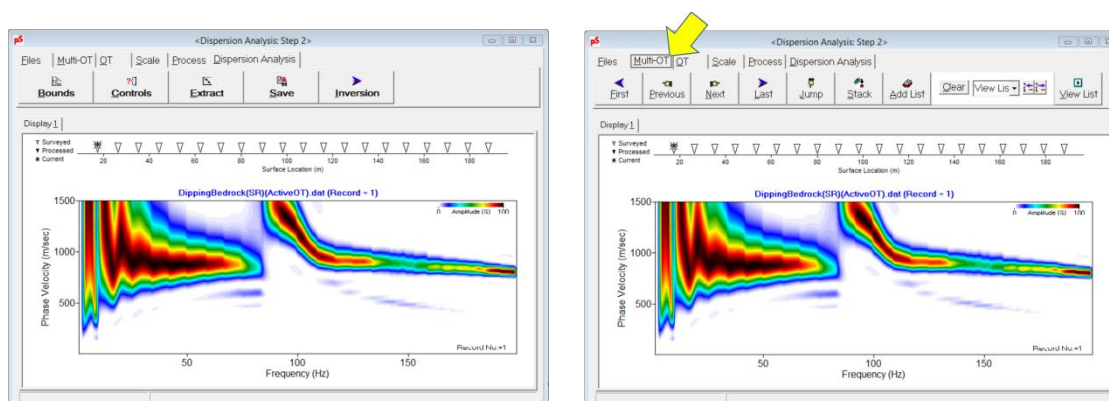


Detailed description about this part of the analysis is provided in the PS User Guide "[Dispersion Image Generation](#)."

### Step 3: Dispersion Curve Extraction

A chart showing the first dispersion image in the output file from previous step ("Step 2") will be displayed with "Dispersion Analysis" tab selected in the top tool panel. (This tab will not be available when this chart is used only for display purposes) There are five (5) buttons in the tab arranged in the order of common use. Before proceeding to extract dispersion curves, it will first be necessary to go through constituent dispersion images, at least for several places along the survey line like at the beginning, in the middle and at the end. This is important to properly interpret the image for the correct trend of the fundamental-mode (M0) dispersion, especially when there are strong and complicated image patterns created from higher modes.

To view dispersion images at different locations, choose the "Multi-OT" tab on the top tool panel, which will show buttons to navigate through different images.



Dispersion images at three different locations are displayed below. Images in the middle and at the end of the survey line show a typical "single coherent" tren in which phase velocity increases at low frequencies and decreases at the higher frequencies approaching an asymptotic constant value at about 200 m/sec, which indicates the velocity ( $V_s$ ) of overburden ( $V_{s1}$ ) is in that range (i.e.,  $V_{s1} \approx 200$  m/sec). This "asymptotic frequency" becomes lower at the end of the survey, indicating the depth of the overburden/bedrock interface is deeper. Other energy trends occurring at the higher frequencies and phase velocities are those of higher modes (e.g., M1, M2, etc.) and aliased M0.

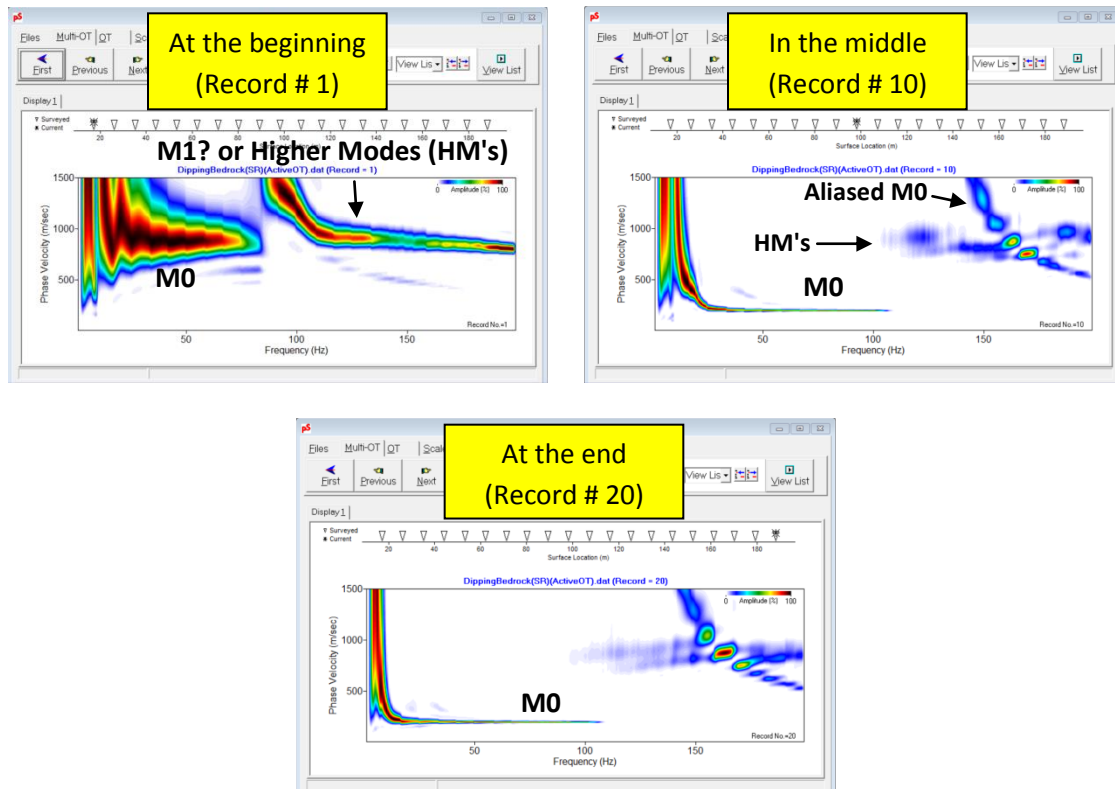
On the other hand, the image at the beginning shows a somewhat complicated pattern with two separate strong energy trends, both of which appear to be aligned along a constant phase velocity of about 1000 m/sec. This is a typical image pattern when the overburden thickness ( $H$ ) is too "thin"; for example, less than a few receiver spacings (e.g.,  $1-3dx$ ). In this case, those strong energy trends usually tend to align (horizontally) at a constant value that corresponds to the phase velocity of bedrock ( $V_{phs}$ ), which is in theory about 95% of the shear-wave velocity ( $V_s$ ) (i.e.,  $V_{phs} \approx 0.95V_s$ ). The weak energy trend of decreasing phase velocity occurring at frequencies higher than about 100 Hz appears to be part of the M0 trend that will eventually approach the asymptotic phase velocity at the highest frequency ever imaged. This indicates the strong energy trend occurring at the lower frequencies can be part of the M0 trend.

Sometimes, this "horizontal" alignment of higher mode energy is observed also at the place where the overburden thickness becomes somewhat significant. In this case, it is usually less conspicuous because

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of the weaker and fragmented energy patterns, which are observed in the other two images at frequencies around and higher than 150 Hz.

From the previous interpretations made by inspecting multiple dispersion images, we can conclude that velocities of overburden ( $V_{s1}$ ) and bedrock ( $V_{s2}$ ) will be around 200 m/sec and 1000 m/sec, respectively, and the depth to the bedrock increases toward the end of the survey line.

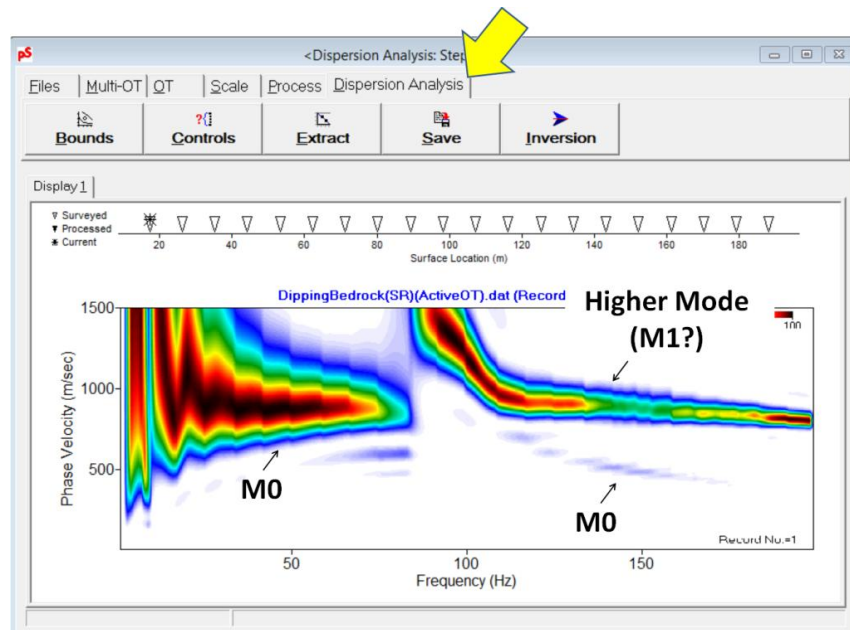


The following image shows a summary of interpretations. Click the "Dispersion Analysis" tab to come back to the process mode.

Detailed description of this part of the analysis is provided in the PS User Guide "[Dispersion Curve Extraction \(2-D Cross Section\)](#)."

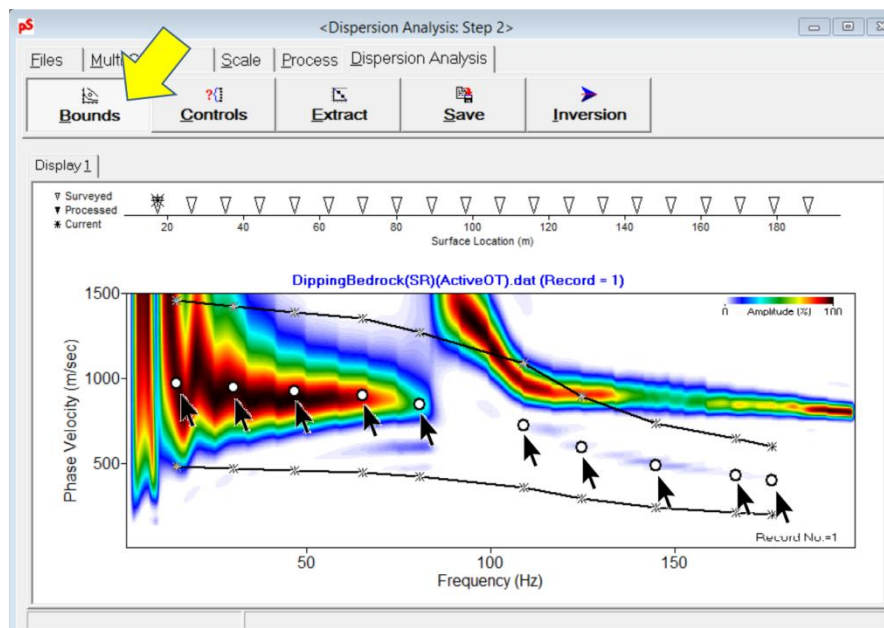


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### Step 3-1: Bounds

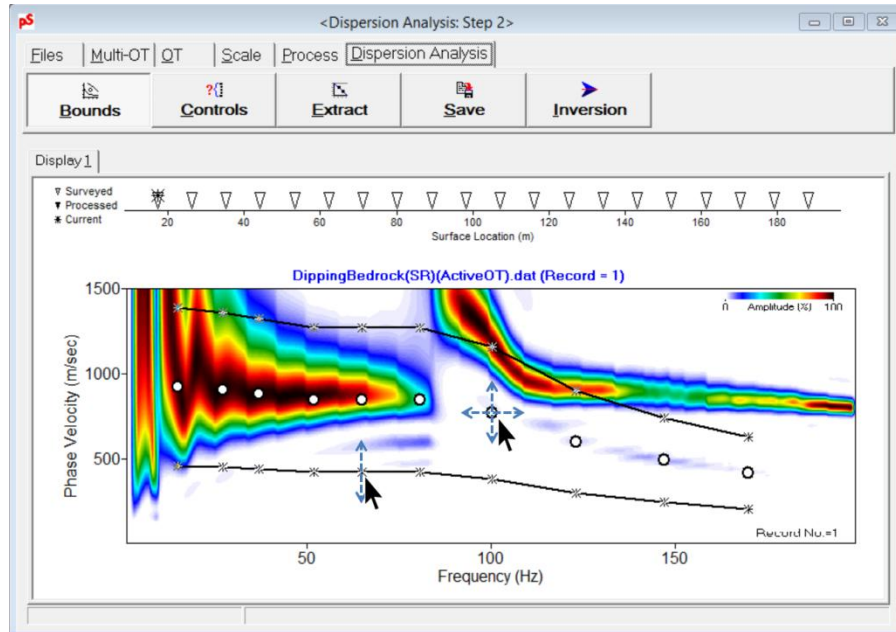
This is the step to set lower and upper bounds of phase velocities for the fundamental-mode dispersion curve to extract. Depress the "Bounds" button and then click along the M0 trend to add reference points ("circles") with lower and upper bounds ("asterisks").



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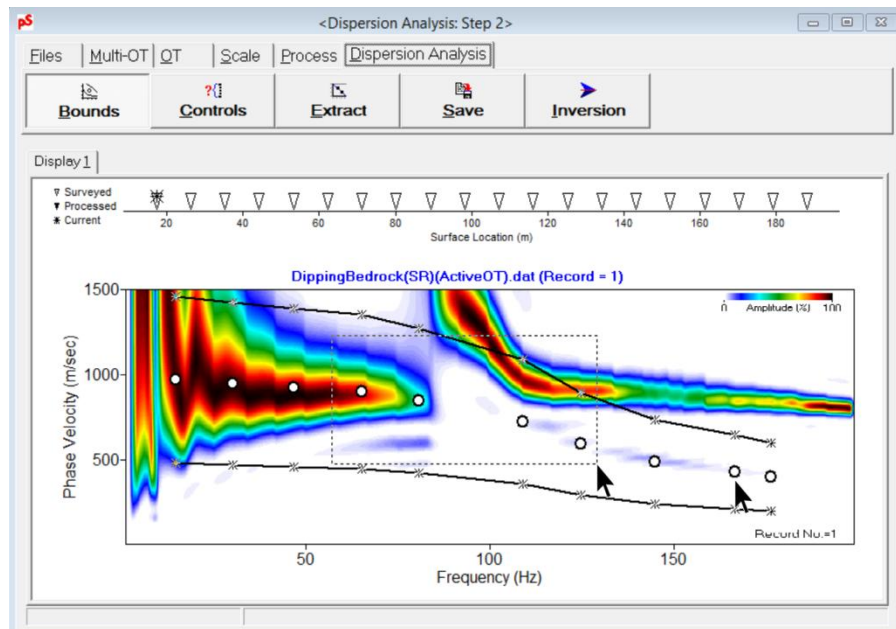
### <Moving Reference and Bounds Points>

Reference points can be moved freely (up and down, left and right), whereas bounds points can be moved only up and down at the fixed horizontal location of the corresponding reference point.



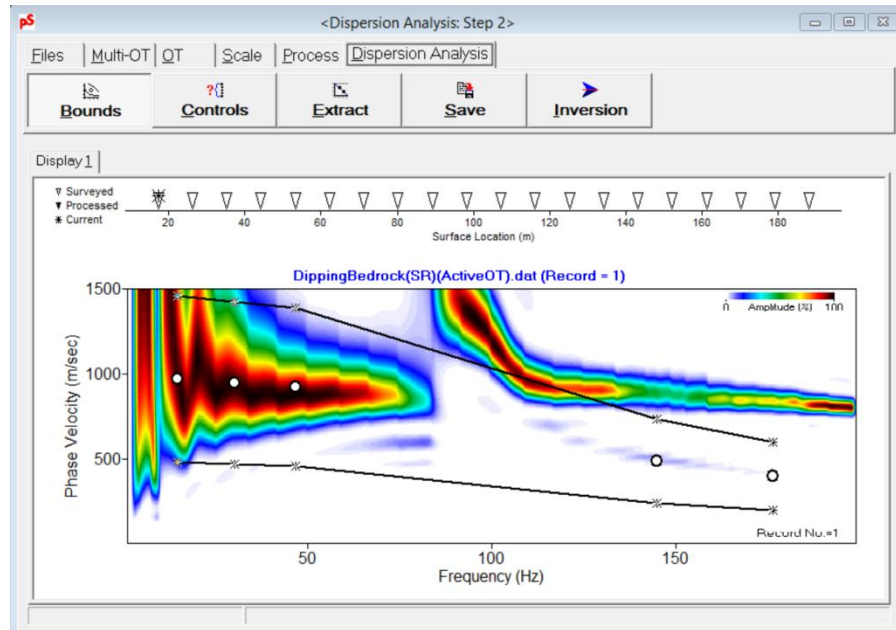
### <Deleting Reference Points>

Drag and draw a zone to delete multiple points, or click individual points to delete one by one. The corresponding bounds points will also be deleted.

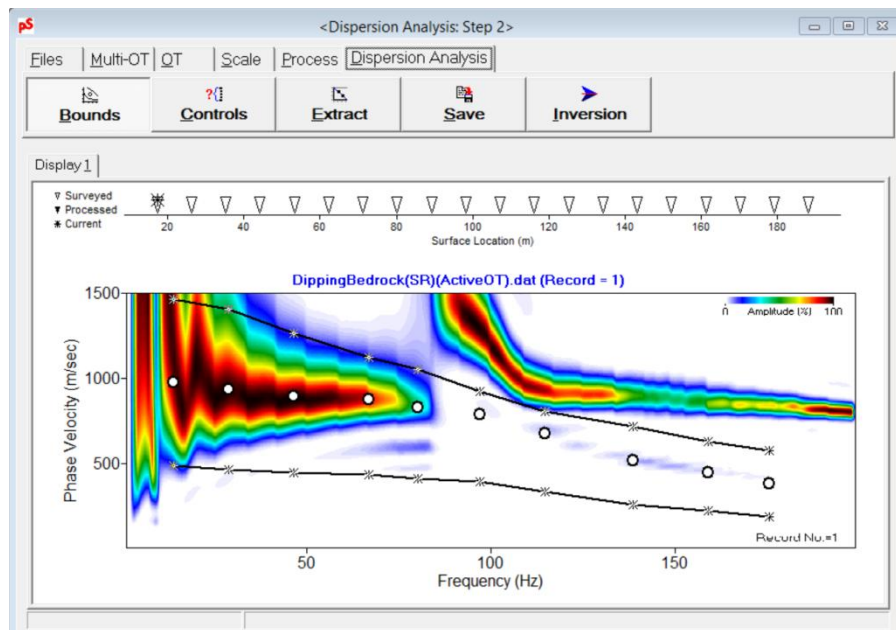


### <Example After Delete According To the Actions Indicated Above>

## PS - Generating 2-D Shear-Wave Velocity ( $V_s$ ) Cross Section

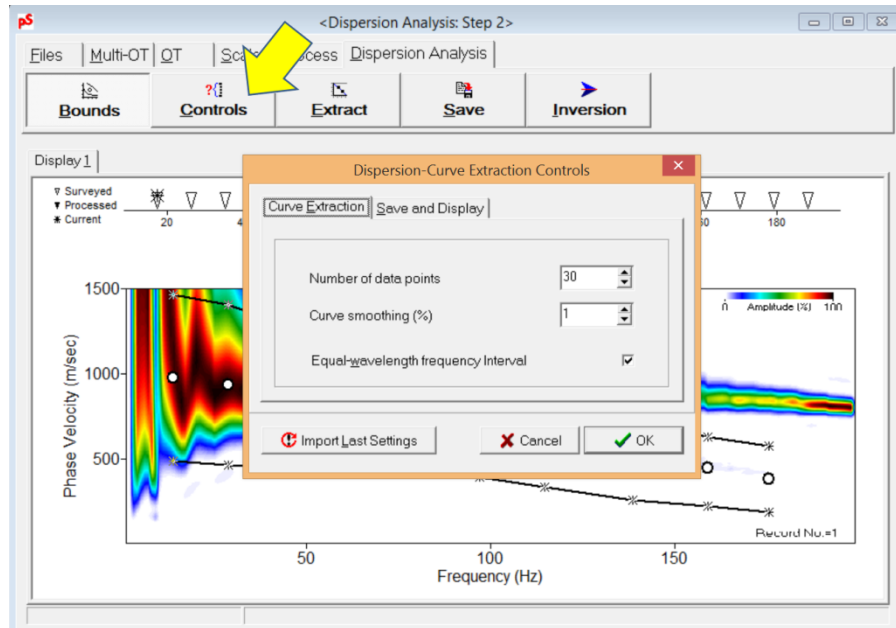


<Finishing Up Reference Points and Bounds Points Properly Around M0 Trend>



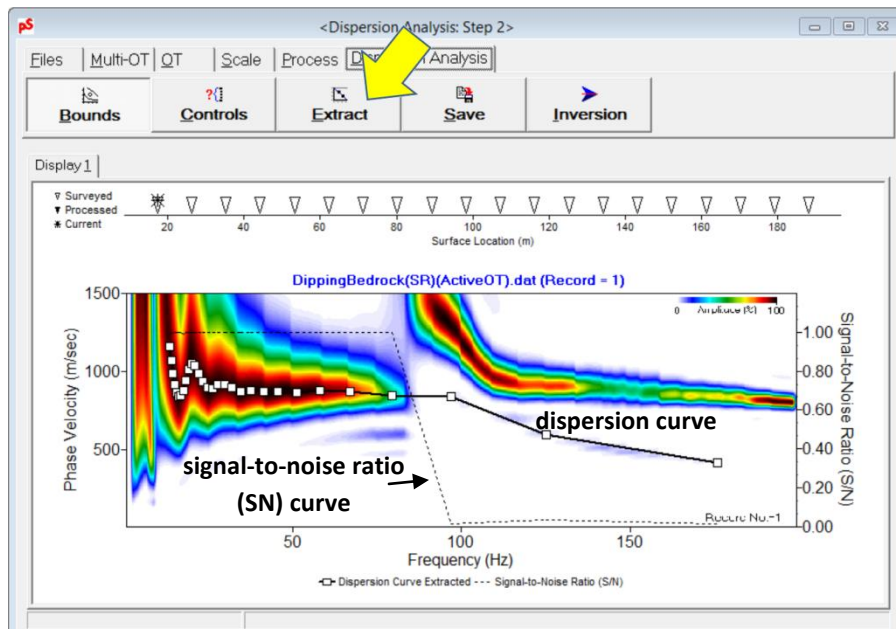
### Step 3-2: Controls

Parameters related to the extracted dispersion curve can be controlled. Click "Controls" button to show the dialog of control parameters. Default values are usually sufficient.



### Step 3-3: Extract

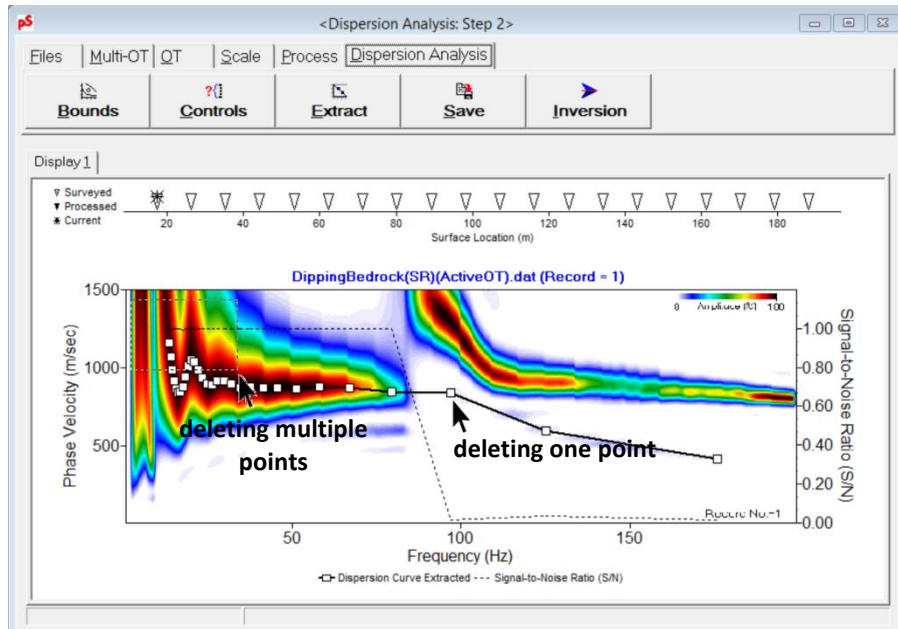
This step will extract the curve by picking data points of maximum amplitude at each frequency in the dispersion image. Click "Extract" button that will show the extracted curve on top of the image.



## PS - Generating 2-D Shear-Wave Velocity ( $V_s$ ) Cross Section

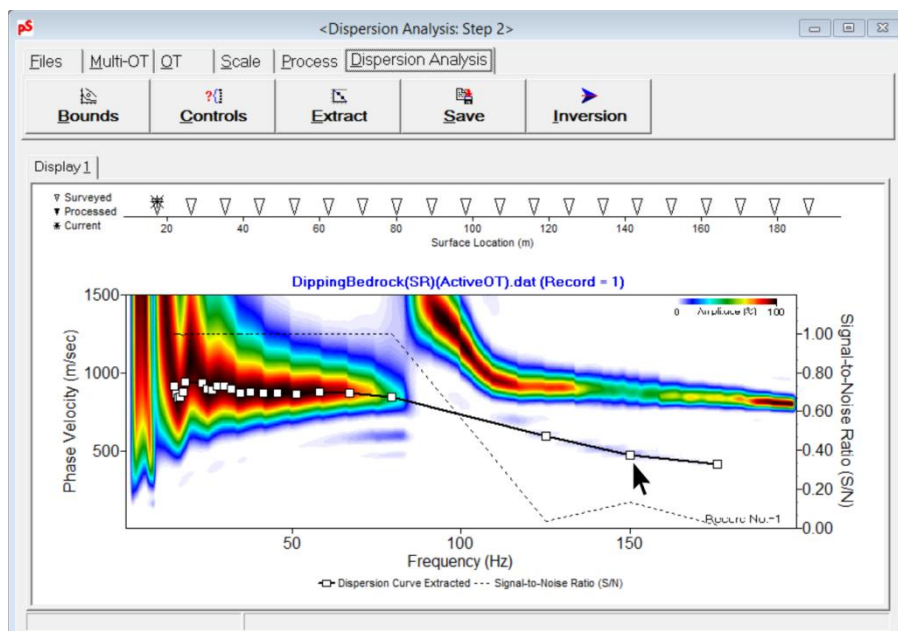
### <Editing Extracted Curve — Deleting Points>

Drag and draw a zone to delete multiple points, or click individual points to delete one by one.



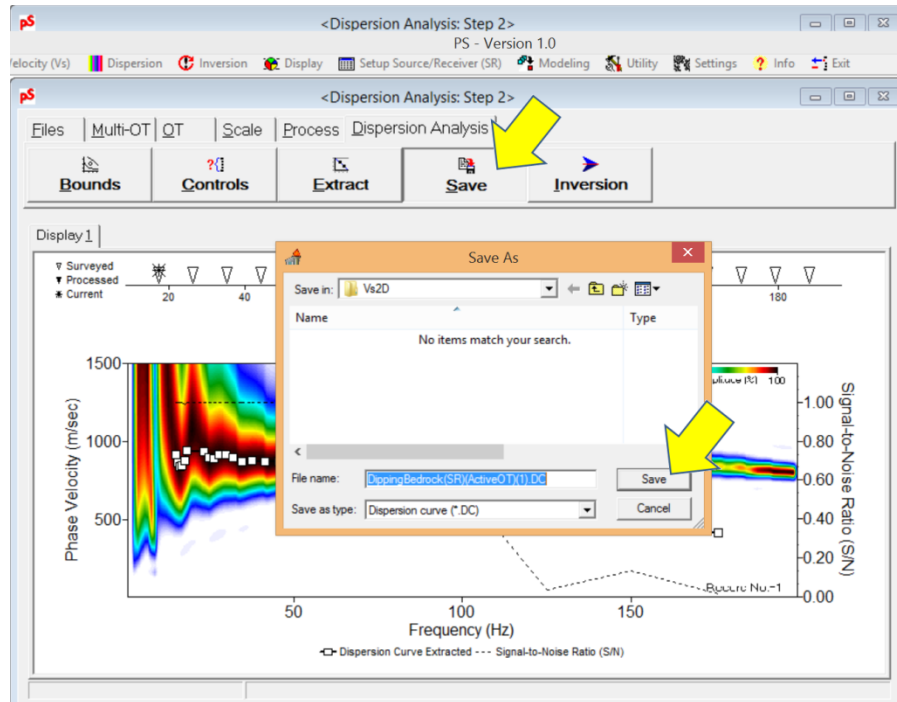
### <Editing Extracted Curve — Adding Points>

Click anyplace on the M0 trend to add points one by one. Corresponding points for SN will also be added by detecting the energy at the clicked points.



### Step 3-4: Save

Click the "Save" button to save the extracted curve (\*.DC). The default file name will have the record number attached at the end of common file name.



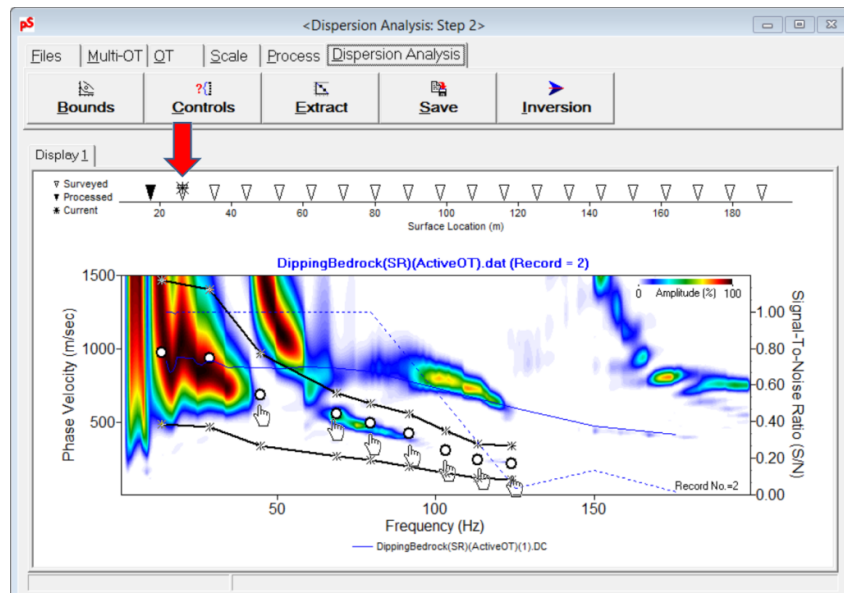
This will complete the process for "one" record, and the program will move to next image automatically. From there on, the same sequence or process can be applied to save subsequent dispersion curve files. The only adjustment to be made will be the accommodation of bounds so that they encompass the correct  $M0$  trend that may change from one image to another.



## PS - Generating 2-D Shear-Wave Velocity ( $V_s$ ) Cross Section

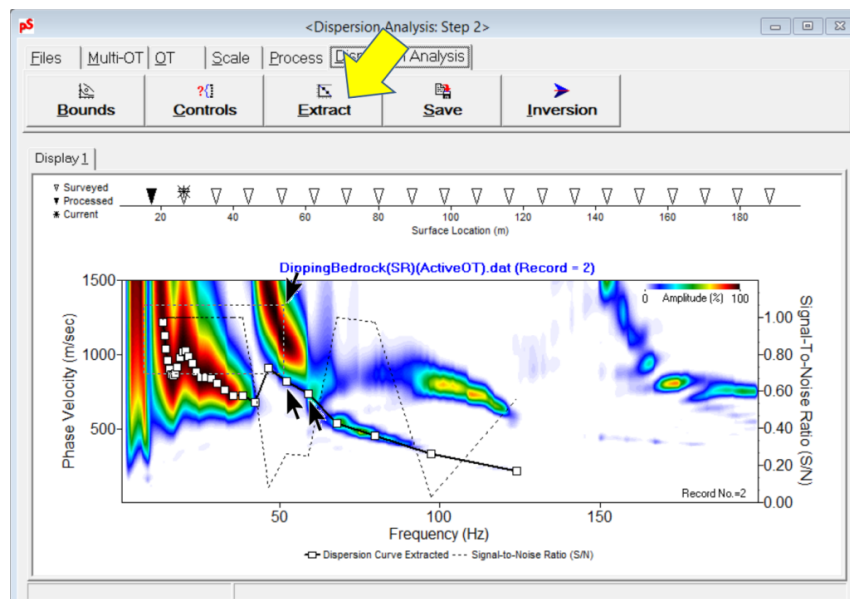
<Moving To Next Record and Adjusting Bounds>

Adjust both reference and bounds points properly to account for M0 trend change.



<Editing Extracted M0 Curve>

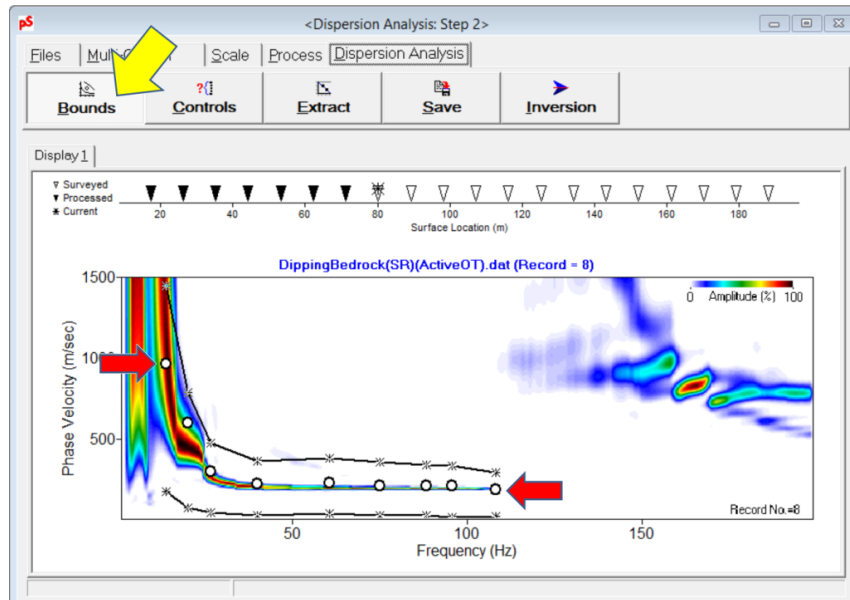
Editing curve by deleting some points.



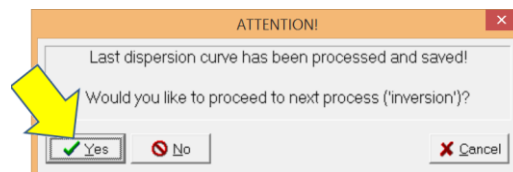


<Changing Bounds by Pressing "Bounds" Button Whenever Necessary>

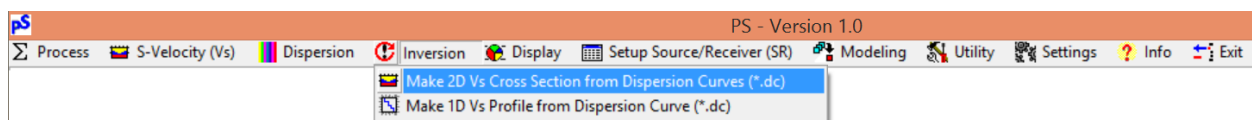
Especially, the first and last reference points may have to be adjusted to account for the change in  $M0$  trend. As depth to bedrock increases, the first and last reference points will have to be gradually moved toward lower frequencies.



You can always go back to previous image by using the navigation buttons in the "Multi-OT" tab and then perform the extraction and saving process again to replace the previously saved curve. At the end of the process after saving all extracted  $M0$  curves, it will ask you to proceed to the last step ("Step 4"). All previously saved  $M0$  curves (\*.DC) will be automatically transferred at this stage.



In case you need to manually import these files, you can do so by going to "Inversion" in the main menu and selecting "Make 2D  $V_s$  Cross Section From Dispersion Curves (\*.dc)" as shown below. You will then have to select all these files at the same time (e.g., "(1).DC", "(2).DC", "(3).DC", etc.).

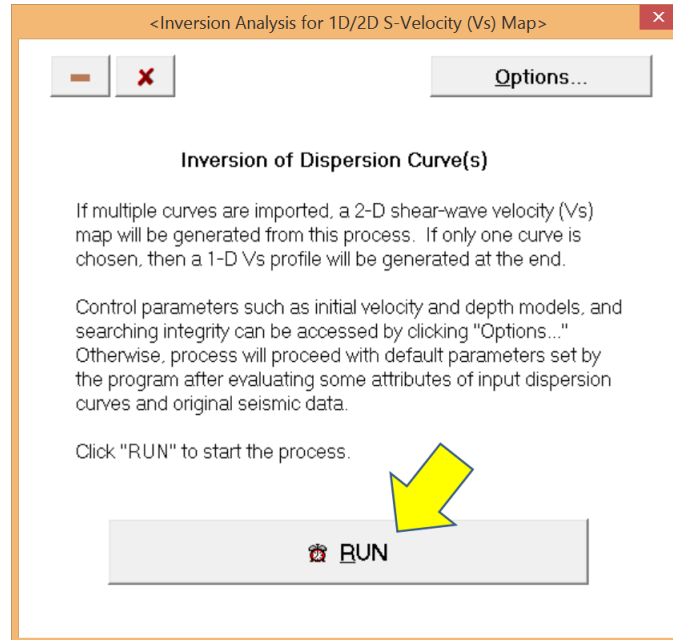


A complete set of extracted dispersion curves and corresponding images are displayed at the end in the section <Sample Example of Extracted Dispersion Curves>.

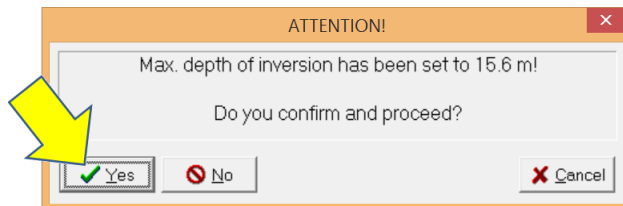
### Step 4: Inversion

The following dialog will be displayed at the beginning of this step. Although there are many control parameters that can be accessed by clicking the "Options..." button at the top, it is usually sufficient to proceed with default values determined by the program based on the range of wavelengths in input dispersion curves and also on the offset range used during data acquisition. For detailed information about this part of the analysis, refer to the PS User Guide "[Inversion \(2-D Cross Section\)](#)."

Click "Run" to launch the process.

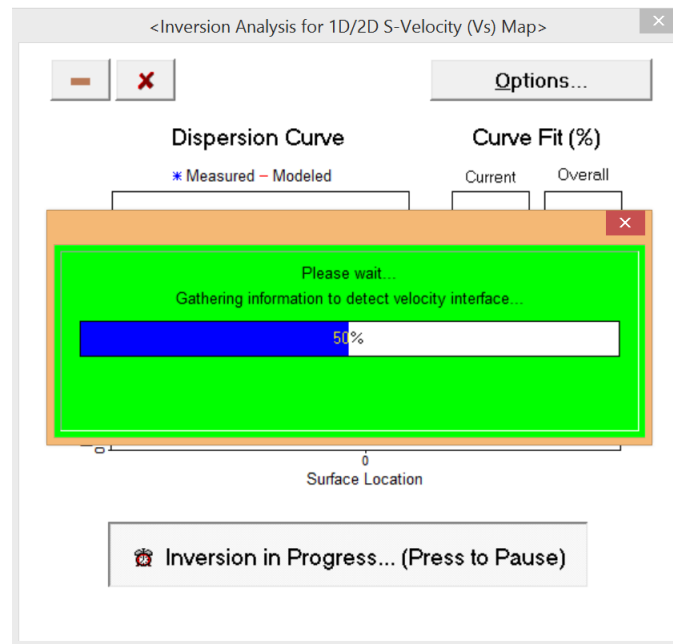


The following dialog will be displayed to confirm the maximum depth ( $Z_{max}$ ) of the inversion that is originally determined by the program based on the average offset range used during data acquisition. This is one of the most important parameters in the inversion process that is directly related to the resolution of the final 2-D shear-wave velocity ( $V_s$ ) map. If you click "No", then the program will show the relevant tab where you can adjust  $Z_{max}$  as well as other parameters. Otherwise, click "Yes."

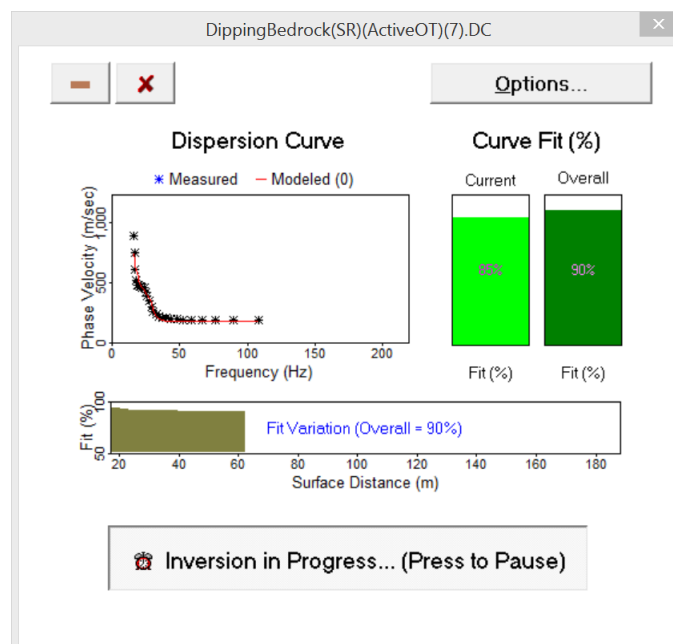


## PS - Generating 2-D Shear-Wave Velocity ( $V_s$ ) Cross Section

First, the process to determine the depth to the velocity ( $V_s$ ) interface will take place. This is the depth where the most abrupt change in velocity occurs. This process is termed in the control diagram as "Bedrock Detection."



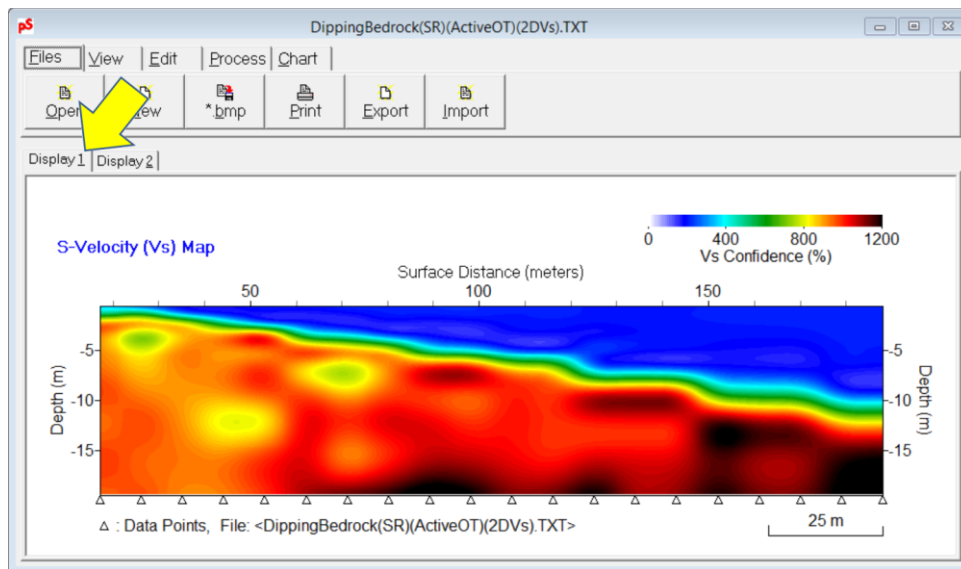
The next processing step to take place will find the velocity ( $V_s$ ) model whose theoretical (i.e., modeled) dispersion curve best matches the measured curve. This is accomplished through an iterative process during which intermediate dispersion curves will be displayed to show corresponding match. The overall match will also be displayed in a single-column graph as well as a 2-D chart form showing its variation with surface location.



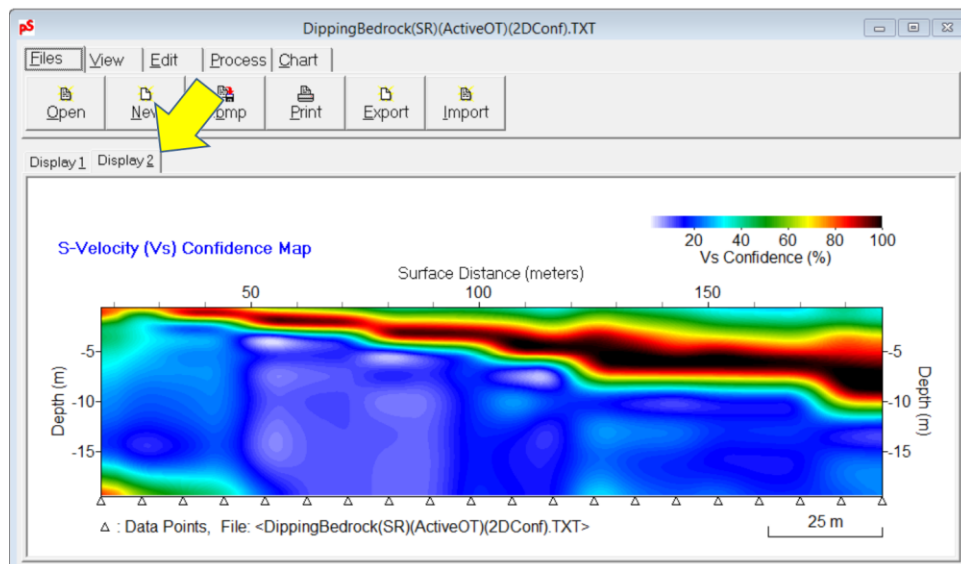
## PS - Generating 2-D Shear-Wave Velocity ( $V_s$ ) Cross Section

As shown below, at the end of the inversion process two types of output will be saved and then automatically displayed within the same form (under "Display 1" and "Display 2" tabs)—a 2-D shear-wave velocity ( $V_s$ ) cross section map [\*(2DVs).TXT], and the corresponding 2-D  $V_s$  confidence map [\*(2DConf).TXT], respectively. The velocity color scheme in the 2-D  $V_s$  cross section is automatically determined by the program based on the velocity value distribution in the input file [\*(2DVs).TXT]. This can be changed through a control dialog explained below. Notice that the cross section map shown below used the color scheme displayed on top that is matched within the  $V_s$  range of 0-1200 m/sec. The confidence map shows distribution of relative reliability in inversion results ( $V_s$  values) so it can be used in link to judge credibility of velocity values in a cross section map that may change from one place to another.

<2-D  $V_s$  Cross Section Map>



<2-D  $V_s$  Confidence Map>

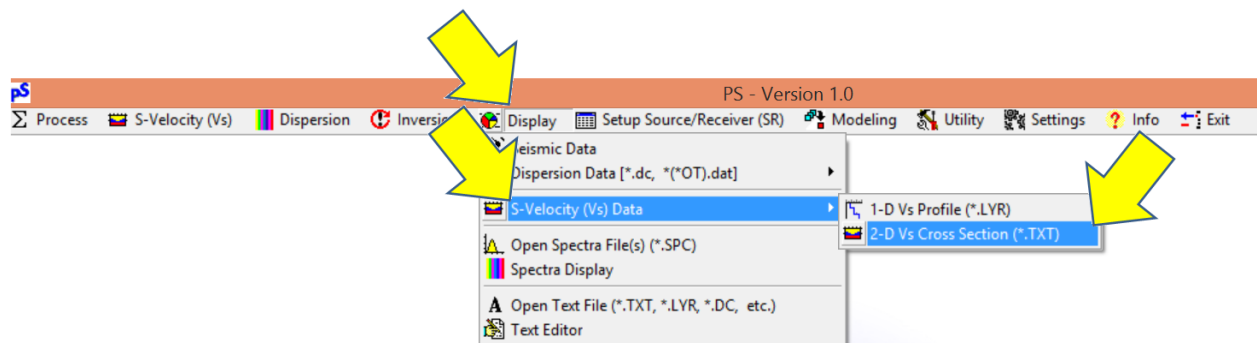


### <To Change Velocity ( $V_s$ ) Color Scale>

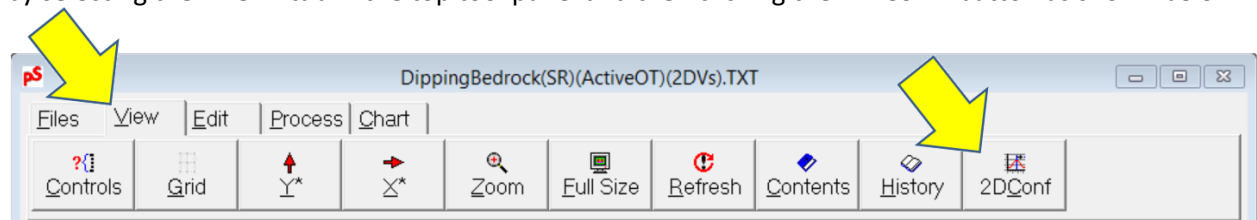
Select the "View" tab in the top tool panel. Then, click the "Controls" button to display the control dialog. Enter values for "MIN" and "MAX" to specify the velocity range and then click the "Update Image" button at the bottom. Many parameters related to the 2-D interpolation (e.g., interpolation schemes) and display (e.g., changing axis scale, labeling, etc.) of the input text file (\*.TXT) in the usual three-column format (i.e., X, Depth, Value) can be accessed through this dialog.



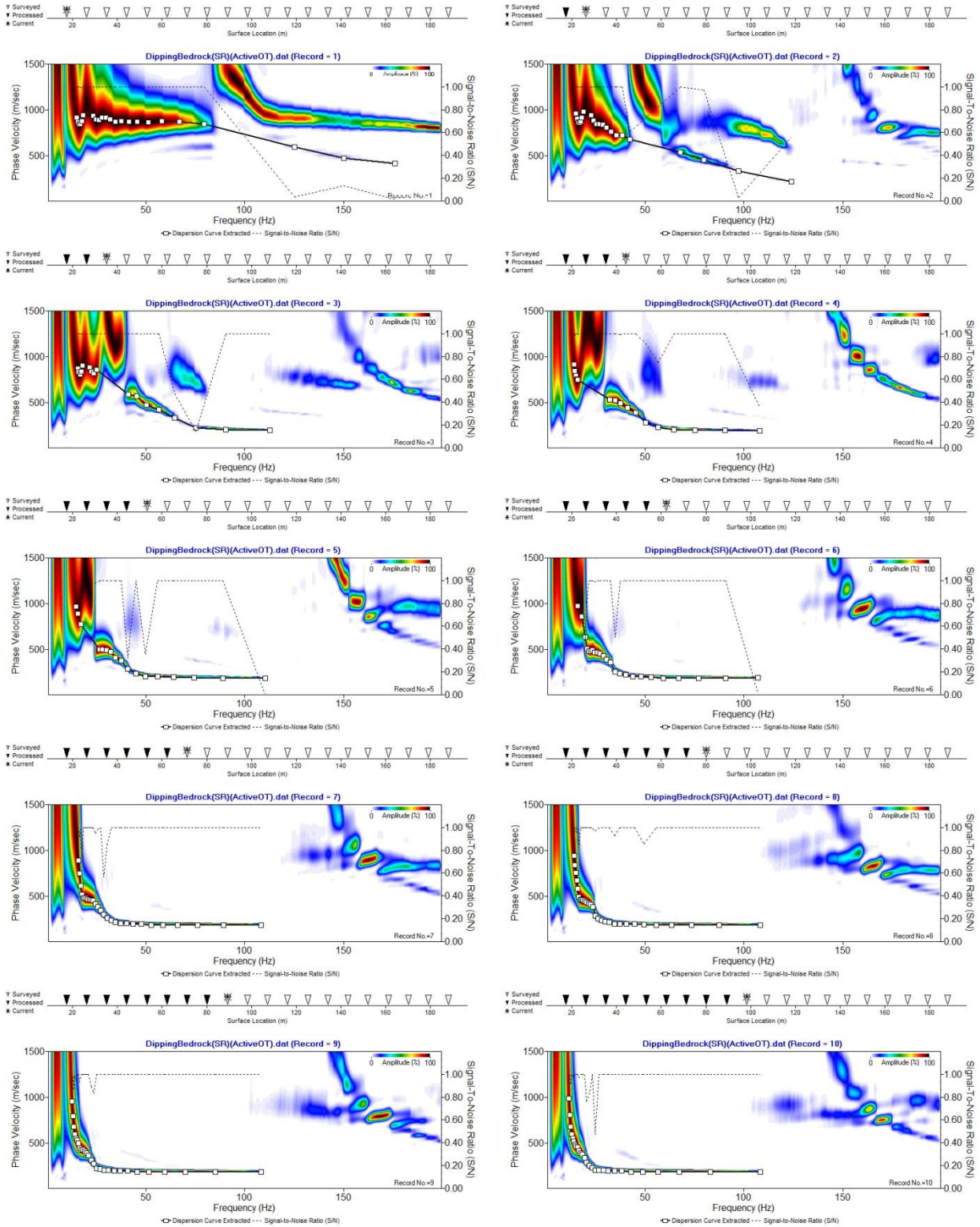
In case you need to manually open the 2D  $V_s$  cross section file, you can do so by going to "Display" in the main menu, and then "S-Velocity ( $V_s$ ) Data" → "2-D  $V_s$  Cross Section (\*.TXT)" as shown below.



The corresponding confidence map can be automatically imported within the cross section display form by selecting the "View" tab in the top tool panel and then clicking the "2DConf" button as shown below.



<Sample Example of Extracted Dispersion Curves; Record # 1-10>





<Sample Example of Extracted Dispersion Curves; Record # 11-20>

