

IRIS EMC PARAVIEW PLUGINS; EXERCISE 2 – EARTH MODEL

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Comments or questions?

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Objective

The EMC Cascade.ANT.Gao-Shen.2014 model by Gao and Shen (2014) is a 3D shear-wave velocity model of the Cascades from full-wave ambient noise tomography. This model is available from IRIS:

<http://ds.iris.edu/ds/products/emc-cascadeantgao-shen2014/>

Reference

Gao, H., and Y. Shen (2014), Upper mantle structure of the Cascades from full-wave ambient noise tomography: Evidence for 3D mantle upwelling in the back-arc, *Earth Planet. Sci. Lett.*, 309, 222-233,

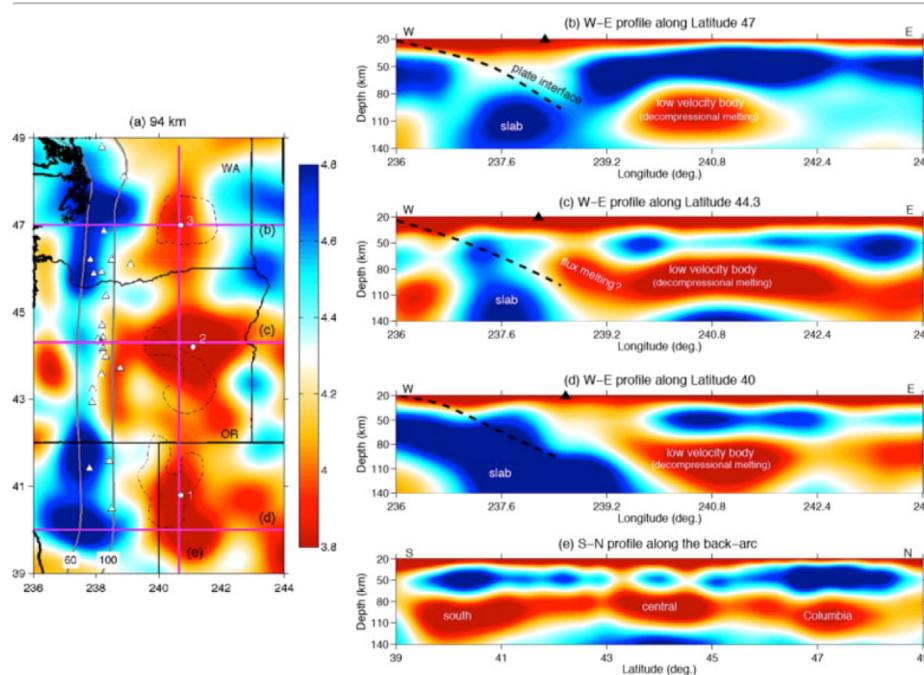
<https://doi.org/10.1016/j.epsl.2014.01.012>.

Use EMC plugins to load this model (CASCADE.ANT.GAO-SHEN.2014_kmps) and reconstruct the horizontal slice at the depth of 94 km (Figure 7a) and the W-E profile along latitude 47 (Figure 7b) as shown in the next slide:

- Area latitude range 39 to 49 degrees
- Area longitude range -124 to -116 degrees
- Plot coastal boundaries, political boundaries
- Plot USGS Slab 1.0 model for the area to mark the plate interface
- Plot volcano locations
- Plot horizontal slice at the depth of 94 km
- Plot the W-E profile along latitude 47 from depth of 20 to 140 km



Gao and Shen (2014), <https://doi.org/10.1016/j.epsl.2014.01.012>



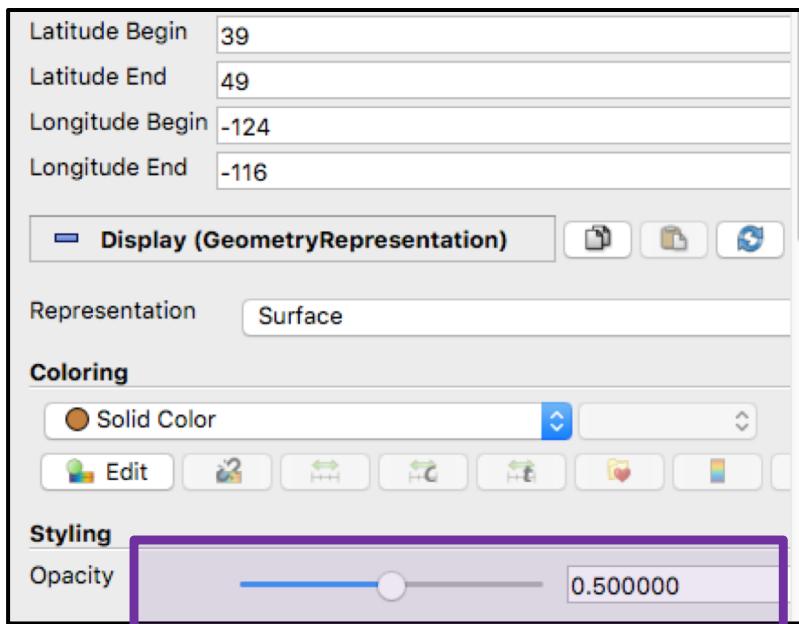
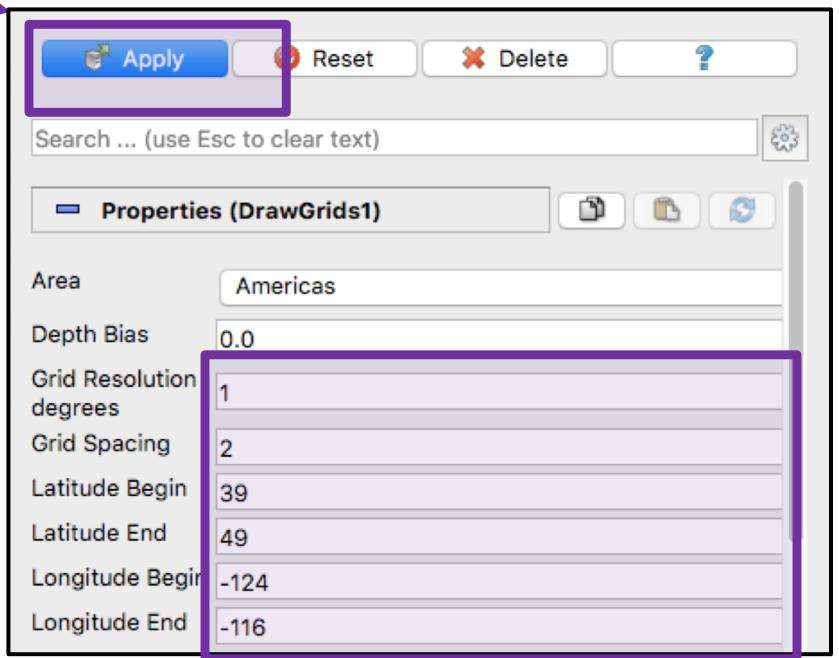
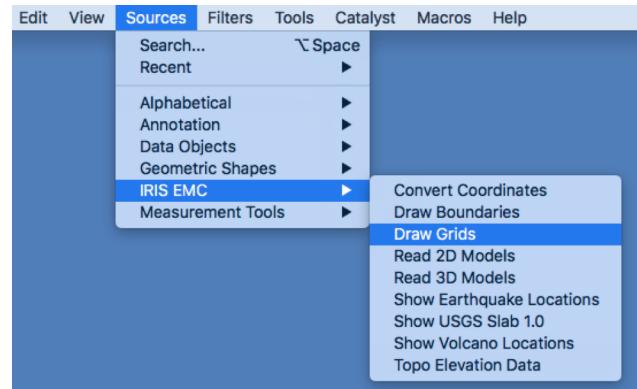
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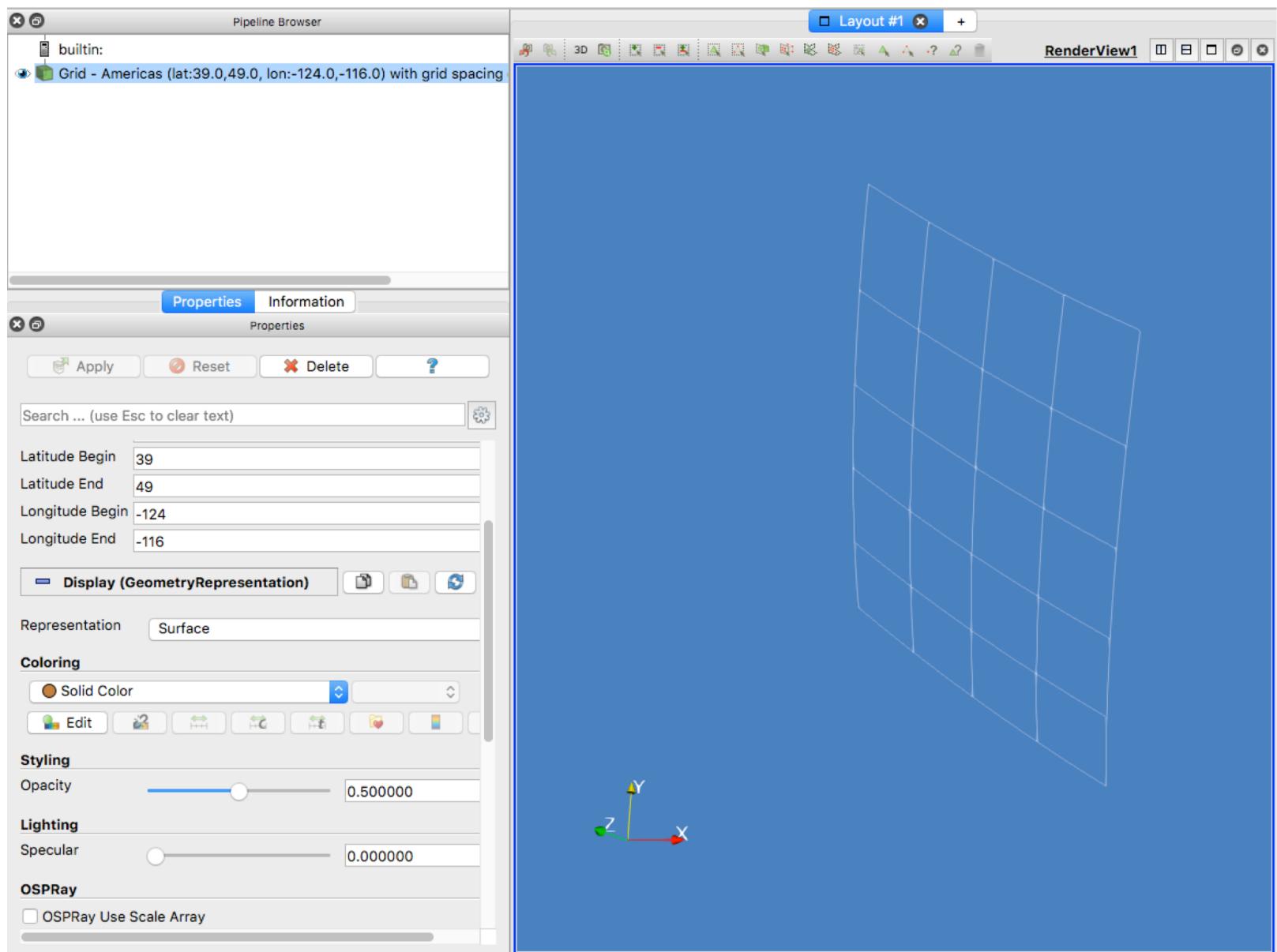
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Fig. 7. Segmented low-velocity anomalies along the Cascade back-arc. (a) Horizontal slice at depth of 94 km (V_s in km/s). The black dashed lines outline the amplitude of largest negative Sp phase from receiver functions in the back-arc (Hopper et al., in press). The magenta lines mark the profile locations in (b), (c), (d) and (e), respectively. The three white dots mark the point locations in Fig. 8. All the panels share the same color bar. (b-d) W-E profiles across the back-arc anomalies. The y-axis has the approximate same length scale as the x-axis. The triangles mark the volcano centers. The Juan de Fuca plate interface at depths of 20–100 km from the model of McCrory et al. (2004) is projected. At greater depth, the plate interface is poorly defined. (e) S-N profile along the back-arc low-velocity anomalies, which spatially correlate with the three volcano clusters as in Fig. 1. The length scale of y-axis is exaggerated two times of the x-axis.

Draw the Grid Lines

- Open ParaView
- Select Draw Grids plugin
- Set the latitude and longitude limits. Set the grid spacing to 2 and click Apply
- Reduce the Opacity of the grid lines to 0.5

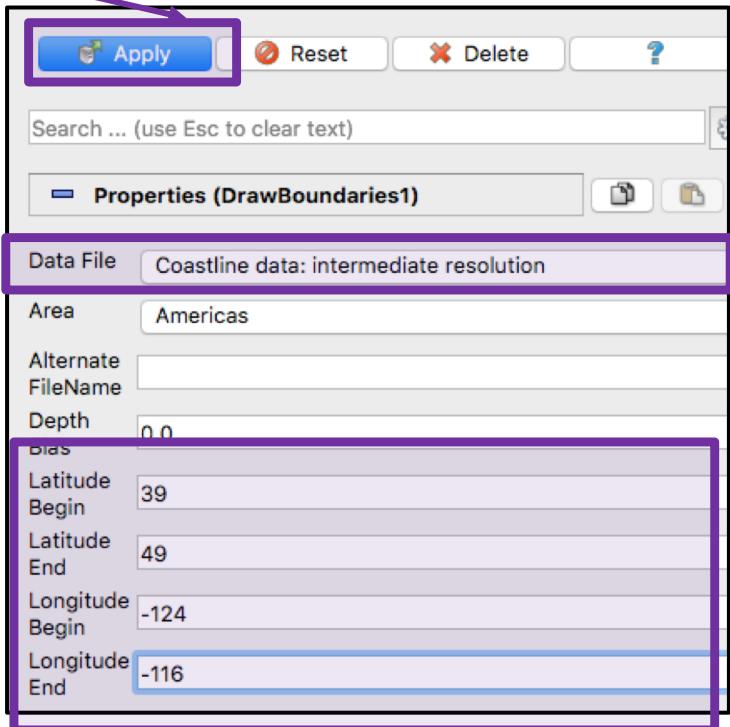
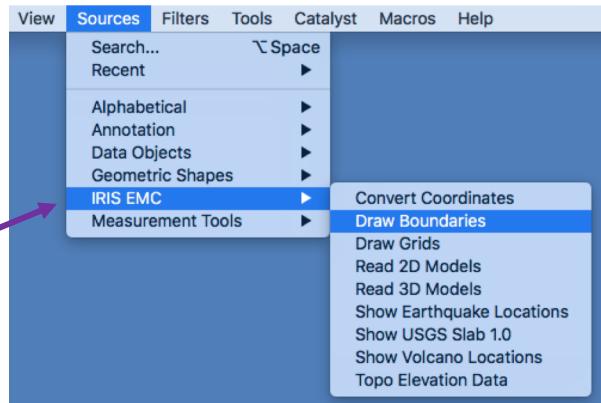


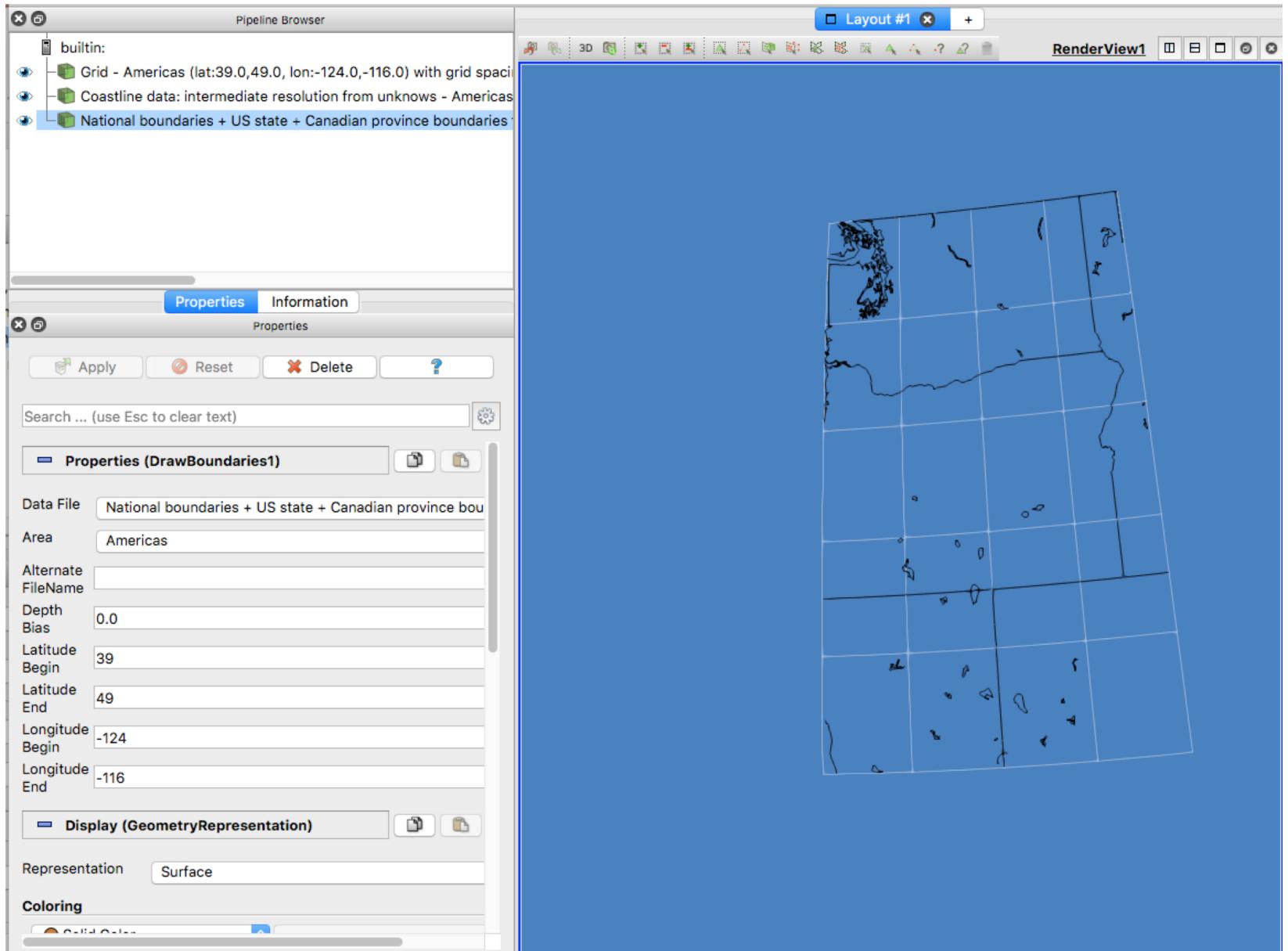


Draw Boundaries

We need two different boundary lines. Each will require a separate call to Draw Boundaries plugin

- Select intermediate resolution coastline, set the latitude and longitude limits and click Apply.
- To change the boundary line color to black, select Edit under Coloring and select black color from the basic colors.
- Select Draw Boundaries one more time and repeat the same sequence as above for national boundaries.

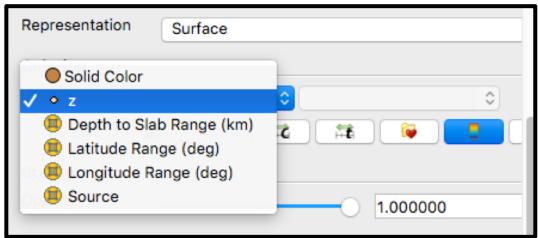
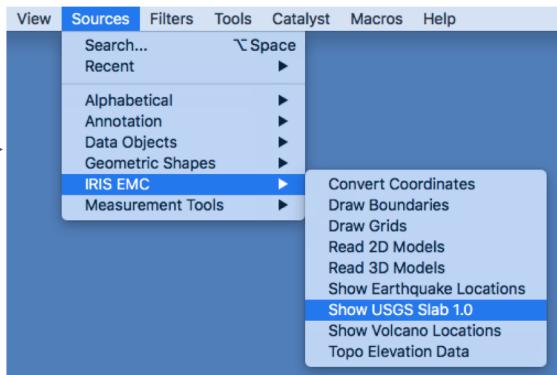




Draw USGS Slab 1.0 Model

Select Show USGS Slab 1.0 plugin

- Select the Cascadia slab, set the latitude and longitude limits and click Apply.
- Change Representation to surface and select z for Coloring

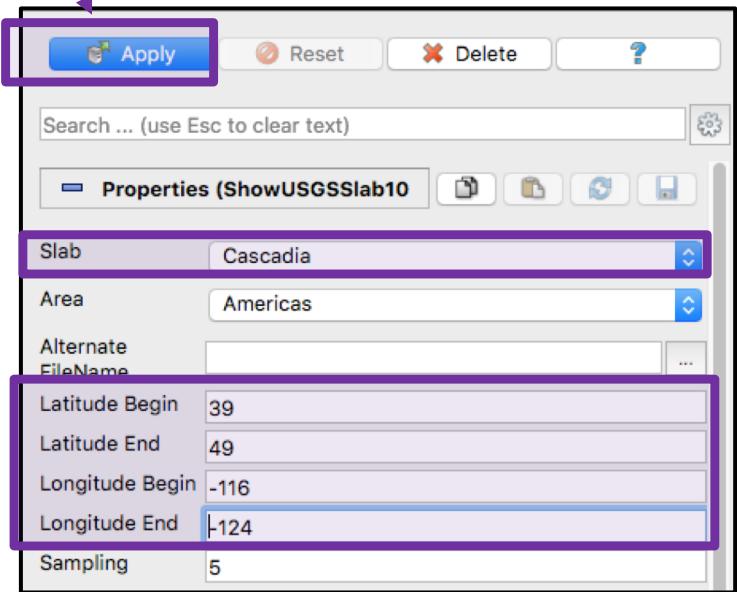
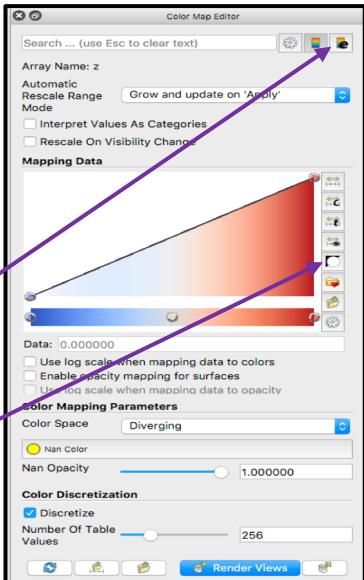


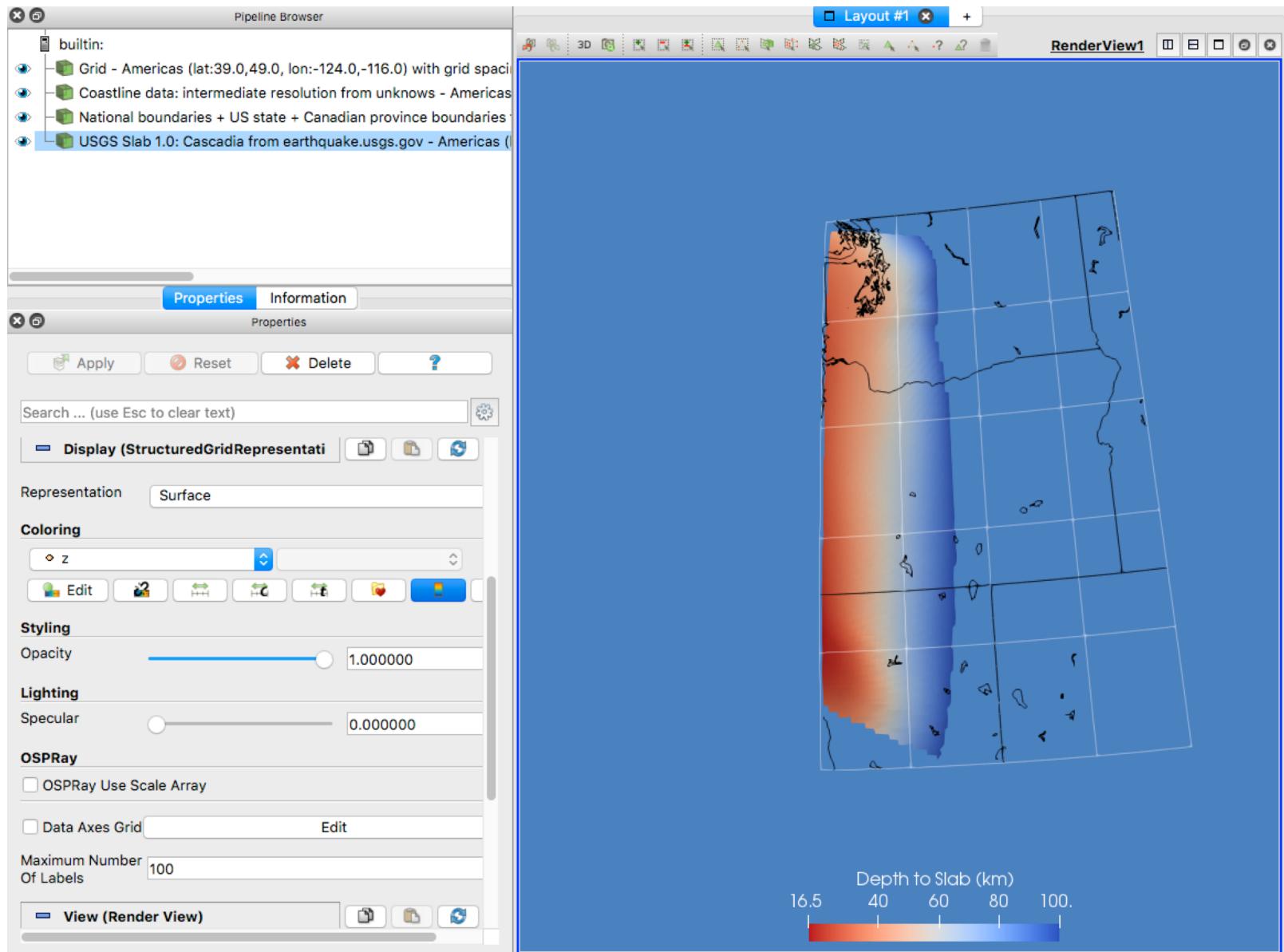
- To change the color scale, click Edit under Coloring



and open the Color Map Editor. The Color Map Editor interface allows you to modify color and scale labeling:

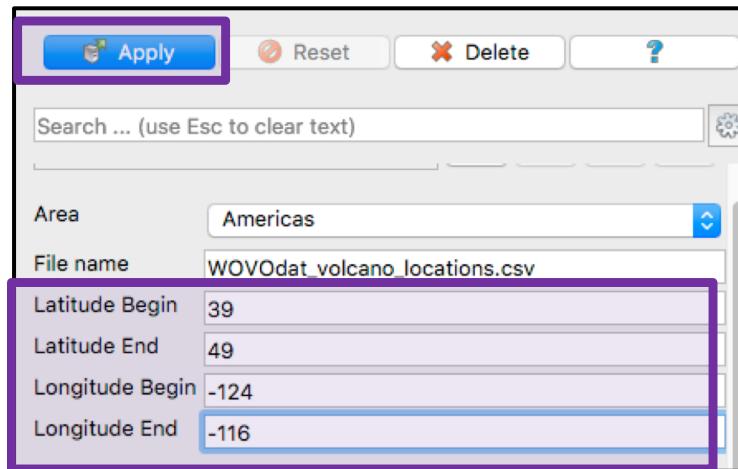
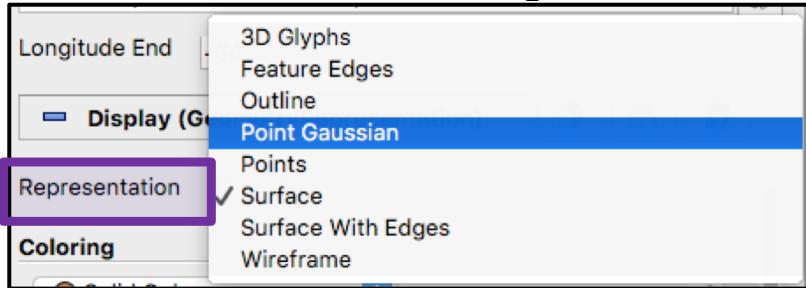
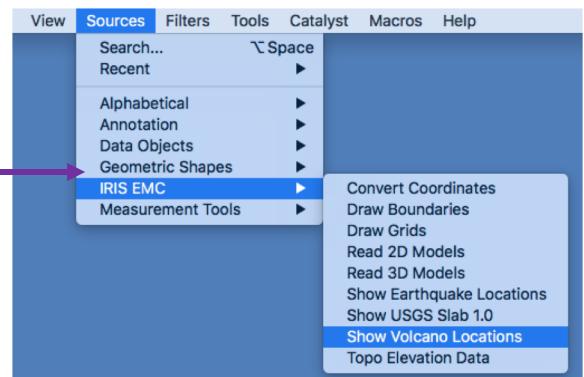
- Edit color legend
- Invert colors



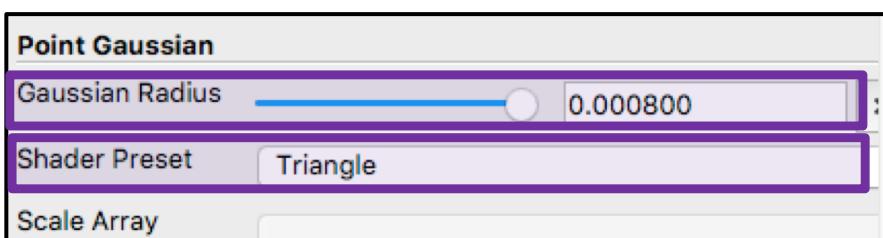
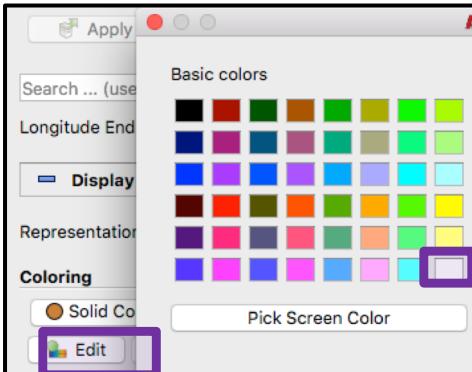


Add Volcano Locations

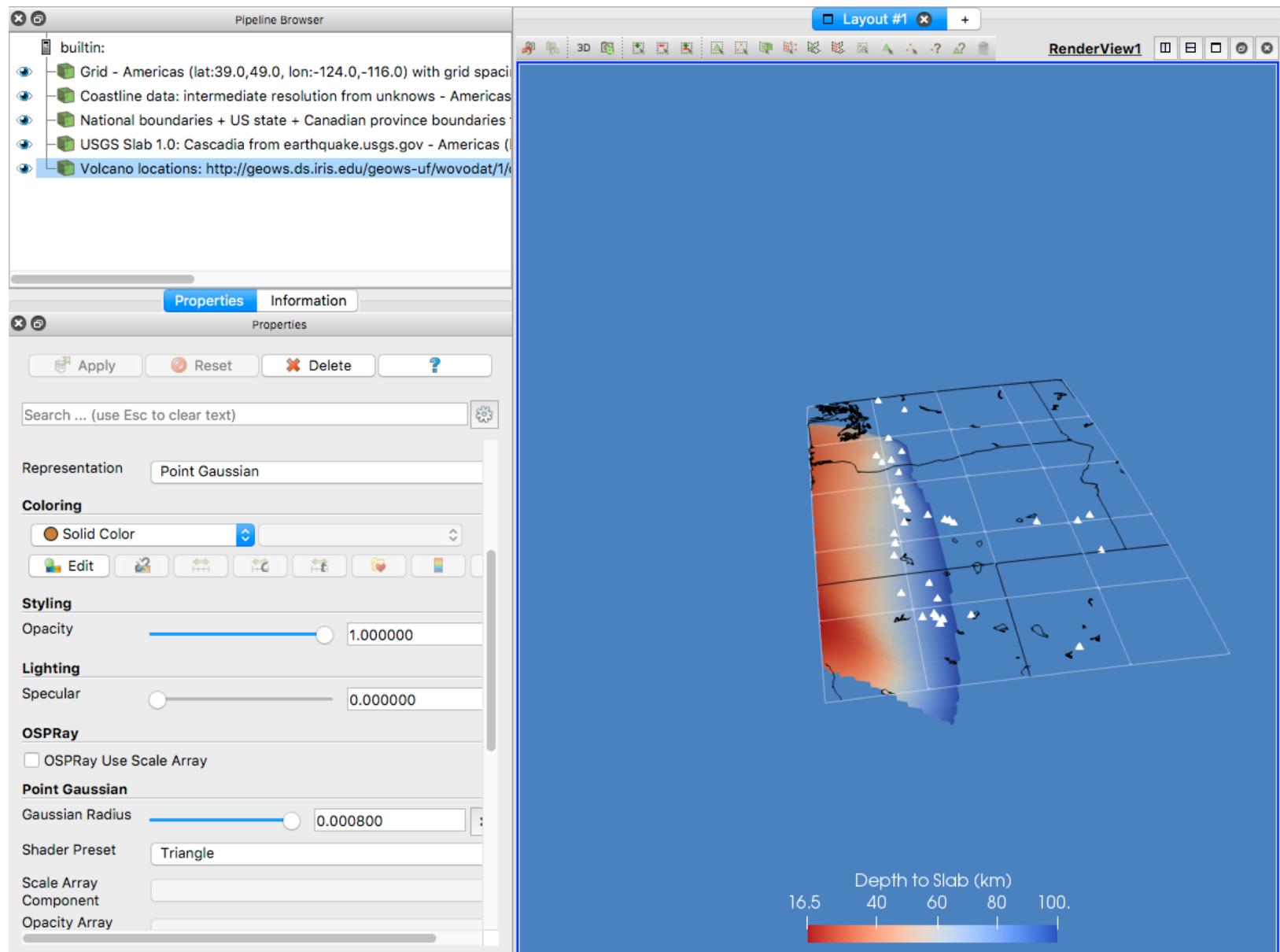
- Select Show Volcano Locations plugin
- Enter the latitude and longitude limits and click Apply.
- To plot red triangle markers for volcanoes , select Point Gaussian for Representation



- Select white color under Coloring
- Set the Point Gaussian properties:
Triangle for Shader Preset
and 0.0008 for Gaussian Radius

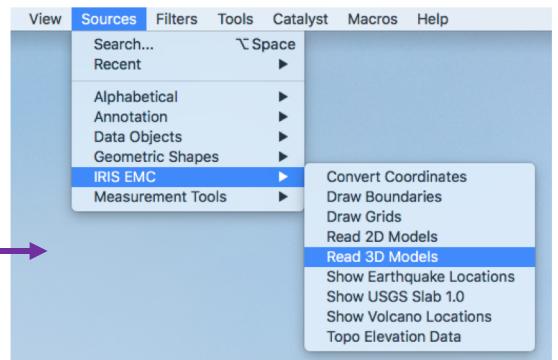


ADD VOLCANO LOCATIONS



Create A Horizontal Slice at the depth of 94 km

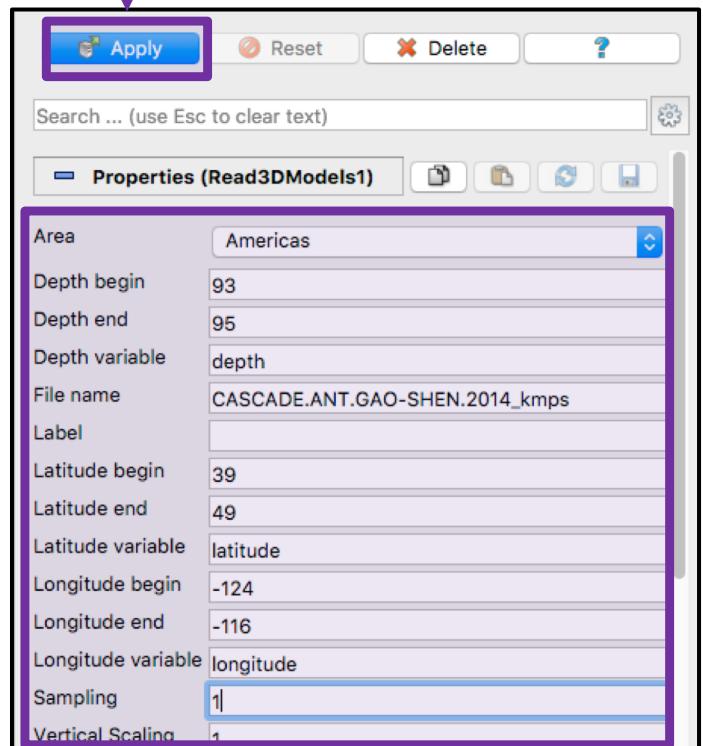
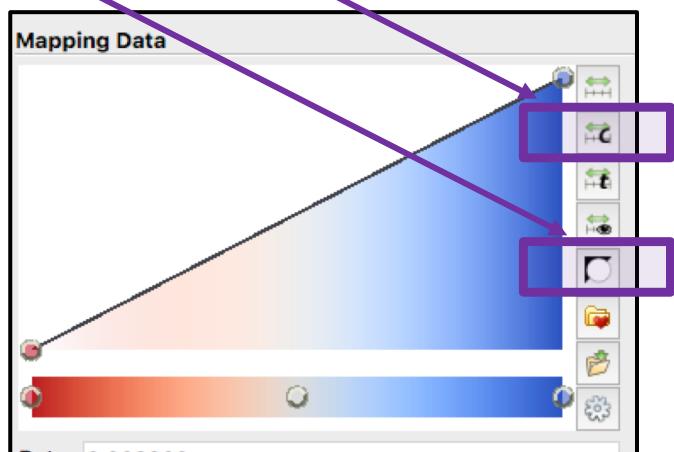
- Select Read 3D Models plugin
- Enter the model file name, depth, latitude and longitude limits and set sampling to 1 to use all data then click Apply.
- Change Representation to surface and select vs for Coloring

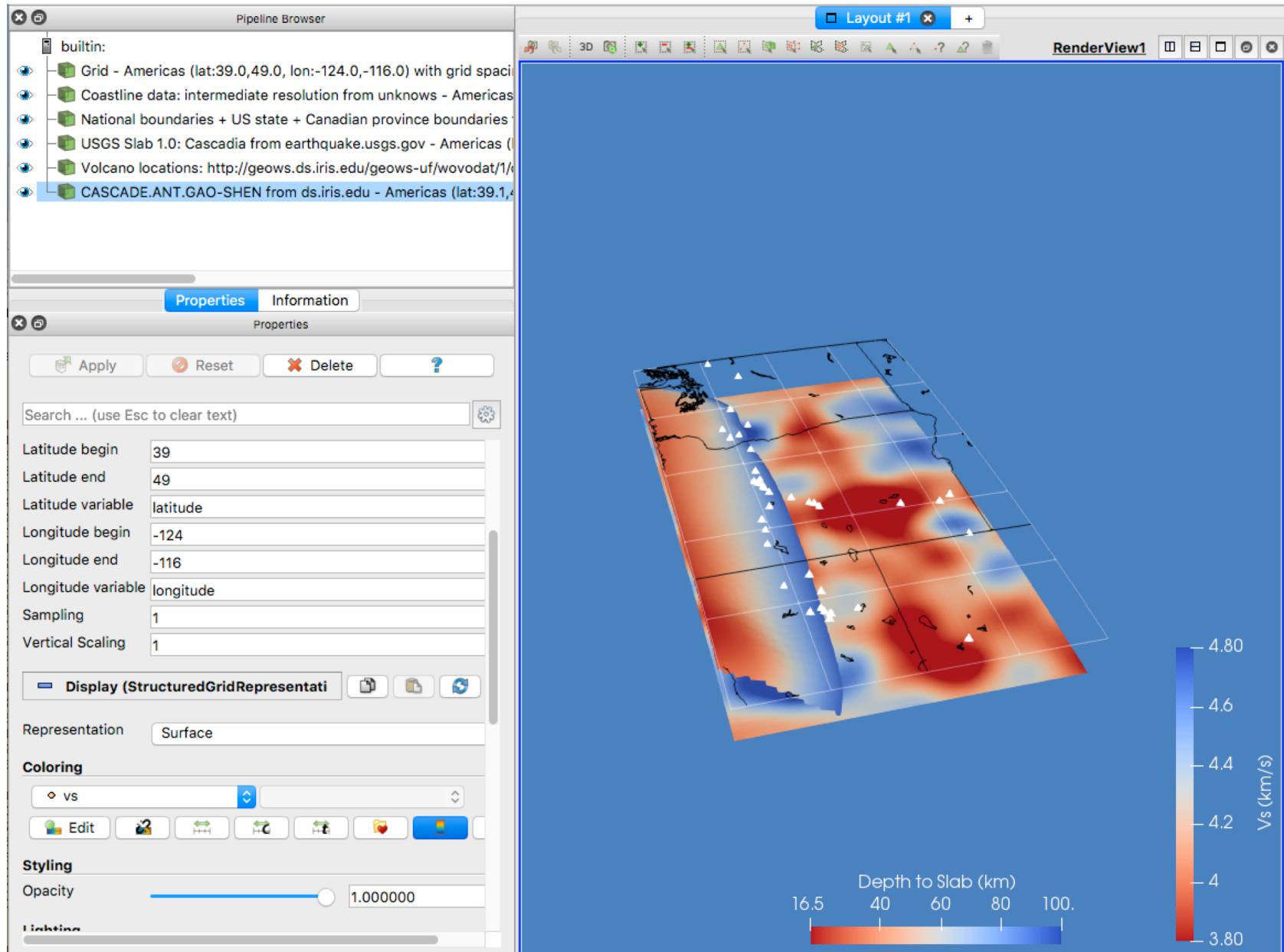


- Update the color scale.



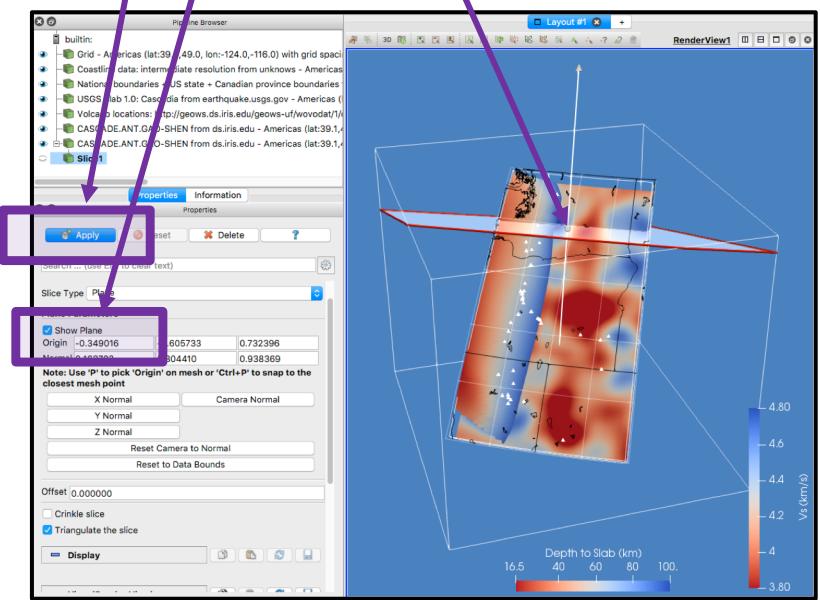
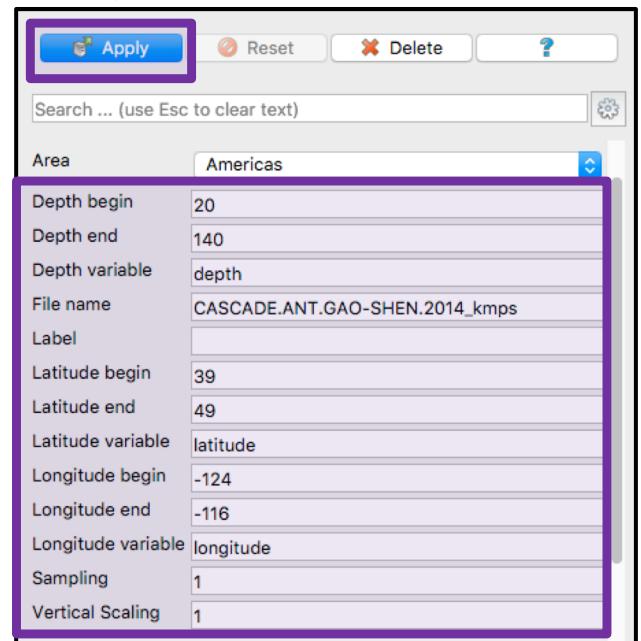
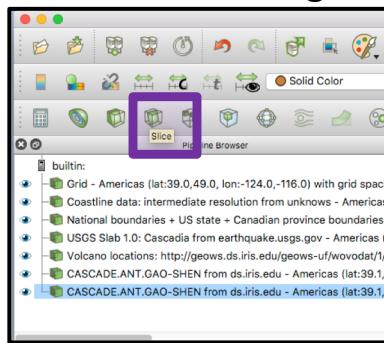
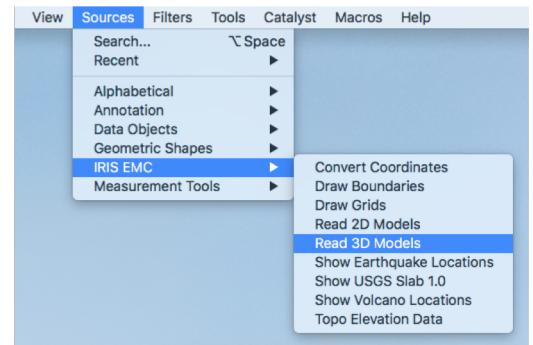
- Custom range
- Invert colors

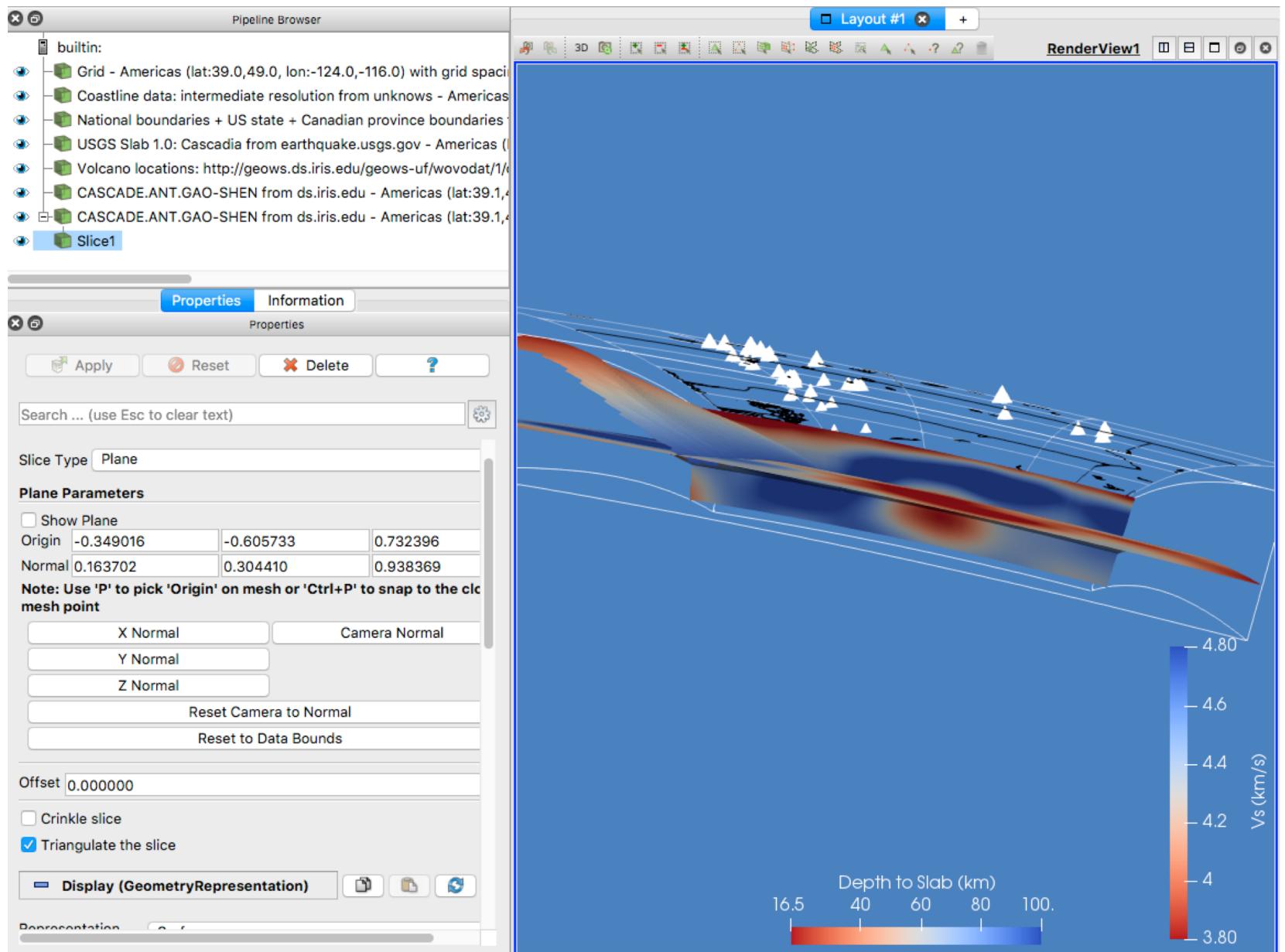




Create a Cross-Section along latitude 47

- Select Read 3D Models plugin →
- Enter the model file name, depth, latitude and longitude limits and set sampling to 1 to use all data then click Apply.
- Use the Slice tool to slice the model along 47 N latitude
- Use the arrow and the cut plane to position the slice along 47 latitude
- Click Apply
- Hide the cut plane

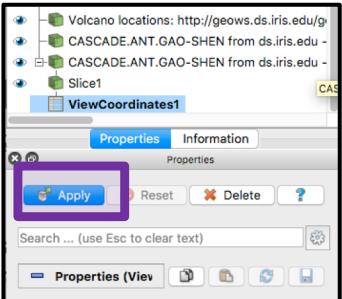
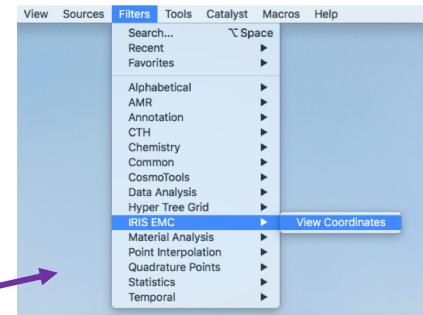




Save the Cross-Section Data

Data in ParaView are stored as X, Y, Z coordinates.

- To convert them to latitude-longitude-depth, select the cross-section object in the Pipeline Browser, then select the View Coordinates Filter:
- Click Apply



- This will open a SpreadSheetView that contains the data for the section.
- Use the Export Spreadsheet button on the upper right of the View to export the data

