Segmentation in Side Scan Targeting and Mosaicking

By Daniel Tobin

New in HYPACK® 2025 is segmentation and contouring in Side Scan Targeting and Mosaicking (SSTM). This includes the following features:

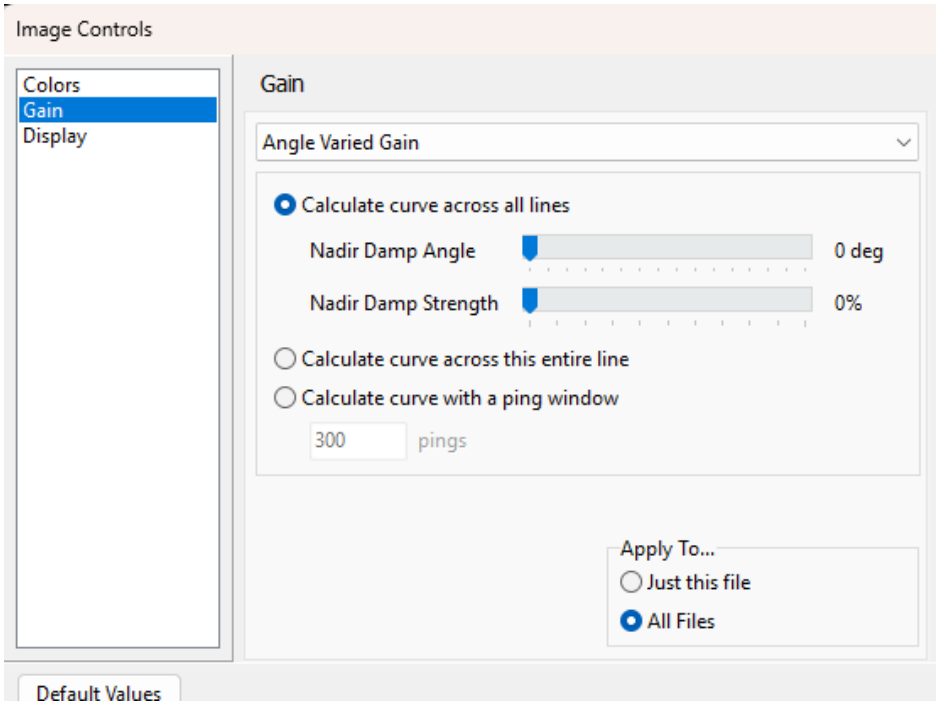
- Create binned XYZ files of your data.
  - > An XYZ file is created at a configurable grid size (say, a 10-foot grid). This is the “bin” size.
  - > In each bin (e.g. each 10x10 foot area) of your mosaic, the X and Y coordinates and average signal intensity are written to the XYZ file (the signal intensity is written instead of depth).
- Create a DXF segment files using your XYZ files.
  - > Our TIN engine is leveraged for this.
  - > Given an XYZ file, adjacent bins with similar intensities are grouped into “segments”.
- Interpret DXFs and label segments.
  - > The range of intensities a given segment covers is configurable.
  - > Once you've created a segment, you can label and color that segment.

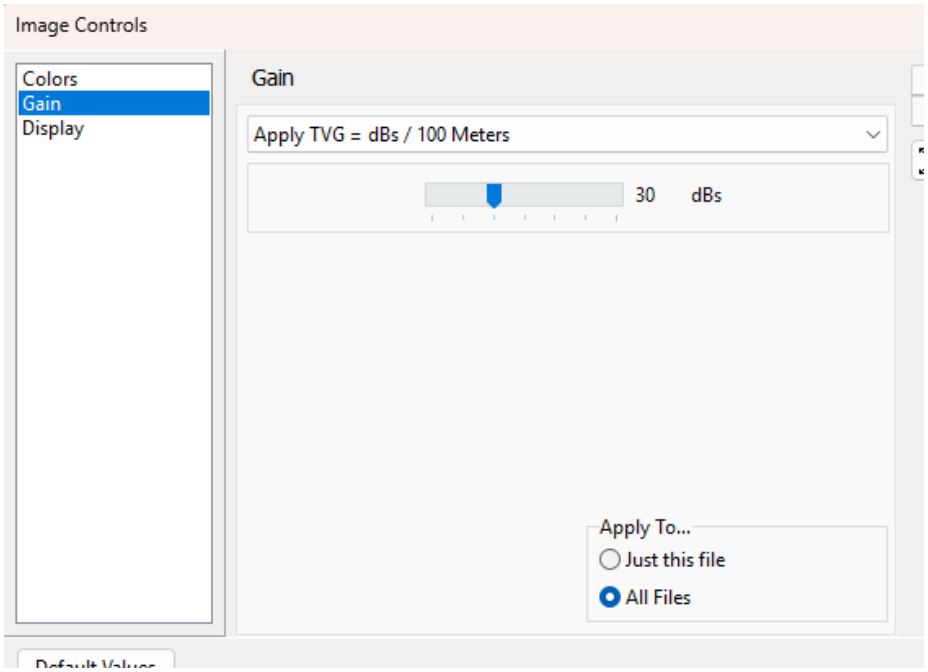
An expected use case for these features is bottom classification. With a given segment, a user can “ground truth” that segment and determine the bottom type that likely fills that segment. Note: HYPACK® will not automatically classify segments.

The compatibility of this feature is wide - any data that can be loaded into SSTM can be segmented. This includes average beam intensity (aka backscatter) data exported from MBMAX in the HS2x format.

The process begins by loading any dataset and processing it like any regular dataset - including bottom tracking, position editing, heading smoothing, and creating a mosaic.

It's important at this point to choose the correct gain settings. Your gains should be set to either “dBs / 100 Meters” or “Angle Varied Gain”, “Calculate curve across all lines”. “Apply to All Files” should be selected for either choice.



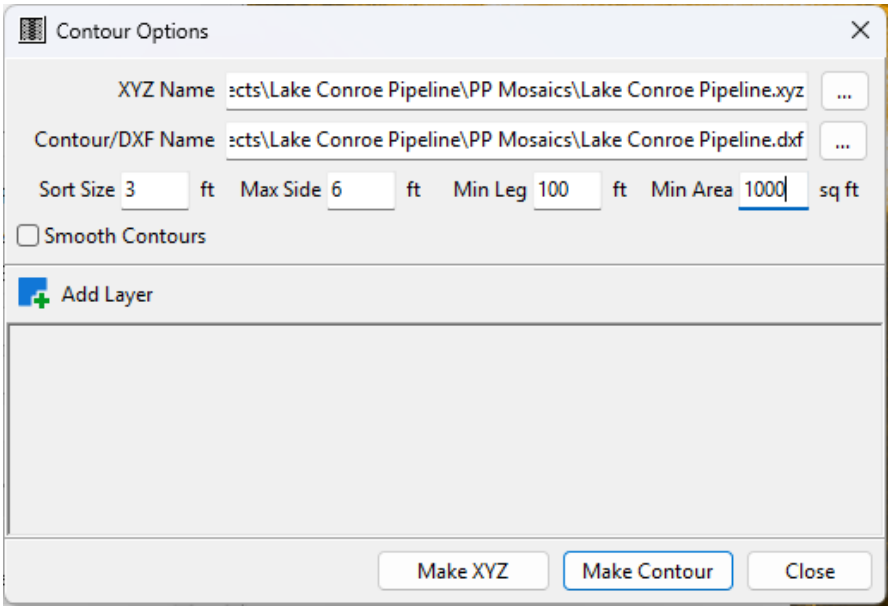


The intensity values saved to the XYI file have gain applied, and thus segmentation is performed on gain-corrected data. The recommended settings above are unique among our gain options because the gain curve is calculated across all files - as opposed to any other setting, which will give each line its own gain curve, calculated only for that specific line.

Having identical gain curves across all lines is important to maintain relative intensities across all lines.

Once you have your gains dialed in correctly, make a mosaic. While this step isn't entirely necessary, it's critical for ensuring your segmentation accuracy.

Next, click the “Contours…” button at the bottom-left corner of the program. This opens a new window for creating contours.



First, we need to create an XYZ file. Choose a sort size. This is the grid or bin size that was mentioned earlier. Once you've chosen a sort size, click “Make XYZ”. Now, you should have an XYZ file, as described above. This will be used for contouring.

Next, we'll create a DXF file. First, set your “max side”. This is the farthest distance allowed between two points in the DXF. A good rule of thumb is to use twice your sort size.

Next, set your “min leg” and “min area”. This is the smallest allowed leg and area in your final contour. Increasing these values will mean fewer small contour layers.

Now we can create our layers. Click “Add Layer” to create your first layer. A layer describes the name, intensity range, and color of a specific contour. In SSTM, intensity is the relative amplitude of a given sample, after gains have been applied. These relative amplitudes range from 0 to 1. An intensity of 0 means that sample has a relatively low amplitude, while a 1 means a relatively high amplitude. The intensity range of a given layer runs from wherever the previous layer's intensity ends to your chosen upper intensity limit.

To choose an intensity limit for a given layer, click the eyedropper icon for that layer. This will bring you to the Scanview tab. When you click in the waterfall, the intensity setting for that layer will be set to the intensity of the point you clicked on. This is now the upper intensity limit for that layer. Any samples whose intensity is below this limit but above the previous layer's limit will fall into this layer.

Now that you know your intensity range, choose a name and color for this layer. Repeat this process for as many layers as you'd like to contour. You must create at least two layers to create a final contour.

Finally, click “Make Contour”. This should create a colored contour in the Map view.

For more advanced analysis, close SSTM and return to the HYPACK Shell. Under “Project Items”, “Project Files”, “Post Processed Mosaics”, you should see the TIF, XYZ, and DXF files you just created. Enable the TIF and DXF files. Right-click your DXF file and select “Bring to front”. Right-click it again and select “Zoom extents”. Right-click it one more time and select “Transparency”. Slide the transparency down to about half. This should let you see the TIF file behind it. Use this to verify the accuracy of your contour layers. If you don't like how it looks, try adjusting the options in the Contour Options window in SSTM and recreating the contour file.

There's two ways to visualize the layer names. Click on “Sounding Colors”, “Select Color Table”, then choose the color table from this list that matches the name of the DXF you created (by default, it is the project name). Click OK. Right-click on the color bar at the top left corner of the map and choose “Show Label”.

Alternatively, click the “+” next to your DXF file in the Project Items list. You should see your label names here. You can turn off individual layers to help with visualization.