

Introduction to the Satellite Information Familiarization Tool (SIFT)

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This short Laboratory exercise will introduce you to some of the features of SIFT that you can use to interrogate and compare different bands. Subsequent labs will guide you through comparisons – this one introduces you to the tool, focusing on the basics.

1. STARTING SIFT: To start SIFT: Find the correct icon on your desktop and double click on it. The SIFT window should open, and a separate window that you can use to monitor SIFT's progress also opens (behind the SIFT window; this mostly-hidden window can be useful to monitor data loading) You'll end up with something that looks like this.



Figure 1: SIFT Display Window on opening

This is the main display window where you will view bands when they are loaded. Different Projections are available – (the default, LCC CONUS, a Lambert Conformal view over CONUS, is shown) – and can be changed via that DropDown Menu above the map. Four Tabs are present to the right: 'Layers', 'Area Probe Graphs', 'Layer Details' and 'RGB Bounds'. There is an 'add tab' "+" above the Layers/Area Probe Graphs region – if you click on it, you'll create new windows. At present, there's no way to get rid of the added windows once they're there. If you click on the 'Area Probe Graphs' and 'RGB Bounds' tabs, your display will change slightly, as shown below in Figure 2, as those Tabs are brought up front.

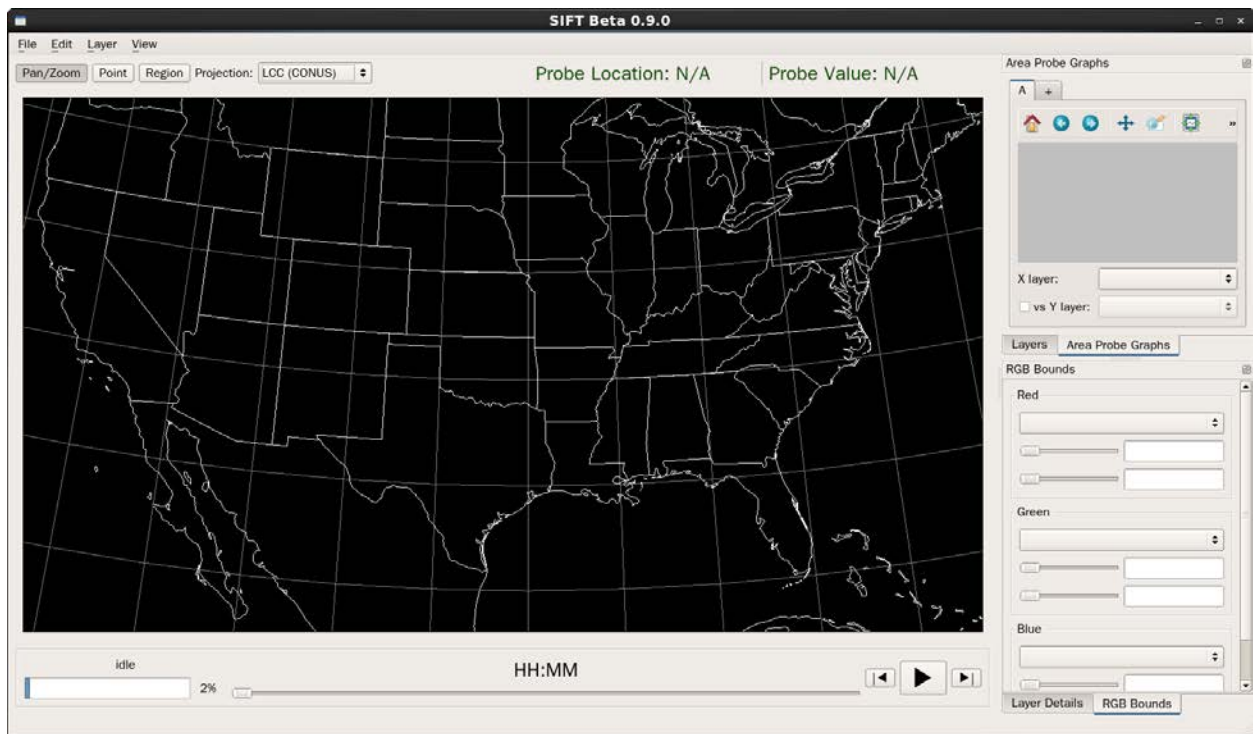


Figure 2: SIFT Display Window with different tabs visible

2. LOADING DATA: In the upper left of the SIFT Display, you'll see 'File' 'Edit' 'Layer' 'View' tabs to click. First, click on 'File' (alternatively, "ctrl-o") and you'll see a probably-familiar view:

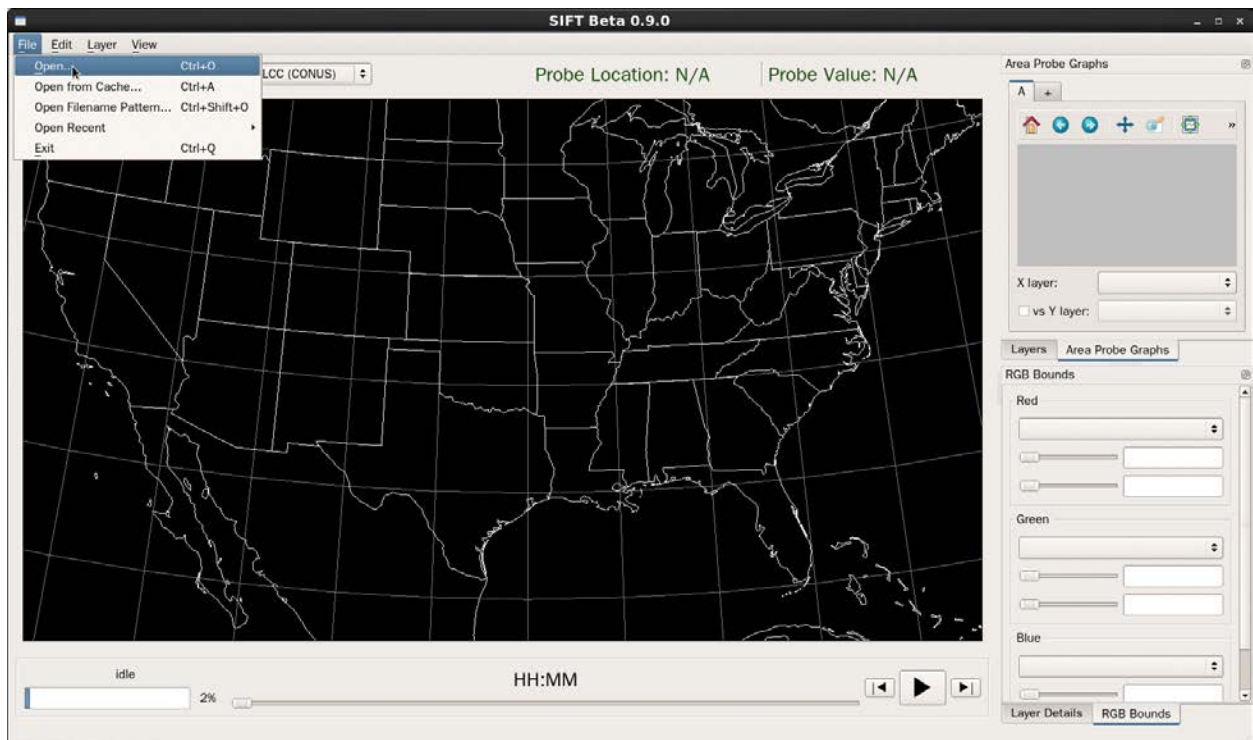


Figure 3: SIFT with the 'File' Tab activated and 'Open' Selected

Click on ‘Open’ and you’ll see a data-selection dialog box (the dialog box will look different depending on if you’re using a Windows-based machine or a linux box; examples here are from a linux box), shown in Figure 4A. Navigate down the directory tree structure to a directory holding data, as shown in Figure 4B. The file listing shows only one ‘type’ of file – in this case, netCDF. If you have navigated to a file directory that contains only netCDF files, the search for mercator GeoTIFF files will show no results, as shown in Figure 4C. If you find an empty directory, consider searching for a different file type!

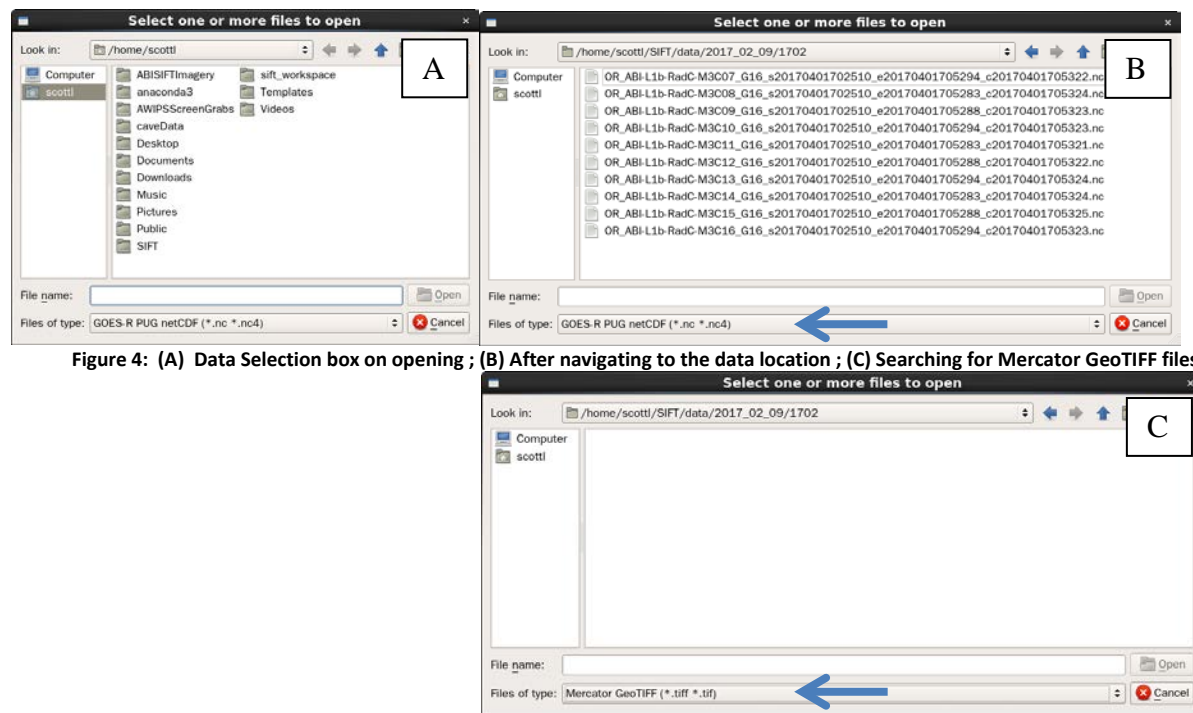


Figure 4: (A) Data Selection box on opening ; (B) After navigating to the data location ; (C) Searching for Mercator GeoTIFF files

Note: **On a Windows machine**, find the **data** directory. There’s an **ahi** folder in it, and that folder contains all the AHI and ABI data you’ll be using. You can probably see a data or ahi folder in the shortcuts on the left side of the windows search screen.

You can choose data in a variety of ways, **click on one file**, or **ctrl-click on several**, or **click** on the first in a series **and shift-click** on the final file in the series. Click on ‘Open’, and the data will start loading into the SIFT window. You can monitor the data load by looking in the usually-hidden status window behind the SIFT display. If you are loading visible imagery, especially the half-kilometer resolution 0.64 μm visible data, this display load can make you think nothing is happening, but it is. Additionally, note that there is a data cache – if data have been loaded before, then data can load more quickly. Once data have loaded, you’ll see a display such as shown below in Figure 5.

A couple things to note: Displays are ordered. In this case, the top-most display is Band 1 (**0.47 μm** , the blue band). If you load a series of a single band, i.e. a time animation, then the earliest image would be the top-most display. If the check-box is ticked in the Layer List, then the image will be displayed; if multiple check-boxes are ticked, the top-most band is displayed.

When multiple bands are loaded, typically all tick boxes in the ‘Layers’ box are checked. Before saving Figure 5, I used the ‘down’ arrow to cycle through all the bands, and ended up back at the **0.47 μm** band

– and that cycling through the bands turned off all the tick boxes (except the one being displayed).

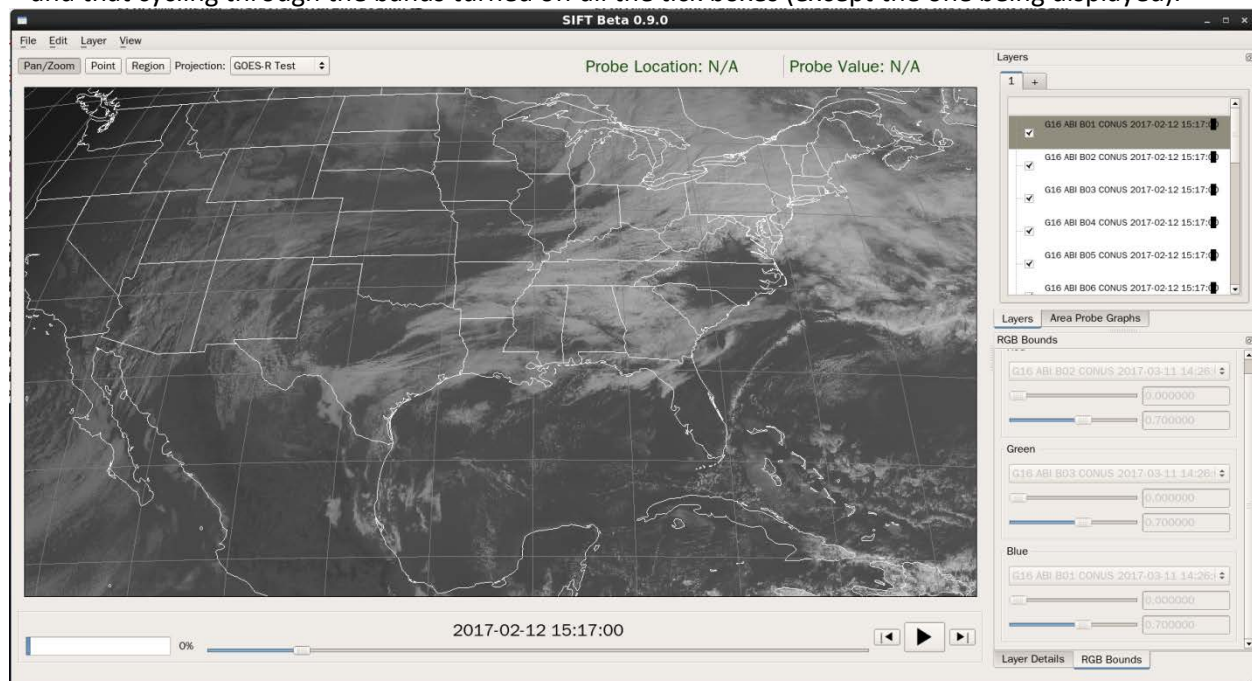


Figure 5: SIFT Display after loading all 16 ABI Bands from GOES-16

3. FEATURES OF THE SIFT WINDOW: After data are loaded, the 'Layers' and 'Layer Details' windows are populated with data. The default color enhancement ('Square Root') is used for all visible/near-Infrared bands, as shown. (The default color enhancement ('Rainbow 11-bit') is used for all infrared bands, not shown) The scene has not yet been probed, so 'Probe Location' and 'Probe Value', both top center above the main display, show N/A.

In the 'Layers' window shown in Figure 5, the band that is displayed is highlighted in blue/grey, and information on the display is shown in the 'Layer Details' window; the small check boxes mean each Band is "visible"; the top-most Visible band is the one you see in the Display Window. If you toggle on/off the Band 1 check box, the SIFT display will change – you'll see for this case nothing in the main display window, but because Band 1 is still highlighted, that's the information you see in the 'Layer Details' window. If you click on Band 4 in the Layers window, the 'Layer Details' window will change, but unless Band 4's tick box is clicked, and Bands 1-3's tick boxes are not clicked, you won't Band 4 in the main display. You can use the up/down arrows to cycle through the Bands. (Alternatively, click on 'View' and then click on 'Previous Band' or 'Next Band')

In this example, all 16 bands have been loaded and there's insufficient window real estate in the SIFT display to see all the bands. So: Double-click on the 'Layers' window – right where 'Layers' sits, and that window will pop out/be un-docked, as shown in Fig. 6. You can then resize and move the 'Layers' window around (it will be re-absorbed back into the SIFT display if you move it close to where it was originally; if you Double Click on the top of the Layers Window it will pop back to where it came from).

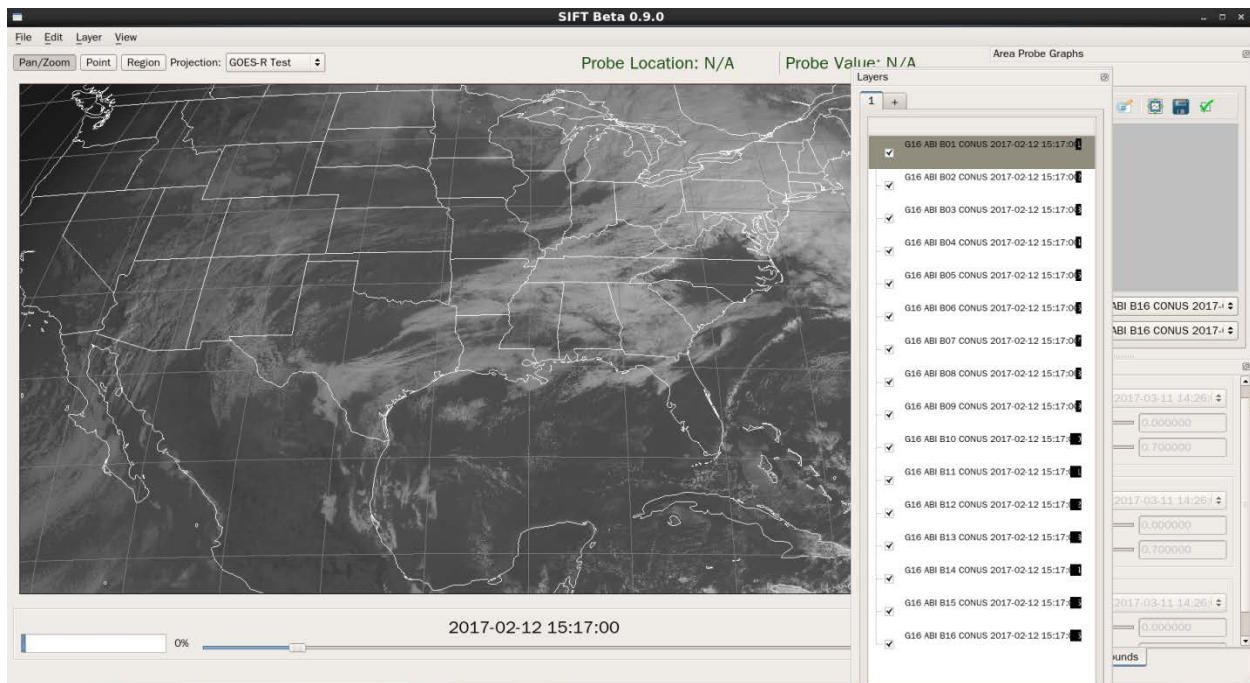


Figure 6: SIFT Display with moveable 'Layers' window undocked from the main display (and resized)

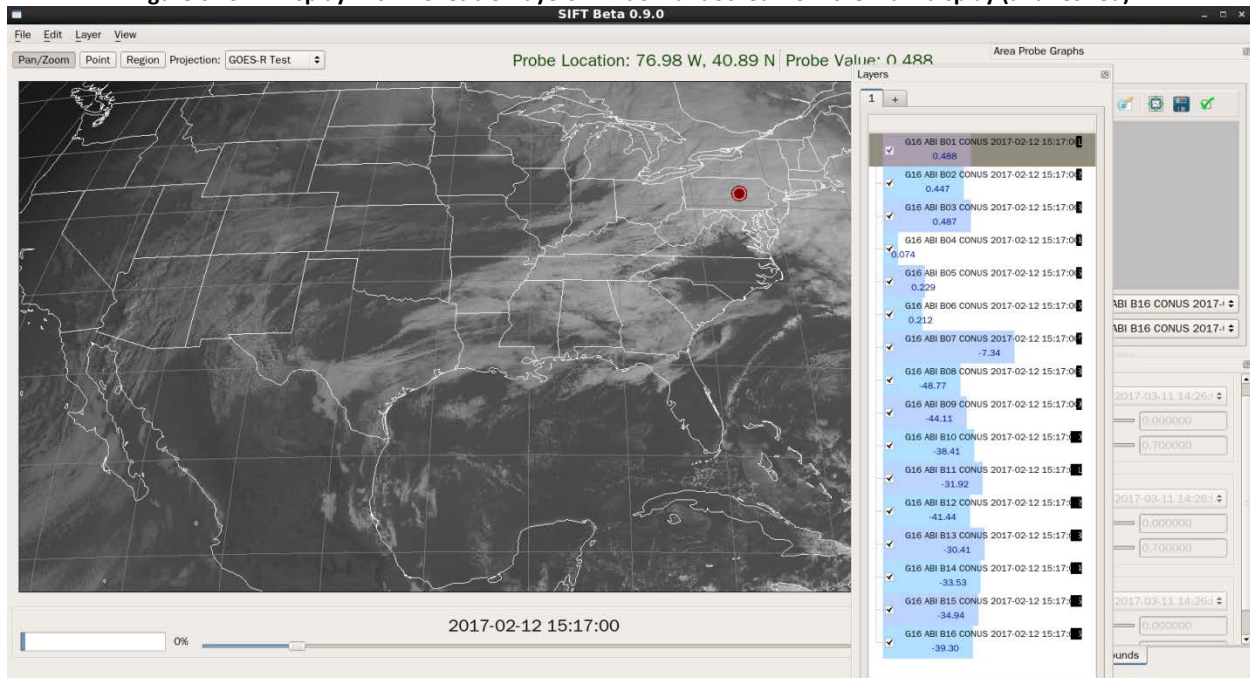


Figure 7: SIFT Display with Probe Value

4. INTERROGATING THE DATA: PROBE FEATURE Figure 6 shows SIFT before probing has occurred. Right-click anywhere in the scene, and a filled 'o' will show the probe location (In Figure 7, the probe is right under the hand-shaped cursor!). Note that 'Probe Location' and 'Probe Value' now show data above the SIFT Display window; additionally, the 'Layer' display shows values for all Bands, values are printed out in the Layers window, and a bargraph – in blue – is present. Bands 1-6 show reflectance values, Bands 7-16 show Brightness Temperatures. Small/cold values are to the left, Large/warm values are to the right in the bar graphs. The clouds over New York being probed are likely high clouds. The

visible and veggie bands both show high reflectance and brightness temperatures are not warm.

When you move the Probe, right-clicking elsewhere in the image, the Layer values change. The Probe value over near Phoenix, in Figure 8 below, shows values associated with deep convection. The Cirrus Channel (**1.38 μm** , band 4) has reflectance similar to the snow/ice channel (**1.61 μm** , band 5), and the infrared channels 8-16 show uniformly cold values. The bar graphs will always have low reflectance on the left and increasing to the right for visible/near-infrared channels, and cold brightness temperatures on the left increasing to the right for infrared channels.

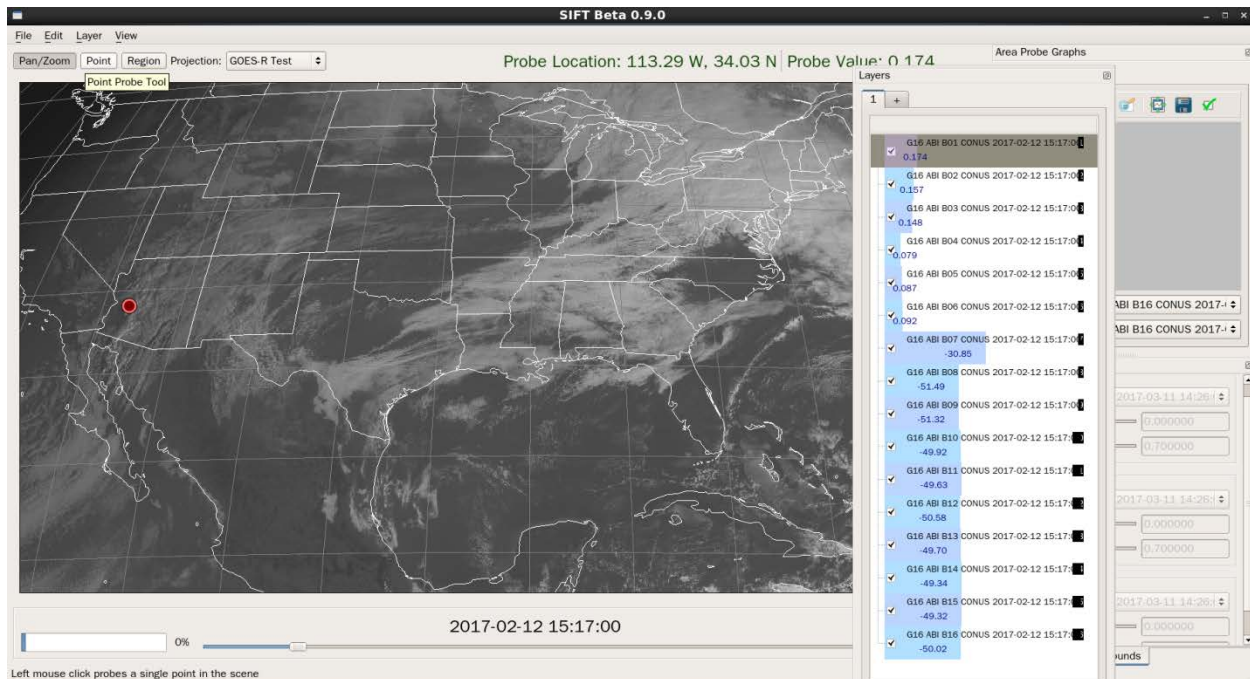


Figure 8: SIFT Display with Probe Value

5. INTERROGATING THE DATA: Bar Graphs and Density Diagrams. Figure 9 shows the SIFT window with the Layers window reinserted into the SIFT window. The 'Region' button in the top left part in the SIFT window has been clicked. When this is done, a polygon can be traced out by left-clicking a series of points. In Figure 9, an oval is being defined, starting Toledo, Ohio and proceeding clockwise – the polygon points selected are shown by the grey/green 'o'. If you're unsatisfied with the polygon, hit 'Esc' and start over.

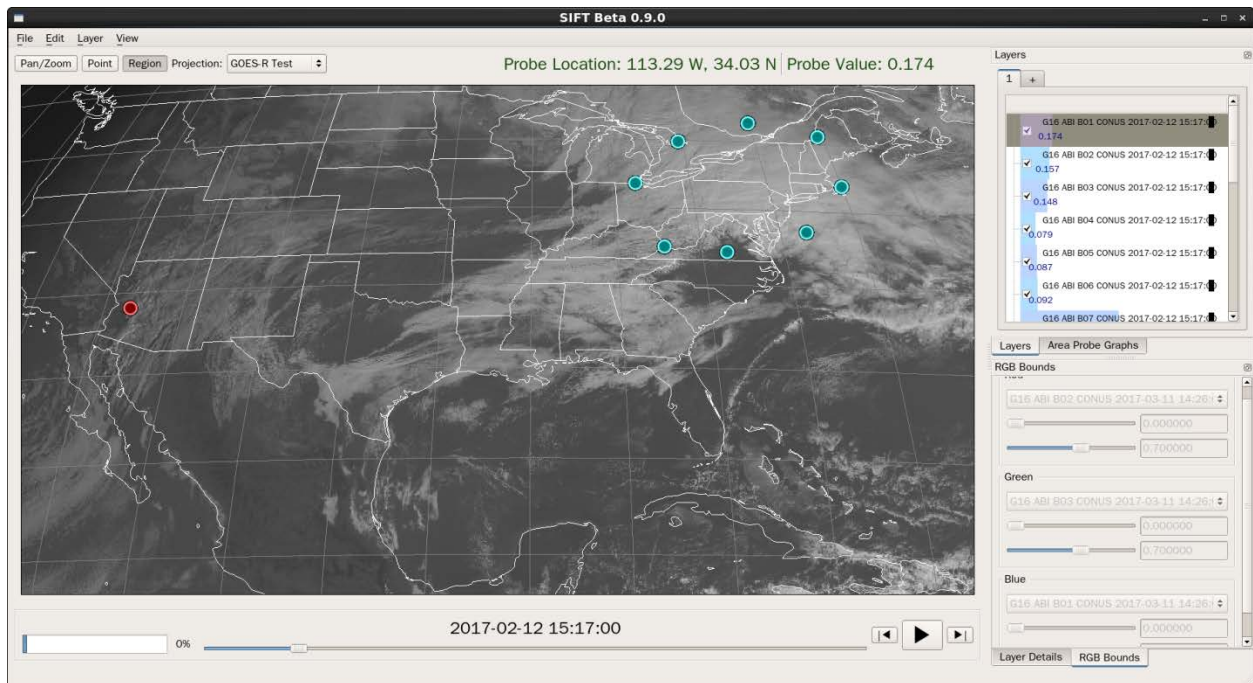


Figure 9: SIFT Window with a Region being defined

The Polygon can have any shape, but the last point described must overlap – or be very close to – the first point. Figure 10, below, shows a polygon defined by completing the polygon in Figure 9 – it is shaded purple. Data within the polygon are used to define bar graphs and density diagrams.

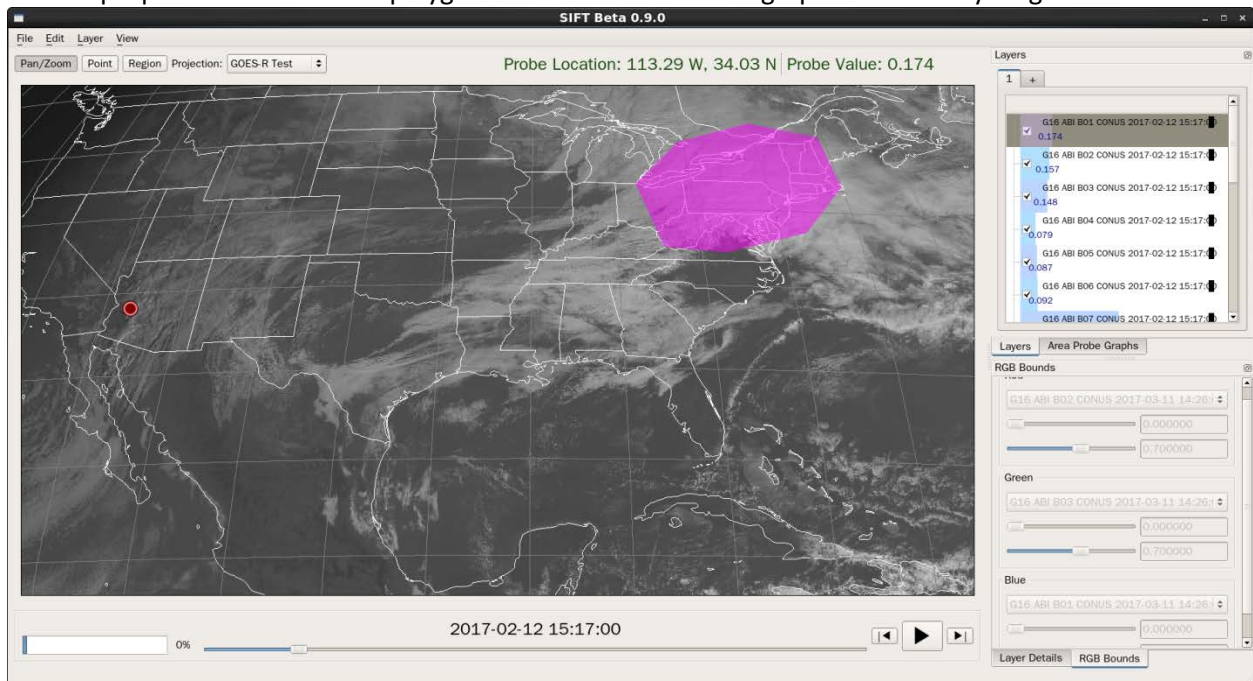
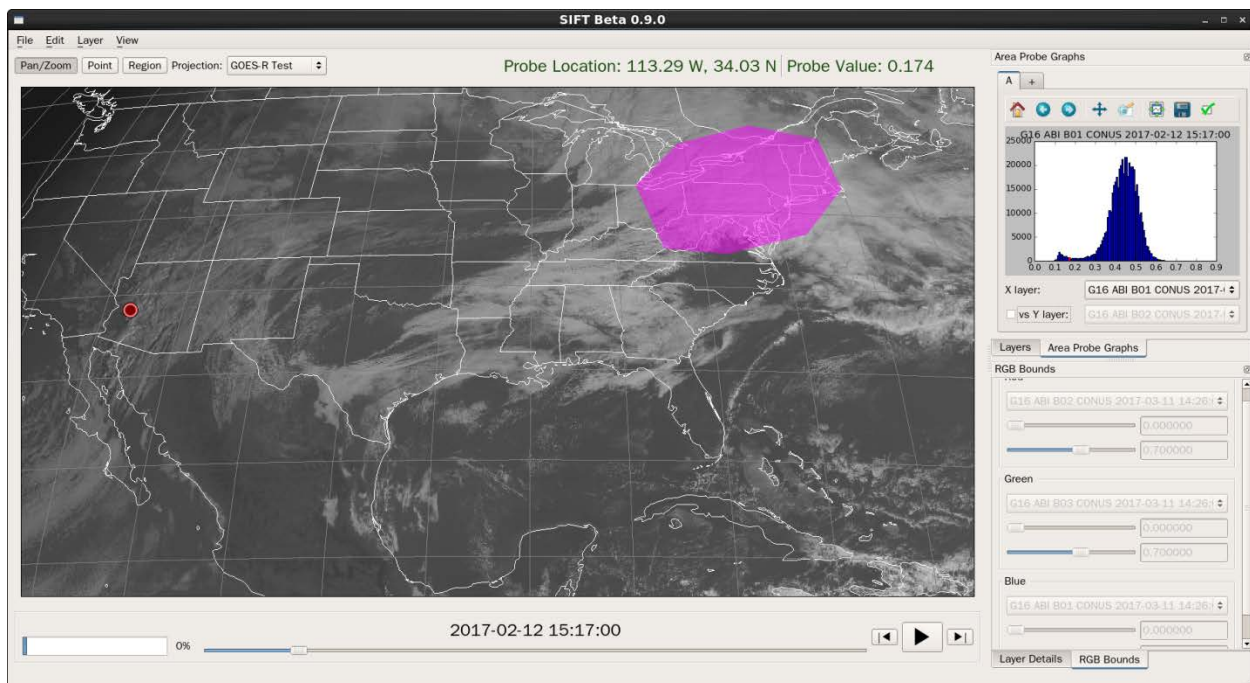


Figure 10, above: SIFT Window with Region defined. Figure 11, below: SIFT Window with Region Defined and Area Probe Graphs made visible by clicking on the 'Area Probe Graphs' Tab



In Figure 11, above, a bar graph shows Band 1 values with different reflectances. Note that a red line is present in the bar graph – this corresponds to the Probe Point. Figure 12, below, shows the same figure but the probe has been moved inside the polygon – and the value associated with the probe is shown by the red line in the bar graph.

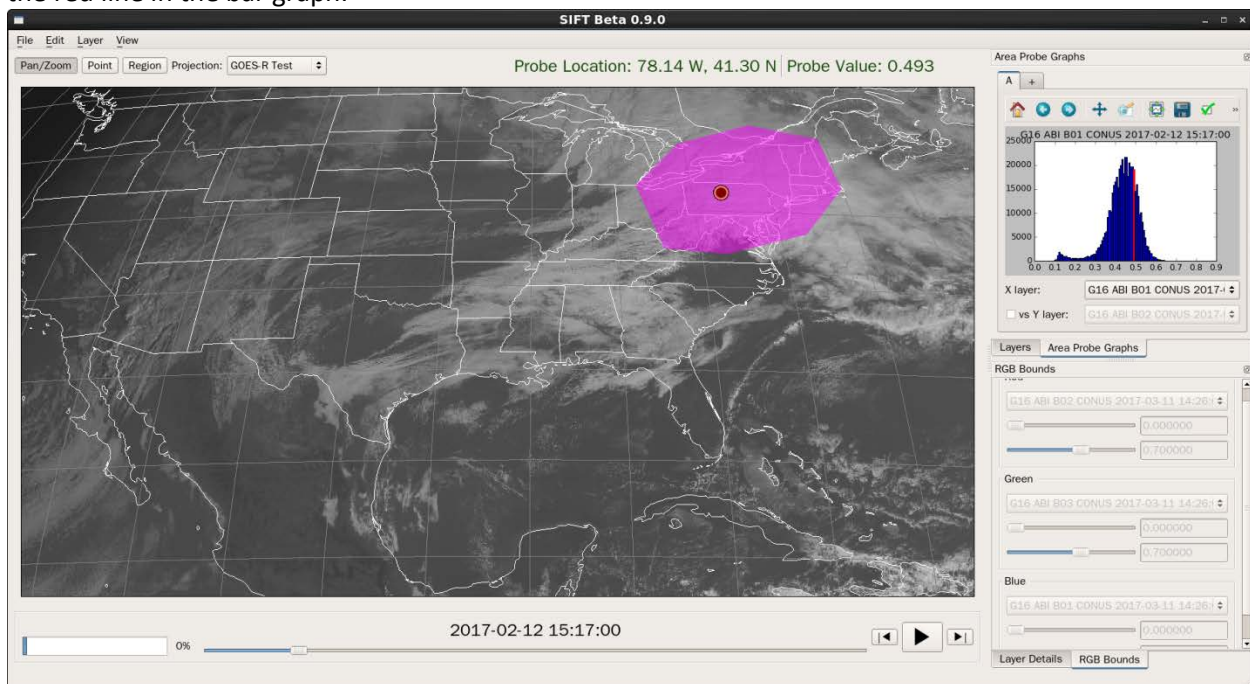


Figure 12: SIFT Display Window and Area Probe Graph inset with a bargraph of $0.47 \mu\text{m}$ / Band 1 Brightness Temperatures within the defined polygon

A toolbar underneath the bar graph allows you to switch the band being displayed in the bargraph. In Figure 12, above, $0.47 \mu\text{m}$ / Band 1 is displayed, the same band that is displayed in the main SIFT display window. All Bands are listed by clicking on the toolbar, and Figure 13, below, shows the bargraph for

1.61 μm / Band 5. The axis values in the plot have changed. If you were to look at the main SIFT display, however, Band 1 would still be displayed unless you made a move to change it; the SIFT display is not affected by changing the Bands in the Area Probe Graph display.

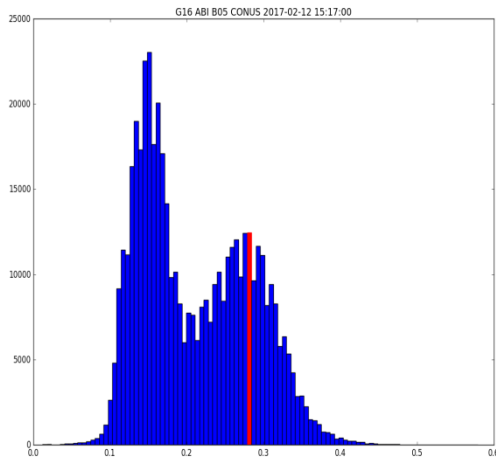


Figure 13: Area Probe Graph for 1.61 μm (Band 5)

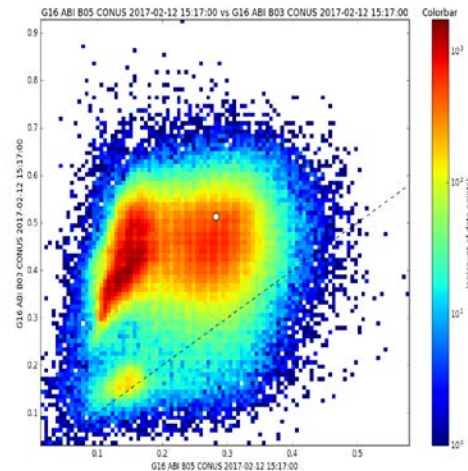


Figure 14: Density Diagram comparing Reflectance at 1.61 μm with Reflectance at 0.86 μm .

Note the box and the 'vs Y layer:' in the lower left corner of the Area Probe Graph window. You can click the box and select a band to compare 1.61 μm / Band 5 to in a scatterplot/density diagram, as shown in Figure 14, above. Figure 15, below, shows 6.2 μm /Band 8 vs 7.3 μm /Band 10, with 6.2 μm /Band 8 displayed in the main SIFT window.

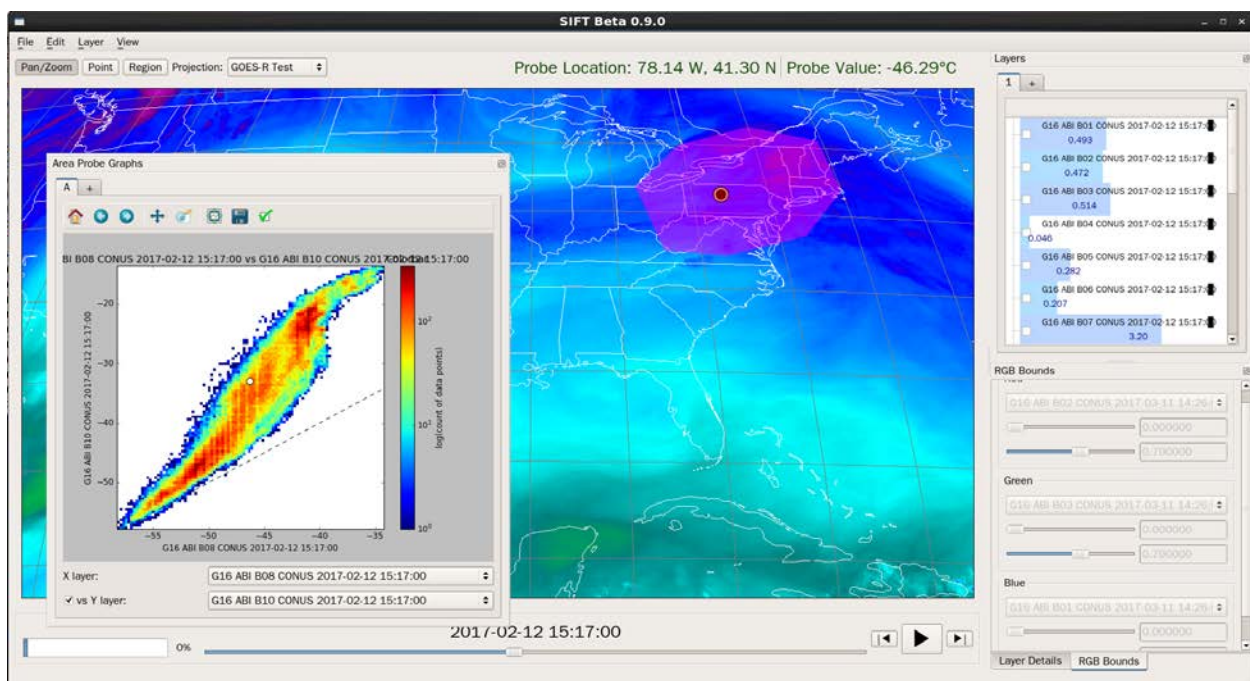


Figure 15: 6.2 μm /Band 8 in the main SIFT display, 6.2 μm /Band 8 vs 7.3 μm /Band 10 density diagram

6. CREATING RED-GREEN-BLUE (RGB) IMAGERY

RGB images are created by specifying different inputs into the Red, Green and Blue components of a full-color image. In SIFT, this is started by Creating a Composite – under the ‘Layer’ Tab in the upper left part of the SIFT Display, choose ‘Create Composite’ as shown below. (Alternatively, type ‘C’ while in the SIFT Display)

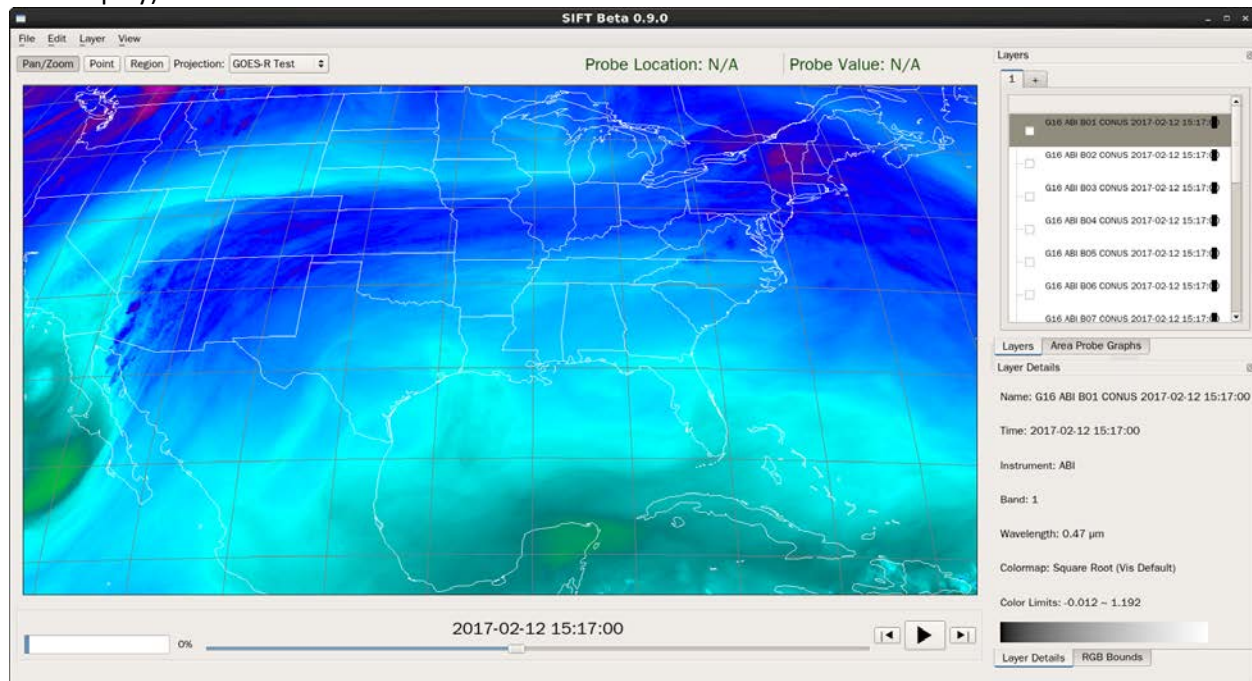


Figure 16: SIFT Display (6.2 μm /Band 8 is displayed, but 0.47 μm /Band 1 is highlighted, so that's the information shown in the Layer Details) at the start of RGB creation.

When the Composite Layer is selected, RGB Bounds must be entered, in the tab that is usually behind the ‘Layer Details’ tab in the bottom right part of the SIFT Display. See Figure 17. Band 1 is the default for the Red, but it can easily be changed. The Reflectance Bounds (for Bands 1-6) or Brightness Temperature Bounds (for Bands 7-16) can also be manipulated to highlight features.

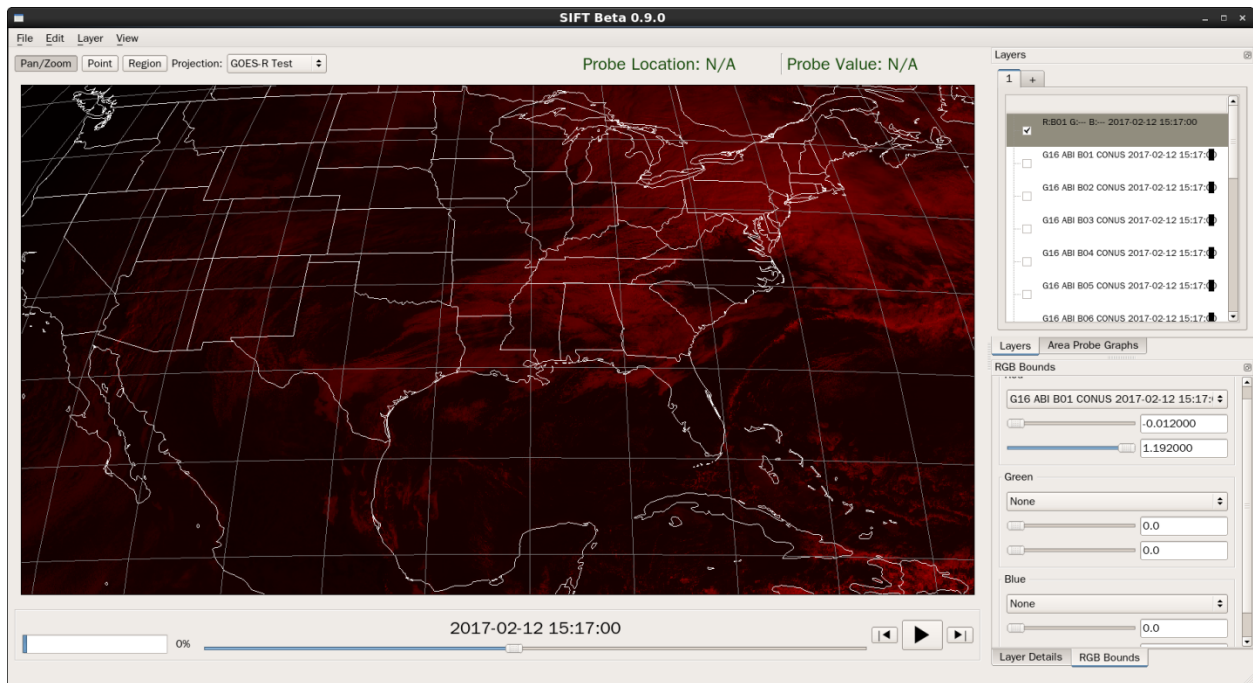


Figure 17: RGB Creation, step 1, default: First Band in list (in this case, 0.47 μm /Band 1), with minimum and maximum reflectance values corresponding to no red and all red, respectively, indicated.

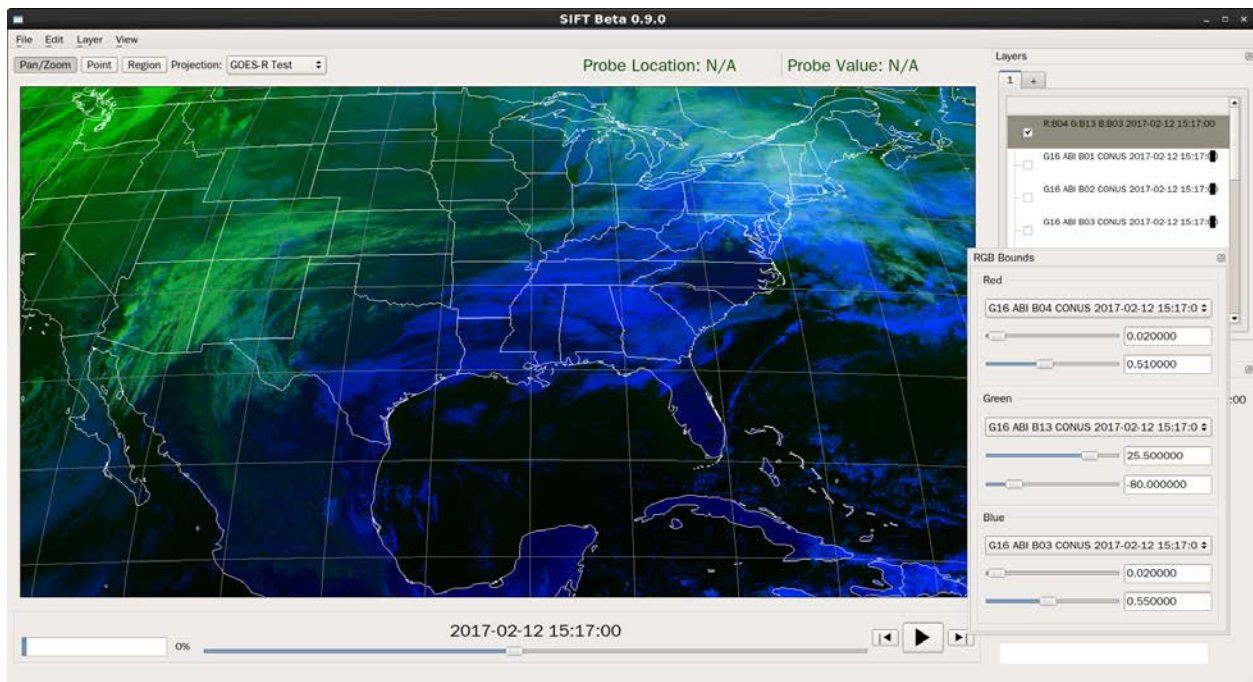


Figure 18: RGB Image created with 1.37 μm /Band 4 (values from 0.02 to 0.51 correspond to no red and all red), 10.3 μm /Band 13 (Warm values are no green, cold values are all green) and 0.86 μm /Band 3 (low reflectance is no blue, high reflectance is all blue)

Can you explain why some clouds are blue and some clouds are whitish and some clouds are green in the imagery in Figure 18?

Finally, previous classes have asked for a SIFT Keyboard Shortcut page – that's on this last page

SIFT Keyboard Shortcuts

a: Toggle animation on and off

b: cycle through Border presentation (white, grey, cyan, black, none)

l: (that's an 'L', not a '1') cycle through lat/lon presentation (white, grey, cyan, black, none)

Left Arrow: Previous Time

Right Arrow: Next Time

Up Arrow: Previous Band

Down Arrow: Next Band

Delete: Remove Layer

x: Turn Probe on/off

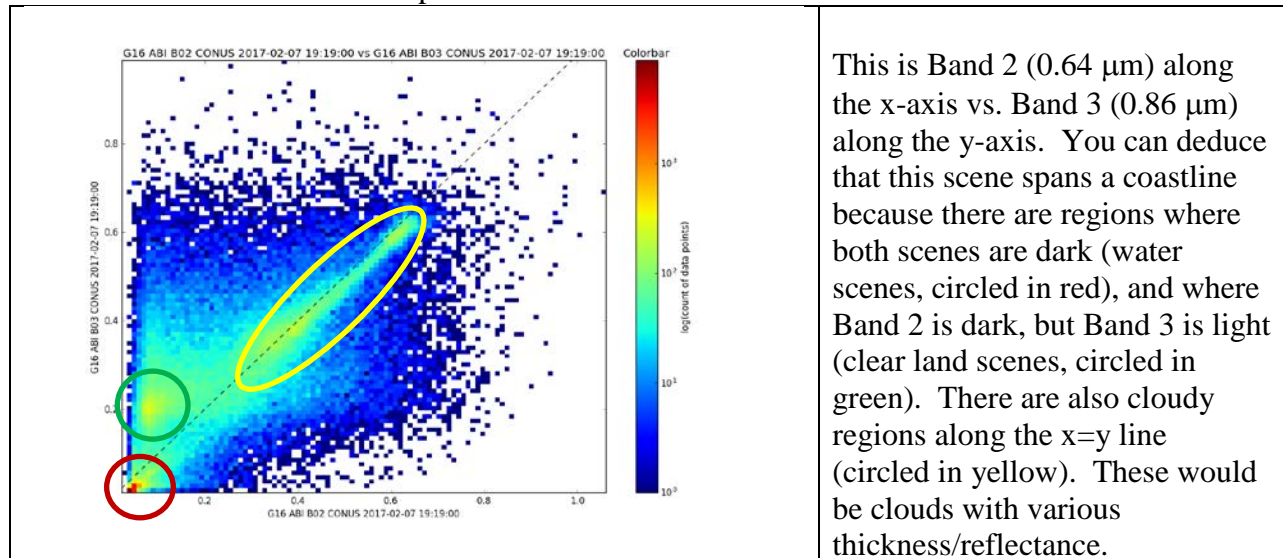
Esc: Clear selected region

c: create RGB composite

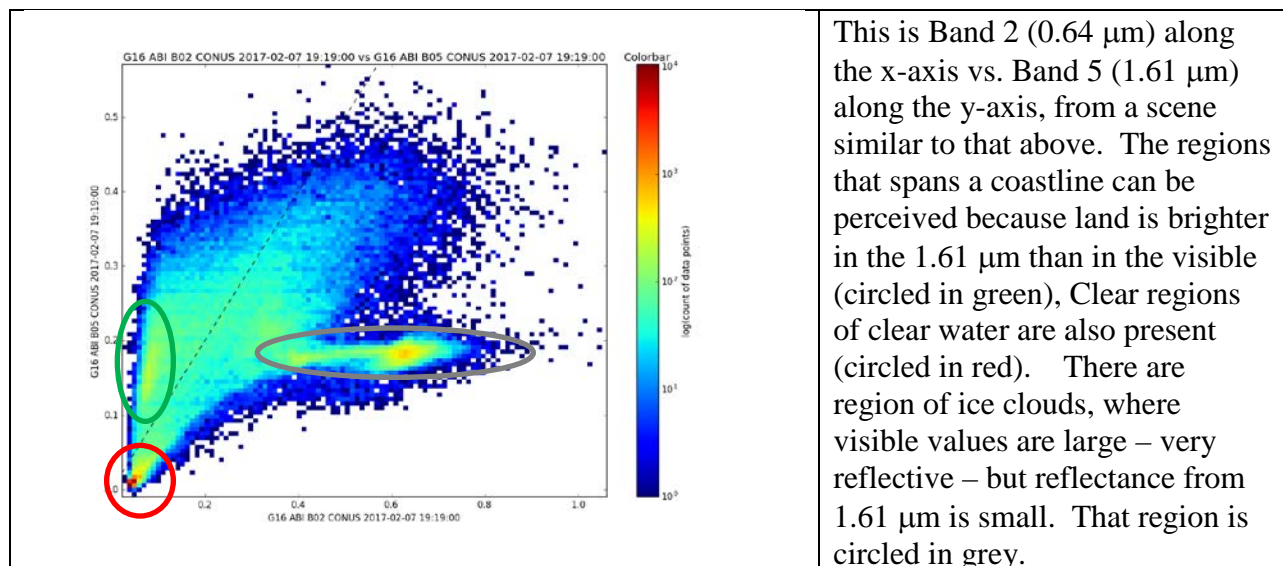
/: invert color bar

v: toggle Visibility on/off

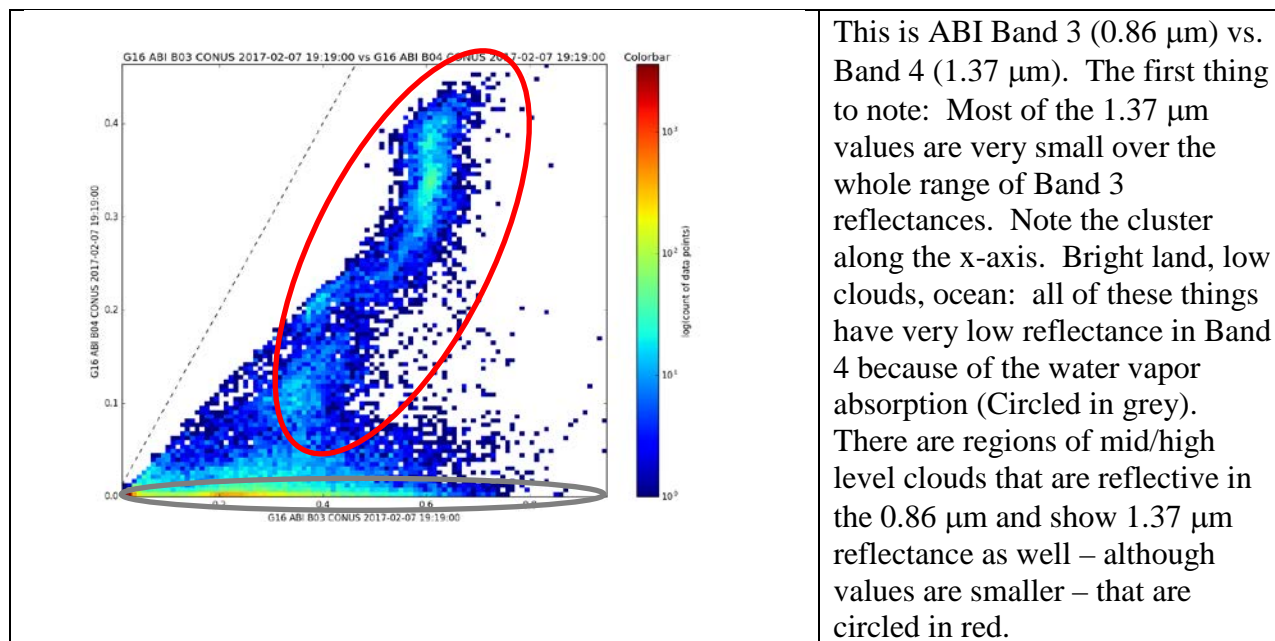
SIFT Software can be used to create density diagrams, scatterplots that include information on the number of points in each region. Those diagrams give you information about the scene. Here are some annotated examples:



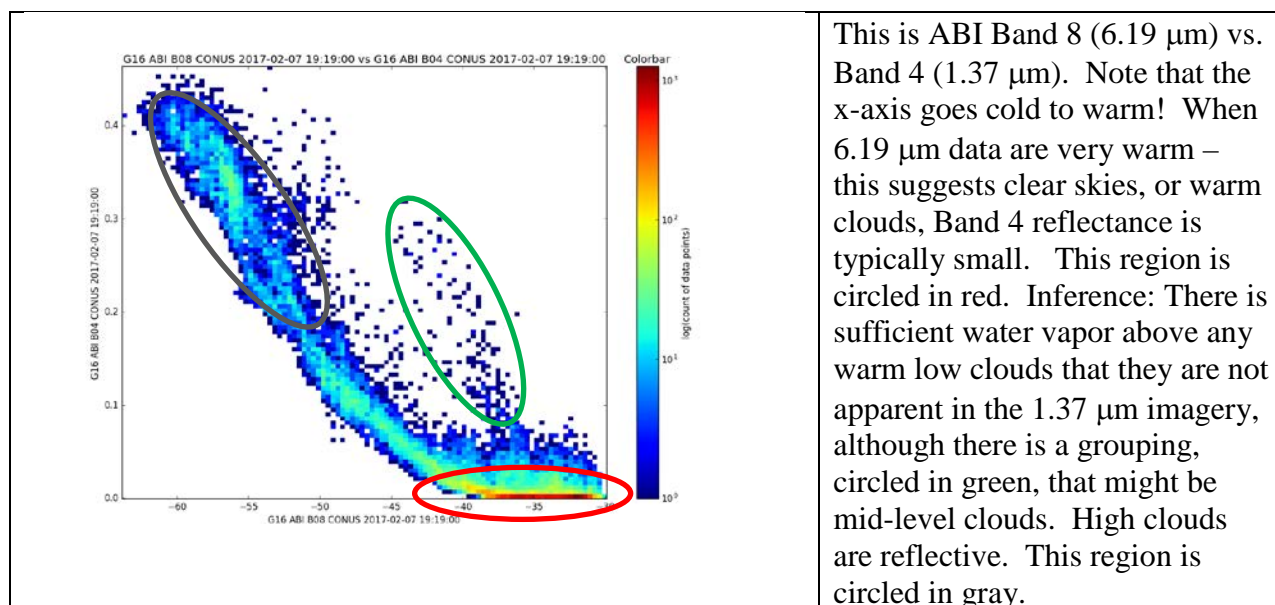
Example 1: GOES-16 Band 2 (0.64 μm) on the x axis, Band 3 (0.86 μm) on the y axis



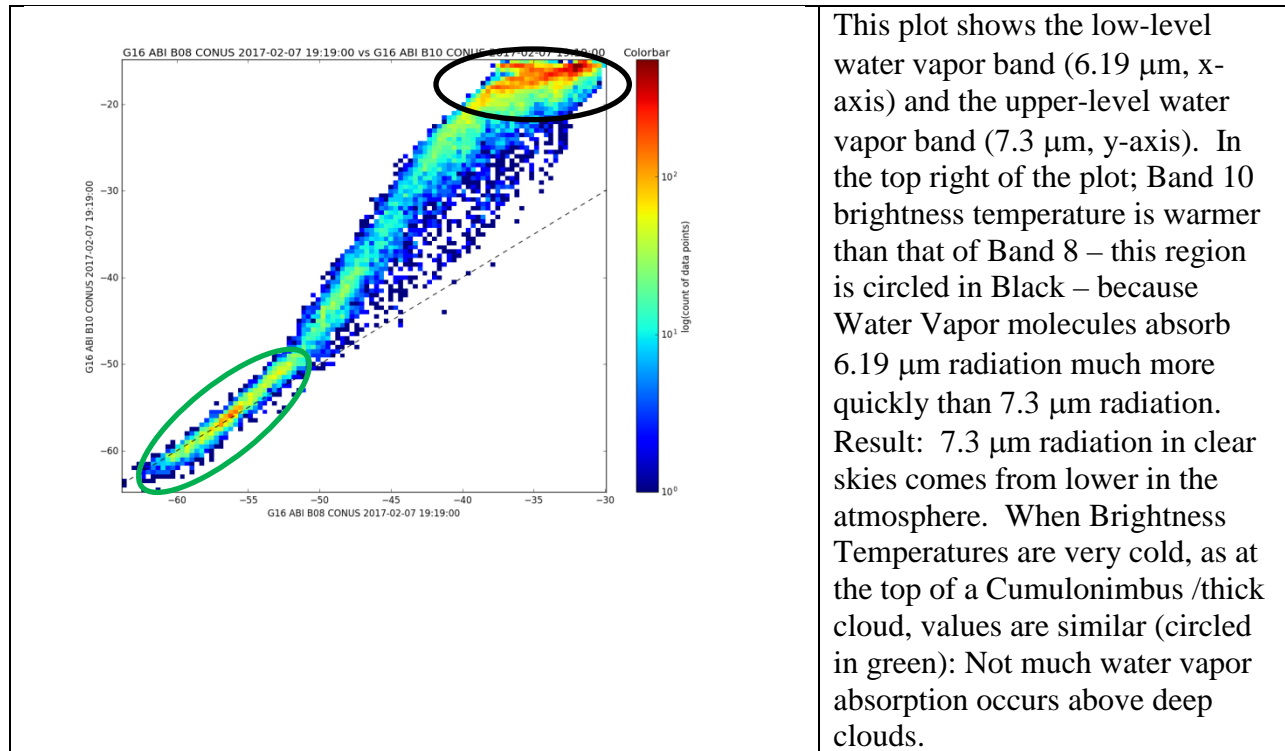
Example 2: GOES-16 Band 2 (0.64 μm) on the x-axis vs. Band 5 (1.61 μm) on the y-axis.



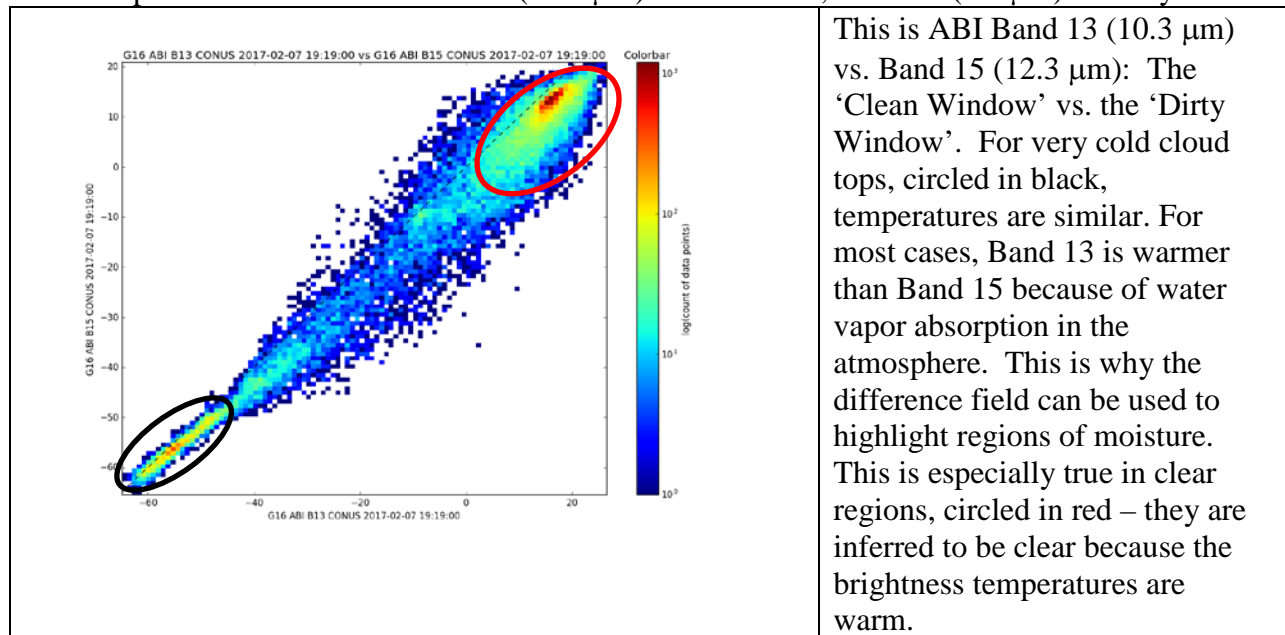
Example 3: GOES-16 ABI Band 3 (0.86 μm) on the x-axis, Band 4 (1.378 μm) on the y-axis



Example 4: GOES-16 ABI Band 8 (6.19 μm) on the x-axis, Band 4 (1.378 μm) on the y-axis



Example 5: GOES-16 ABI Band 8 (6.19 μm) on the x-axis, Band 10 (7.3 μm) on the y-axis



Example 6: GOES-16 ABI Band 13 (10.3 μm) on the x-axis, Band 15 (12.3 μm) on the y-axis