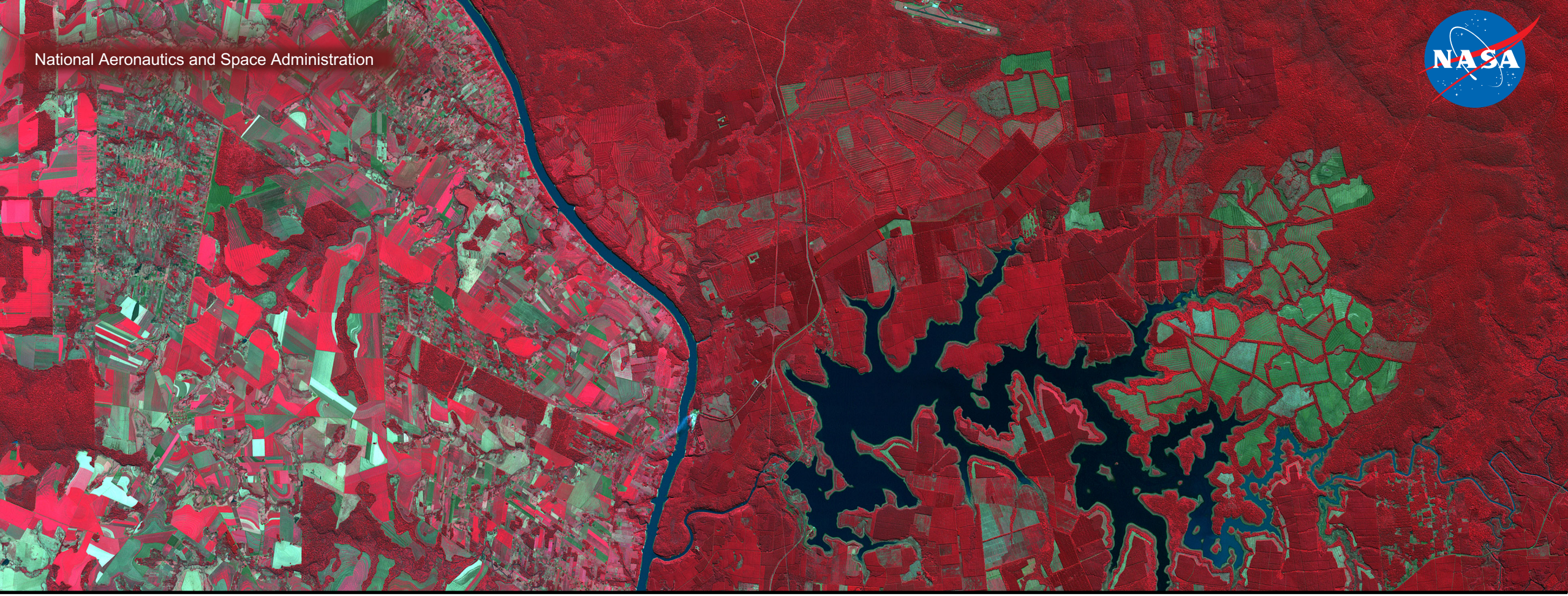


Analysis of SAR Data for Flooding and Land Cover

Erika Podest

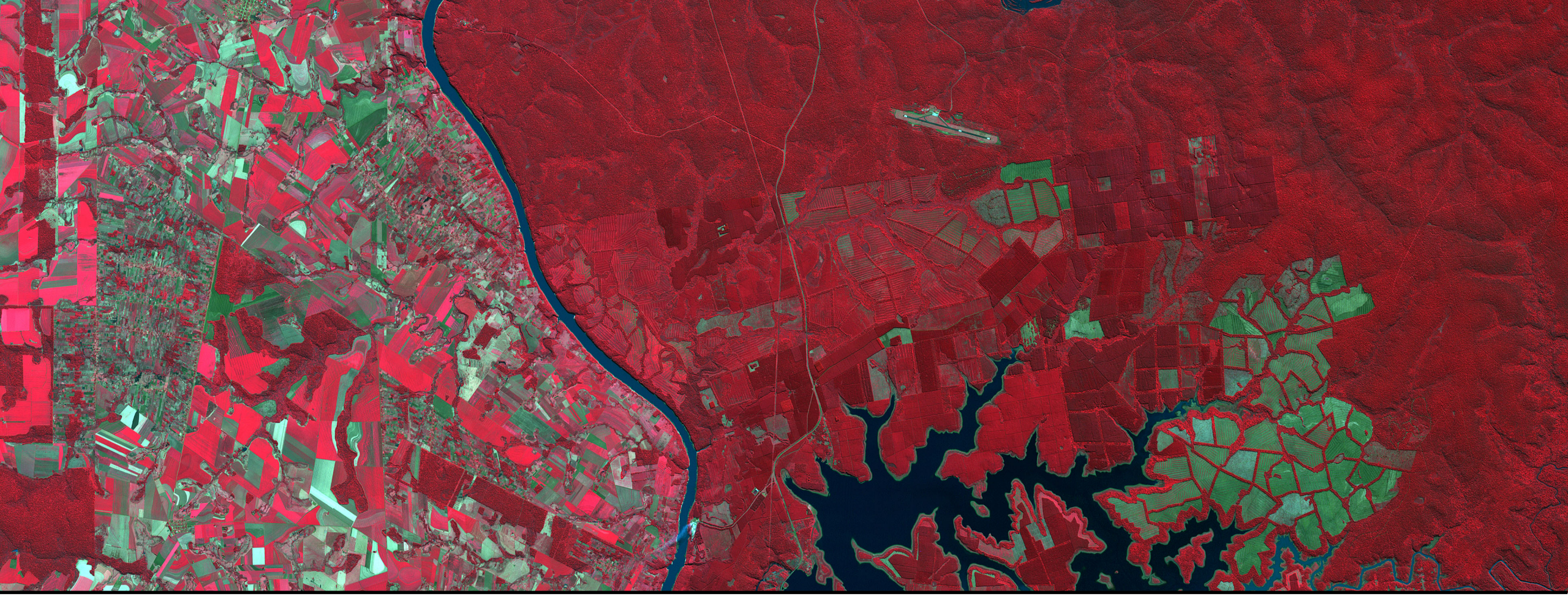
29 November 2017

Objectives

By the end of this exercise, you will be able to generate a classification of flooding and land cover from a SAR image

Outline

- Part 1: Histogram Analysis and Thresholding
- Part 2: Supervised Classification

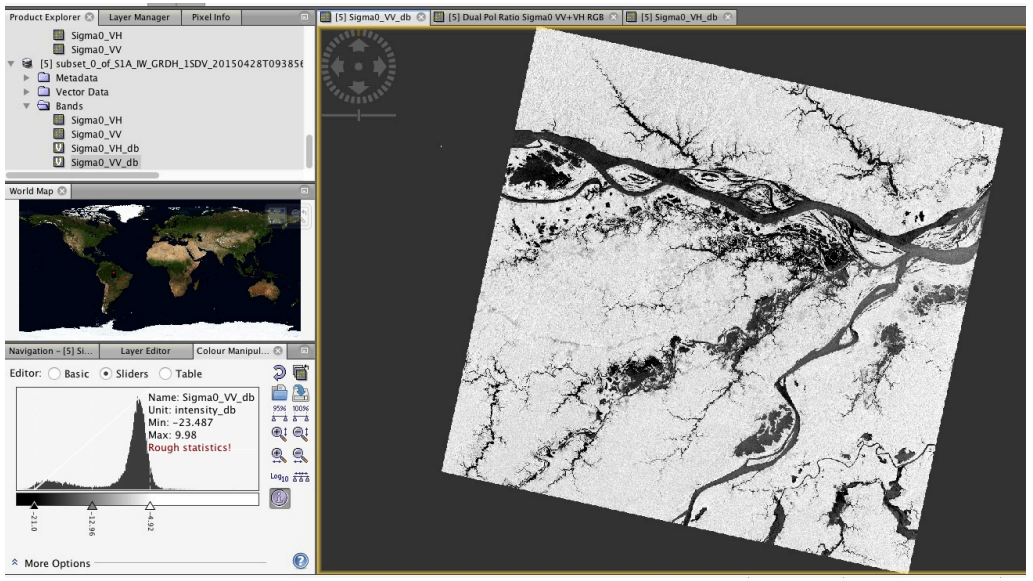


Histogram Analysis and Thresholding

Histogram Analysis with SNAP

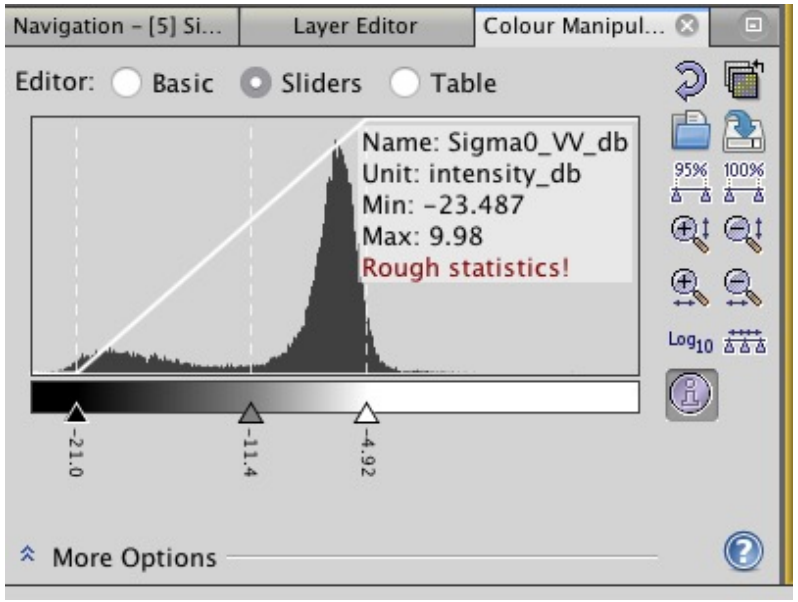
Using the calibrated, speckle filtered, terrain corrected image from the previous session, we will now do a histogram analysis to first understand the distribution of the pixel values within the image

1. Display the Sigma_VV_db image
2. Analyze the image histogram using the "Color Manipulation"tab in the lower left window. If the tab is not there, you can enable it by going to the main menu bar and selecting **View** > **Tools Windows** > **Colour Manipulation**



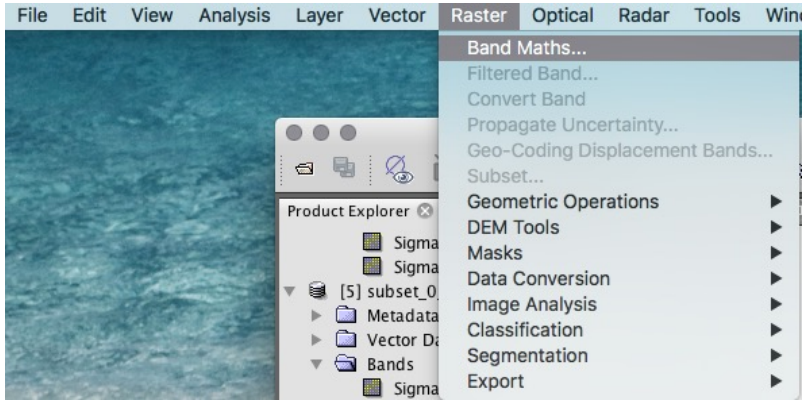
Histogram Analysis with SNAP

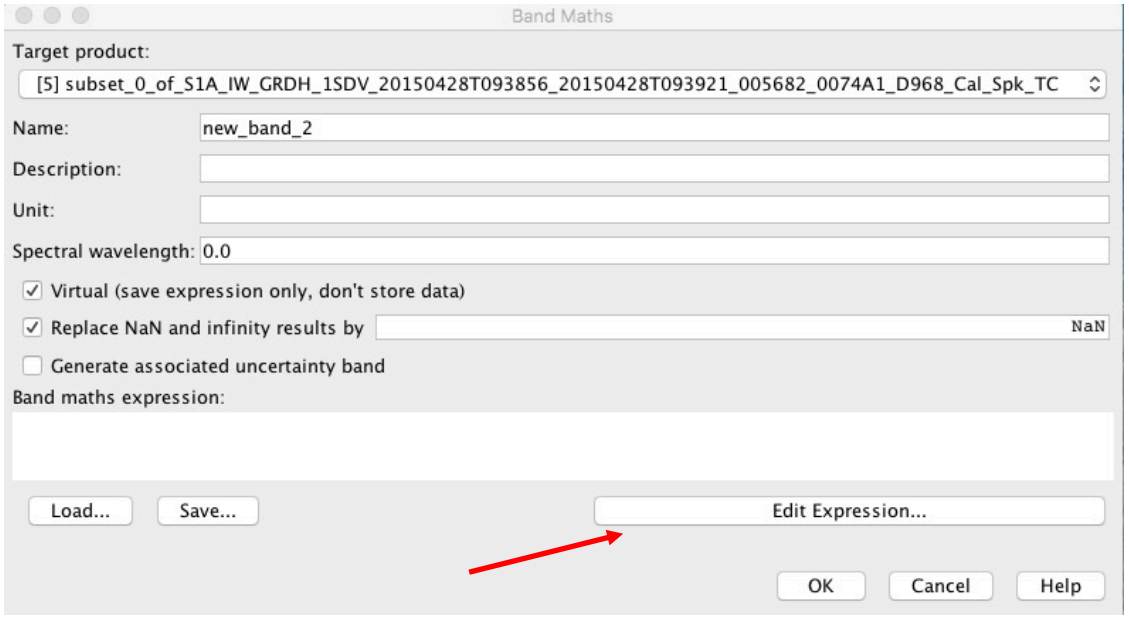
3. Analyze the VV image histogram by:
   - identifying the two peaks: the lower one represents water and the higher one represents everything else
   - selecting the value that separates water from everything else. In this case, it's about -11.4 dB

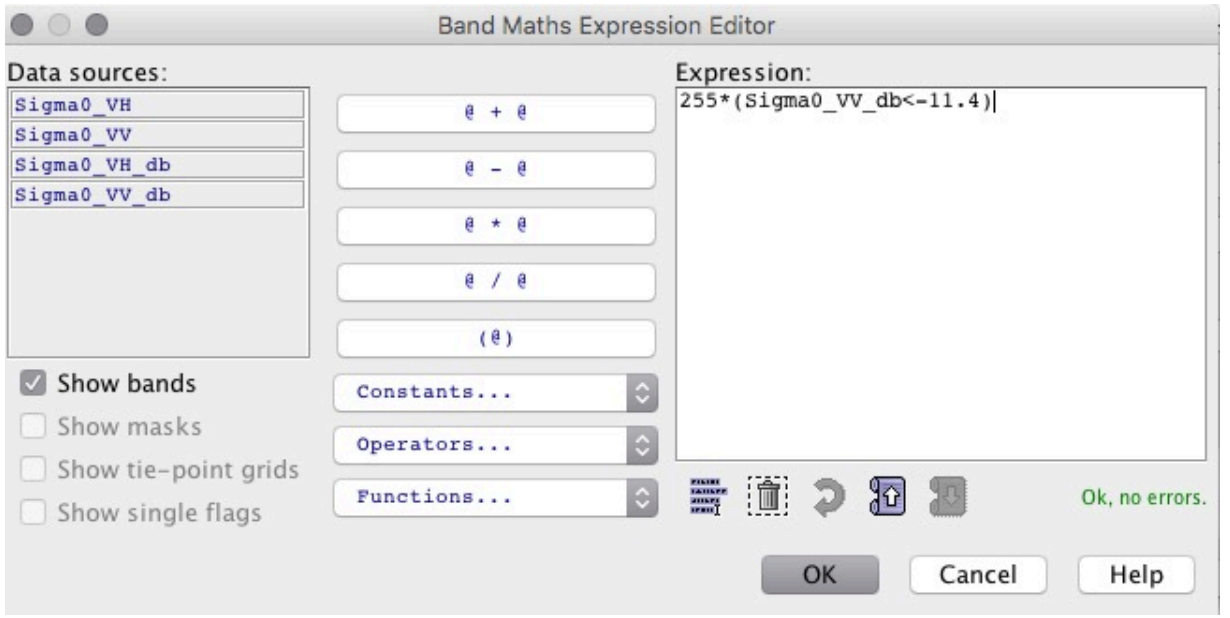


Histogram Analysis with SNAP

4. Apply a threshold:
   - Select Raster > Band Maths
   - Select "Edit expression in the first window that pops up. Then, edit the expression so that it indicates: 255*(Sigma0_VV_db<-11.4)

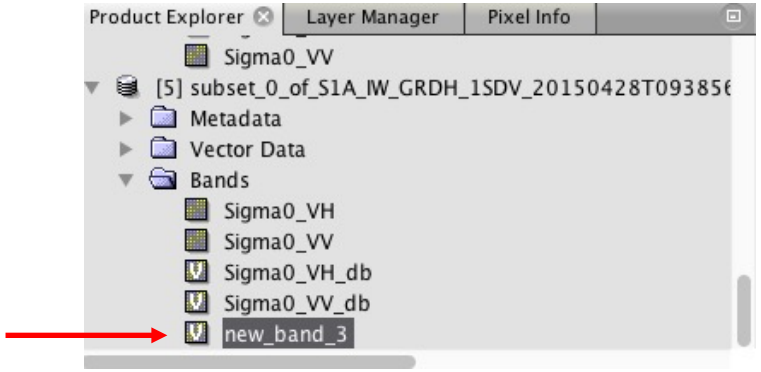


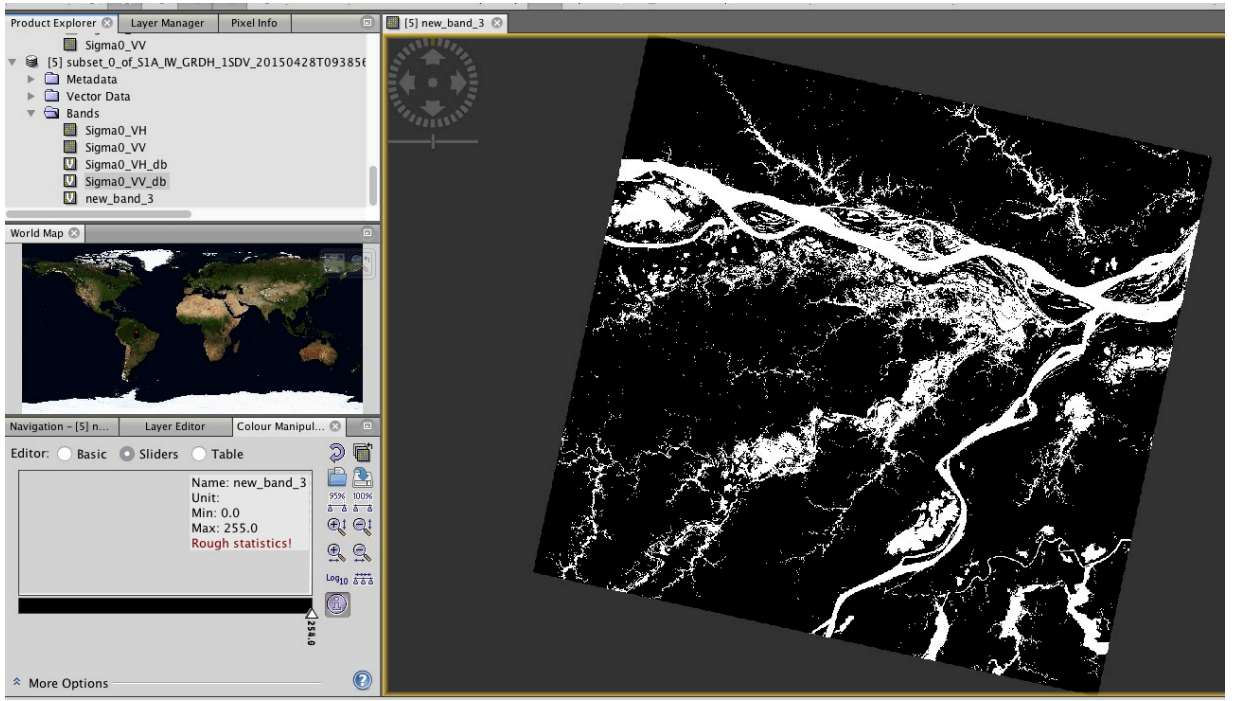




Histogram Analysis with SNAP

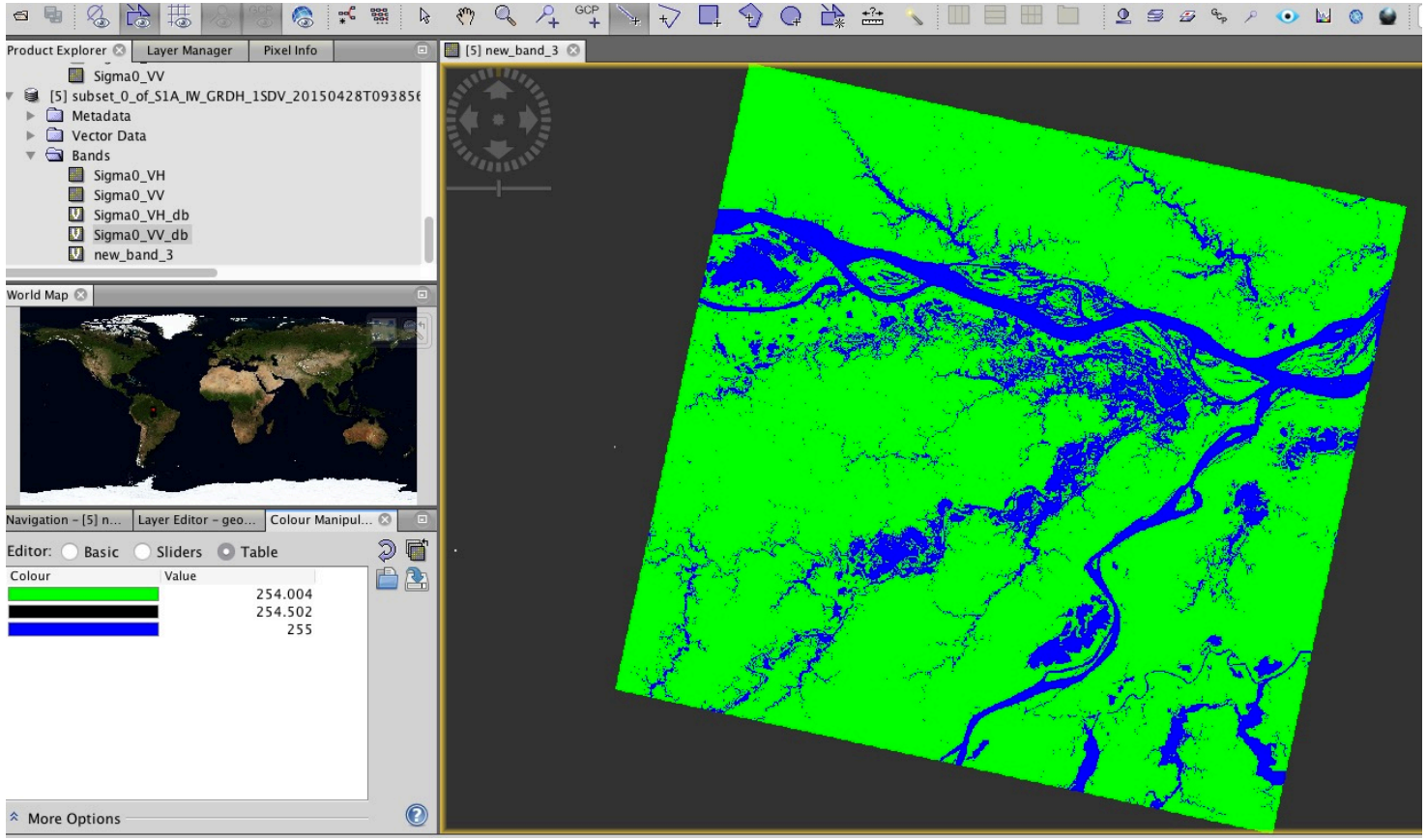
5. Display the results:
   - the new image will appear as new_band_3 in the bands folder of the most recent image file
   - The result is an image where water has a value of 255 and everything else has a value of 0

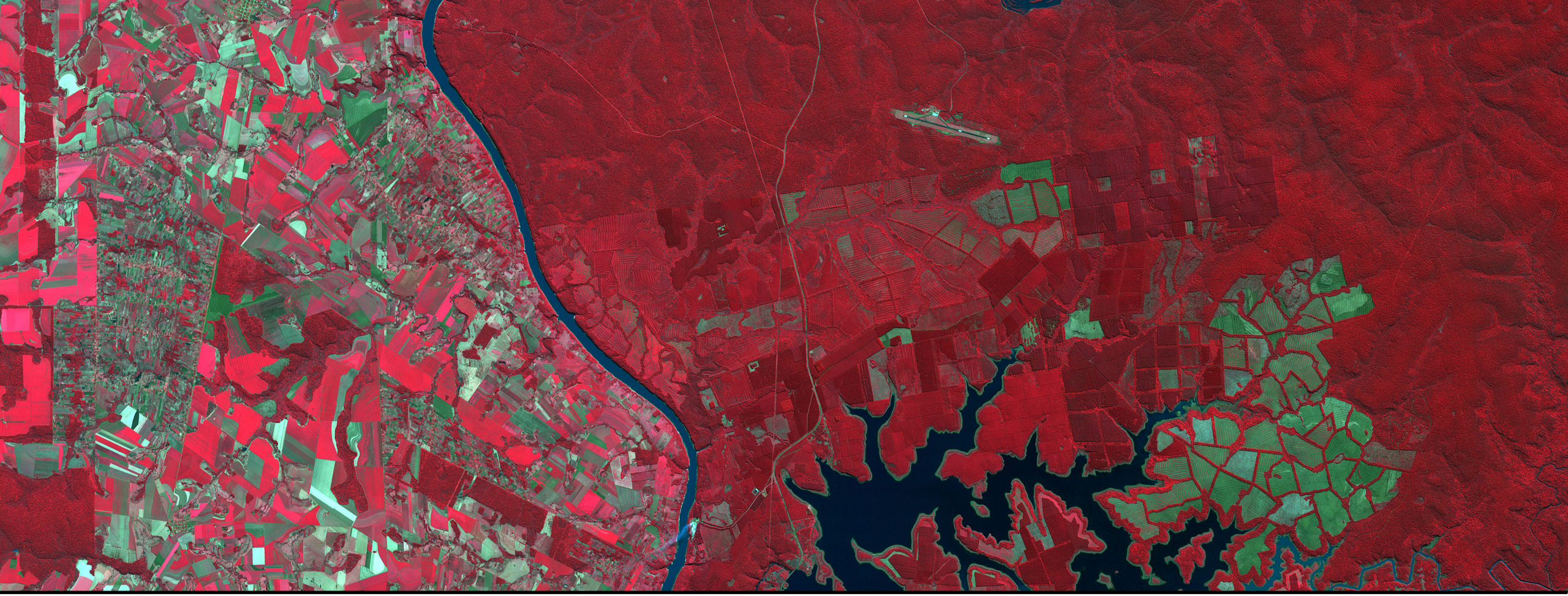




Histogram Analysis with SNAP

6. Change the colors:
   - go to the color manipulation tabon the bottom left
   - select Table to assign a color to each of the 3 classes.

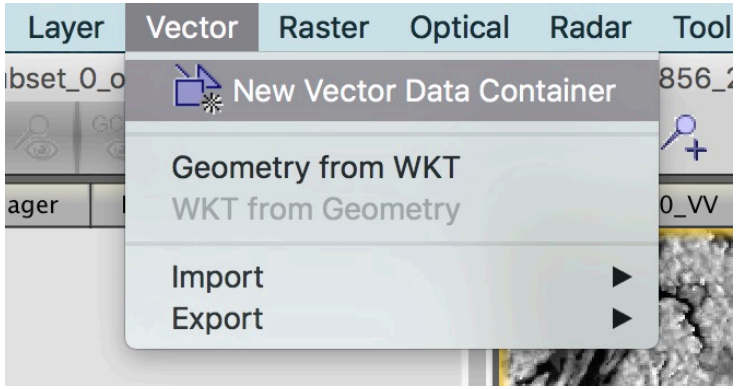


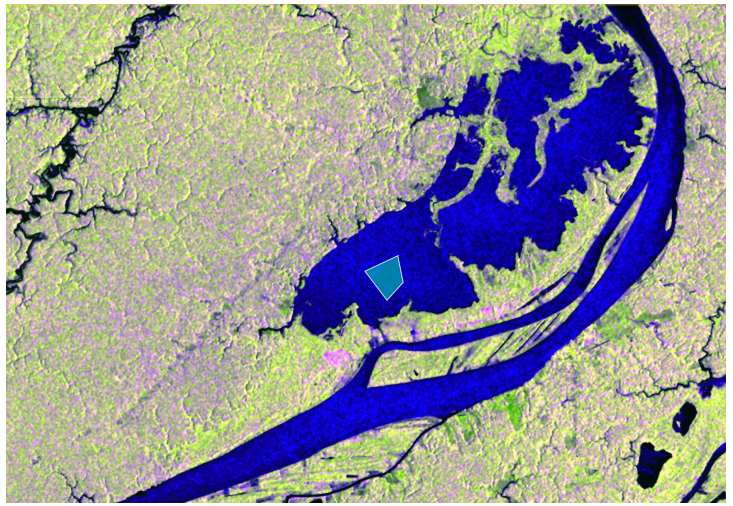


Supervised Classification

Training Area Selection

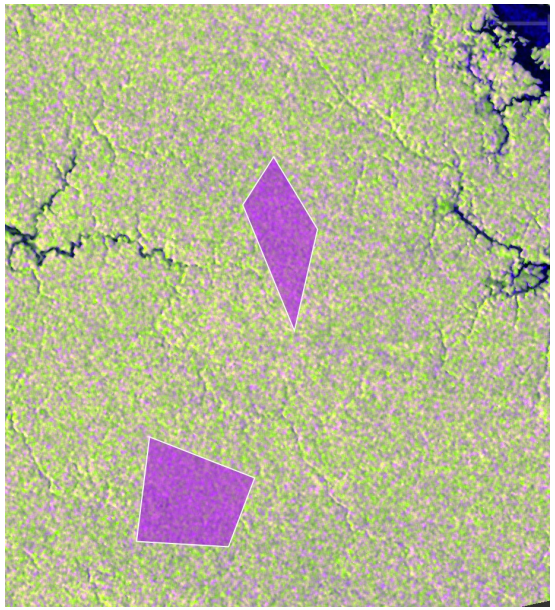
1. Display the image as RGB
2. From the main menu, select **Vector>New Vector Data Container** and provide a name for your first training class (in this case: open_water)
3. In the Tools menu along the top bar, select the **Polygon Drawing Tool**
4. Create a polygon of the area representative of open water

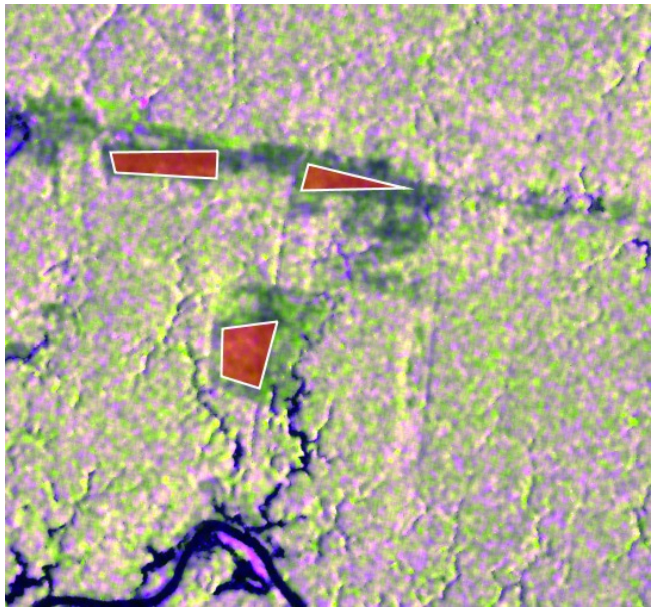


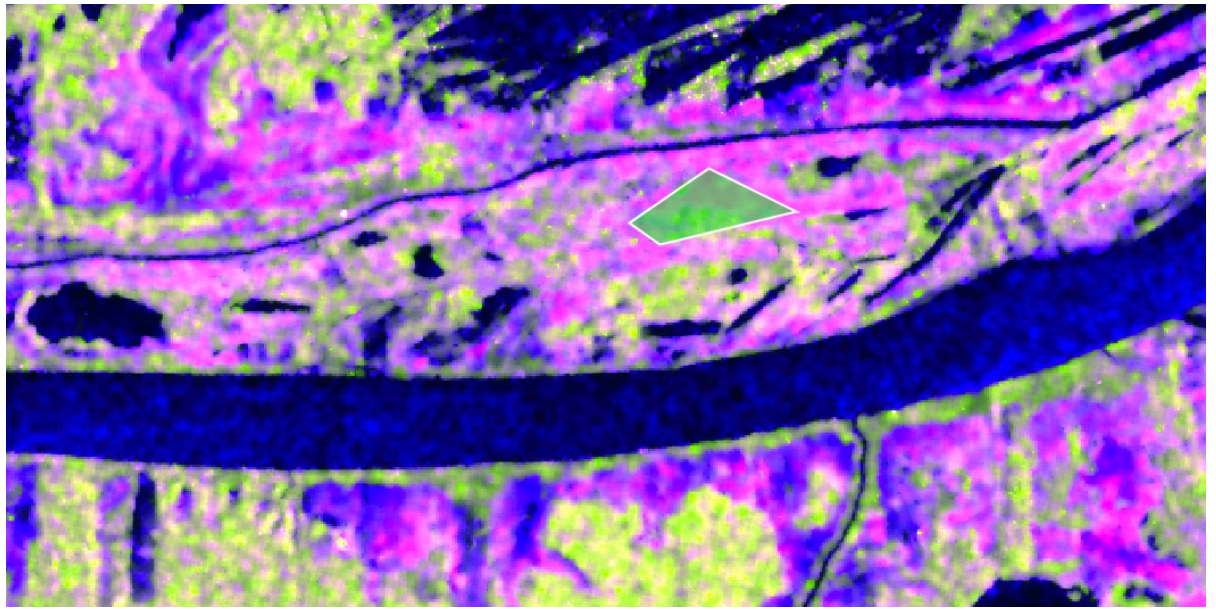


Training Area Selection

5. Repeat these same steps for each class
   - Forest, low vegetation, flooded vegetation

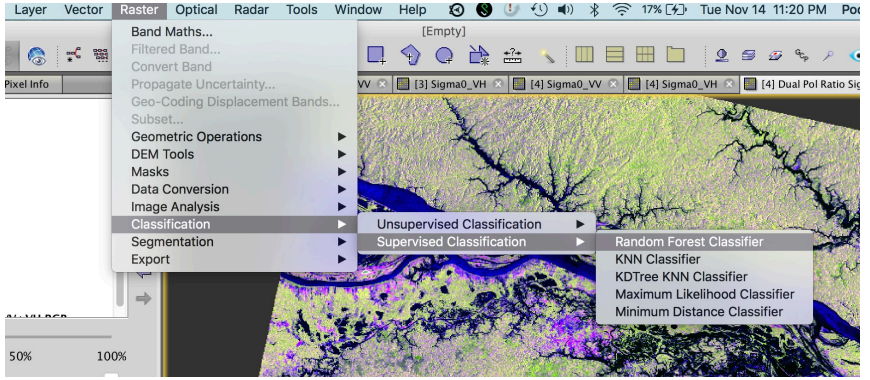


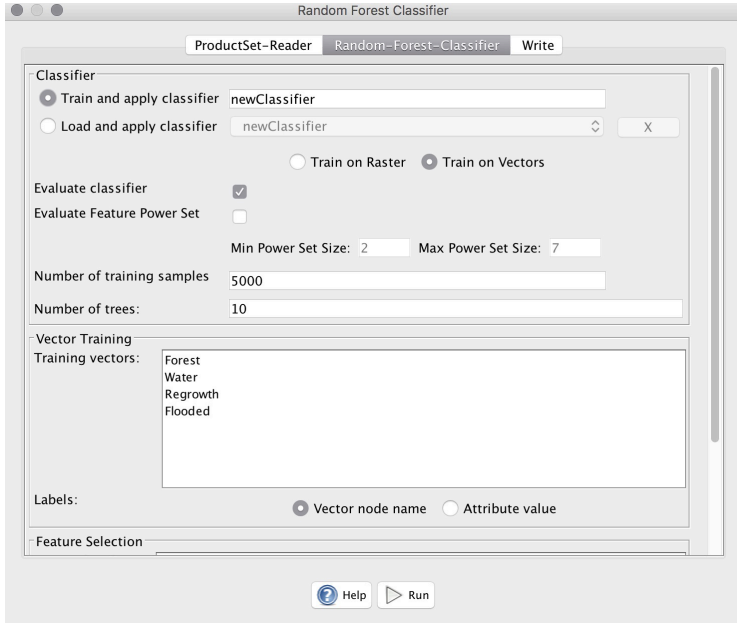




Running the Random Forest Classifier

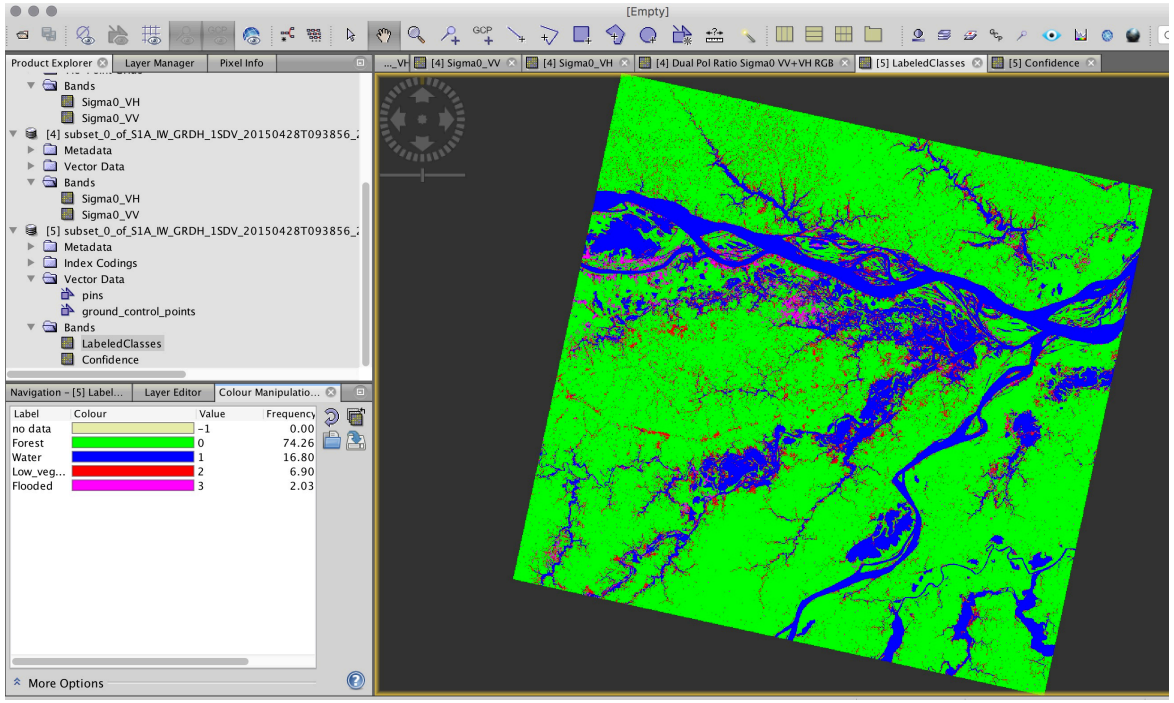
6. From the top menu, select **Raster** > **Classification** > **Supervised Classification** > **Radom Forest Classifier**
7. In the pop-up window, select the file that you want to classify
   - To load it, select the add-opened files on the column on the right (the second one down)
   - Load the calibrated, speckle filtered, terrain corrected file.
8. The second tab, Random Forest Classifier, will have a list of the training areas selected
   - Keep the defaults and click **Run**





Running the Random Forest Classifier

9. A new image with extension _RF will be added in the product explorer window. Display the bands > labeled classes image.
10. In the color manipulation tab of the bottom left window, assign the desired colors to each class.



Running the Random Forest Classifier

11. While Random Forest is running, a separate text window pops up displaying the classification validation results:

```
RandomForest classifier newClassifier

Cross Validation
Number of classes = 4
   class 0.0: Forest
    accuracy = 0.9984 precision = 0.9984 correlation = 0.9957 errorRate = 0.0016
    TruePositives = 1244.0000 FalsePositives = 2.0000 TrueNegatives = 3748.0000 FalseNegatives = 6.0000
   class 1.0: Water
    accuracy = 1.0000 precision = 1.0000 correlation = 1.0000 errorRate = 0.0000
    TruePositives = 1250.0000 FalsePositives = 0.0000 TrueNegatives = 3750.0000 FalseNegatives = 0.0000
   class 2.0: Regrowth
    accuracy = 1.0000 precision = 1.0000 correlation = 1.0000 errorRate = 0.0000
    TruePositives = 1250.0000 FalsePositives = 0.0000 TrueNegatives = 3750.0000 FalseNegatives = 0.0000
   class 3.0: Flooded
    accuracy = 0.9984 precision = 0.9952 correlation = 0.9957 errorRate = 0.0016
    TruePositives = 1248.0000 FalsePositives = 6.0000 TrueNegatives = 3744.0000 FalseNegatives = 2.0000

Using Testing dataset, % correct predictions = 99.8400
```