

WATER BODY MAPPING WITH SENTINEL-1 DATA

Data: Sentinel-1A IW GRDH 1SDV:

- S1B_IW_GRDH_1SDV_20161015T165945_20161015T170010_002520_00440D_CF2D_subset

1. Open file
 - 1.1. File / Open Product
 - 1.2. Browse to S1B_IW_GRDH_1SDV_20161015T165945_20161015T170010_002520_00440D_CF2D_subset
2. View metadata
 - 2.1. Select plus icons by filenames in "Product Explorer", expand "Metadata", double click on "Extracted Metadata". Here you can see the basic product information such as acquisition date, product type, acquisition mode, and geometry (antenna pointing, incidence angle, pass).
3. View world map
 - 3.1. View / Tool Windows / World Map
 - 3.2. Select magnifying glass icon to zoom to image footprint
 - 3.3. Use mouse wheel and left click to zoom and pan respectively
4. View image single bands
 - 4.1. Select "Bands" folder in "Product Explorer" window and view each band by double clicking on band name.
5. View multiple viewers
 - 5.1. Close metadata views, leaving only viewers with bands
 - 5.2. Synchronise views by selecting the relevant icons in the "Navigation" tab
 - 5.3. Select: Window / Tile Horizontally
6. Calibrate
 - 6.1. Radar / Radiometric / Calibrate
 - 6.2. In the "I/O Parameters" select "S1B_IW_GRDH_1SDV_20161015T165945_20161015T170010_002520_00440D_CF2D_subset". The target product will be automatically renamed with the ending "_Orb".
 - 6.3. View the "Processing Parameters" tab (but leave all settings as default)
 - 6.4. Select "Run"
 - 6.5. View the calibrated image
 - 6.6. Convert S0 to decibel (logarithmic scale)
 - 6.6.1. Expand the list of bands of the calibrated image, right mouse click on the band "Sigma0_VH", select: "Linear to/from dB", then select "Yes" in the pop-up window.
 - 6.6.2. Repeat this also for the "Sigma0_VV" band.
 - 6.7. Right click on the newly created "Sigma0_VH_db" and "Sigma0_VV_db" bands and select "Convert Band", then: File / Save Product, to save the virtual bands to file.
7. Filter speckle
 - 7.1. Radar / Speckle Filtering / Single Product Speckle Filter
 - 7.2. In the "I/O Parameters" select "S1B_IW_GRDH_1SDV_20161015T165945_20161015T170010_002520_00440D_CF2D_subset_Cal". The target product will be automatically renamed with the ending "_Spk".
 - 7.3. View the "Processing Parameters" tab (but leave all settings as default)
 - 7.4. In the "Filter" dropdown box, select "Lee"
 - 7.5. In "Filter Size X:" and "Filter Size Y:" select 5, and 5 respectively.
 - 7.6. Select "Run"

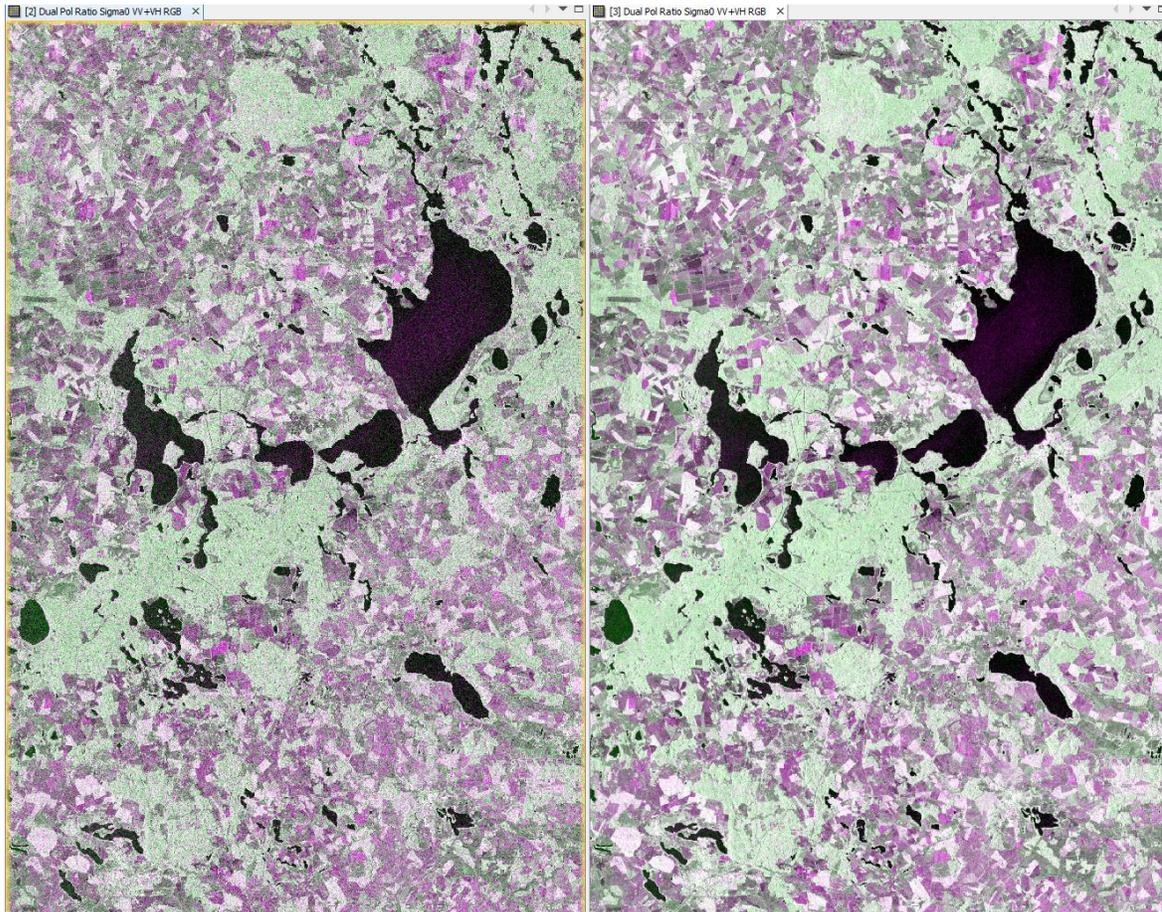
8. RGB image view

8.1. Window / Open RGB Image Window

8.2. Select the following bands: Red = Sigma0_VV_db, Green = Sigma0_VH_db, Blue = Sigma0_VV_db

8.3. Contrast stretch the images: Colour Manipulation tab, move triangular sliders to either side of the histogram for each R, G and B channel.

8.4. Repeat the process for the image prior to speckle filtering, and compare both speckle filtered and non-speckle filtered images: Window / Tile Horizontally, then link viewers in the "Navigation" tab



9. Geocoding / Terrain Correction

9.1. Radar / Geometric / Terrain Correction / Range-Doppler Terrain Correction

9.2. In the "I/O Parameters" select

"S1B_IW_GRDH_1SDV_20161015T165945_20161015T170010_002520_00440D_CF2D_subset_Cal_Spk".

The target product will be automatically renamed with the ending "_TC".

9.3. View the "Processing Parameters" tab (but leave all settings as default)

9.4. Select "Run"

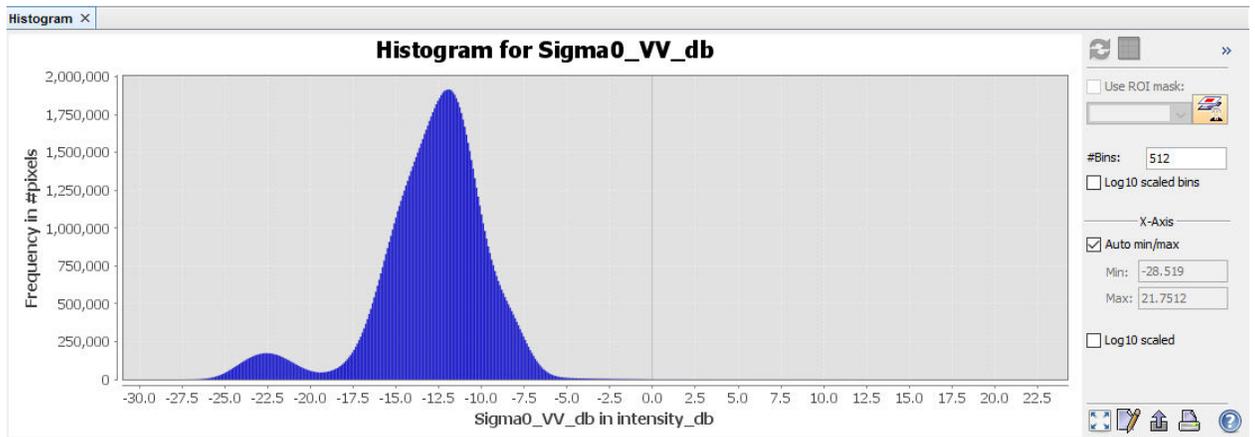
9.5. Open the terrain corrected Sigma0_VV_db. Now the dataset is geocoded.

10. Compute histogram

10.1. Analysis / Histogram

10.2. Select "Bands" folder in "Product Explorer" window and select "Sigma0_VV_db" by clicking on band name. Click on "Refresh View" button.

10.3. You might see a small second peak between around -20 and -25 db. These are backscatters for water bodies.



11. To extract water bodies, we will apply a simple threshold to VV backscatter
 - 11.1. Mask out the areas by selecting Raster / Band Maths / Edit Expression. In the "Expression" window, type "Sigma0_VV_db < -20".
 - 11.2. Save the newly created virtual band to actual band by right clicking on the band and selecting "Convert band"
 - 11.3. You can see that some single bright pixels in the lake are classified as non-water. You can apply a lower threshold (e.g., -19 db).

