SENTINEL-2 PROCESSING IN SNAP

Data: Sentinel-2A Level 1C:

- S2A_OPER_MTD_SAFL1C_PDMC_20160325T153413_R022_V20150813T101657_20150813T101657.xml

1. Open file (resampled to 10m)
   1.1. File / Open Product
   1.2. Browse to S2A_OPER_MTD_SAFL1C_PDMC_20160325T153413_R022_V20150813T101657_20150813T101657.xml
   1.3. Select “Resampled at 10m resolution”

2. View metadata
   2.1. Select plus icons [MAC = triangle icons] by filenames in “Product Explorer”, expand “Metadata / Level-1C_User_Product / General_Info” folder and double click on “Product_Info”. Here you can see the basic product information such as acquisition date, processing level and processing baseline (indicates quality of preprocessing)
   2.2. Double click on “Product_Image_Characteristics”. Here you can see the solar irradiance per band and correction factors necessary to convert from Top of Atmosphere Reflectance to Top of Atmosphere Radiance.

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. View RGB image view
   6.1. Close all viewers
   6.2. Select image name in “Product Explorer” window
   6.3. Select: Window / Open RGB Image Window
   6.4. Leave default natural colour combination and select OK

7. Crop
   7.1. Zoom into Beijing
   7.2. Raster / Subset… and select OK

8. Save the newly created subset image
   8.1. Select image in “Product Explorer”
   8.2. Select: File / Save Product As…
   8.3. Select “Yes” to convert to BEAM DIMAP format (SNAP native file format)
   8.4. Select an output filename and location, and select “Save”
   8.5. In order to view the saved file with the filename you specified, close the cropped image and reopen it

9. Spectral analysis
   9.1. Open a false colour RGB of the cropped image: Red = B8, Green = B4, Blue = B3

9.2. View / Tool Windows / Pin Manager
9.3. Select the "Pin Placing Tool" (icon on top toolbar)
9.4. Click to place a pin on an area of water in the image
9.5. In the "Pin Manager" window, double click in the "Label" field to rename the pin "Water"
9.6. Click in the colour field to change the colour to blue
9.7. Repeat the steps above to create 3 other pins, one each over an area of vegetation (shown as red on false colour image), buildings (shown as cyan) and cloud (shown as white), giving each a unique colour and label.
9.8. Select the Filter icon and select bands 1 to 12
9.9. Export the pins to both XML and TXT using the relevant icons in the "Pin Manager" window
9.10. Select: Optical / Spectrum View
9.11. View spectral signature of all pins
9.12. Deselect "Show spectra for all pins" and select "Show spectrum at cursor position"
9.13. Move mouse cursor over image to view spectra of different pixels.
9.14. Now close the Spectrum View and delete all pins in Pin Manager window: select pins, then select "remove selected pin" icon. Then close also the Pin Manager window.

10. NDVI (Normalised Difference Vegetation Index)

10.1. Raster / Band Maths
10.2. Change name to NDVI
10.3. Deselect "Virtual"
10.4. Select "Edit Expression…"
10.5. Type in the following expression in the "Expression" field: "(B8 - B4)/(B8 + B4)" then select OK and OK.
10.6. View the newly created NDVI band

11. Change Projection

11.1. Raster / Geometric Operations / Reprojection
11.2. In "Reprojection Parameters" leave default projection "Geographic Lat/Lon (WGS84)" and select "Run"

12. Export to Google Earth

12.1. Open the NDVI band of the reprojected S2 image subset.
12.2. File / Export / Other / View as Google Earth KMZ
12.3. Double click on the newly created KMZ file to open it in Google Earth

SENTINEL-1 BATCH PROCESSING IN SNAP

Data: Sentinel-1A IW GRDH 1SDV:
- S1A_IW_GRDH_1SDV_20151120T222038_20151120T222105_008694_00C5EE_B572.zip
- S1A_IW_GRDH_1SDV_20151214T222037_20151214T222104_009044_00CFAE_F8B4.zip
- S1A_IW_GRDH_1SDV_20160212T222035_20160212T222102_009919_00E8E4_00DC.zip
- S1A_IW_GRDH_1SDV_20160307T222035_20160307T222102_010269_00F2F3_DF4F.zip
- S1A_IW_GRDH_1SDV_20160319T222036_20160319T222103_010444_00F7EB_A5F1.zip
- S1A_IW_GRDH_1SDV_20160412T222037_20160412T222103_010794_01022C_3FB1.zip

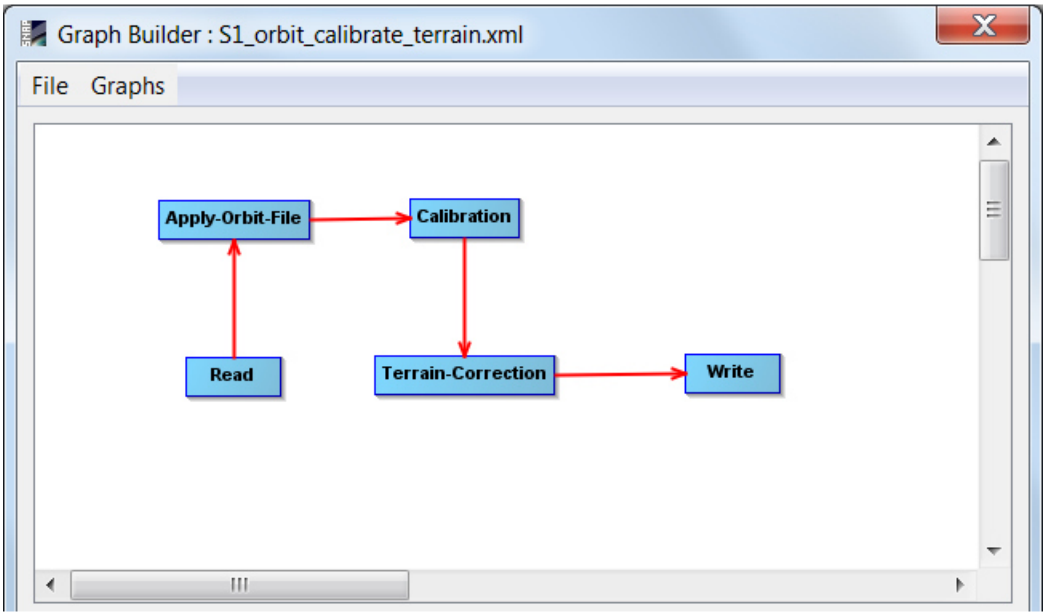
1. Open all files
   1.1. File / Open Product

2. View world map
   2.1. View / Tool Windows / World Map
   2.2. Select magnifying glass icon to zoom to image footprint
   2.3. Use mouse wheel and left click to zoom and pan respectively

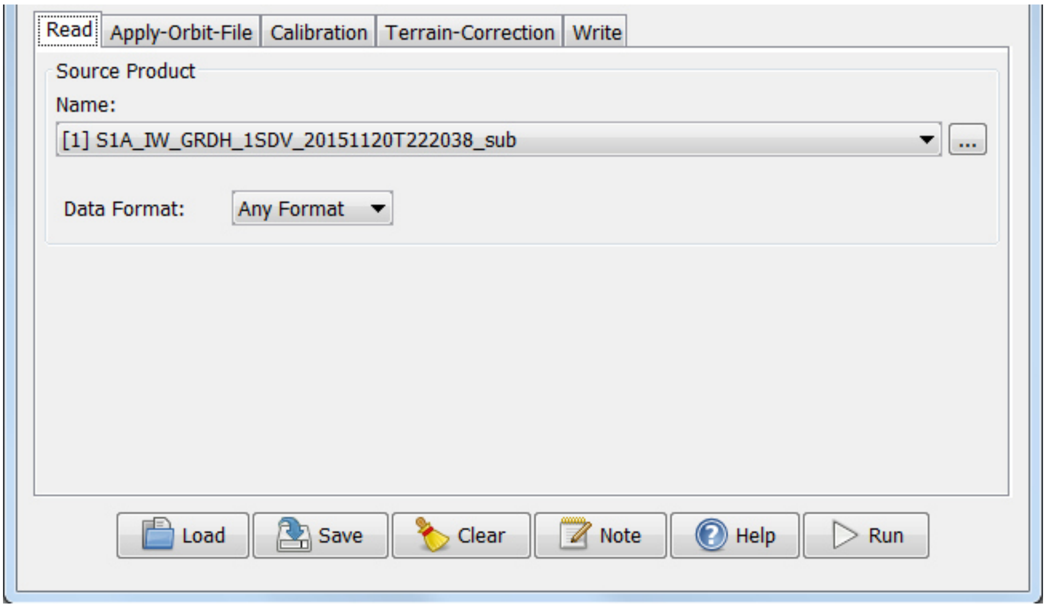
3. Crop
   3.1. Select the name of the first image listed in the “Product Explorer” window
   3.2. Raster / Subset… / Geo Coordinates
   3.3. North latitude bound: 40.111
   3.4. West longitude bound: 116.718
   3.5. South latitude bound: 39.747
   3.6. East longitude bound: 115.818
   3.7. Select OK
   3.8. Repeat for each image in time series

4. Save the newly created subset image
   4.1. Select subsetted image in “Product Explorer”
   4.2. Select: File / Save Product As…
   4.3. Select “Yes” to convert to BEAM DIMAP format (SNAP native file format)
   4.4. Select an output filename and location, and select “Save”
   4.5. Repeat for all images
   4.6. Close all images
   4.7. Open the cropped images

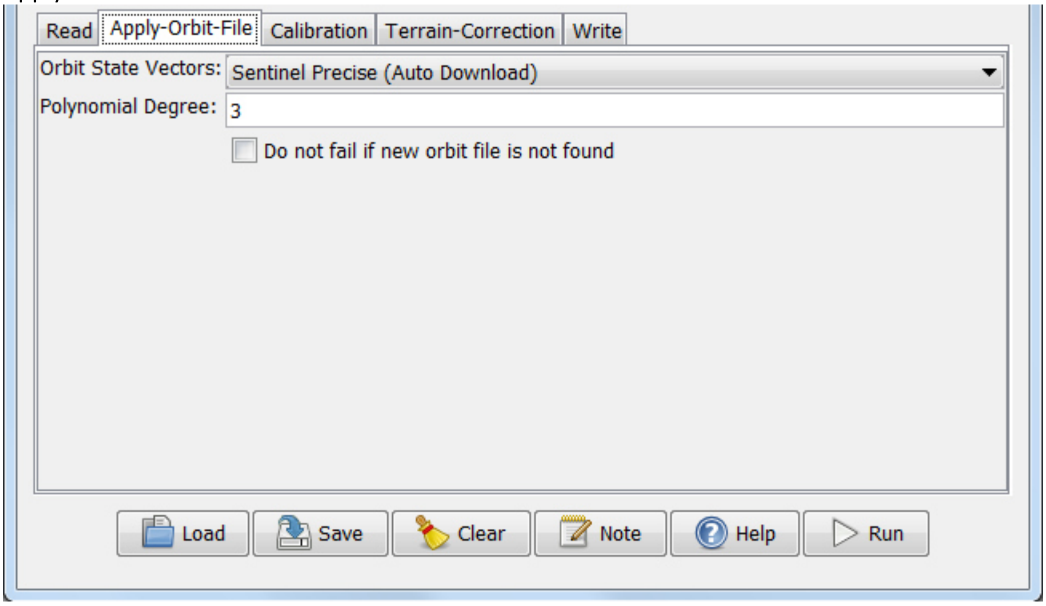
5. Create processing chain
   5.1. Tools / GraphBuilder
   5.2. Create the following graph by right mouse clicking and selecting a process, and left clicking on each process to connect them with arrows.
   5.3. Below the graph, for each process, apply the settings as shown below:


Graph Builder : S1_orbit_calibrate_terrain.xml
File
Graphs
Apply-Orbit-File
Calibration
Read
Terrain-Correction
Write

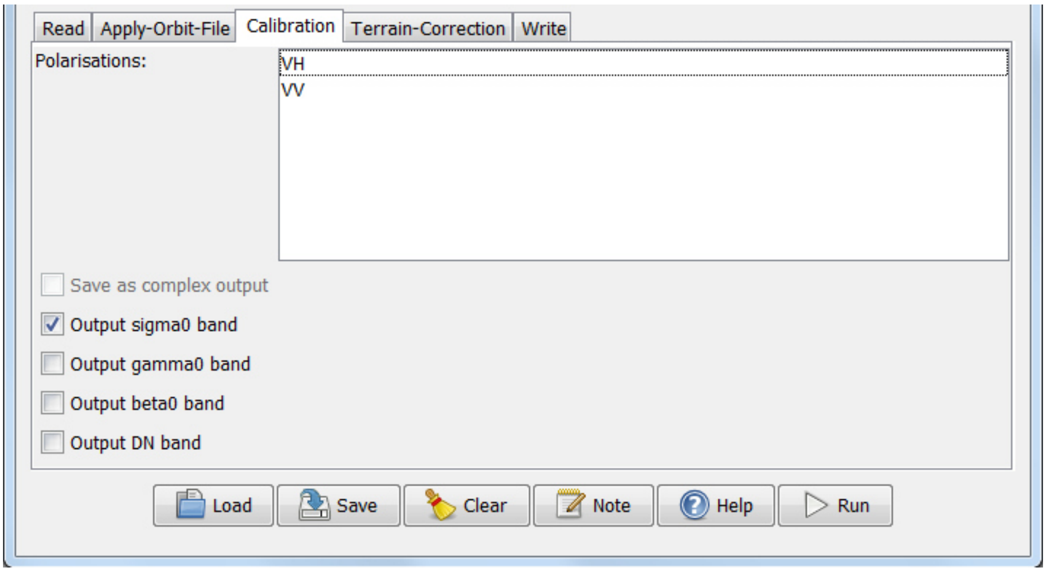
Read


Read
Apply-Orbit-File
Calibration
Terrain-Correction
Write
Source Product
Name:
[1] S1A_IW_GRDH_1SDV_20151120T222038_sub
...
Data Format:
Any Format
Load
Save
Clear
Note
Help
Run

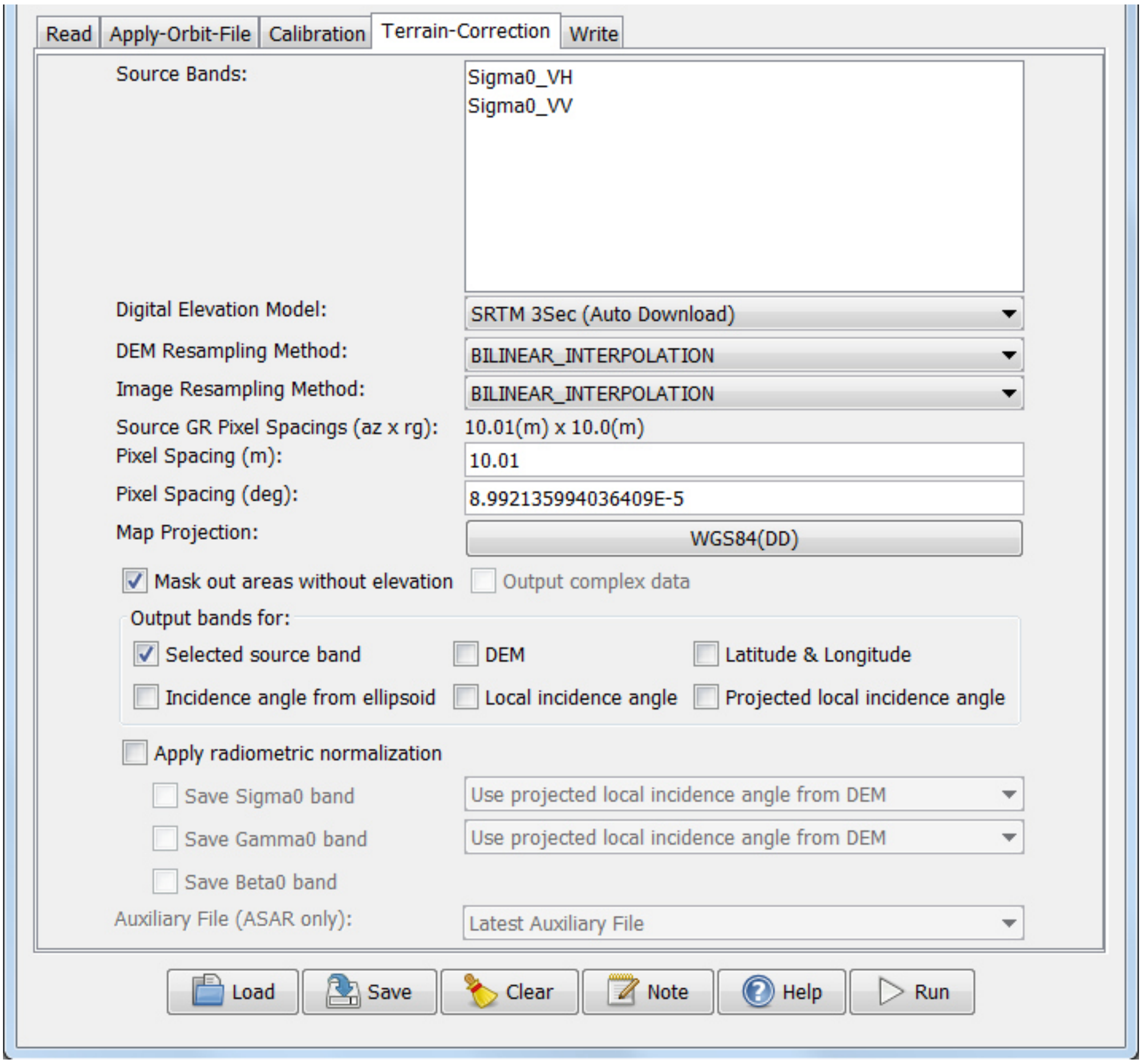
Apply-Orbit-File



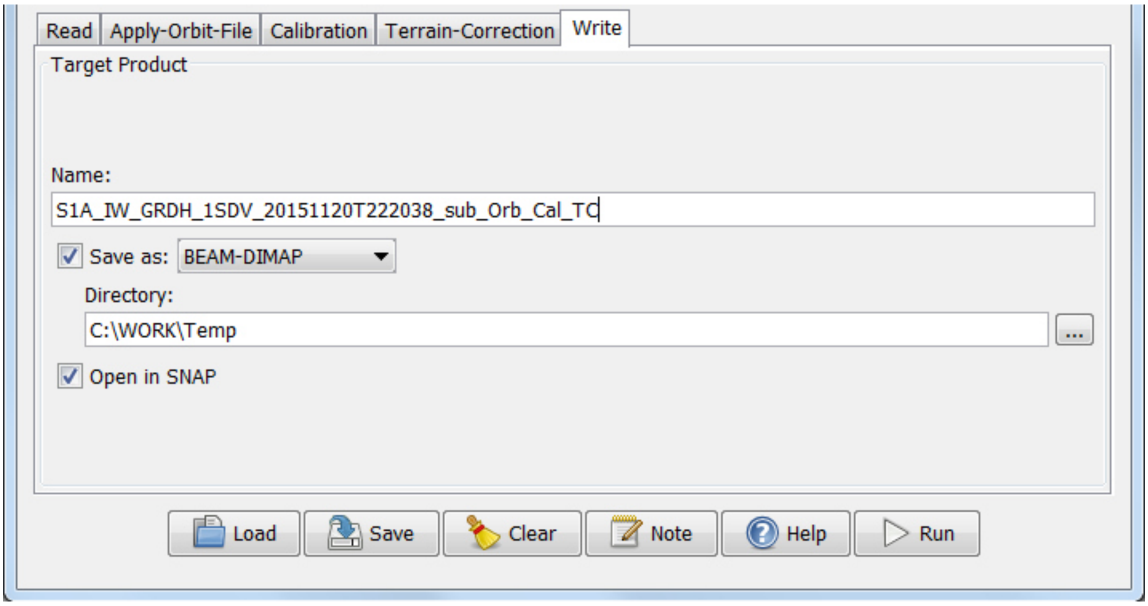
Calibration



Terrain-Correction



Write

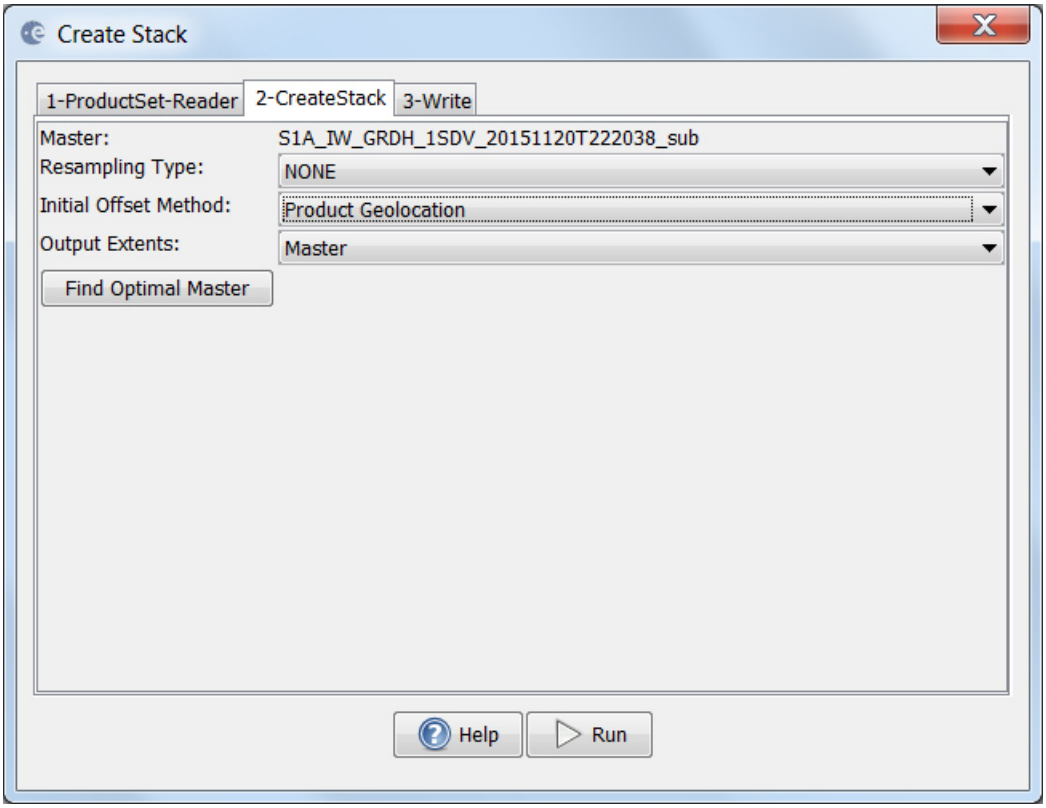


5.4. Select “Save” and save the graph.
5.5. Close the Graph Builder window.

6. Create batch directory
   6.1. Create a new folder in which to save batch processed imagery

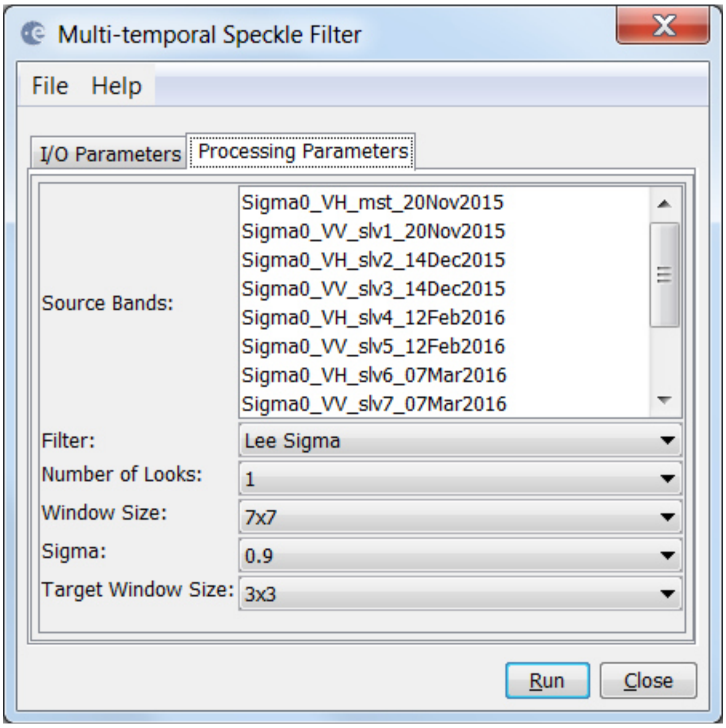
7. Batch processing
   7.1. Tools / Batch Processing
   7.2. Select “Add Opened”
   7.3. Select “Load Graph” and browse to saved graph.
   7.4. Under “Directory” browse to newly create batch directory
   7.5. Select “Run”

8. Create stack
   8.1. Close all images and reopen batch processed images in the batch folder
   8.2. Radar / Coregistration / Stack Tools / Create Stack
   8.3. Select “Add Opened”
   8.4. In the “2-CreateStack” tab, select the following parameters:



   8.5. In the “Write” tab, select a filename and location
   8.6. Select “Run”

9. Multitemporal Speckle Filtering
   9.1. Radar / Speckle Filtering / Multi-temporal Speckle Filter
   9.2. Select the stack as input
   9.3. Select the parameters below:



9.4. Select “Run”

10. Convert to dB

10.1. Expand the bands of the speckle filtered stack in the “Product Explorer” window

10.2. Right mouse click on each band and select “Linear to/from dB”

11. Multitemporal, polarimetric analysis

11.1. View various RGB composites of the speckled filtered stack in dB: Window / Open RGB Image Window

11.1.1. View: Red = VV_dB, Green = VH_dB, Blue = VV_dB from the same date

11.1.2. View: Red = Sigma0_VH_mst_20Nov2015_db, Green = Sigma0_VH_mst_12Feb2016_db, Blue = Sigma0_VH_mst_12Apr2016_db