

FORESTRY WITH SENTINEL-1: MULTITEMPORAL ANALYSIS

Data: The data used is high resolution Sentinel 1A Level 1 GRD data using dual polarization (VV/VH) acquired in interferometric wide swath mode. The inputs provided are already subsets.

MULTI IMAGE ANALYSIS:

1. Load S1 image subsets into SNAP
 - File / Open Product... (use control key to select multiple files)
2. Build a pre-processing graph
 - Using the graph builder tool, you can create workflows for data processing.
 - Go to Tools>GraphBuilder
 - Right click and add, in the order below, each of the preprocessing steps:
 - The first tool is Read
 - Add>Radar>Apply-Orbit-File and keep pre-defined parameters (Sentinel Precise and polynomial of third degree)
 - Add>Radar>Radiometric>Calibration and select **Output beta0 band**
 - Add>Radar>Radiometric>Terrain Flattening will add terrain flattening
 - Add>Radar>Geometric> Terrain Correction>Terrain Correction
 - The last tool is Write
 - Click on each tool, and connect them by dragging the red arrows from one tool to the next, respecting the order above
 - Then got to File>Save Graph to save the workflow as a XML file. Adjust output folder and name
3. Batch processing

Note: this step will take several hours to run. The outputs were created prior to this course and saved in your folder shared/2018-09_ESA_PECS/Forestry/Multitemporal analysis/output_backup/Step3.

 - Using the batch processing tool in the toolbar (normally next to the symbol for the graph builder; else go to Tools>Batch Processing) you can apply your workflow defined above to multiple images at the same time.
 - Using the **Add** symbol you can directly select the files you want to process. You can also simply add all images currently in the Product Explorer by clicking on **Add Opened**.
 - Using the **Load Graph** button, load the .xml-file you just saved your workflow in.
 - Adjust the output folder, click Run.
4. Create stack of images

Note: this step will take about 15 min to run in your VM. The outputs were created prior to this course and saved in your folder shared/2018-09_ESA_PECS/Forestry/Multitemporal analysis/output_backup/Step4.

- To display the outputs of Step3, navigate to their folder and drag them to the Product Explorer Window
 - Go to Radar>Coregistration>Stack Tools>Create Stack.
 - Under the CreateStack tab, select Product Geolocation as Initial Offset Method
 - Under the Write tab, adjust the stack name to Step4_1A_IW_GRDH_1SDV_Cal_TF_TC_Stack, adjust the output folder and click Run. This step will take about 10 min or more.
- 5. Convert bands to Db and display an RGB**
- Select different band combinations to see the change of backscatter between different acquisitions.
- 6. Time Series Analysis (using single scenes, not a stack)**
- Drag the outputs of Step3 (from your backup folder, if needed) into the Product Explorer window. This tool cannot use a stack, and needs single images instead.
 - View>Tool Windows>Radar>Time Series opens the Time Series tab at the bottom left of your SNAP window.
 - Click on Settings (top right of Time Series tab) and add all the individual pre-processed images. Click Apply.
 - Using the time series tab, hover your mouse over the area to see the behaviour of single pixels over.