Hungarian Space Office

SZENT ISTVÁN UNIVERSITY

esa

→ 7th ADVANCED TRAINING COURSE ON LAND REMOTE SENSING

4–9 September 2017 | Szent István University | Gödöllő, Hungary

ESA SNAP SENTINEL-1 TOOLBOX

MULTI-TEMPORAL ANALYSIS OF SENTINEL-1 SAR BACKSCATTERED INTENSITY

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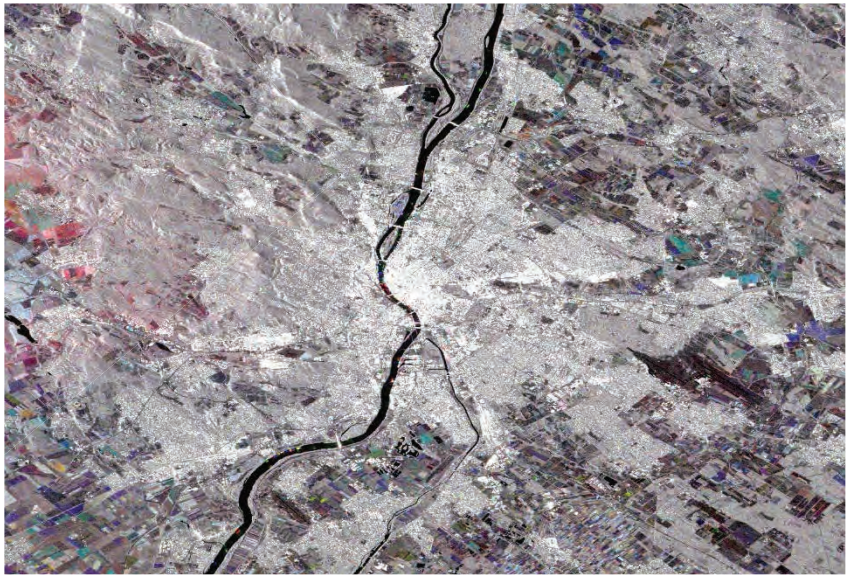
Goals of the Exercise

- Familiarize with open source **ESA SNAP** Toolbox.
- Familiarize with **Copernicus Sentinel-1** SAR products.
- Training on calculation and analysis of **backscatter coefficient** from Sentinel-1 detected products
- Review of manual as well as **batch processing** options of ESA SNAP Toolbox
- End-to-end showcase over the broader area of Bucharest (Hungary).



Contains modified
Copernicus Sentinel data [2017]

Input Dataset

- A set of **Sentinel-1A SLCs** YYYYMMDDTHHMMSS

  S1A_IW_GRDH_1SDV_20170709T163414_20170709T163439_017397_01D0F4_1BC0

  S1A_IW_GRDH_1SDV_20170721T163415_20170721T163440_017572_01D647_D282

  S1A_IW_GRDH_1SDV_20170802T163415_20170802T163440_017747_01DBA1_F344

  [downloadable @ https://scihub.esa.int]

- Sentinel-1 **Precise Orbits** (PODs) for the corresponding S1A dates (auxiliary data)

  S1A_OPER_AUX_POEORB_OPOD_*.EOF.zip

  [downloadable @ https://qc.sentinel1.eo.esa.int]

  [stored locally @ C:\Users\#username#\.snap\auxdata\Orbits\Sentinel-1\POEORB\2014]

- **Digital Elevation Model** (DEM) dataset from SRTM 3 arc-sec covering the Area of Interest (auxiliary data)

  srtm_40_03.zip

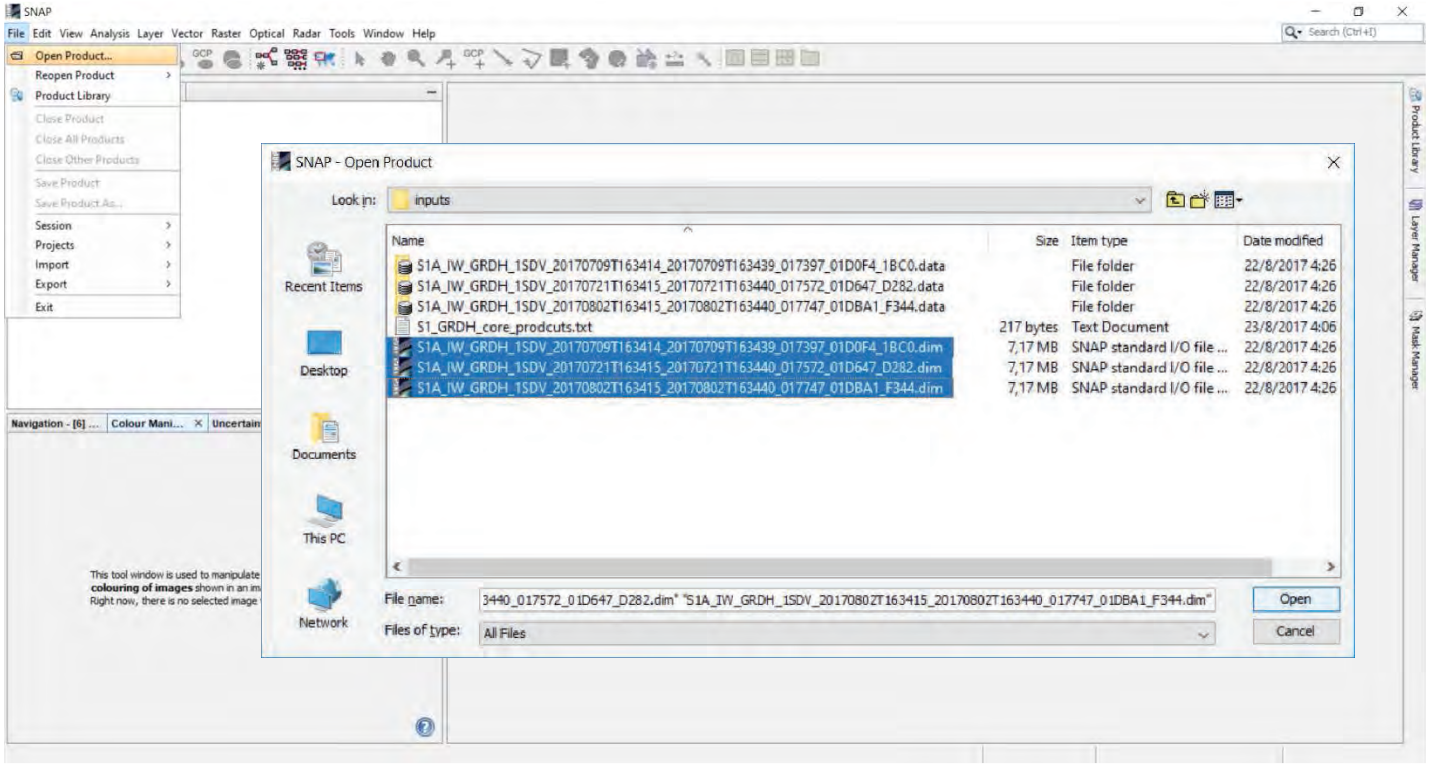
  [stored locally @ C:\Users\#username#\.snap\auxdata\dem\SRTM 3Sec]

EXERCISE

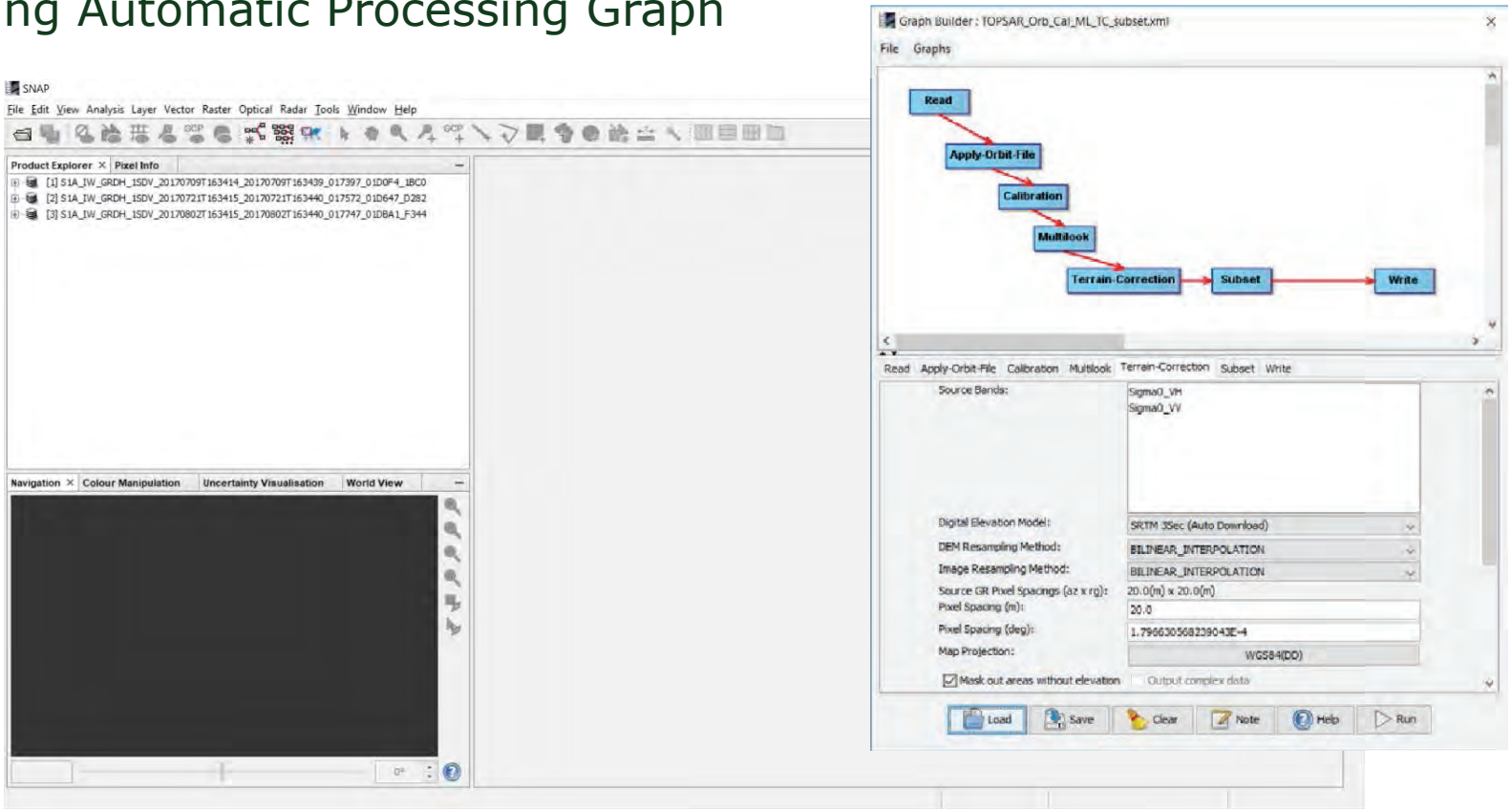
Multi-temporal Analysis of Sentinel-1 SAR Backscattered Intensity

- **Data Preparation** »
  - Update Orbits
  - Calibrate
  - Multi-looking
  - Terrain Correction
- **Build Multi-temporal Stacks**
- **Multi-temporal Filtering**
- **Stack Statistics**

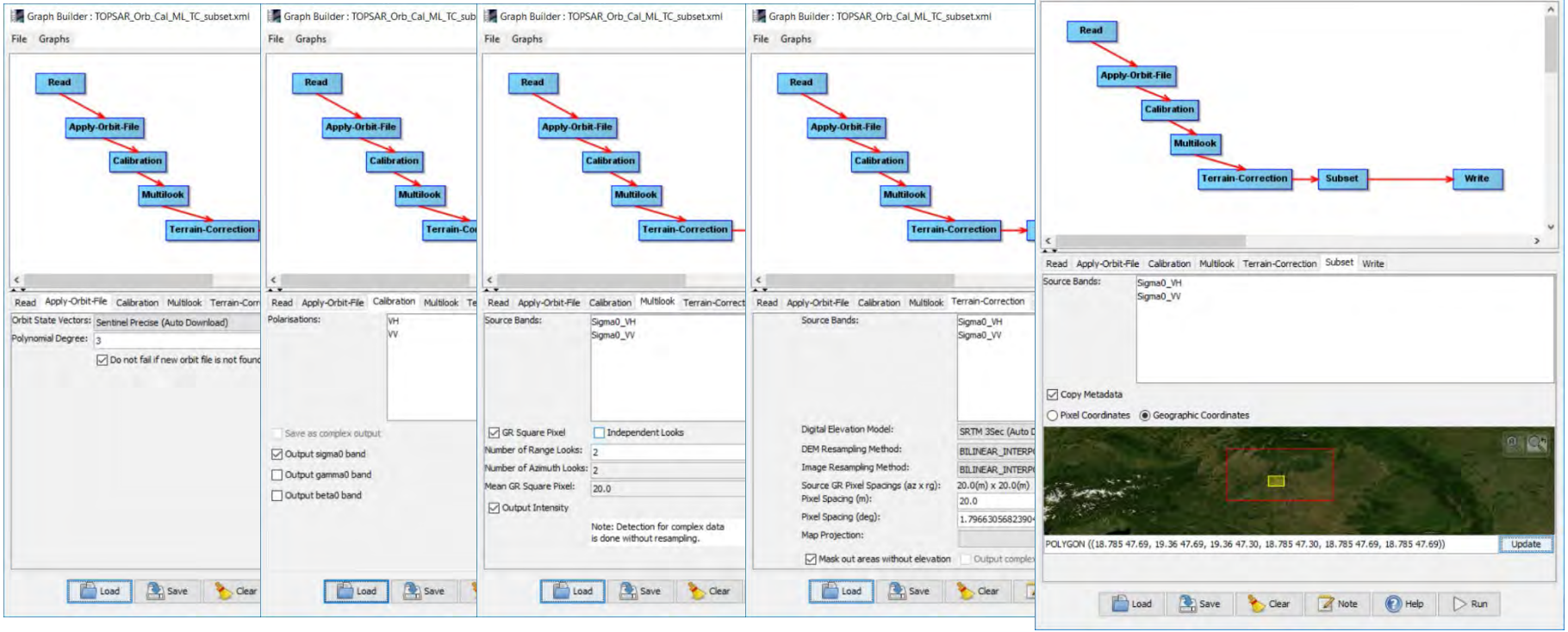
Read Sentinel-1 SLC (Level-1) Products



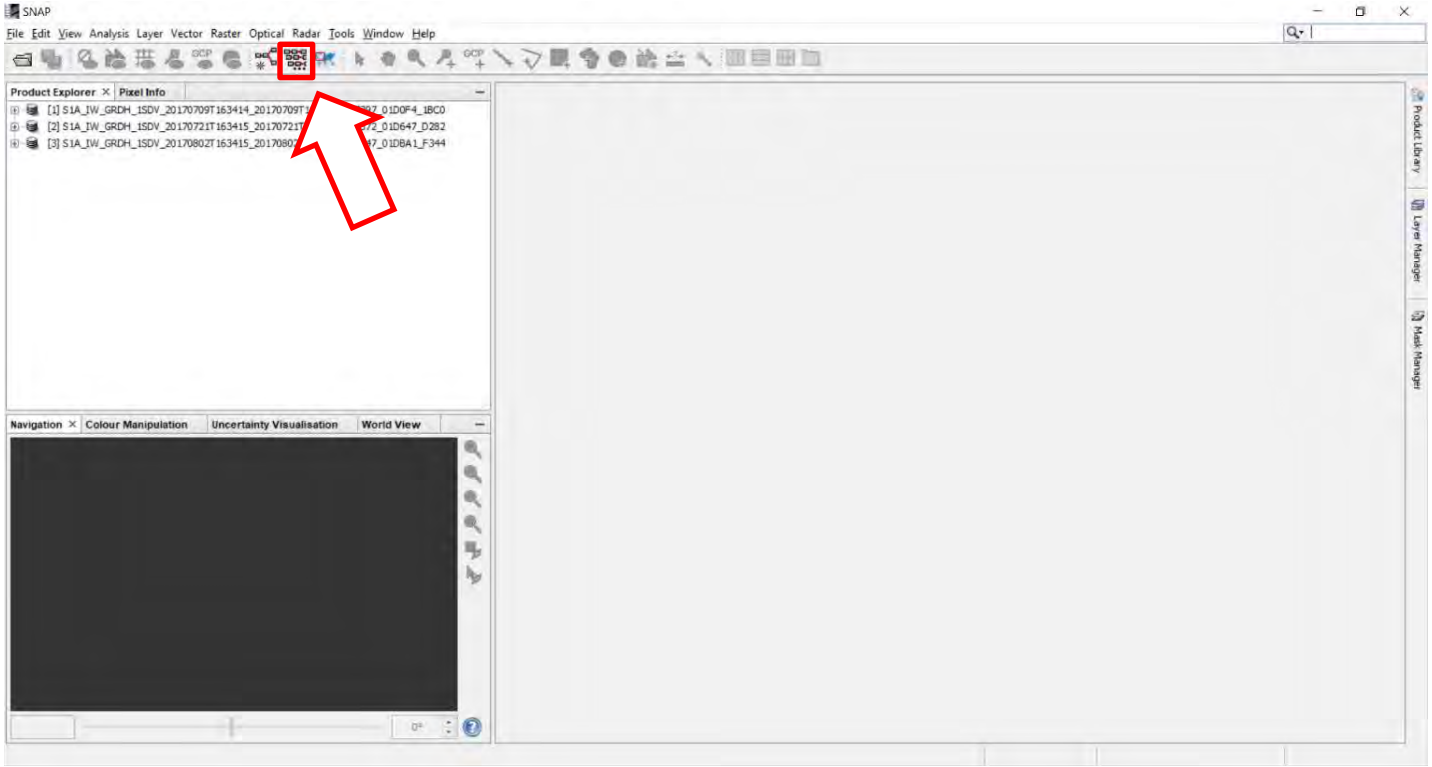
Building Automatic Processing Graph



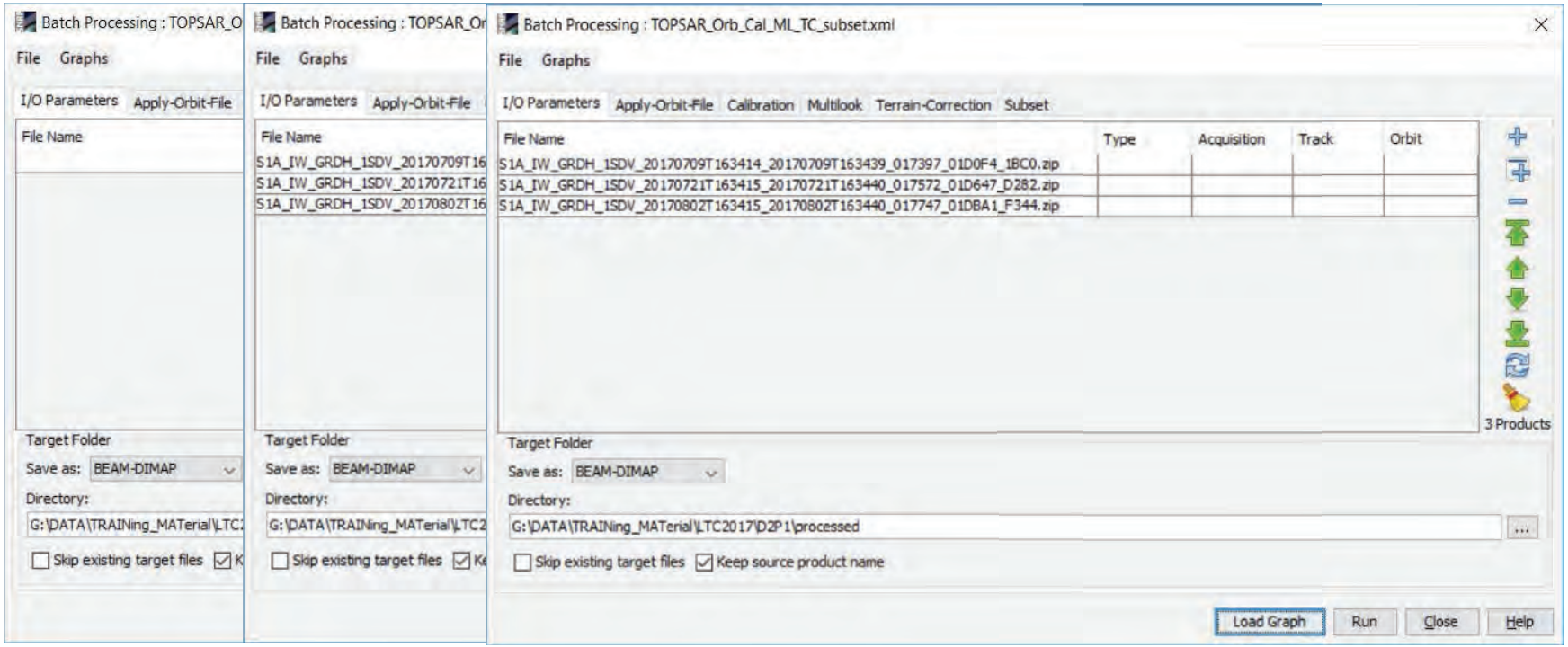
Define Processing Parameters



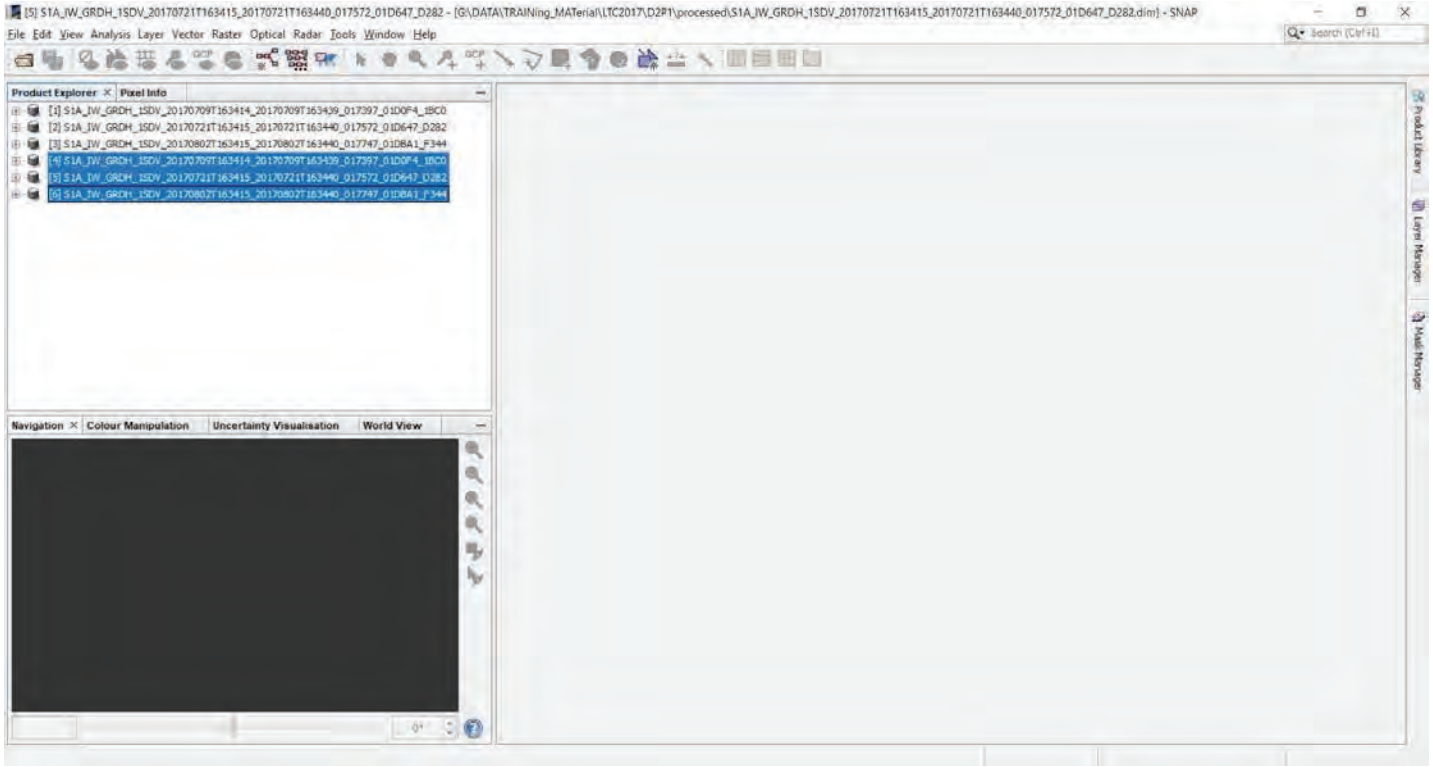
SNAP Batch Processing Operator



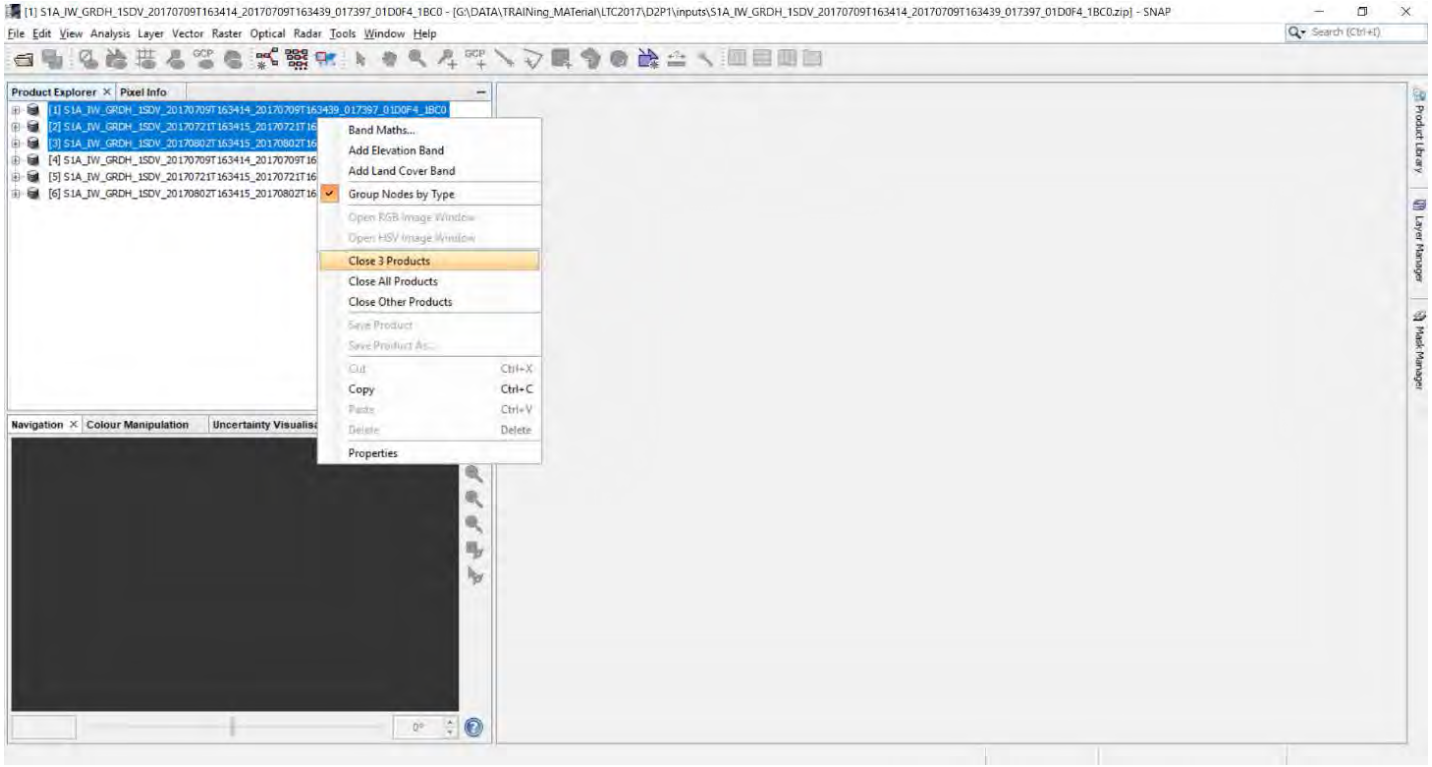
Apply Batch Processing (*.xml file)



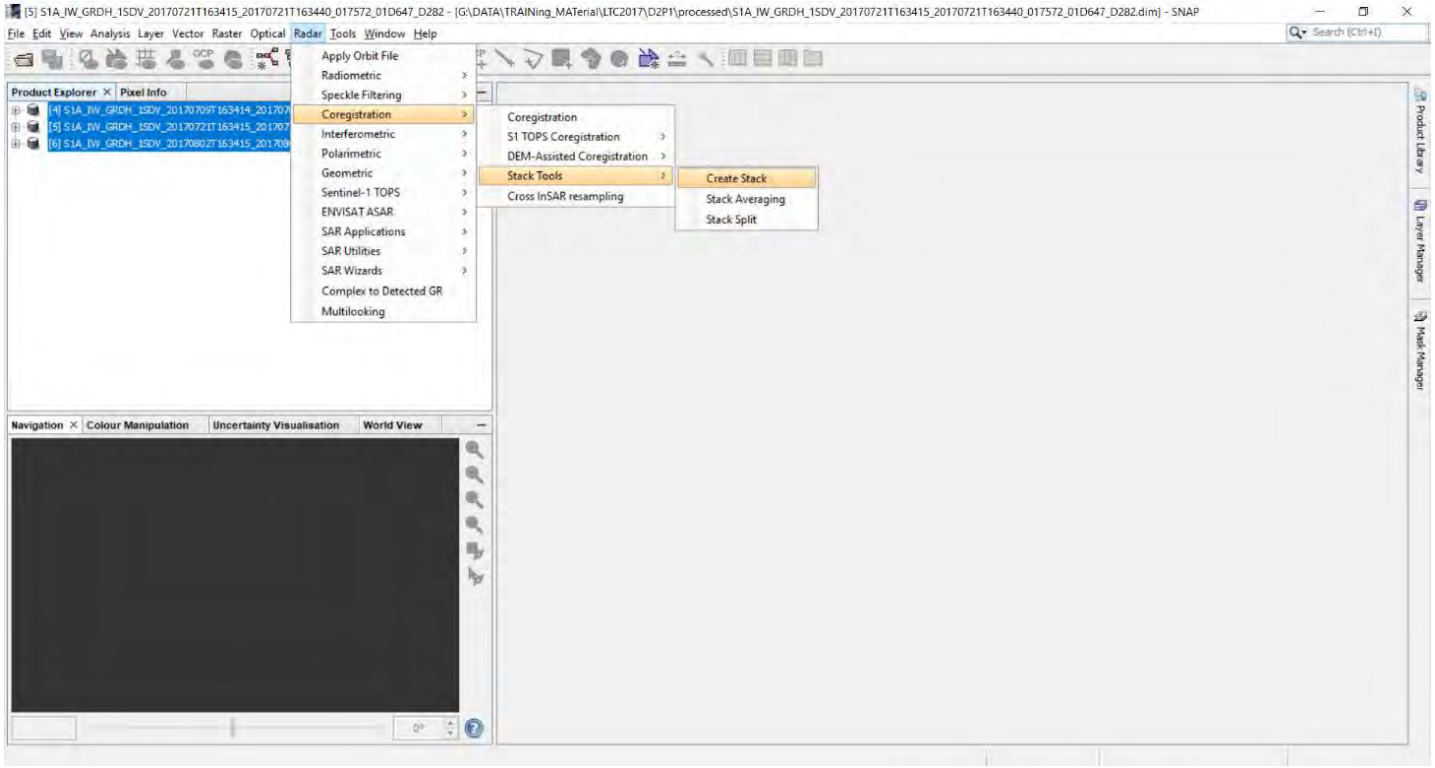
Batch Processing Results | Products' Naming



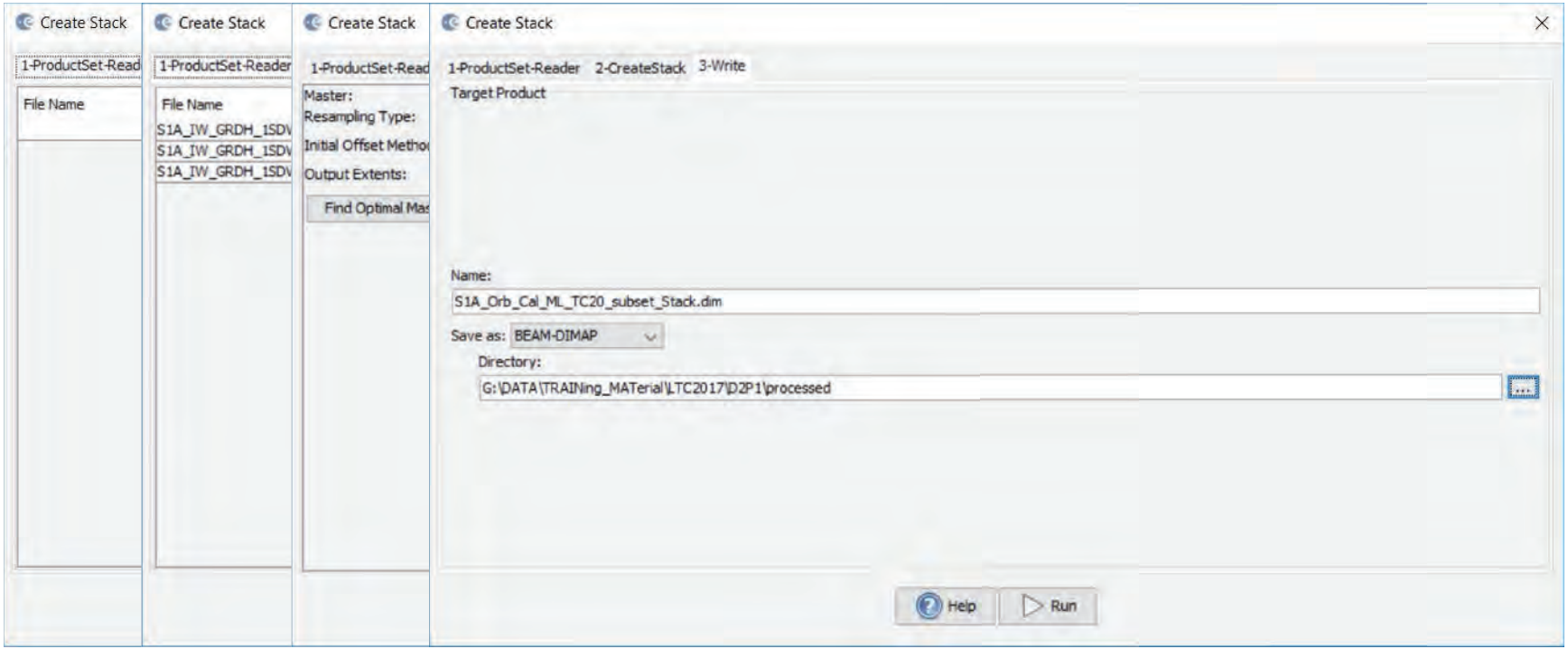
Close Initial Products



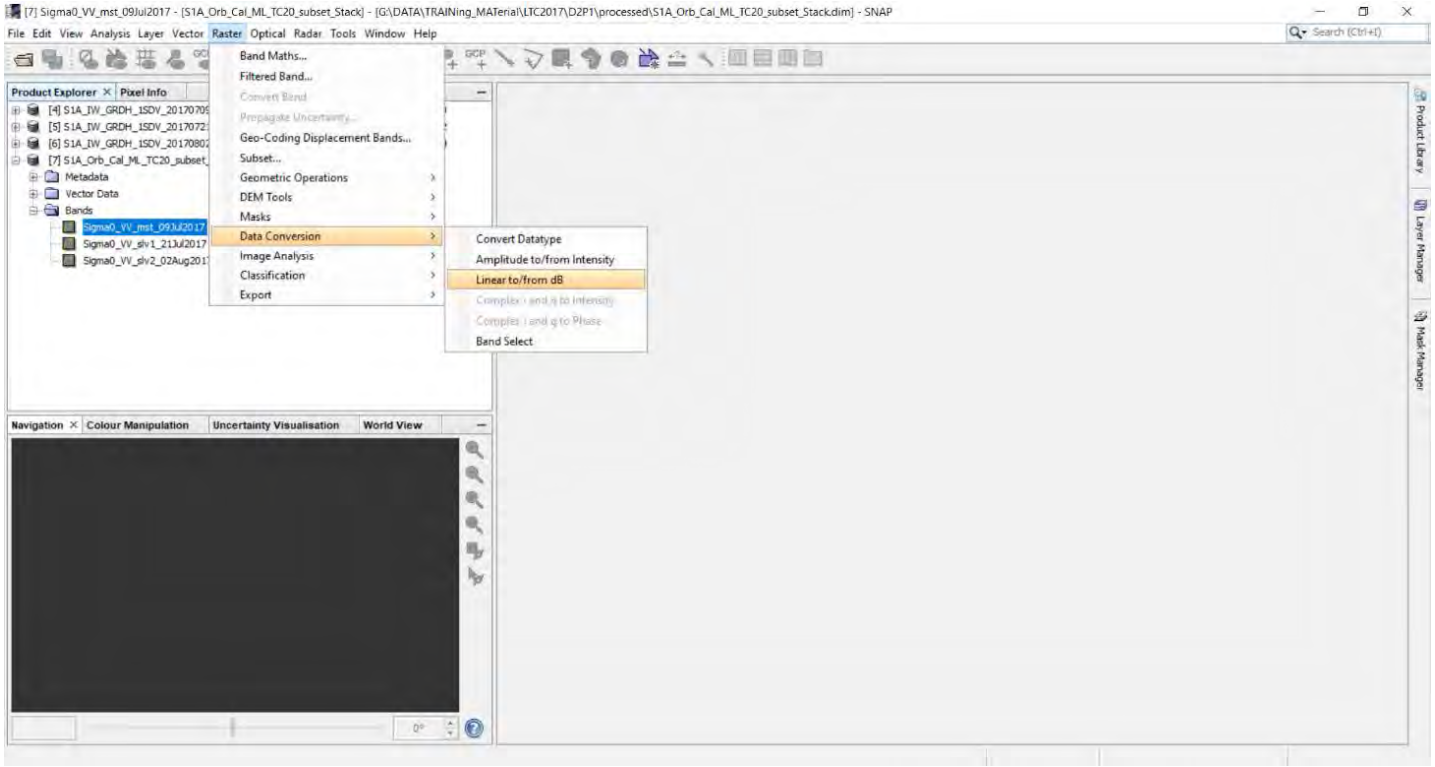
Create Stack (Container of Multiple Products)



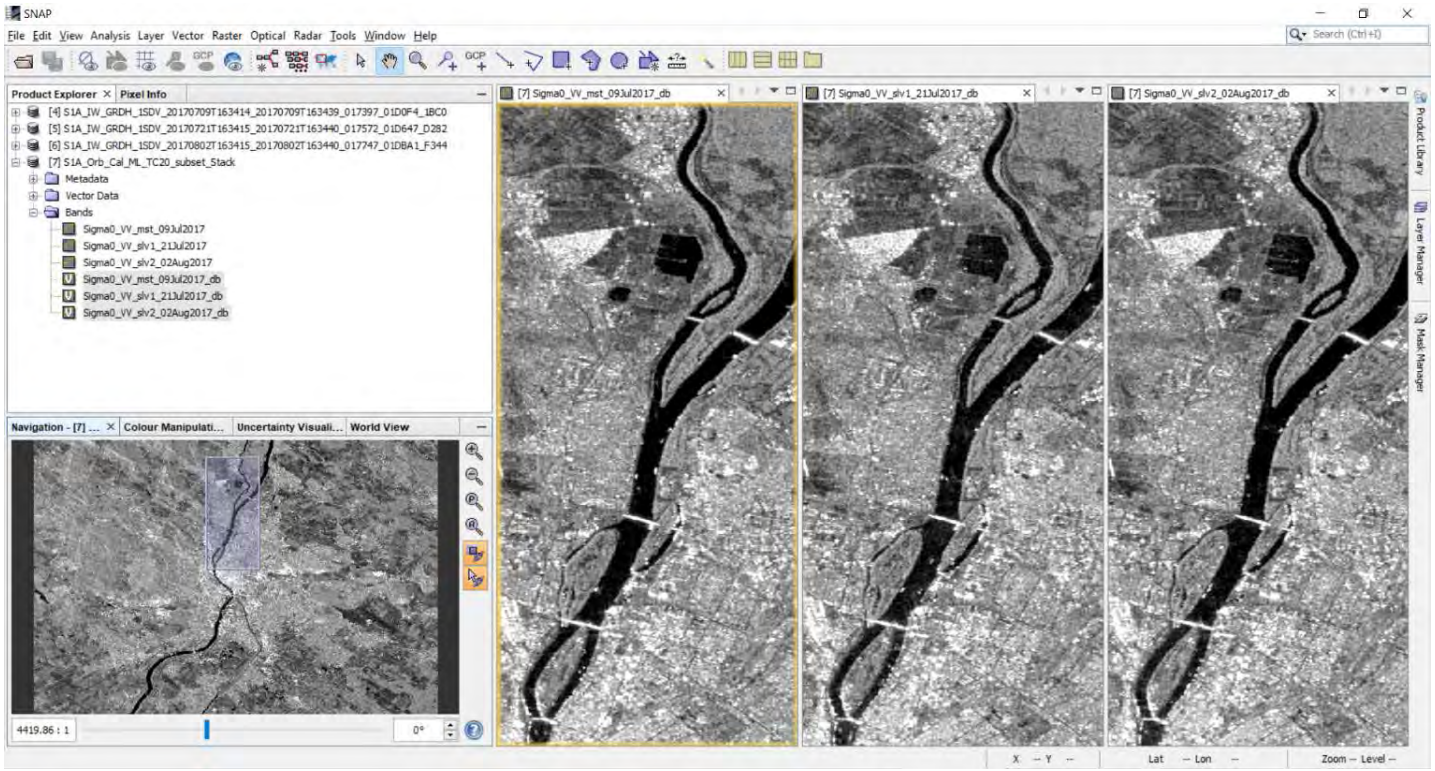
Create Stack Parameters



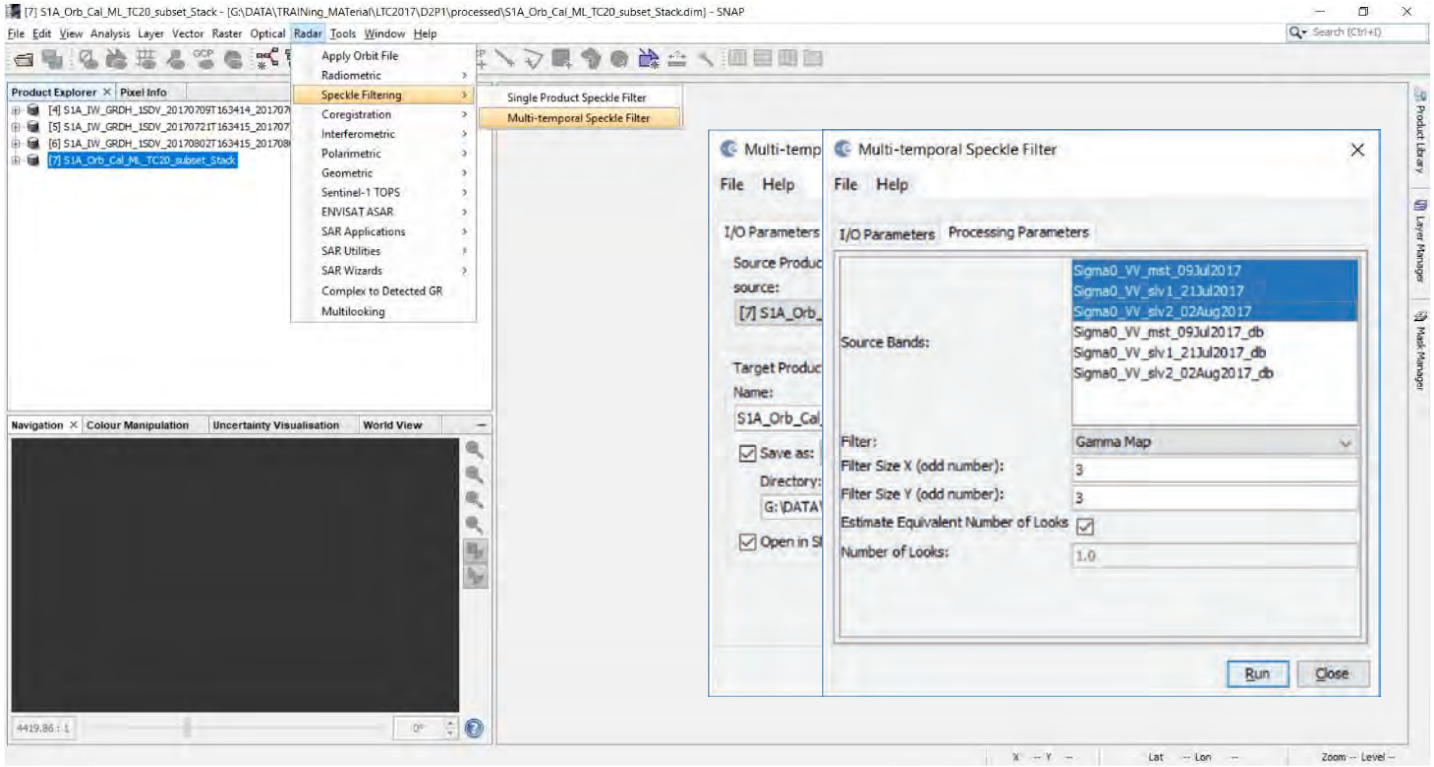
Convert Backscatter (Linear to dB Scale)



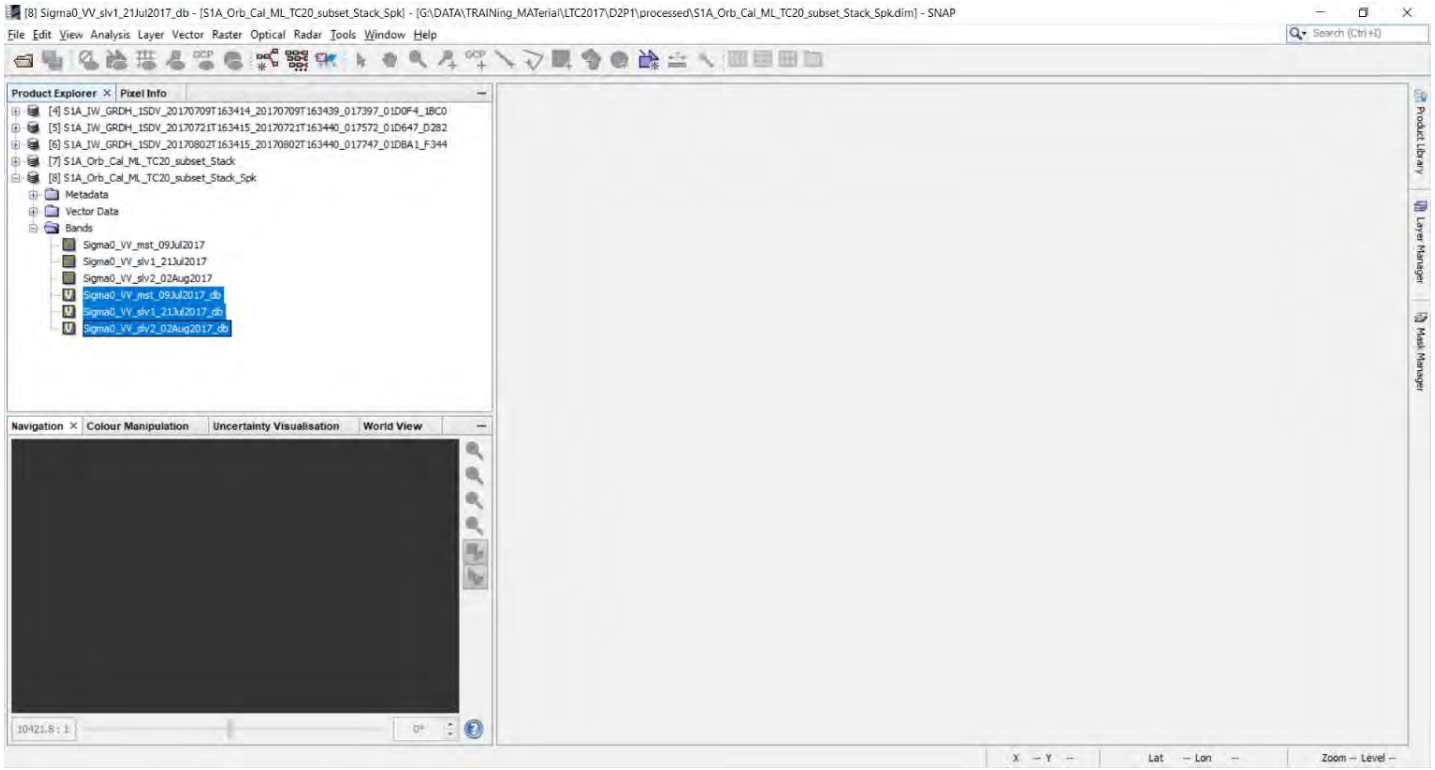
Visual Inspection of Mutli-temporal dataset



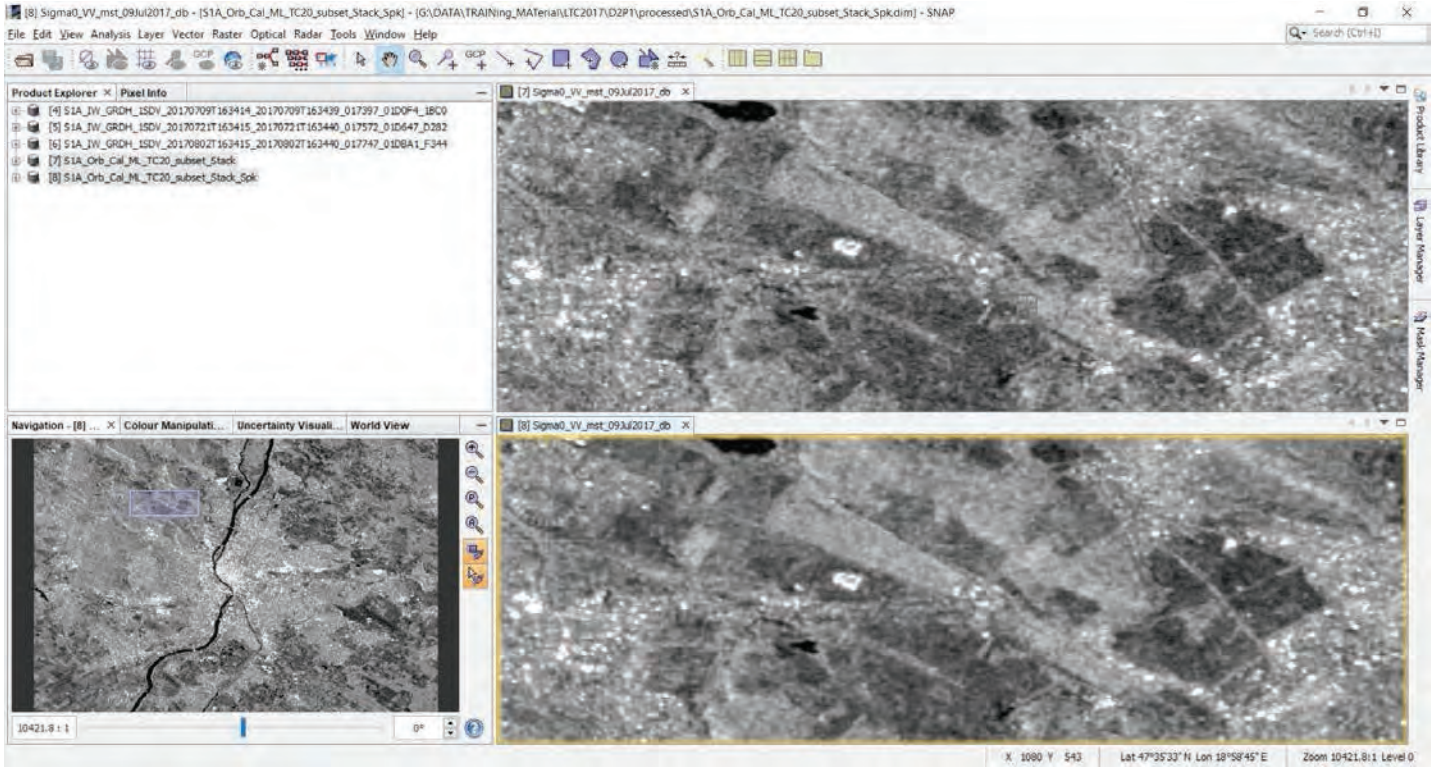
Mutli-temporal Speckle Filtering



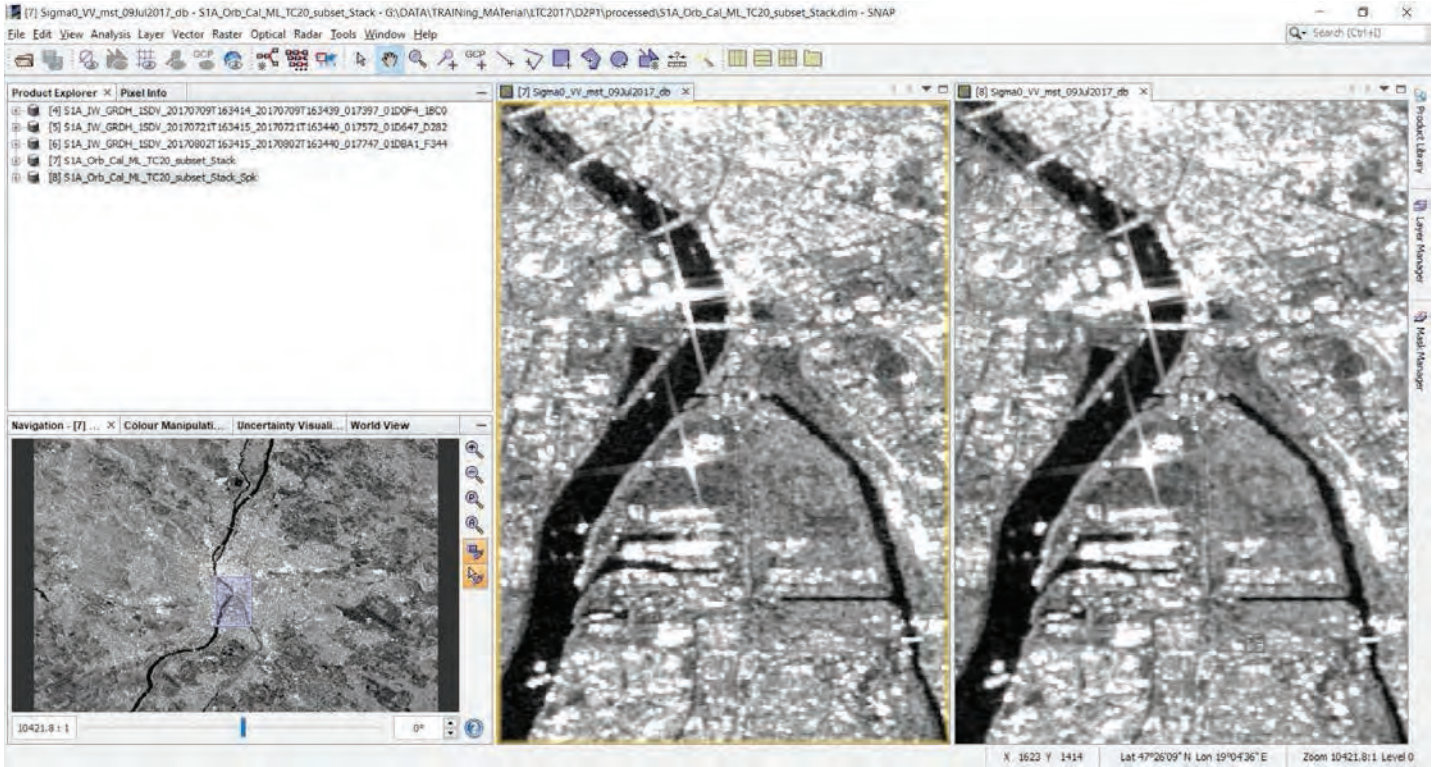
Convert Backscatter (Linear to dB Scale)



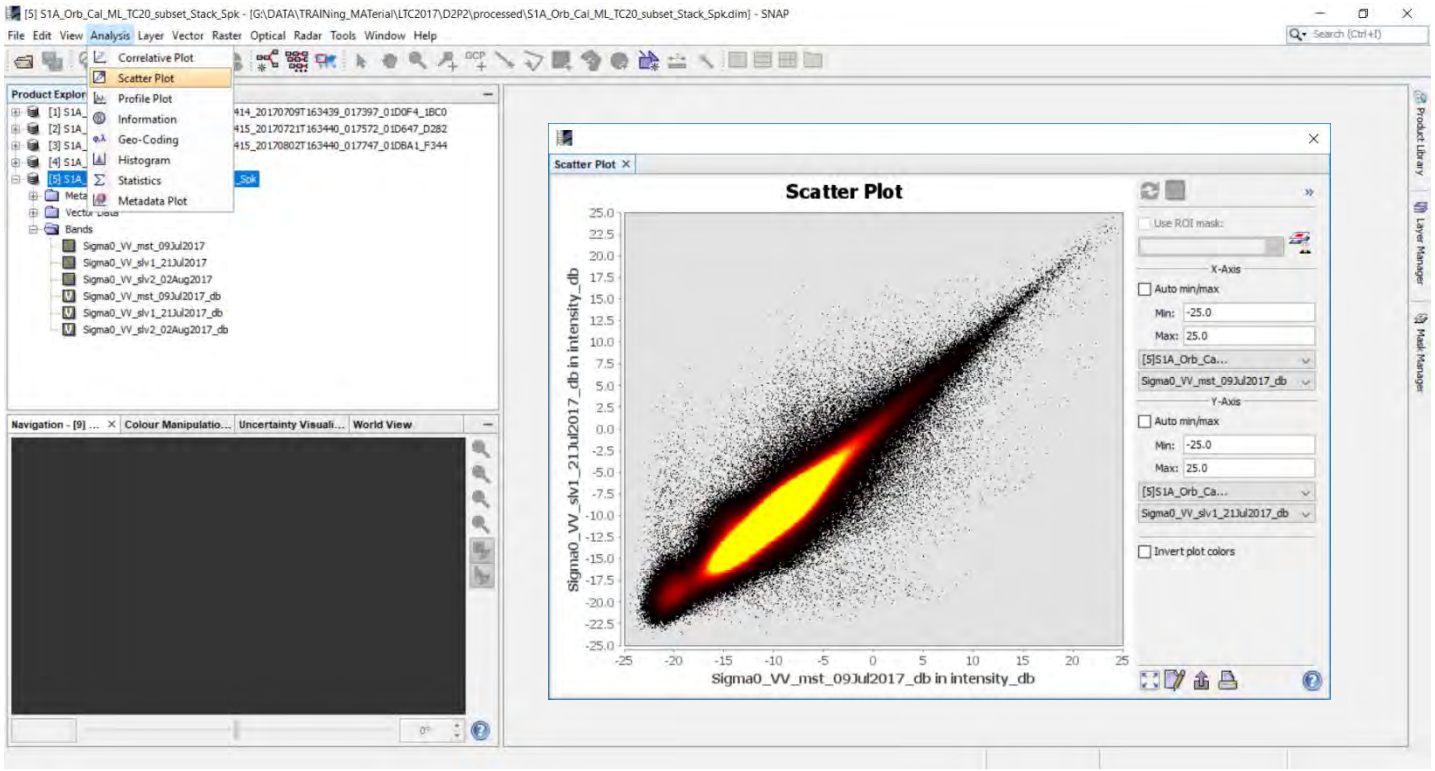
Evaluate Performance of Multi-temporal Filter 1/2



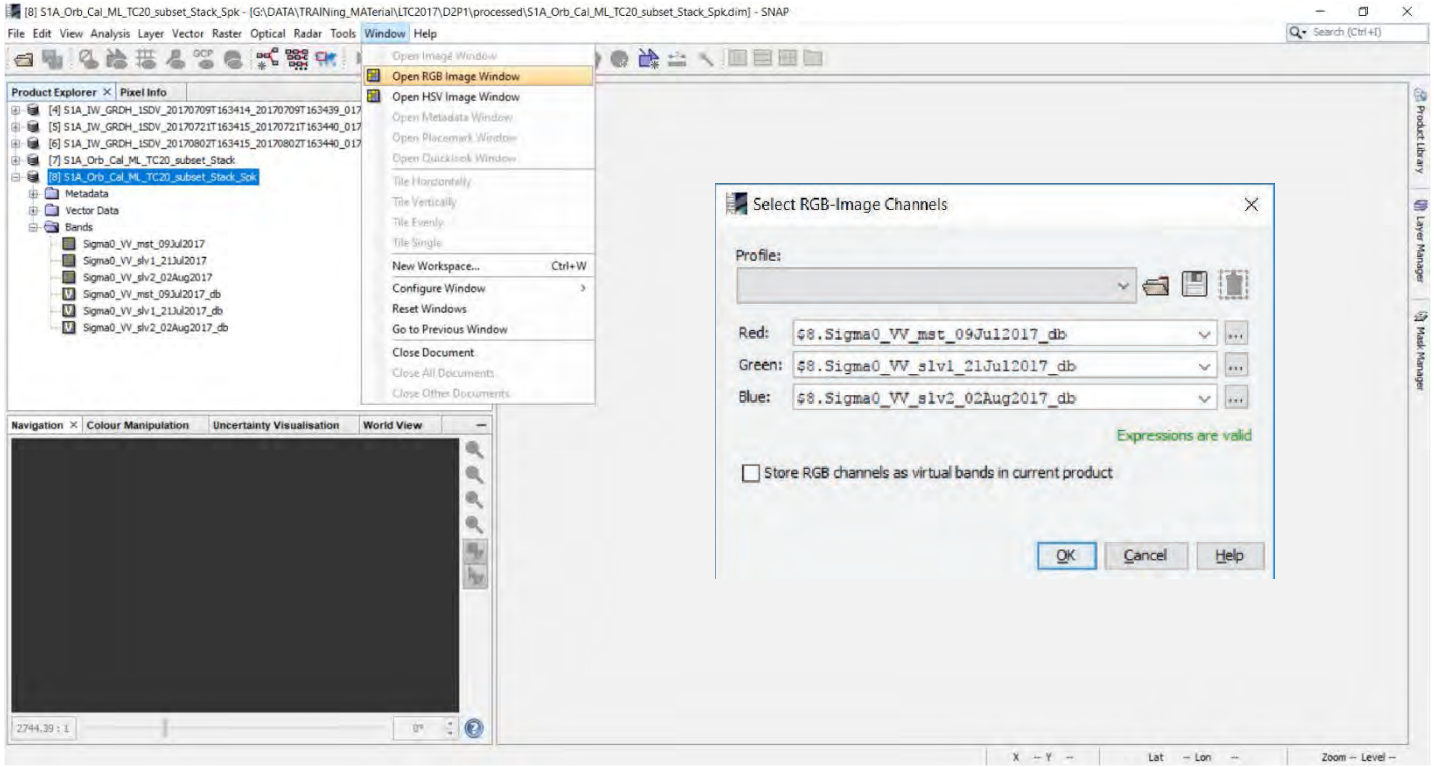
Evaluate Performance of Multi-temporal Filter 2/2



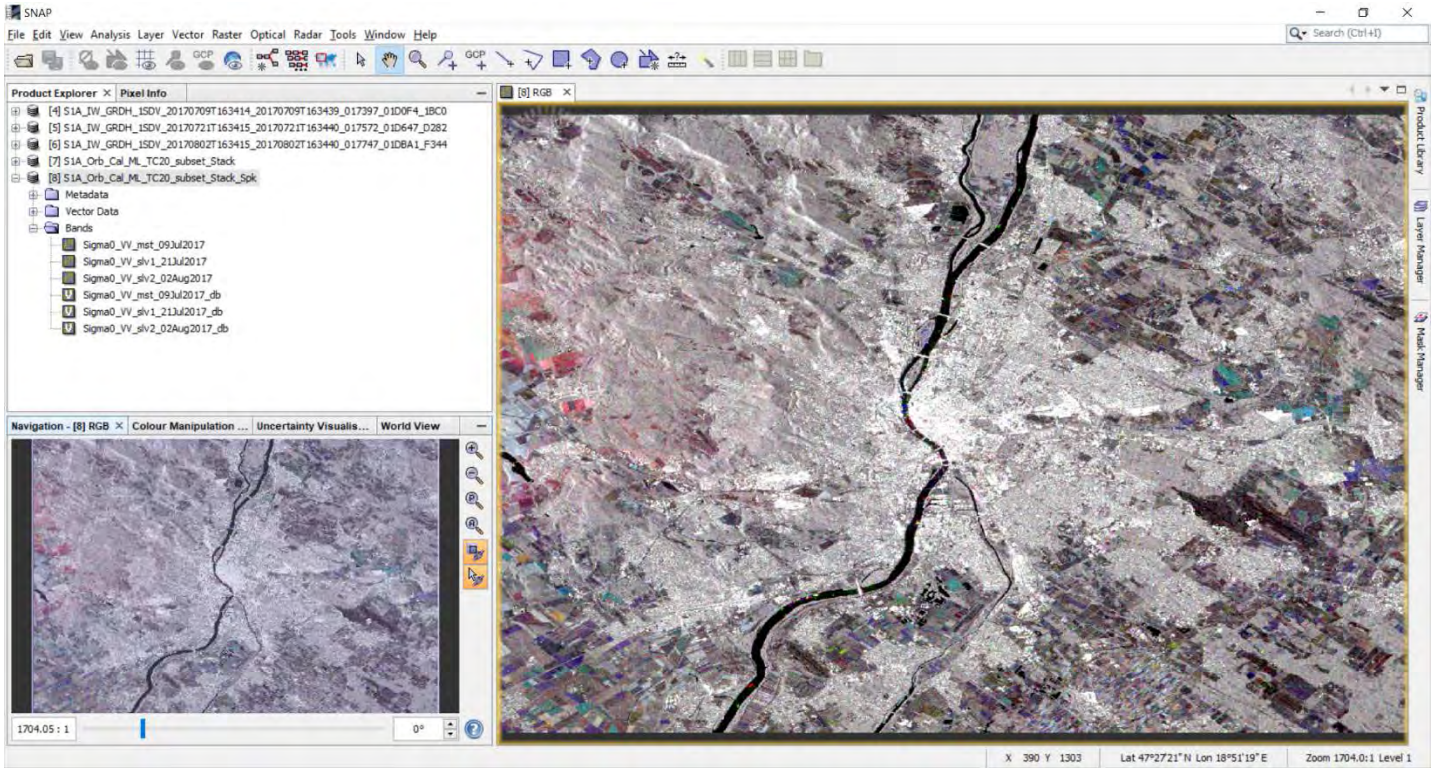
Compare Filtered/Unfiltered Sigma0 Values | Scatter Plot



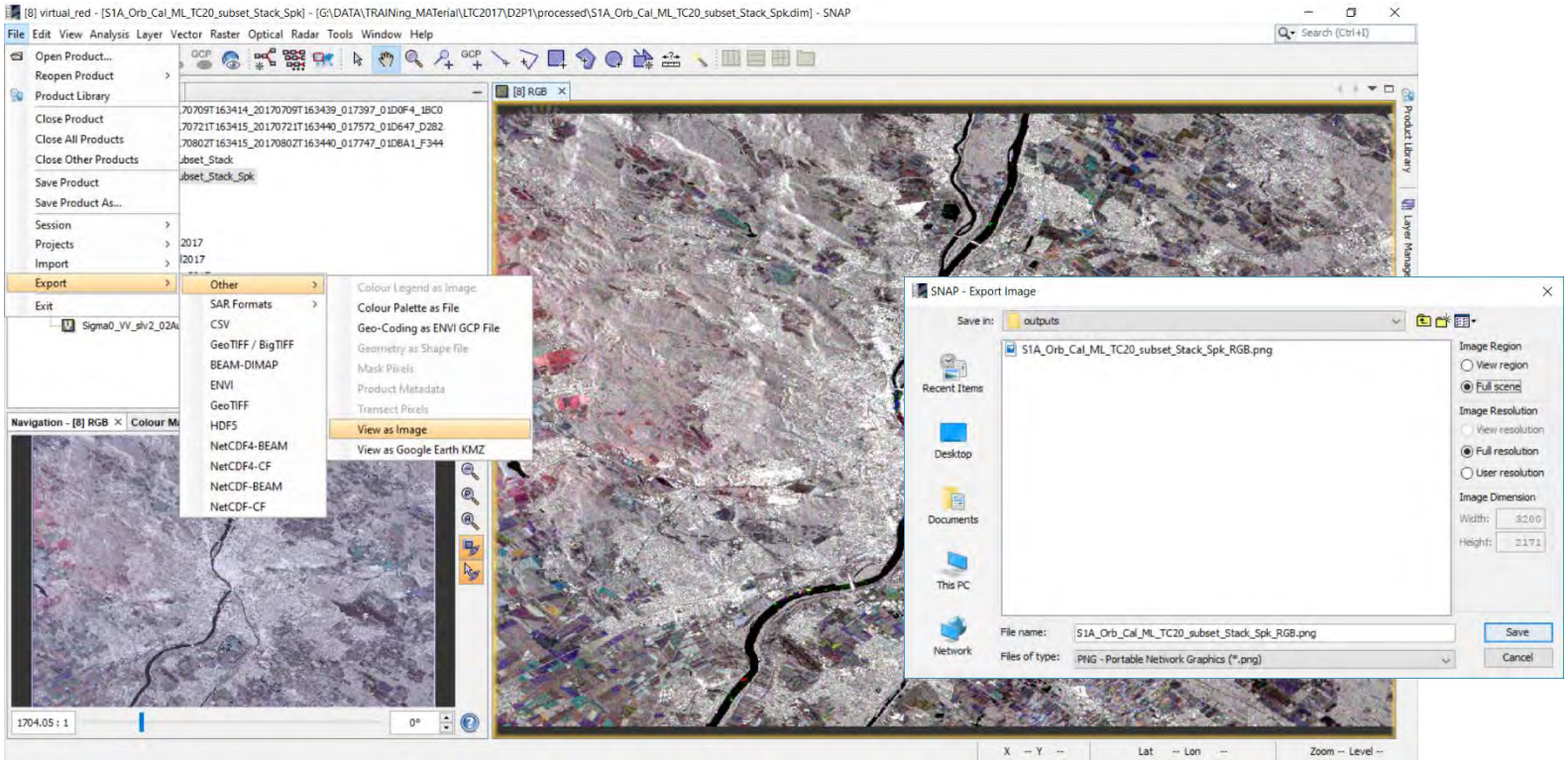
Generate RGB False Colour Composite



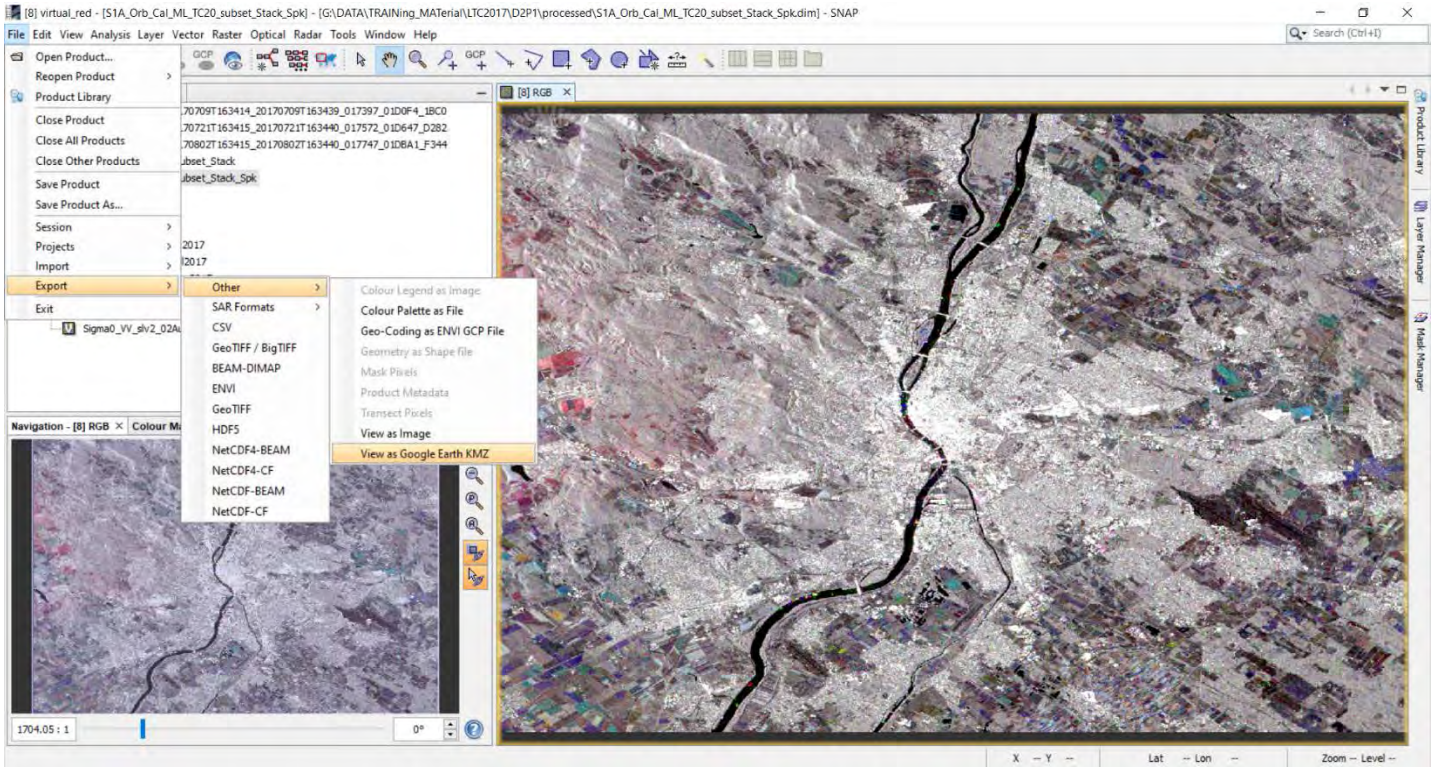
Generate RGB Composite >> R: 20170709 G: 20170721 B: 20170802



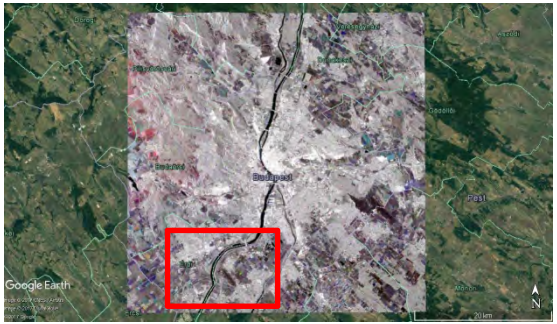
Export View as Image (*.png)

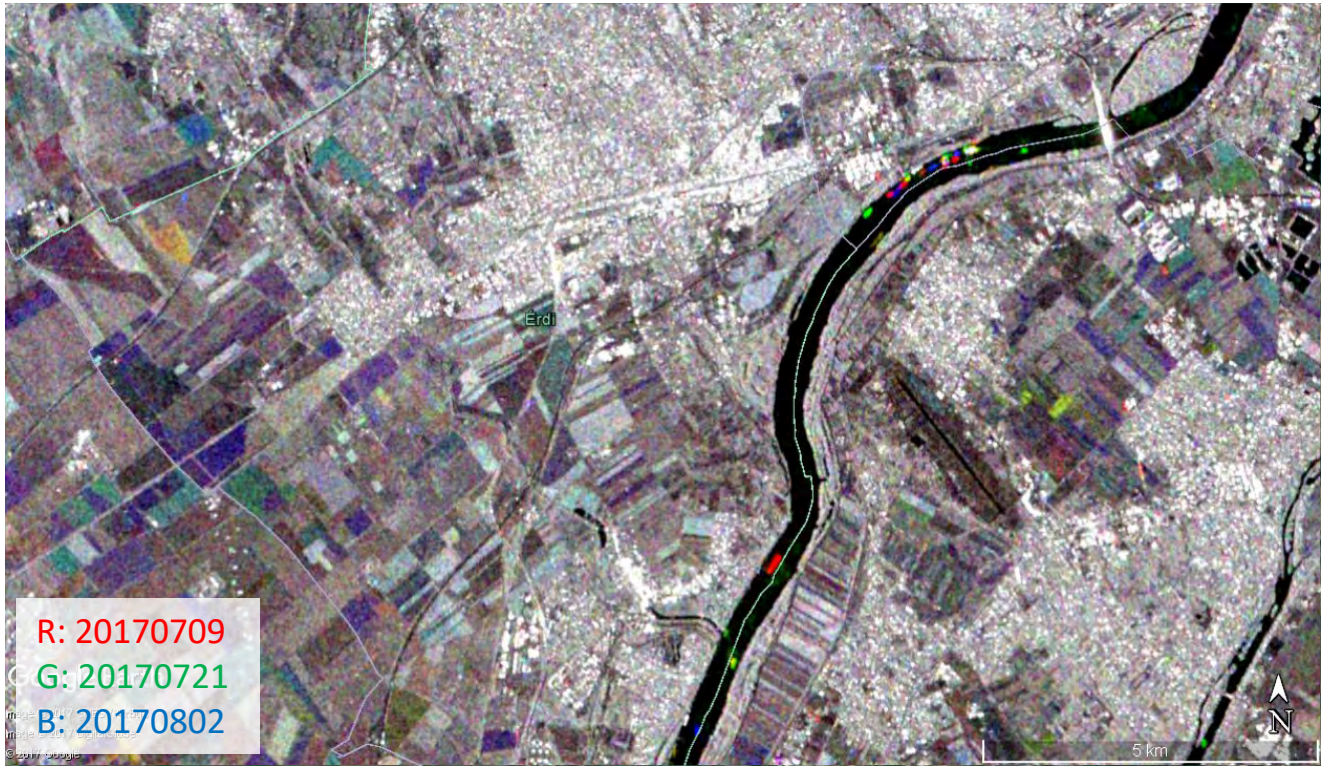


Export RGB Composite to Google Earth (*.kmz file)

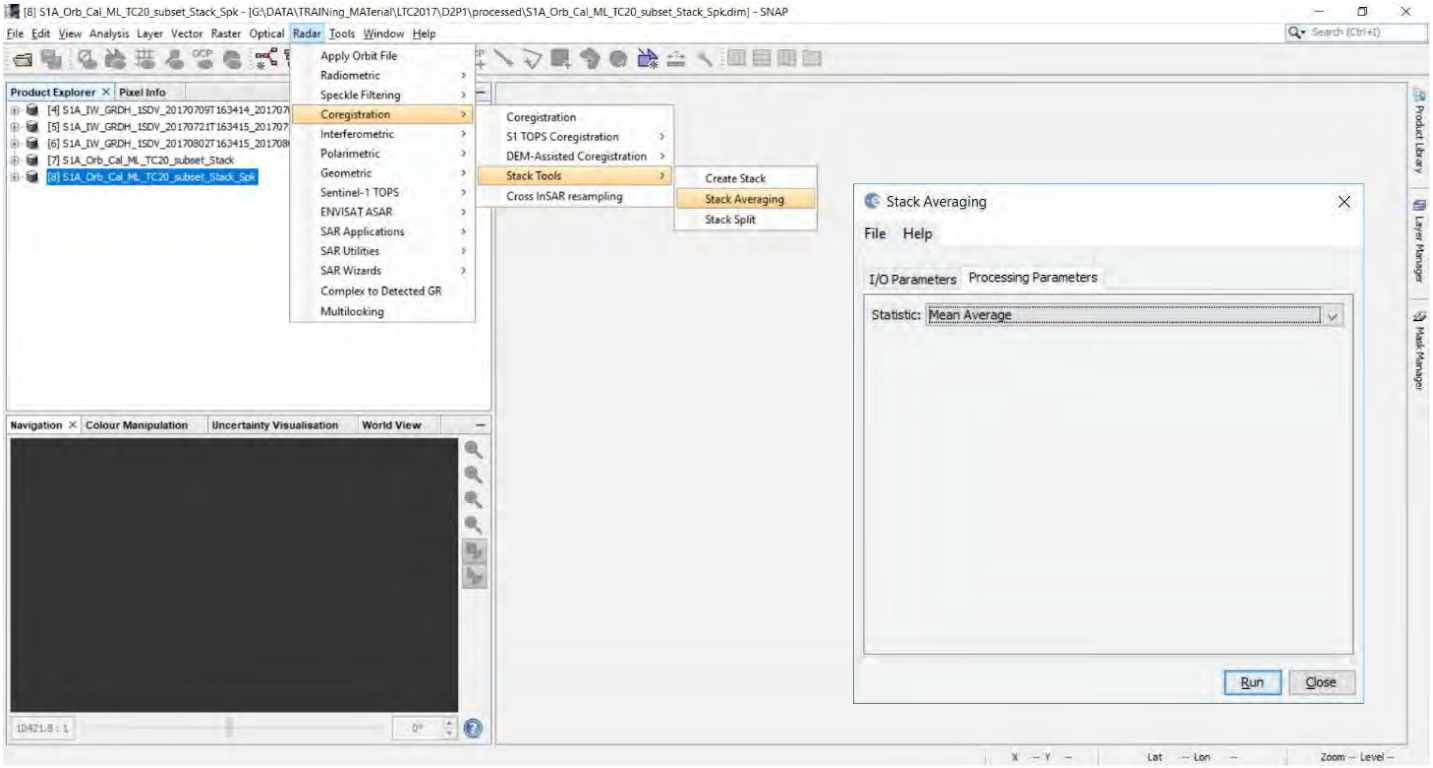


Sentinel-1 Multi-temporal **6-days** Backscatter Coefficient Composite

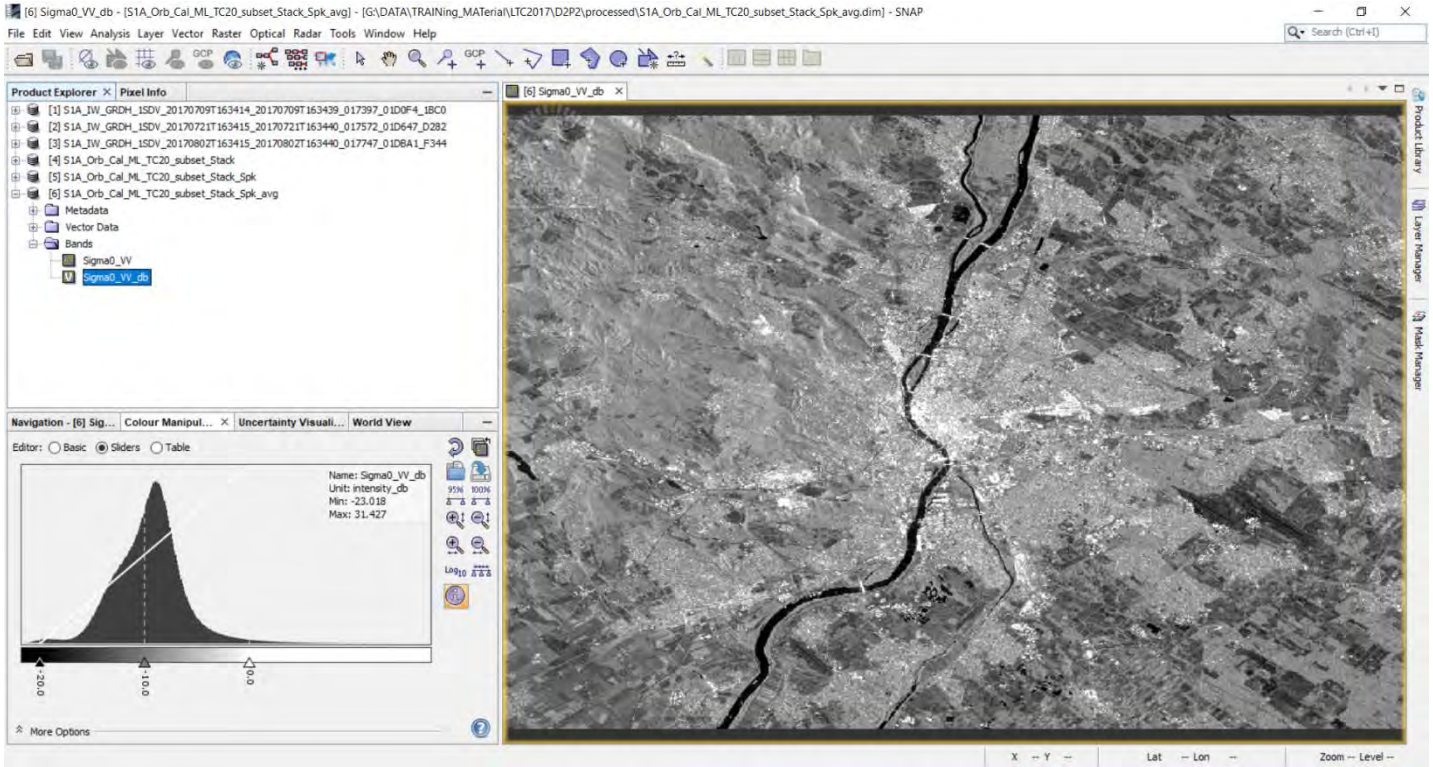




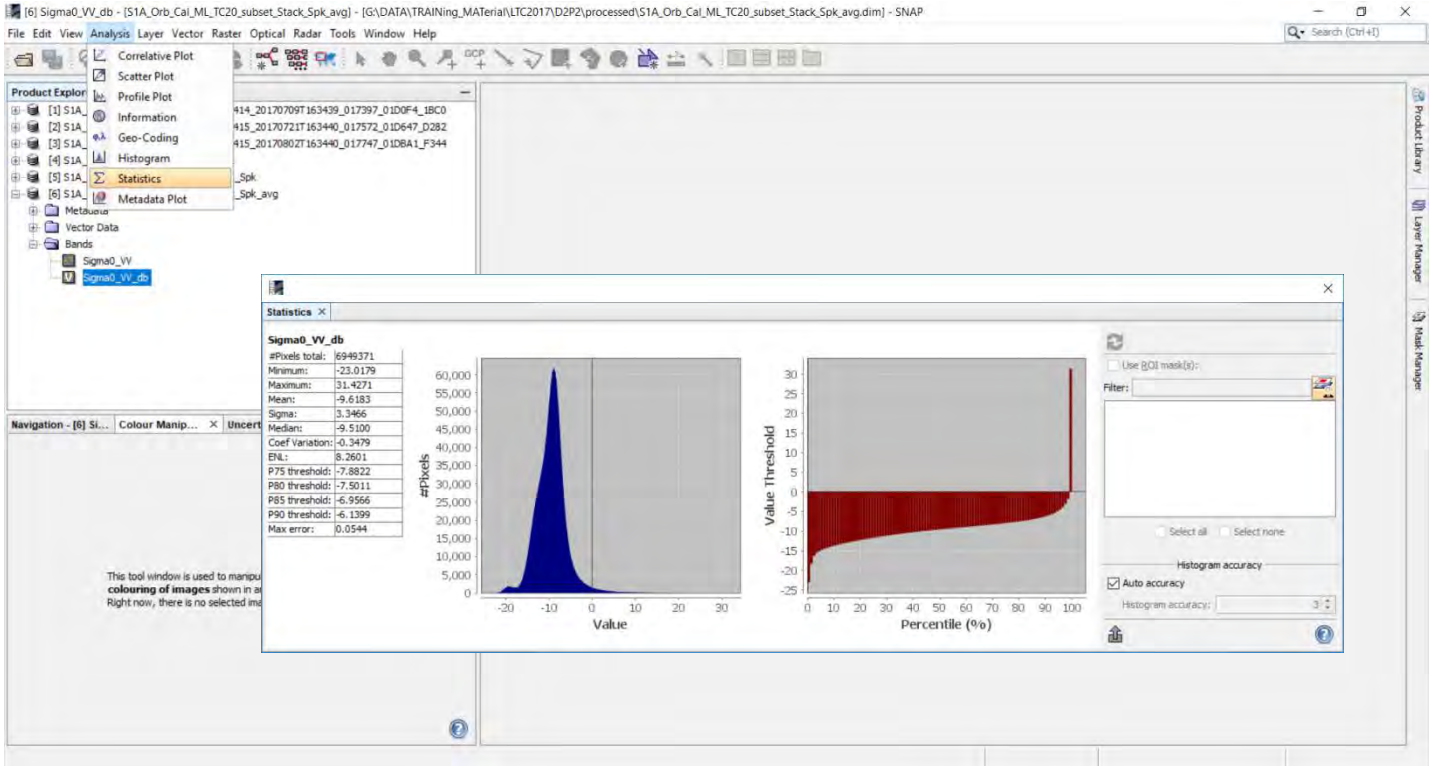
Multi-temporal Stack Averaging



Convert Backscatter (Linear to dB Scale)



Extract Image Statistics



Lesson Learnt

- A full range of **processing options for Copernicus Sentinel-1** core products are available in ESA's SNAP toolbox.
- The design and implementation of **processing graph** (*.xml) in SNAP is straightforward.
- A processing graph can be run both via the **Graph Builder** and the **Batch operator**.
- Processing graphs are effected by **SNAP versioning**.
- Batch processing requires multiple **unique input/output files**.
- **Automatic monitoring** of an AOI shall be implemented in upcoming SNAP version 6.

Thank you