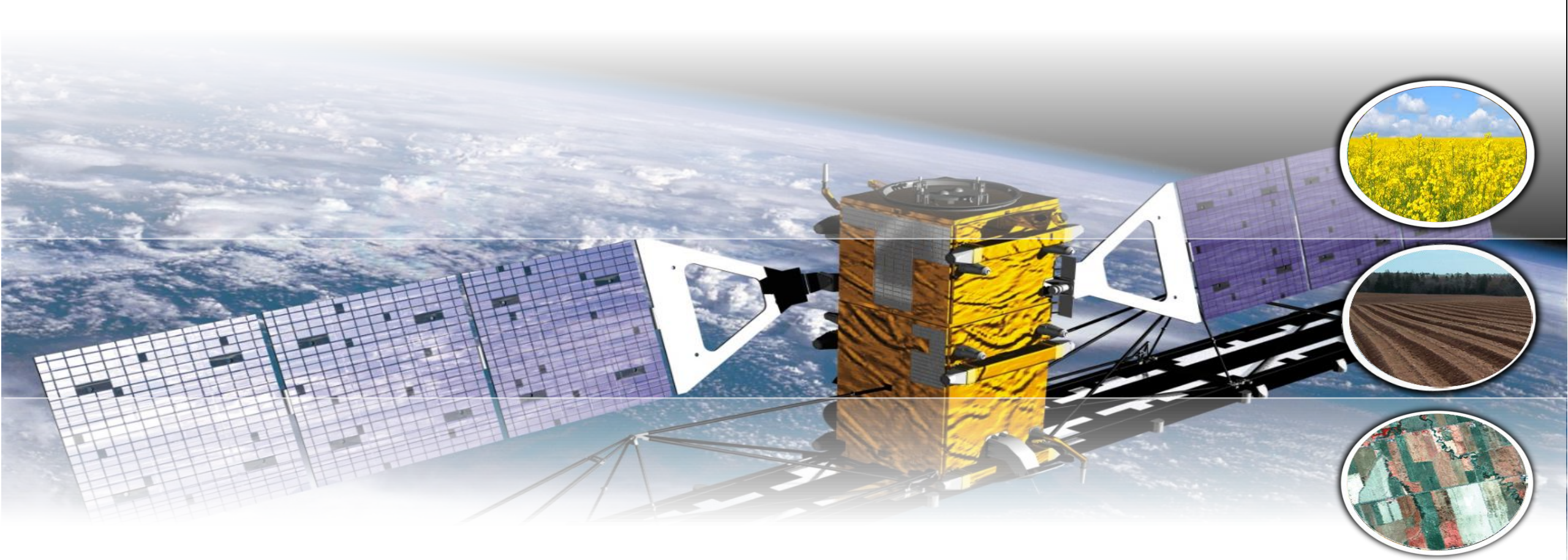


Lab 4:
InSAR Data Processing

InSAR Processing Steps

Co-register the two radar images,

Form the complex interferogram and construct interferometric phase, amplitude and coherence;

Post-processing to remove the topographic phase and filter the interferogram;

Unwrapping to convert the interferometric phase into line-of-sight (LOS) displacement;

Geocoding to switch the radar image coordinates into geographic coordinates

Processing workflow

1. Data input
2. Preprocessing
    1. Create subset (optional)
    2. Automatic Coregistration
3. Interferogram generation
4. Removal of topographic phase
5. Phase filtering
6. Multilooking
7. Phase unwrapping via Snaphu
8. Conversion of unwrapped phases to vertical displacement values
9. Geocoding
10. Export to Google Earth

Land subsidence in Mexico City

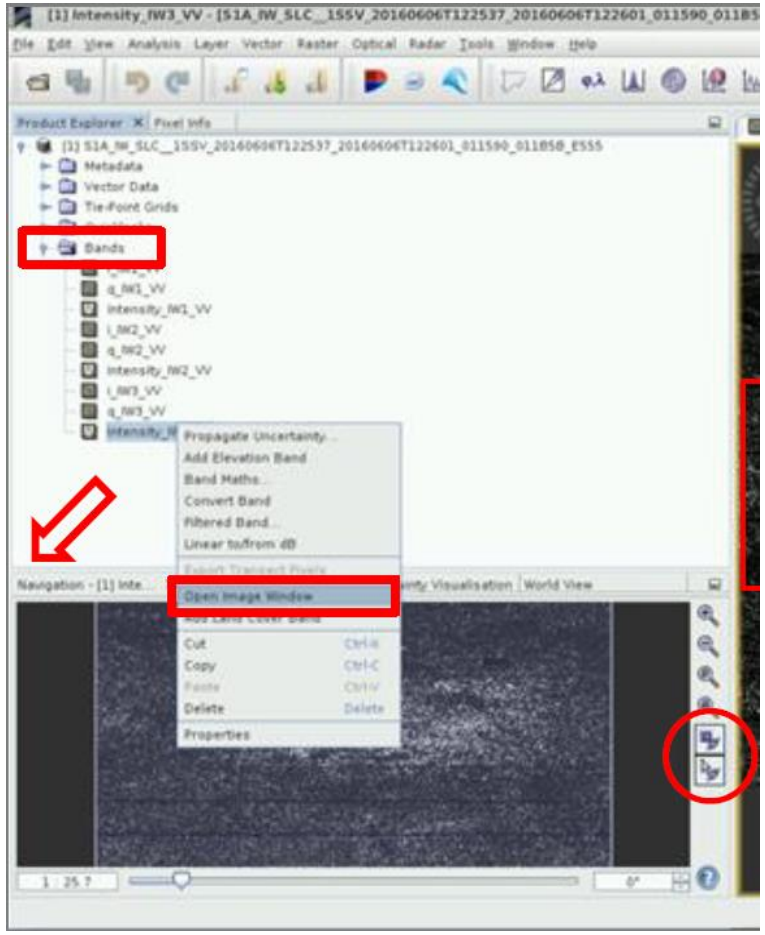
Image Source: JOSH HANER/THE NEW YORK TIMES (http://www.sciencemag.org)

Data Used

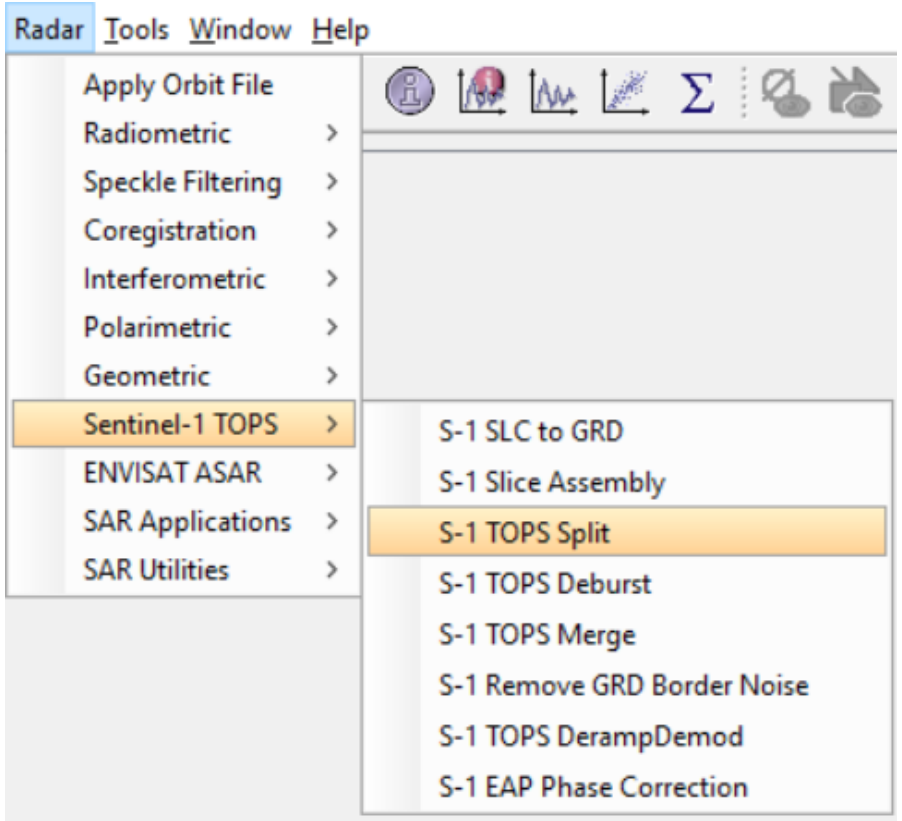
- Two Sentinel-1A images acquired on June 6, 2016 and September 10, 2016 (downloadable @ https://vertex.daac.asf.alaska.edu/)

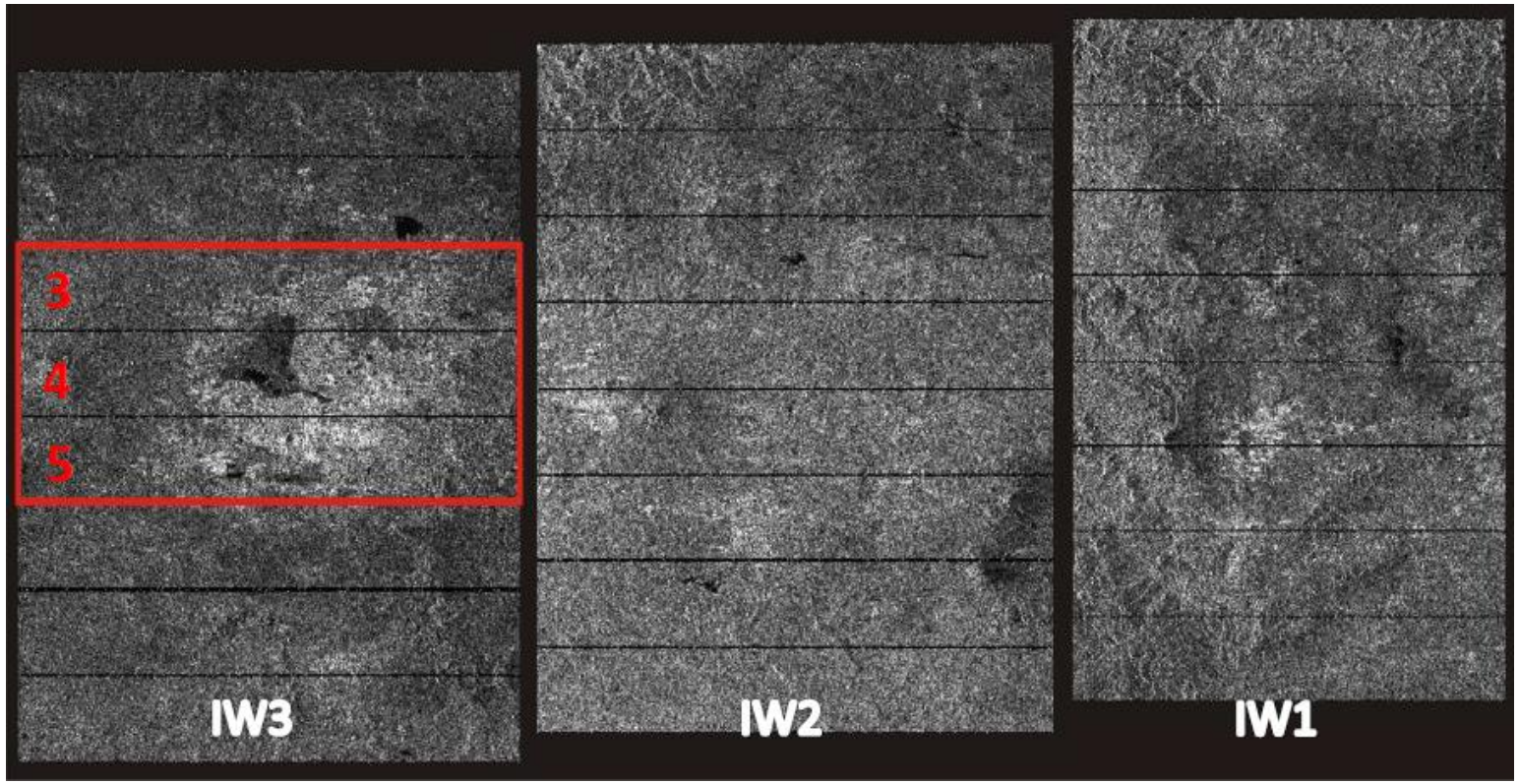
S1A_IW_SLC__1SSV_20160606T122537_20160606T122601_011590_011B5B_E555.zip
S1A_IW_SLC__1SSV_20160910T122542_20160910T122606_012990_0148FA_76D7.zip

Opening a Pair of SLC Products



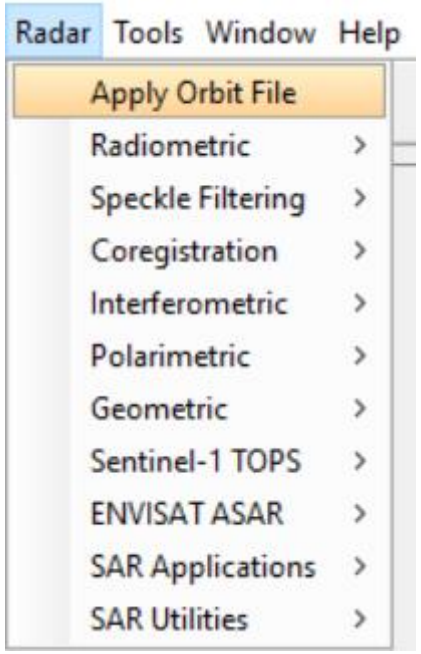
Create Subsets





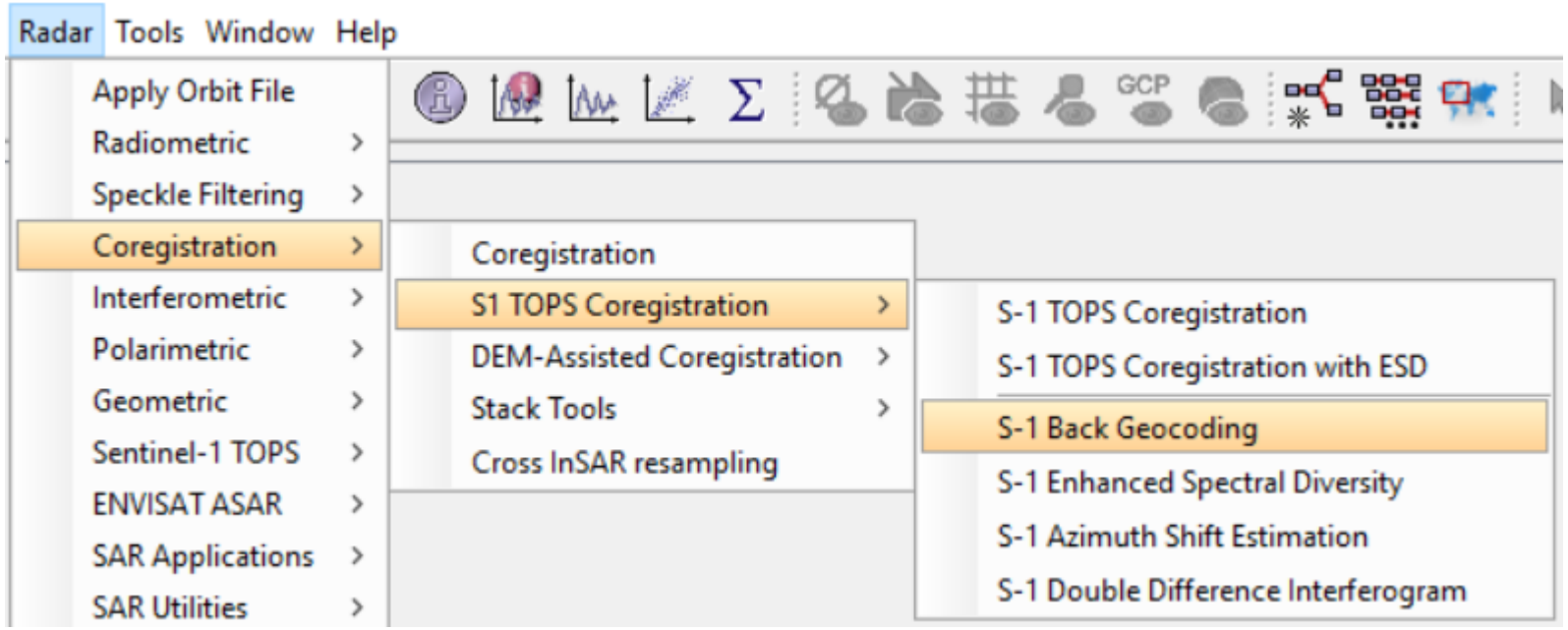
Apply Orbit File

- The first processing step is to apply the orbit files in Sentinel-1 products in order to provide accurate satellite position and velocity information.

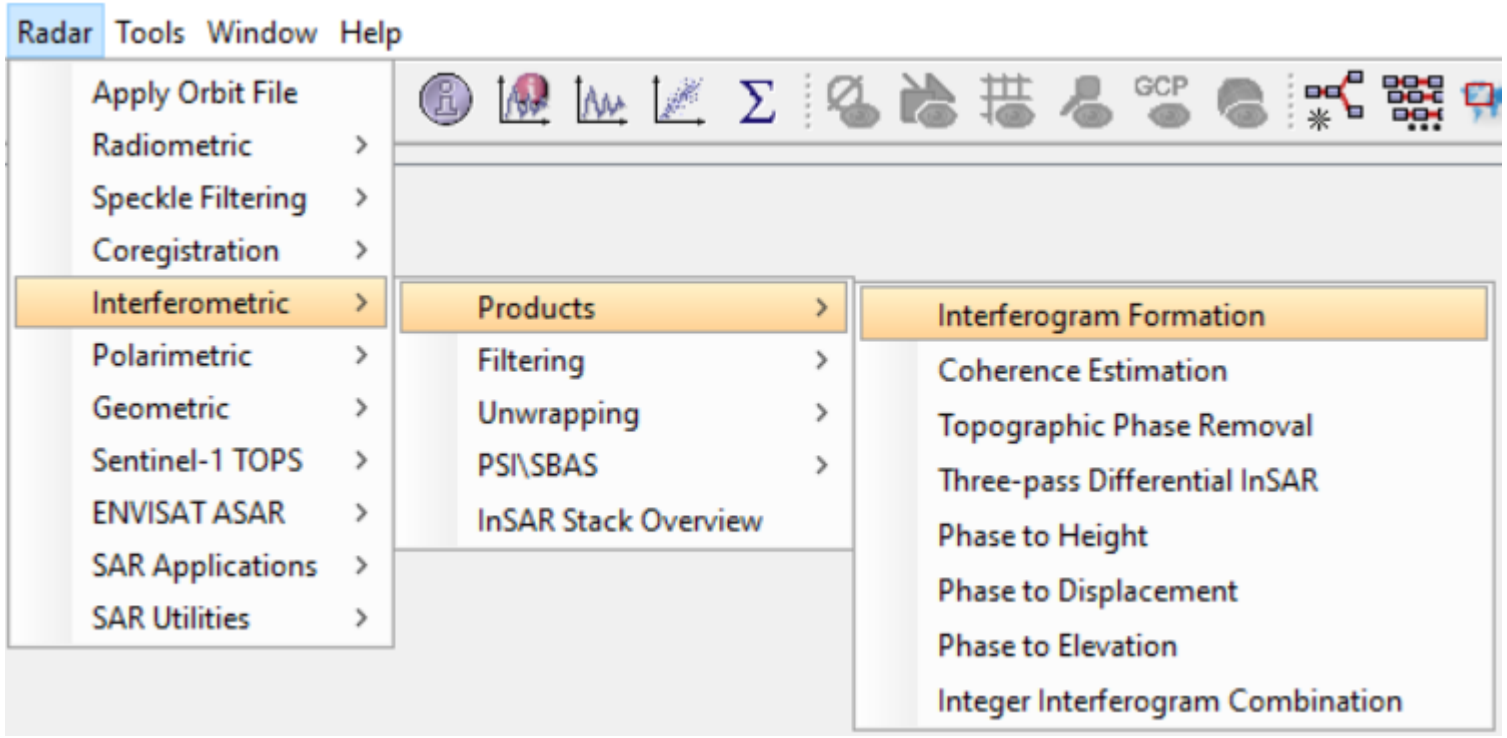


Coregistration

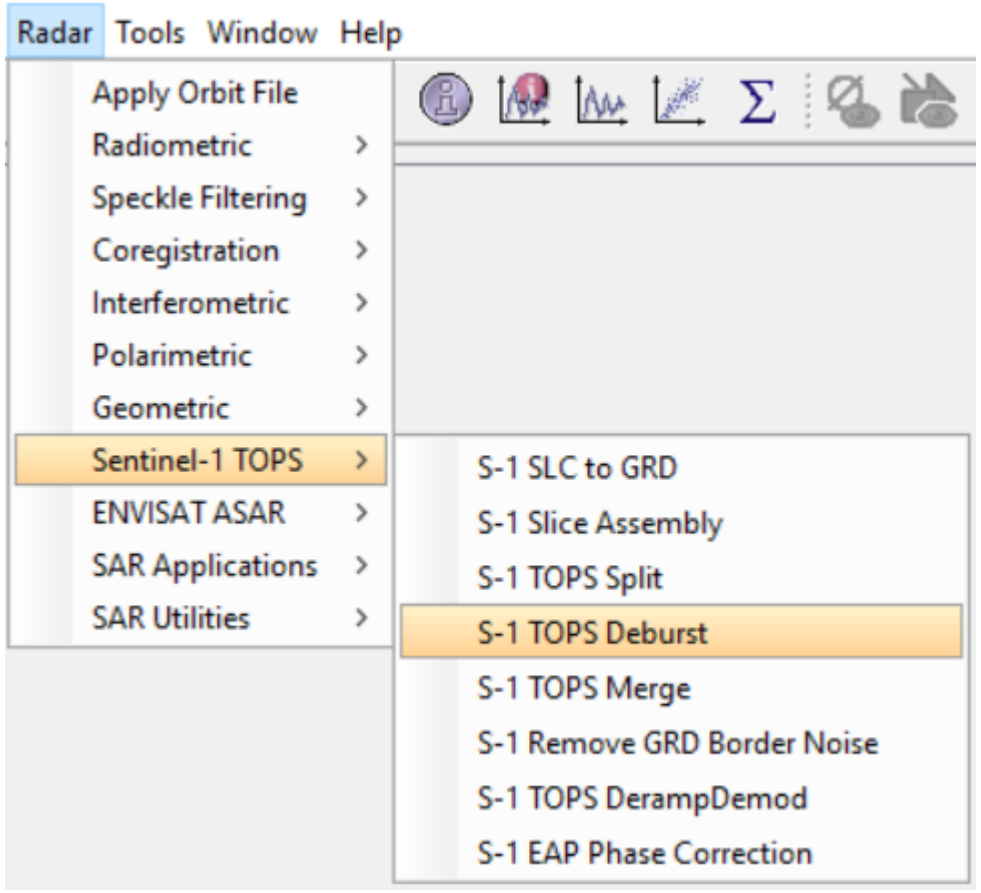
- The phase difference is determined at pixel level on the two images, therefore pixels must correspond.



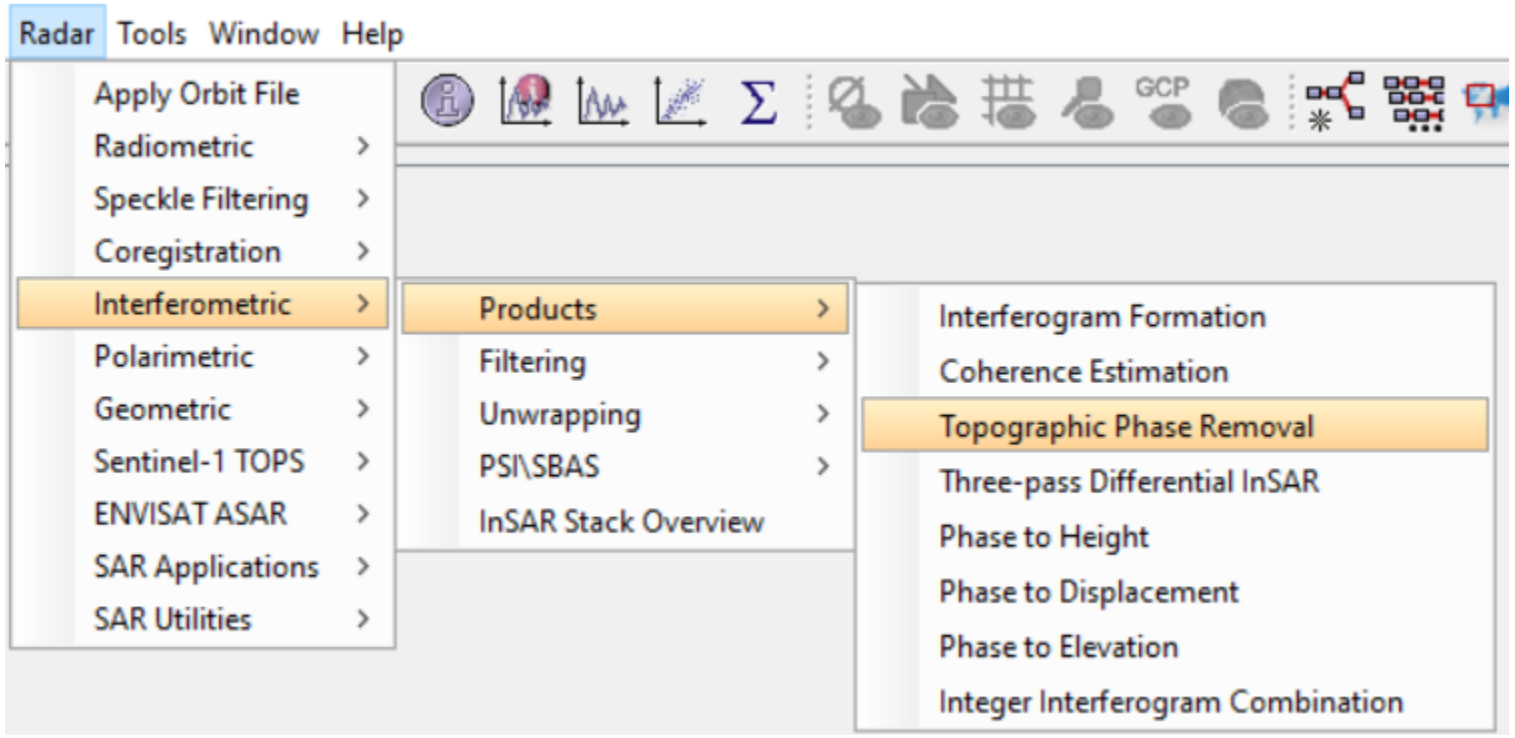
Form the Interferogram



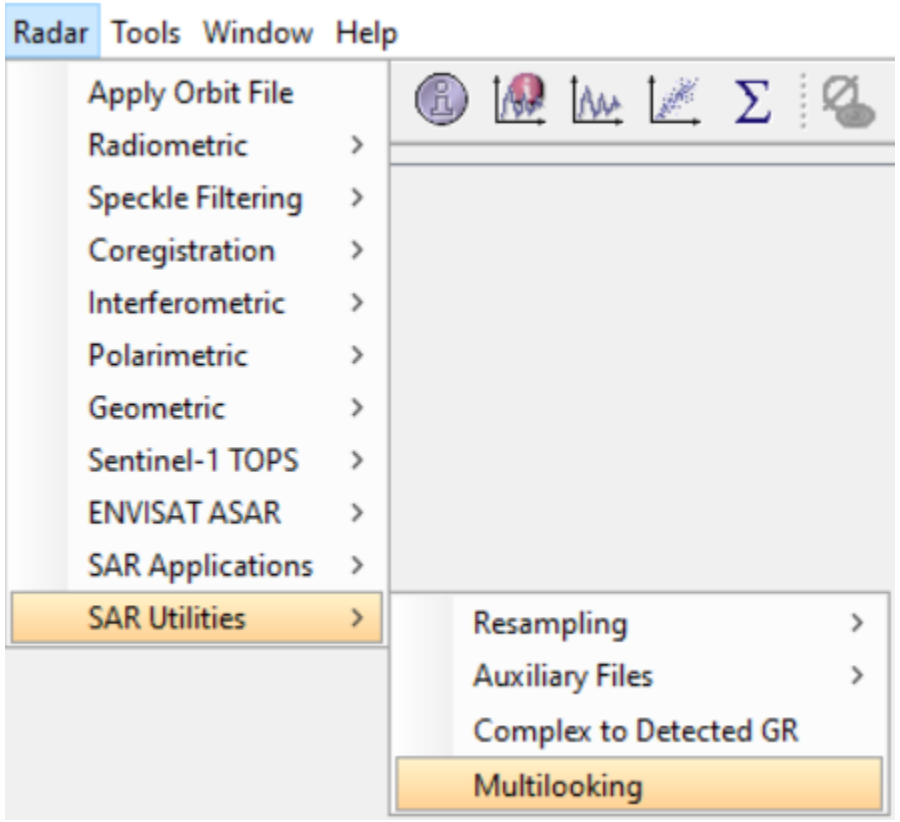
TOPS Deburst



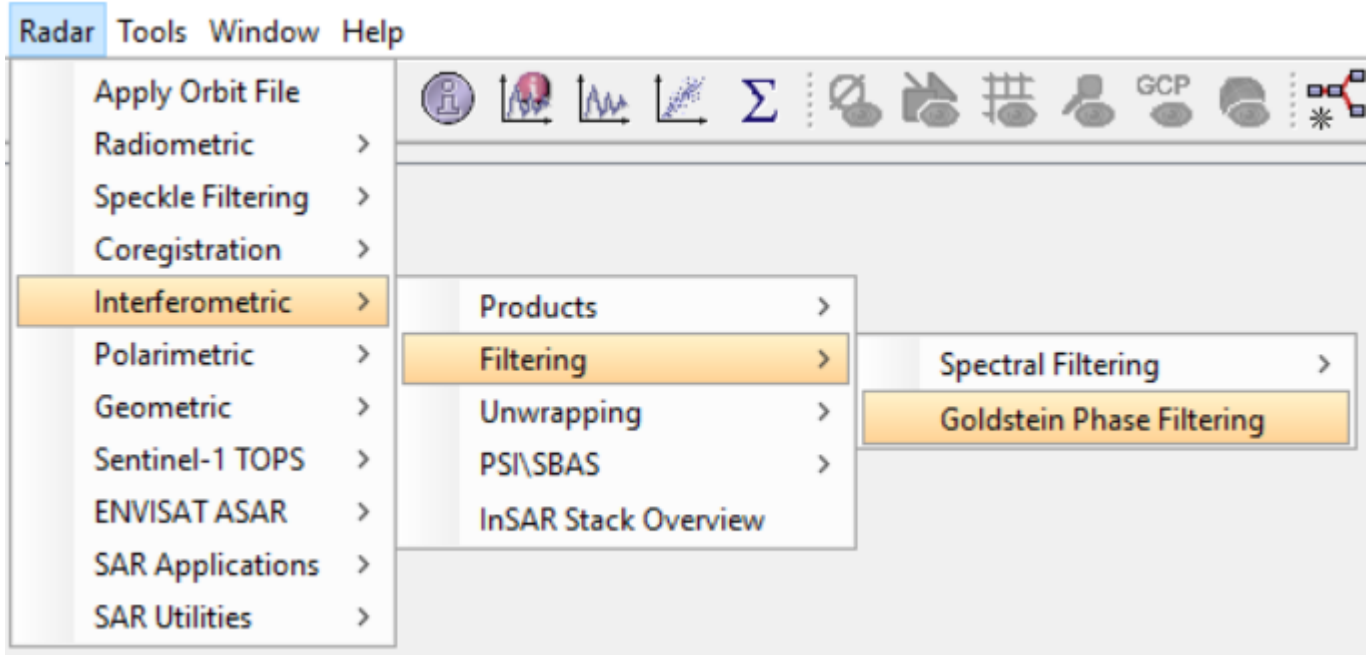
Remove Topographic Phase



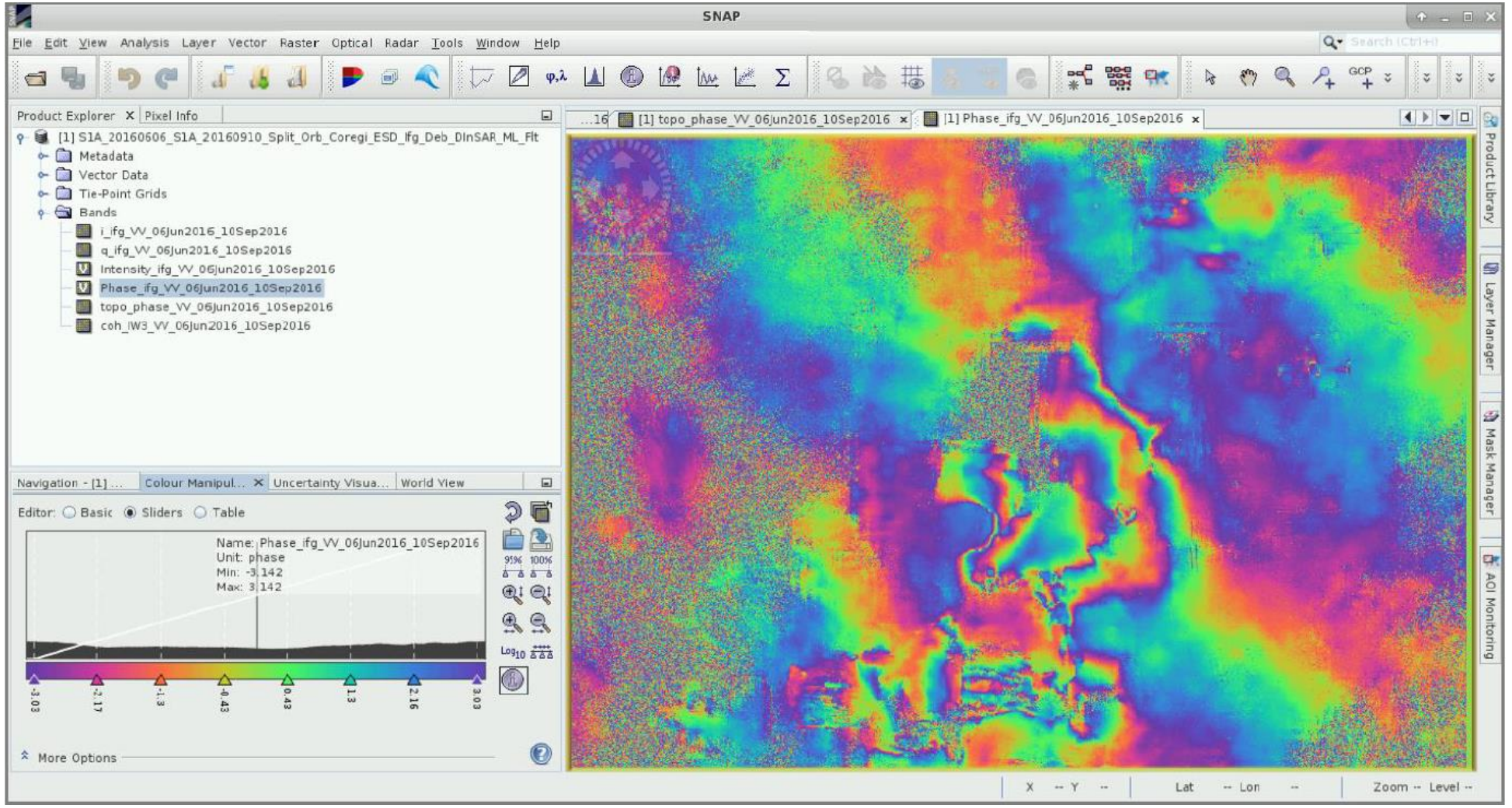
Multi-looking



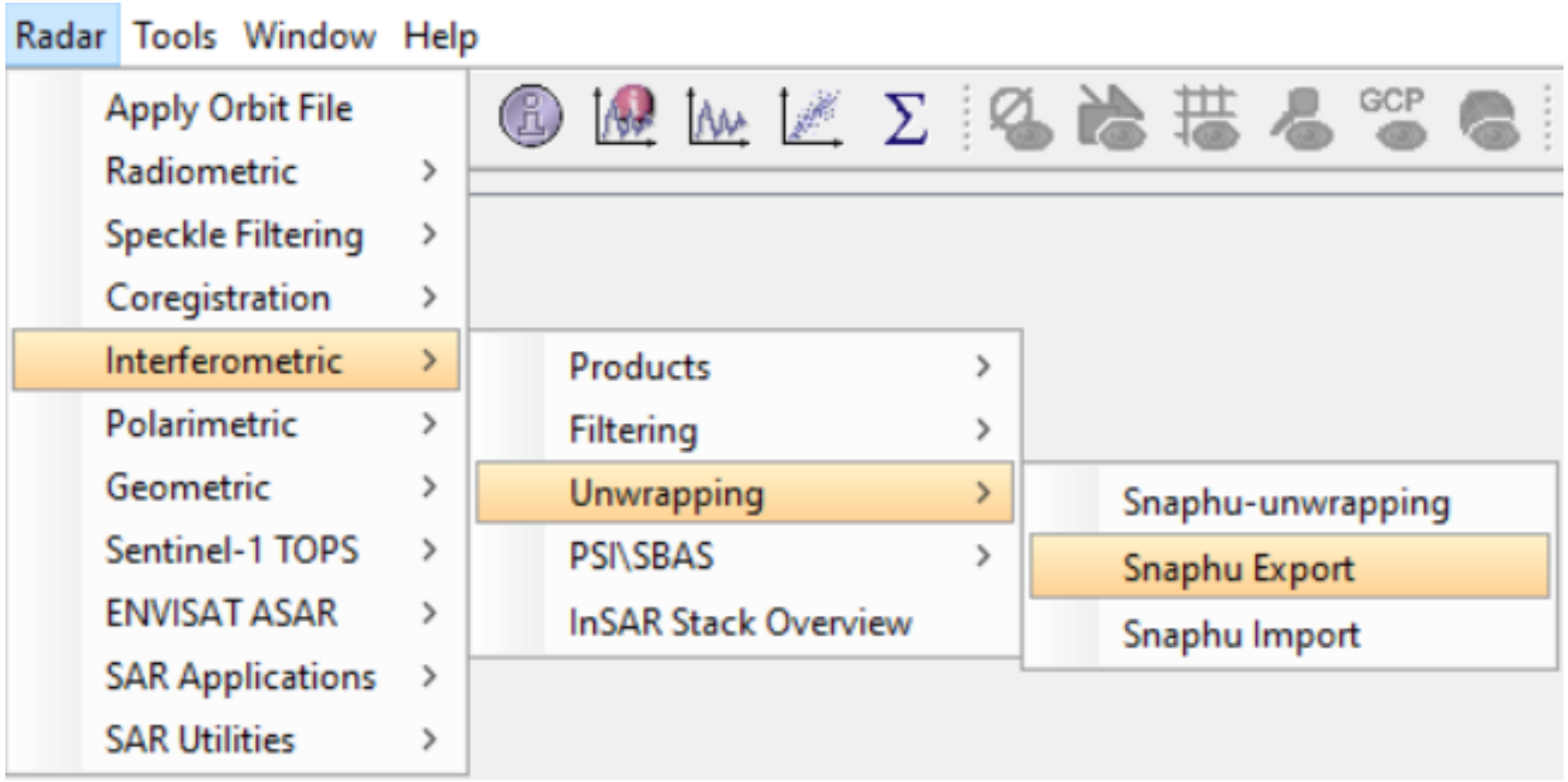
Phase Filtering



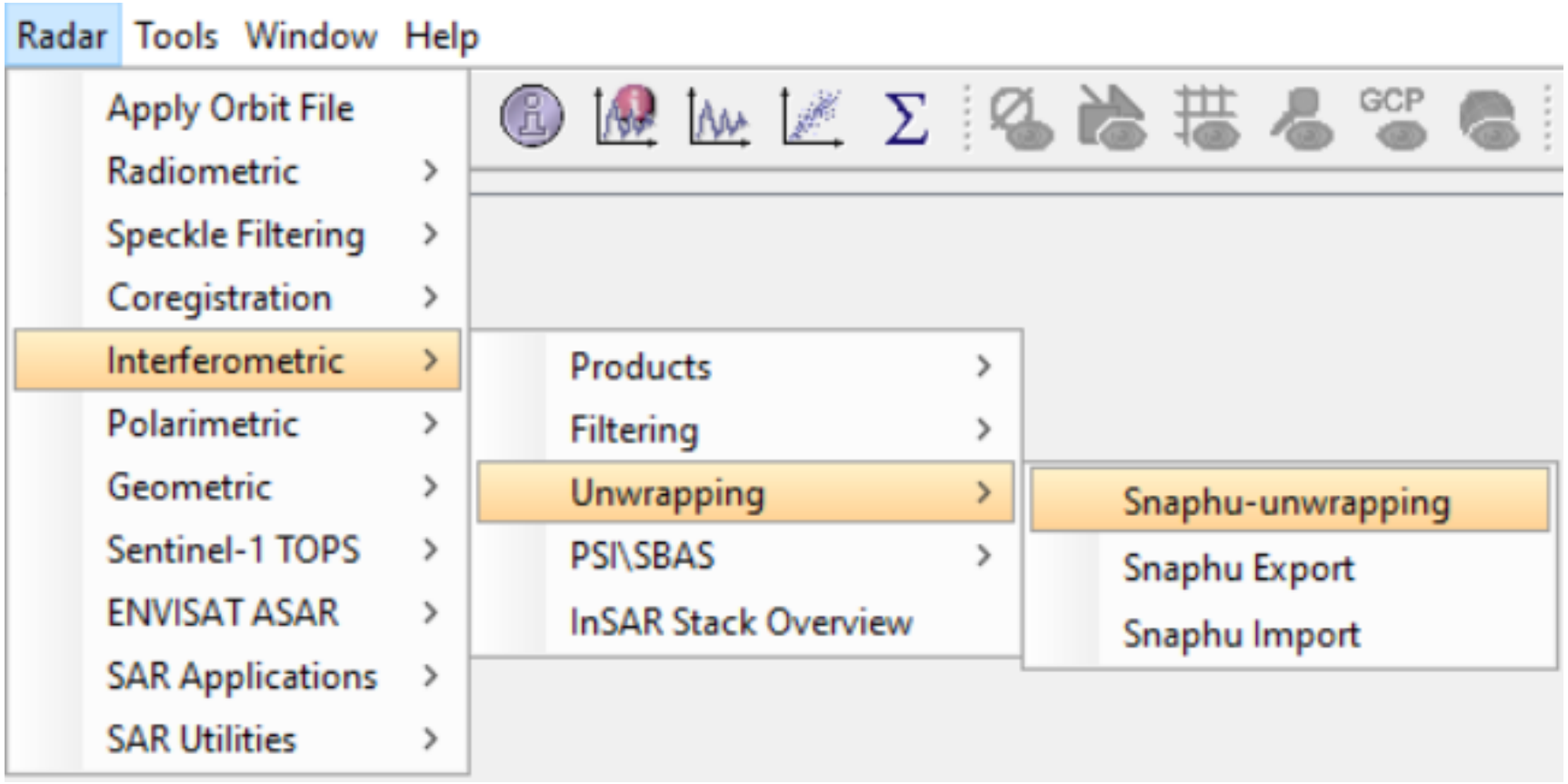
Interferogram



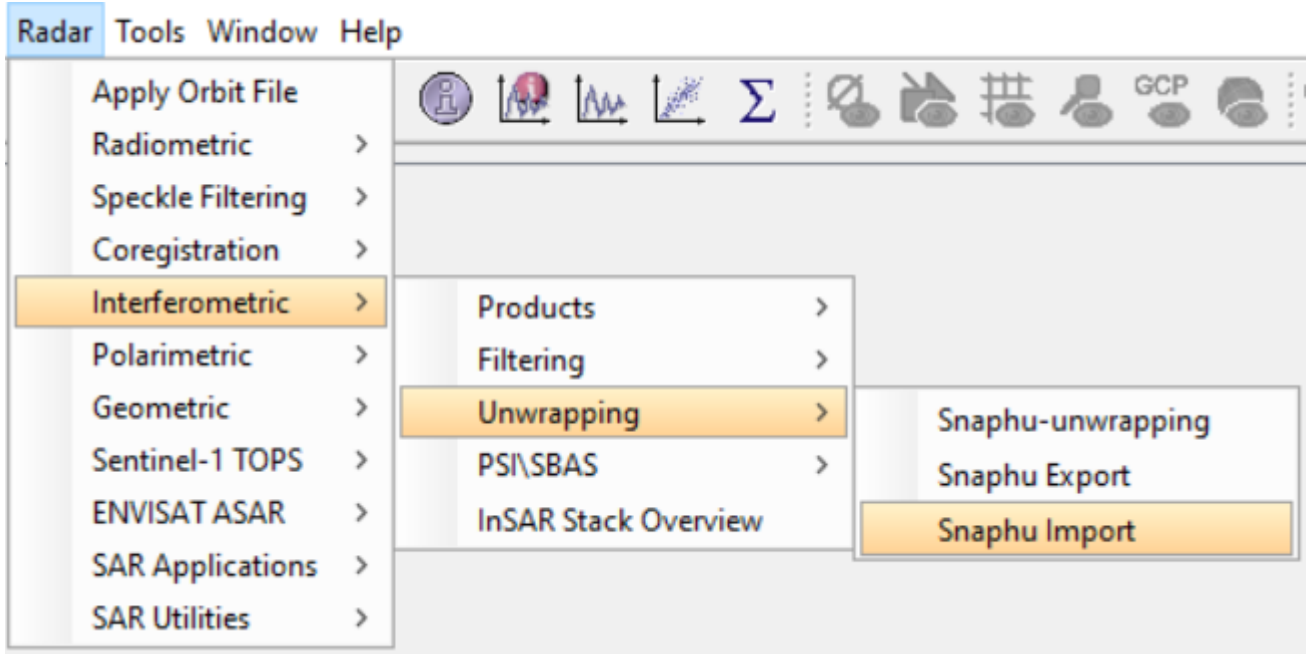
SNAPHU Export



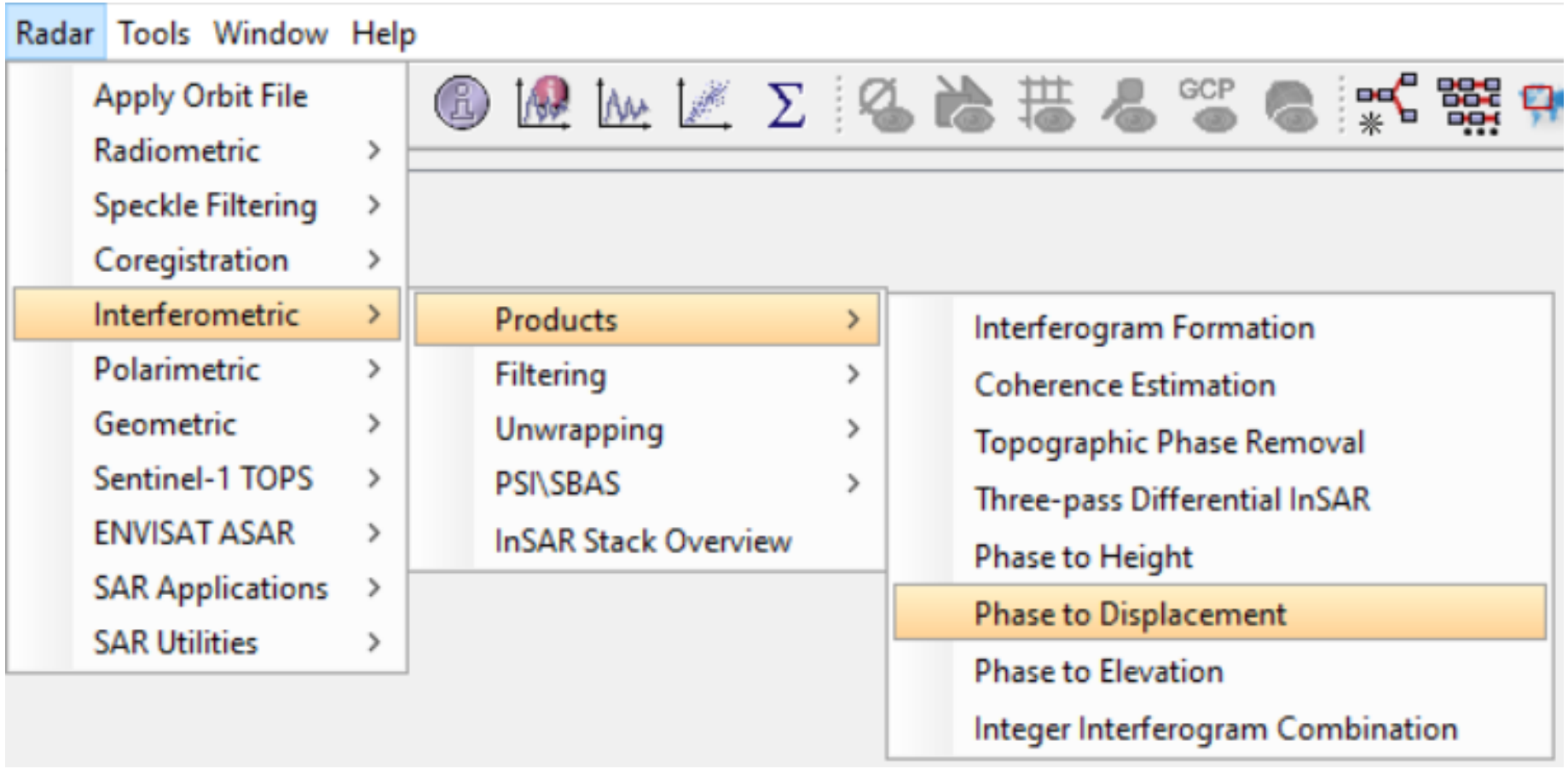
Phase Unwrapping



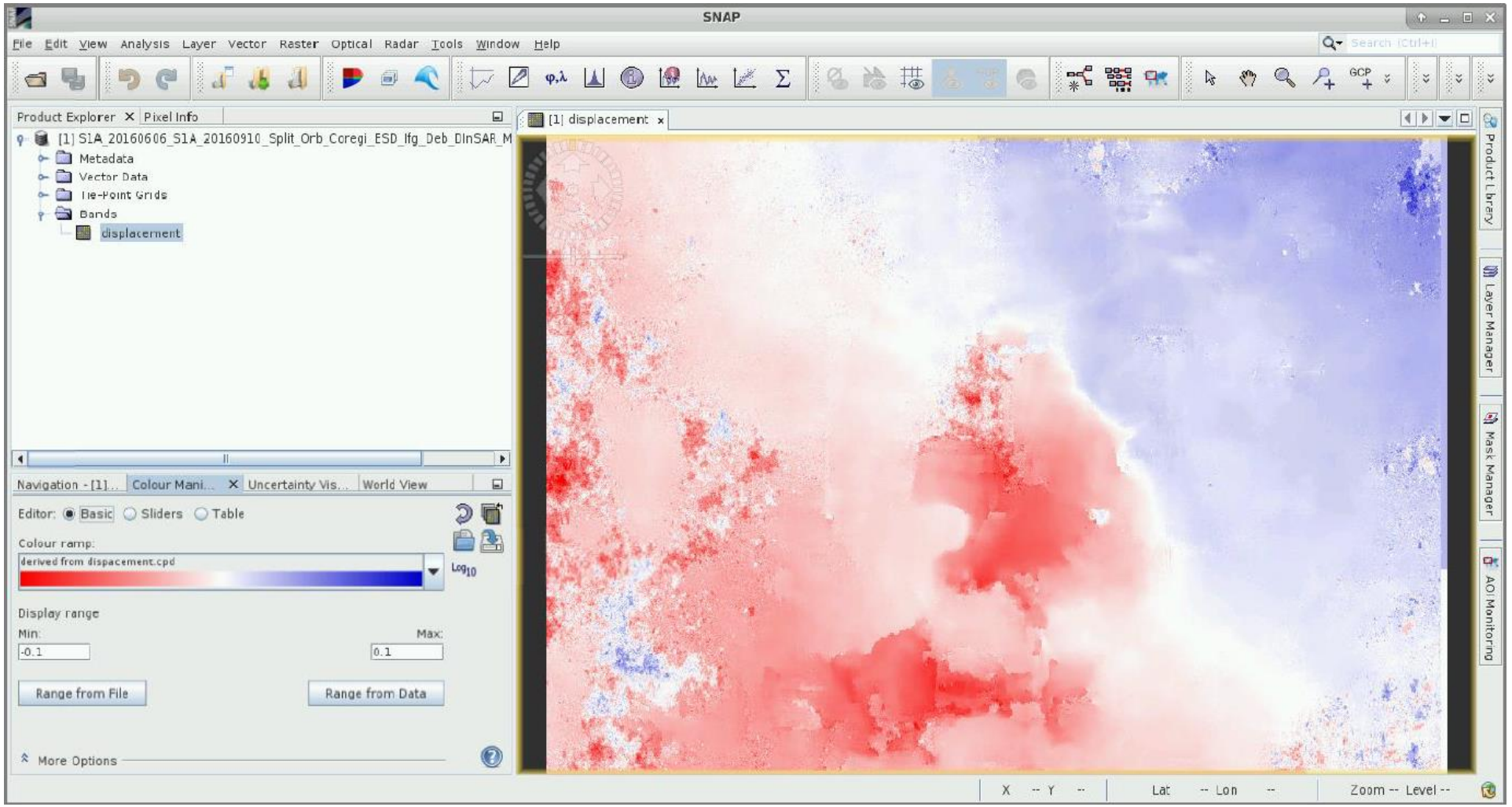
SNAPHU Import



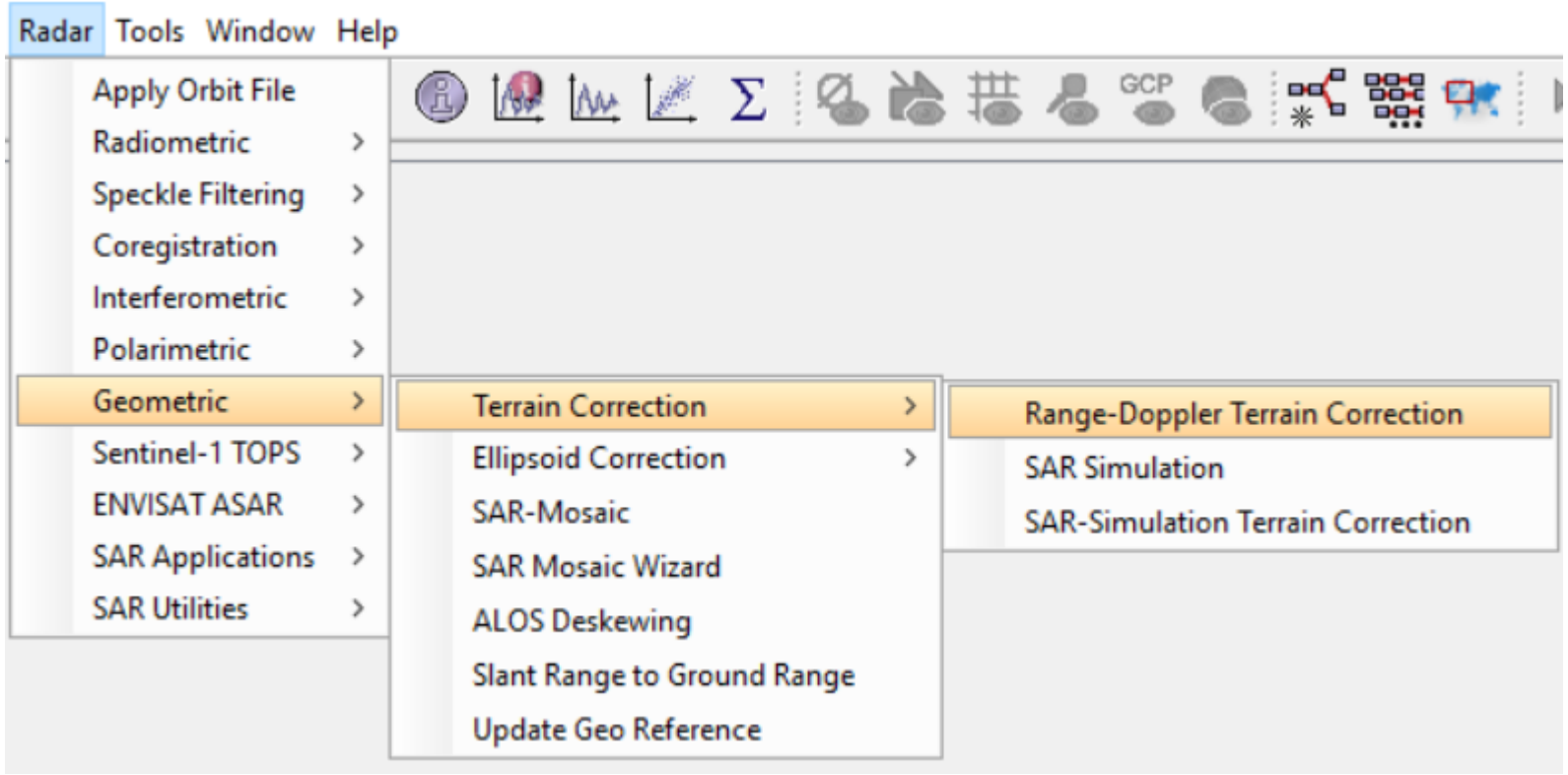
Displacement Map



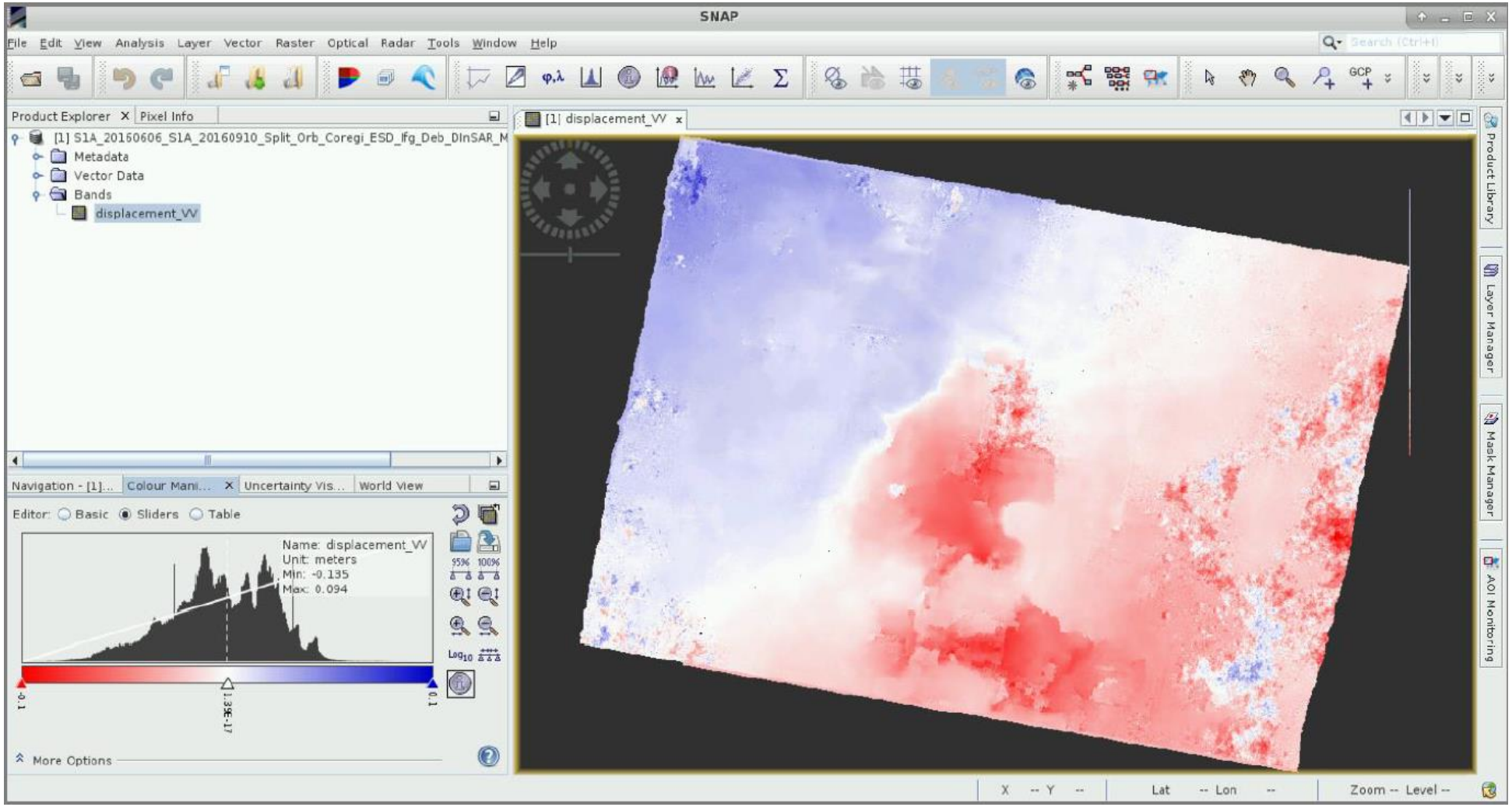
Displacement Map



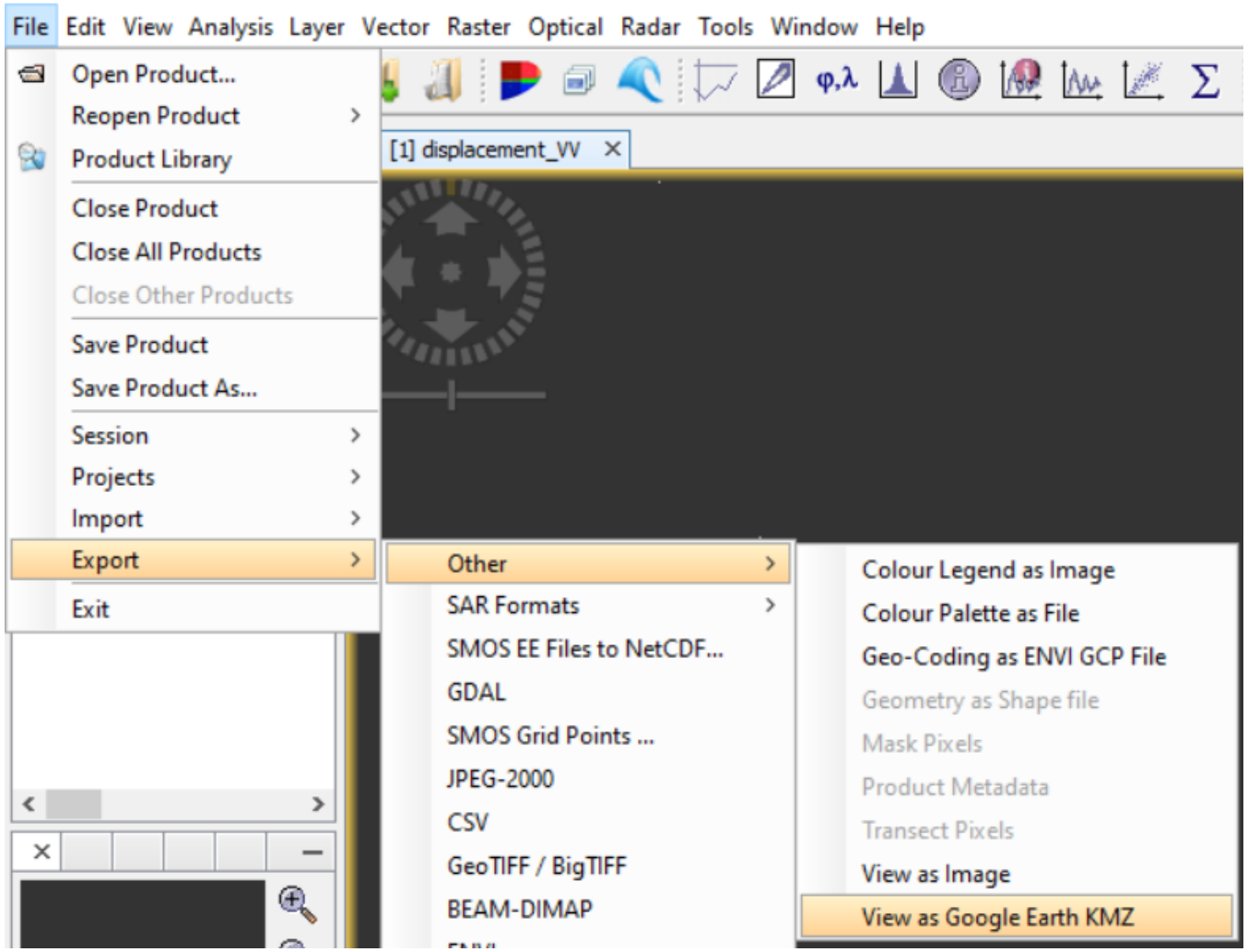
Geocoding


Radar
Tools
Window
Help
Apply Orbit File
Radiometric
Speckle Filtering
Coregistration
Interferometric
Polarimetric
Geometric
Sentinel-1 TOPS
ENVISAT ASAR
SAR Applications
SAR Utilities
GCP
Terrain Correction
Ellipsoid Correction
SAR-Mosaic
SAR Mosaic Wizard
ALOS Deskewing
Slant Range to Ground Range
Update Geo Reference
Range-Doppler Terrain Correction
SAR Simulation
SAR-Simulation Terrain Correction

Geocoded Map



Convert to KMZ



Assignment!

- Create one single graph for all these operations using Graph Builder.

Acknowledgment

Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

Natural Resources Canada | Ressources naturelles Canada

Environment and Climate Change Canada
Environnement et Changement climatique Canada