InSAR Displacement Workflow - Detailed Explanation

1. Read 1 & Read 2

Import two SAR images acquired by Sentinel-1 from different dates. The phase difference between these images is used to measure ground displacement.

2. TOPSAR-Split

Split the data into sub-swaths (IW1, IW2, IW3). Sentinel-1's TOPS mode has overlapping sub-swaths, which need splitting for focused processing.

3. Apply Orbit File

Corrects the satellite's orbital position using precise orbit data, reducing geometric errors for better image alignment.

4. Back Geocoding

Aligns master and slave images accurately using a Digital Elevation Model (DEM) to account for terrain variations, ensuring accurate phase difference measurement.

5. Interferogram Formation

Computes the phase difference between master and slave images to produce an interferogram with amplitude and phase data. Phase data reveal ground displacement.

6. TOPSAR-Deburst

Merges bursts of the same sub-swath to create a seamless interferogram, ensuring complete coverage for displacement analysis.

7. Subset

Focuses on the region of interest, minimizing data size and optimizing processing efficiency.

8. Goldstein Phase Filtering

Applies a spectral filter to reduce noise and improve the signal-to-noise ratio, aiding in accurate phase unwrapping.

9. Snaphu Export

Prepares the interferogram for phase unwrapping using the Snaphu tool. Phase unwrapping converts wrapped phase (-pi to pi) to continuous values for precise displacement measurement.

Summary:

The InSAR displacement workflow detects ground displacement by analyzing phase differences between SAR images. It is valuable for monitoring natural hazards like earthquakes or human-induced changes such as mining or urban development.