Instructions for practical exercises

Pre-processing and multi-temporal analysis of SAR time series

Multitemporal Analysis using SAR Coherence-Intensity composites

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Objectives

- Familiarize with SNAP toolbox

- Familiarize with Sentinel-1 SLC products

- Calculating backscatter intensity from Sentinel-1 SLC products

- Calculating interferometric coherence

- Analysing coherence and intensity fals colour composites

Dataset

Set of two Sensintel-1 SLC products over China

S1A_IW_SLC__1SDV_20151003T222043_20151003T222111_007994_00B2F6_4C0E.zip

S1A_IW_SLC__1SDV_20171115T222013_20171115T222041_008298_00EAE8_F7A2.zip

Data preparation

Both SLCs were splitted - only one subswath and 4 bursts were selected

In order to split SLC products follow these steps:

File/Open Products

Radar/Sentinel-1 TOPS/S-1 TOPS Split

Input: *S1A_IW_SLC__1SDV_20151003T222043_20151003T222111_007994_00B2F6_4C0E.zip*

Output:
S1A_IW_SLC__1SDV_20151003T222043_20151003T222111_007994_00B2F6_4C0E_Split

Processing parameters

Subswath – IW1

Polarisation – VV

Bursts – 2-5

1. Interferometric Coherence

1.1 Coregistration

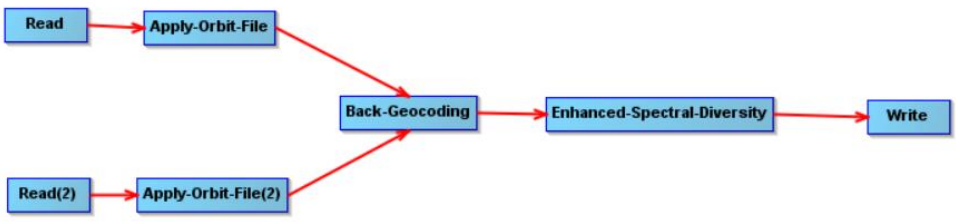
Tools/Graph Builder

Input: *S1A_IW_SLC__1SDV_20151003T222043_20151003T222111_007994_00B2F6_4C0E*

S1A_IW_SLC__1SDV_20171115T222013_20171115T222041_008298_00EAE8_F7A2

Output: SLC_Stack.dim

Parameters:



Read: *S1A_IW_SLC__1SDV_20151003T222043…*

Read(2): *S1A_IW_SLC__1SDV_20171115T222013…*

Apply orbits: Sentinel Precise

Back Geocoding: DEM SRTM3sec, Resampling Bilinear_interpolation, Mask areas without elevation

1.2 Coherence

Radar/Interferometric/Products/Coherence Estimation

Input: SLC_Stack.dim

Output: SLC_Stack_coh.dim

Parameters:

Coherence Range Window 10

1.2 Debursting

Radar/Sentinel-1 TOPS/S-1 TOPS Deburst

Input: SLC_Stack_coh.dim

Output: SLC_Stack_coh_deb.dim

Parameters: -

1.3 Terrain Correction

Radar/Geometric/Terrain Correction/Range-Doppler Terrain Correction

Input: SLC_Stack_coh_deb.dim

Output: SLC_Stack_coh_deb_TC.dim

Parameters:

Digital Elevation Model SRTM3sec

Pixel spacing 20m

Map projection WGS84

Mask areas without elevation

2. Backscatter Intensity

Tools/Graph Builder

Input: SLC product (splitted IW1,bursts 2-5) eg. *S1A_IW_SLC__1SDV_20151003T222043…*

Output: SLC_Intensity.xml

Parameters:

Apply orbits – Sentinel Precise

Calibration – Output Sigma0 band

TOPSAR Deburst – VV

Terrain Correction – same as in point 1.3

Output- *S1A_IW_SLC__1SDV_20151003T222043…_Orb_Cal_Deb_TC*

Tools/Batch Processing
Input : both SLCs
Load graph: SLC_Intensity.xml

3. Coherence-intensity Stack

Radar/Coregistration/Stack Tools/Create Stack
Input: S1A_IW_SLC__1SDV_20151003T222043…_Orb_Cal_Deb_TC
S1A_IW_SLC__1SDV_20171115T222013…_Orb_Cal_Deb_TC
SLC_Stack_coh.dim

Output: Coherence_intensity_Stack.dim
Parameters:
Resampling type: NONE
Initial Offset Method: Product Geolocation
Output Extents: Master

4. Conversion of sigma0 to dB

Right click in the Product Explorer on the name of the band to be converted (product created in section 3)

Select ‘Linear to/from dB’

Right click on newly created band sigma0_db

Select ‘Convert band’

5. Creating new band – average and difference

Raster/Band Maths
Name: diff_sigma
Band math expression (use edit expression) : Sigma0_VV_db_2017 – Sigma0_VV_db_2015

Raster/Band Maths
Name: average_sigma
Band math expression (use edit expression) : (Sigma0_VV_db_2017 + Sigma0_VV_db_2015)/2

6. Creating RGB

Right click on the name of the product created in 5 (in Product Explorer)
Open RGB Image Window
R: coherence
G: average sigma0
B: difference sigma0