

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. **Coregistration**

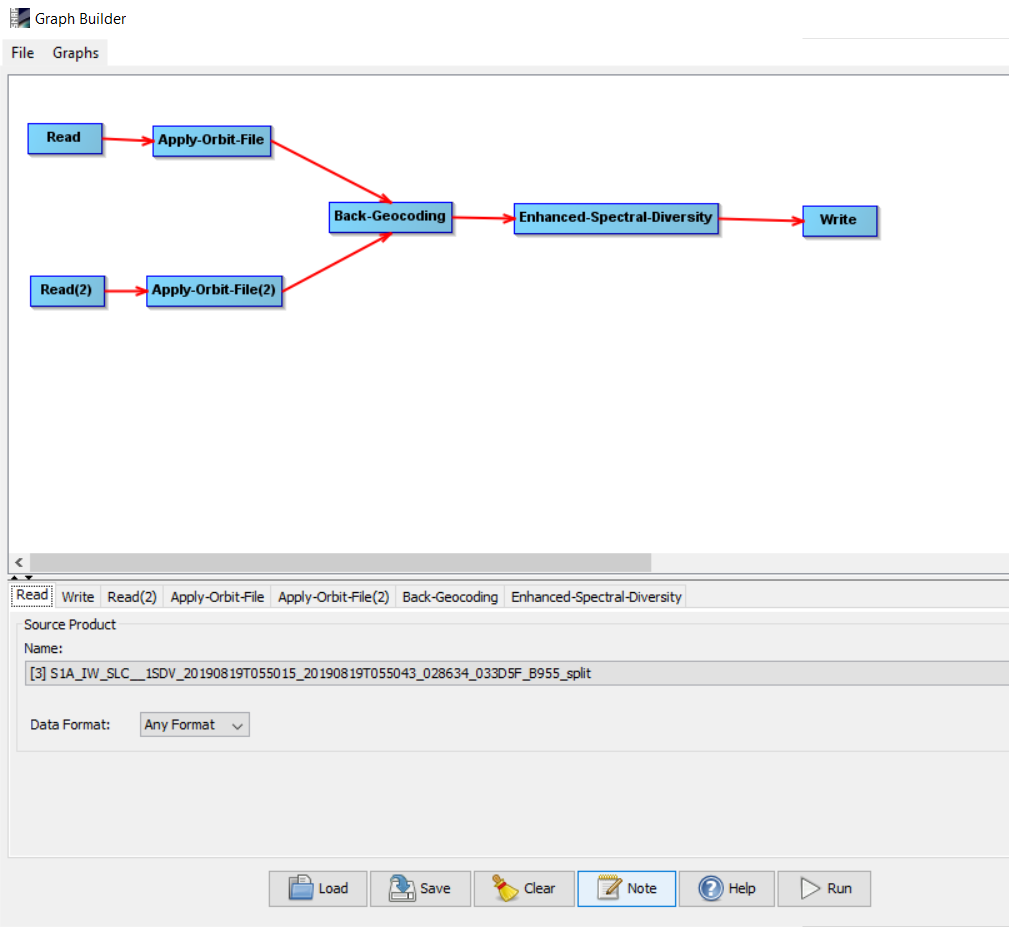
*Tools/Graph Builder*

Input: *S1A\_IW\_SLC\_\_1SDV\_20151003T222043\_20151003T222111\_007994\_00B2F6\_4C0E*

*S1A\_IW\_SLC\_\_1SDV\_20171115T222013\_20171115T222041\_008298\_00EAE8\_F7A2*

Output: SLC\_Stack.dim

Parameters:

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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. Debursting

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

Input: SLC\_Stack\_coh.dim

Output: SLC\_Stack\_coh\_deb.dim

Parameters: -

* 1. 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

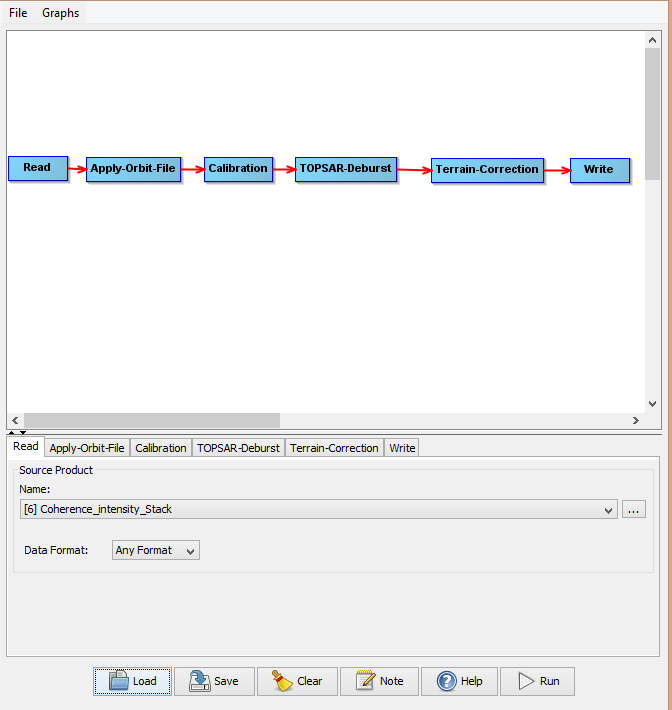
1. Backscatter Intensity

*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

1. 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

1. 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’

1. 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

1. 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