Sentinel Intensity Time Series SARscape Modeler

Version 1.0

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General Information

Examples of SARscape Modeler workflows can be find in in the installation folder (C:\Program Files\SARMAP SA\SARscape\examples\modeler_examples). We suggest keeping the already set parameters to obtain the results shown in this tutorial.

The main steps of this tutorial are described by a number. Steps that are not characterized by a number are not mandatory.

This symbol ✎ specify a practical step that the user should perform in order to proceed with the tutorial.

Steps that are not identified by this symbol must not be modified. If parameters will be modified results obtained in this tutorial are not guarantee.

DownloadSentinel1IwImportSampleSelectionITS

This model allows users to:

Download GRD Sentinel-1 data from July 1st to 31st 2018 given an area of interest for a specific relative orbit, to import the downloaded Sentinel-1 images; to download the SRTM3 V4 DEM; to extract a spatial subset using a vector file; to coregistrate the subsampled images; to apply the De Grandi Spatio-Temporal filtering; to geocode the filtered images; to view the filtered images, to extract multitemporal features from the geocoded images, to view to the computed multitemporal features, to collect the results as outputs.

Sentinel-1 data has to be used to perform this task.

Data used in this tutorial are available in our FTP site, please, contact us at support@sarmap.ch to get login credentials.
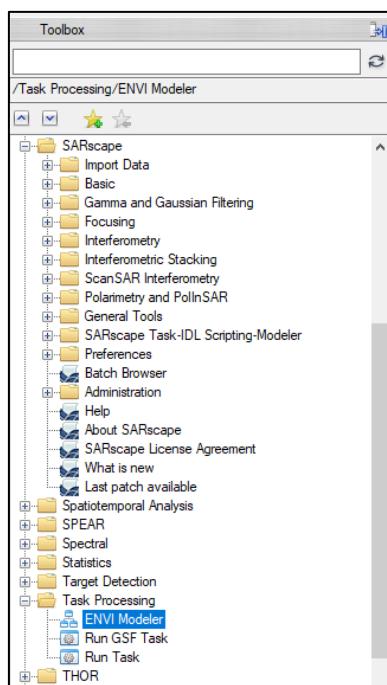
Figure 1 ENVI Modeler in ENVI Toolbox.

✎ Start ENVI Modeler (Figure 1). Click the Open button in the ENVI menu bar, navigate to the examples folder in your SARscape installation path (i.e.: C:\Program Files\SARMAP SA\SARscape\examples\modeler_examples) and select the "DownloadSentinel1IwImportSampleSelectionITS". The model opens in an ENVI Layout window, the model will appear as in Figure 2.
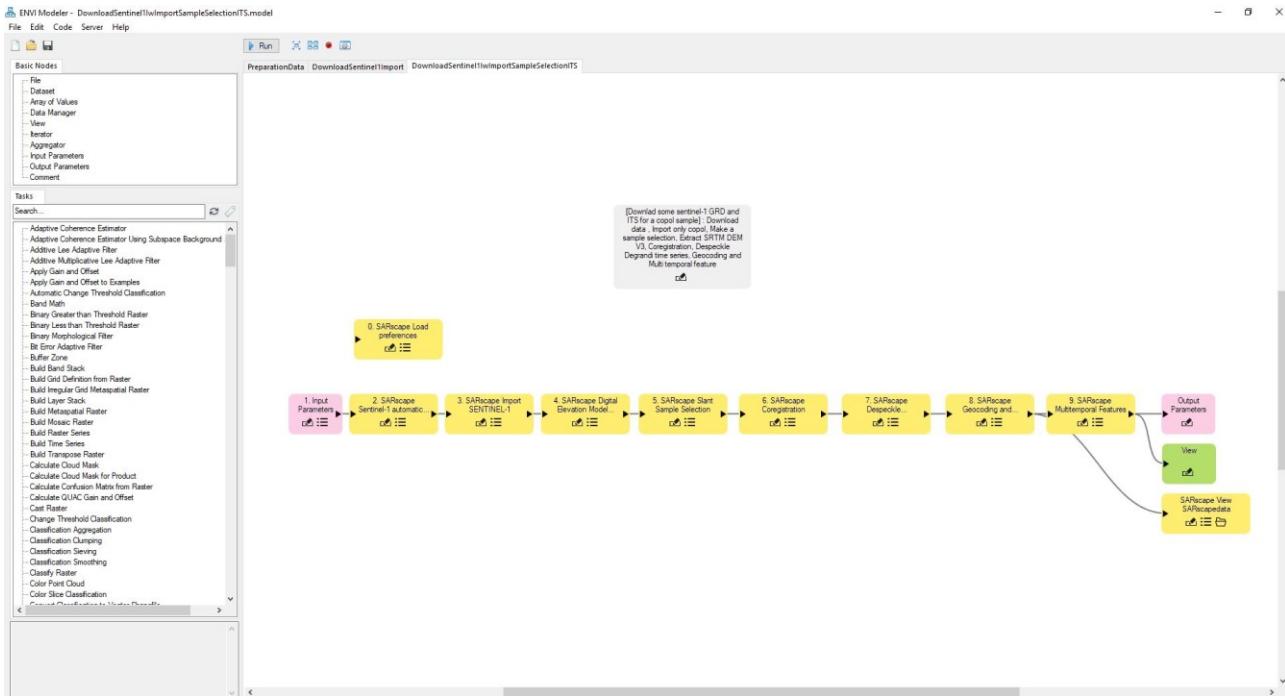
Figure 2 The example model in ENVI Modeler.

This model can be run as it is, each parameter is set to properly work.

✍ Click the Run button in ENVI Modeler window to run the model.

Step 0: SARscape Preferences

It loads SARscape Preferences. TOPSAR preferences are set. This step is not mandatory.

The processing will stop since any data has been added. It will open the Input Parameter tasks to add data (Step 1).

Step 1 Input Parameters

✍ Fill out the fields in the dialog box as in Figure 3 including:

- Login - USERNAME and Login – PASSWORD: set the username and password obtained by registering on the Sentinels Scientific Data Hub https://scihub.copernicus.eu/dhus/.

- Out Cartographic System: make sure it is set to *GEO-GLOBAL* (see Sentinel Download tool Help).

- Area of Interest: set the area of interest including the AOI-TEST-Sentinel.shp file (this shapefile is available in the modeler examples folder).

- Common URI for output: set the filename to create the output, which is not mandatory. In this case it means that output files will be saved in the ENVI temporary folder.

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Outputs will be created for: Sentinel download, Geocoding and Radiometric Calibration and Multitemporal Features tasks. For this example, make sure to fill out the Common URI for outputs, otherwise results will be created in the ENVI temporary folder.

Once the model is set the completed task will appear in green color and a progress bar will describe the running processing step and view the progression of that step (Figure 4).
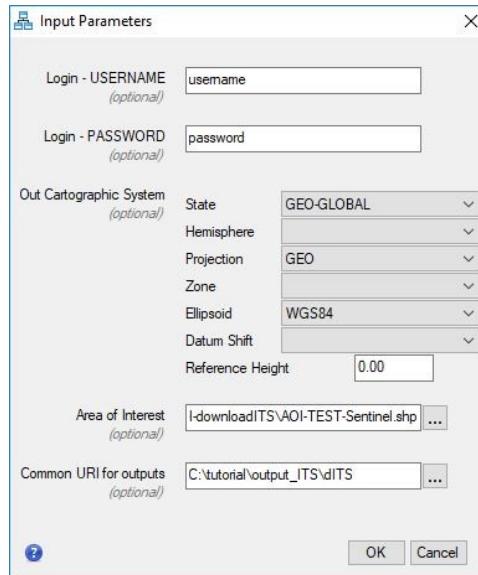
Figure 3 Input parameters task.
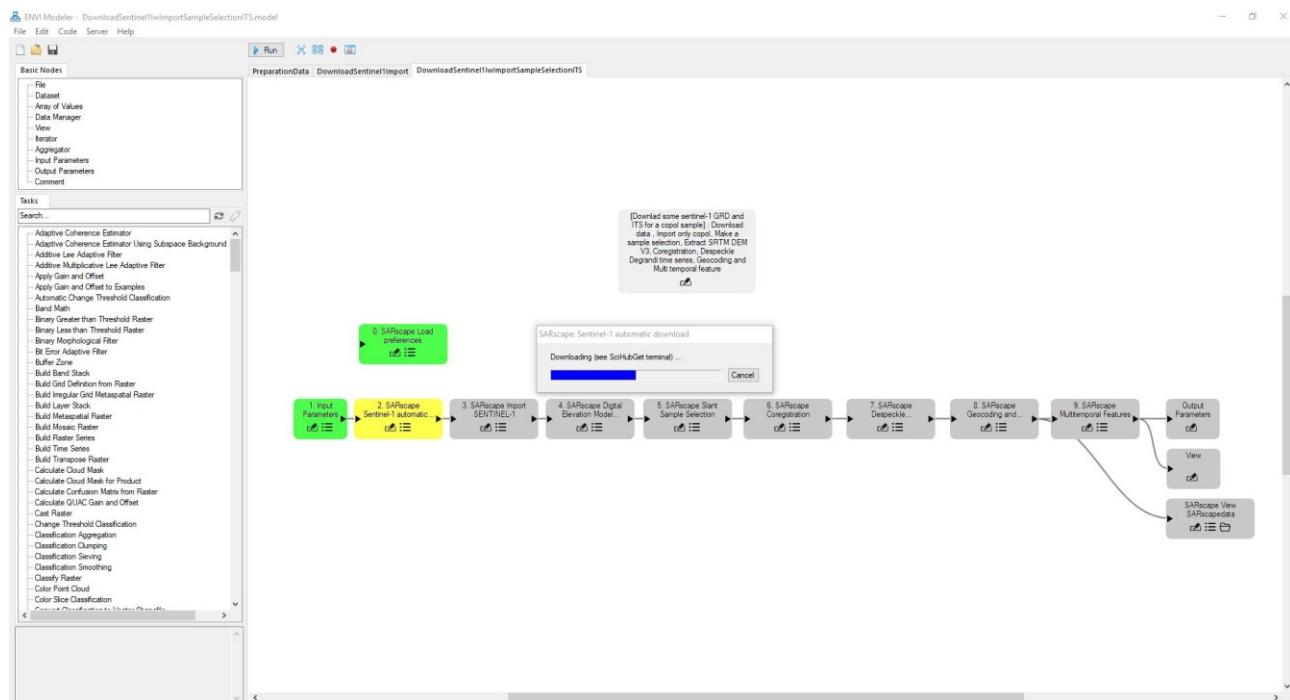
Figure 4 Running model appearance.

Step 2 SARscape Sentinel-1 automatic download.

This task will download Sentinel-1 data (Figure 4). Coordinates for the download are reported in Figure 5. The sensing dates are July 1st-July 31st, 2018, the Platform name is set to Sentinel-1, the Product Type is set to GRD, Acquisition Mode is set to IW, the Relative Orbit Number is 88. Login USERNAME, Login PASSWORD and Common URI for outputs have been autocompleted based on the Input Parameters. Please, set proxy information if needed. The downloaded data are saved in the output as set in *Common URI for outputs*.

Note: Once a parameter has been already set in a previous step, as in this case Login USERNAME and PASSWORD, the corresponding field will be autocompleted. Please, create an account with login credentials as reported in Sentinel Data Download tool Help.
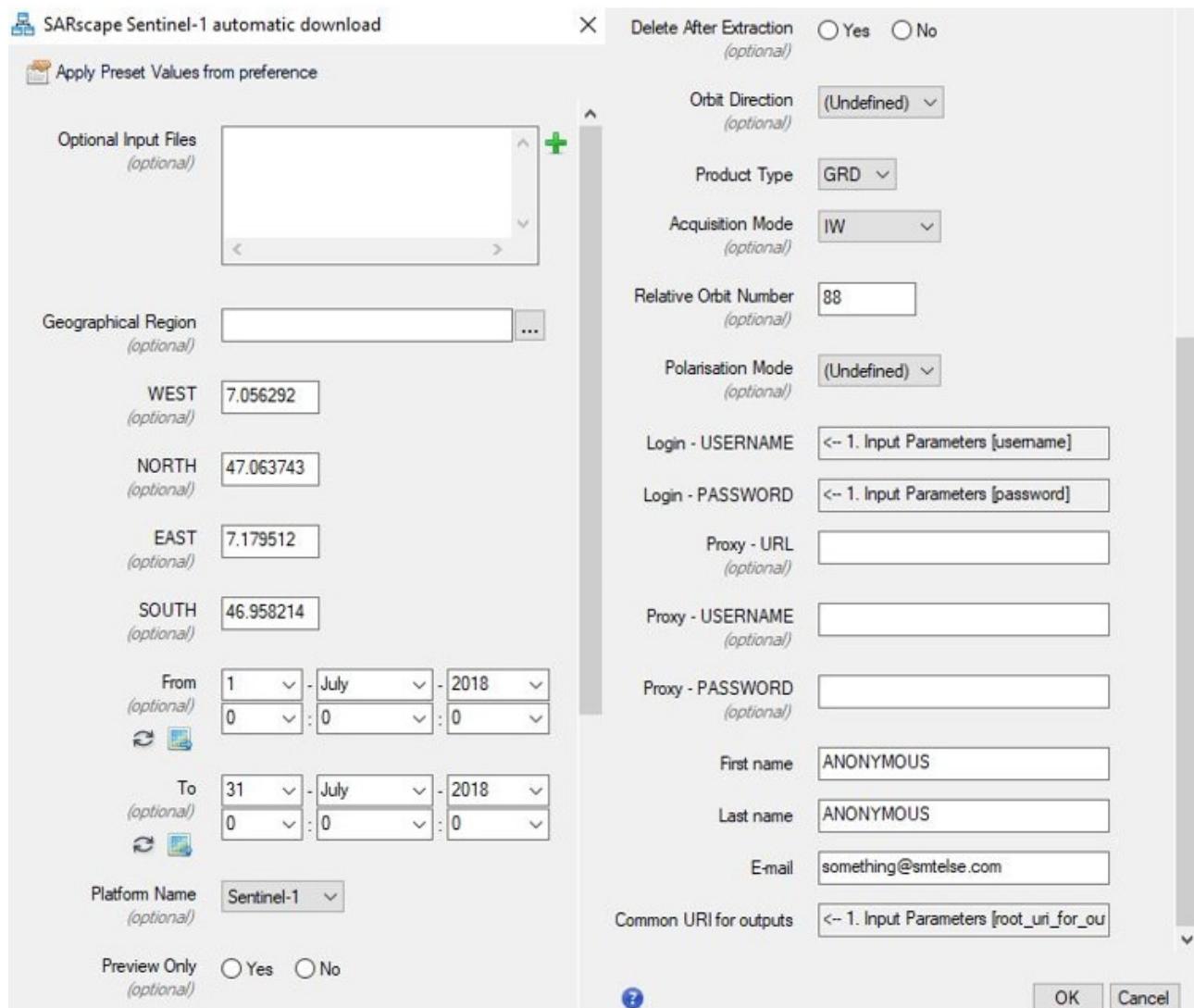
Figure 5 SARscape Sentinel automatic panel. The coordinates have to be included in the corresponding fields.

Step 3 SARscape Import Sentinel-1

This task imports only copolarized data that have been downloaded using the Sentinel-1 automatic download task.

Note: Imported data will be saved in the output folder since the common URI for outputs is set.
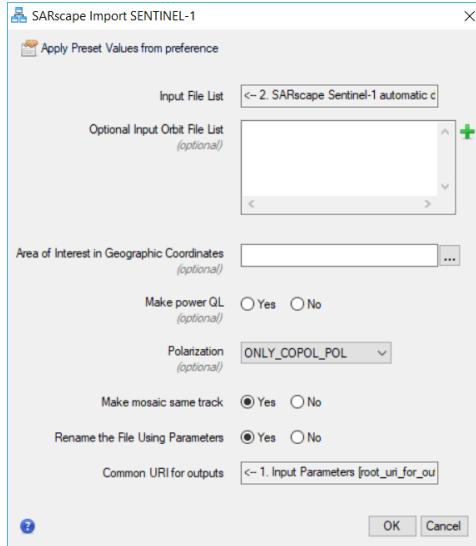

Figure 6 SARscape Import Sentinel-1 shows that only the copolarized data is imported.

Step 4 SARscape Digital Elevation Model Extraction SRTM3 V4

The Digital Elevation Model SRTM3 v4 is extracted. A *Reference* image from the Import Sentinel-1 task is used the imported data from the Import Generic task as geographic reference (Figure 7).

Note: The DEM will be saved in the output folder since the common URI for outputs is set.
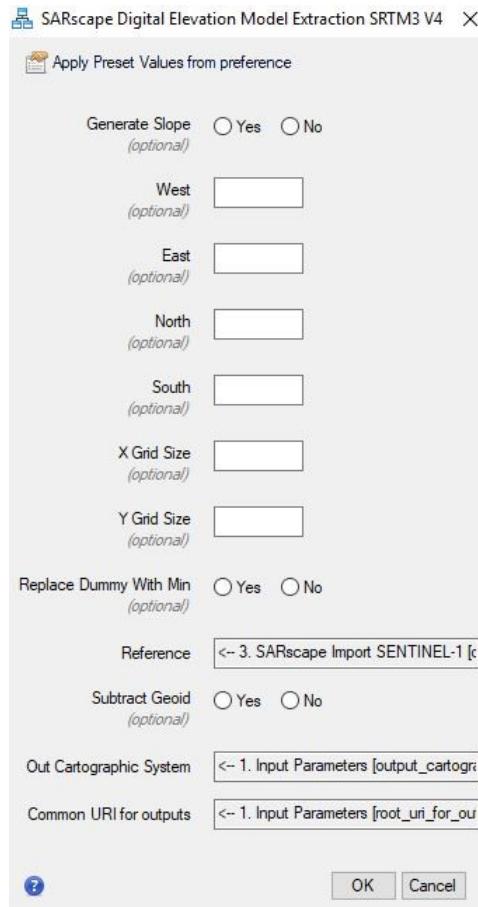
Figure 7 SARscape DEM Model Extraction SRTM3 V4 task.

Step 5 SARscape Slant Sample Selection

This task creates a subsample of the imported data. The imported data, the DEM, the Area of Interest are used as input for the Slant Sample Selection (see also Sample Selection SAR Geometry Data tool Help).

Note: This task output will not be saved in the output folder since the common URI for outputs is not set.
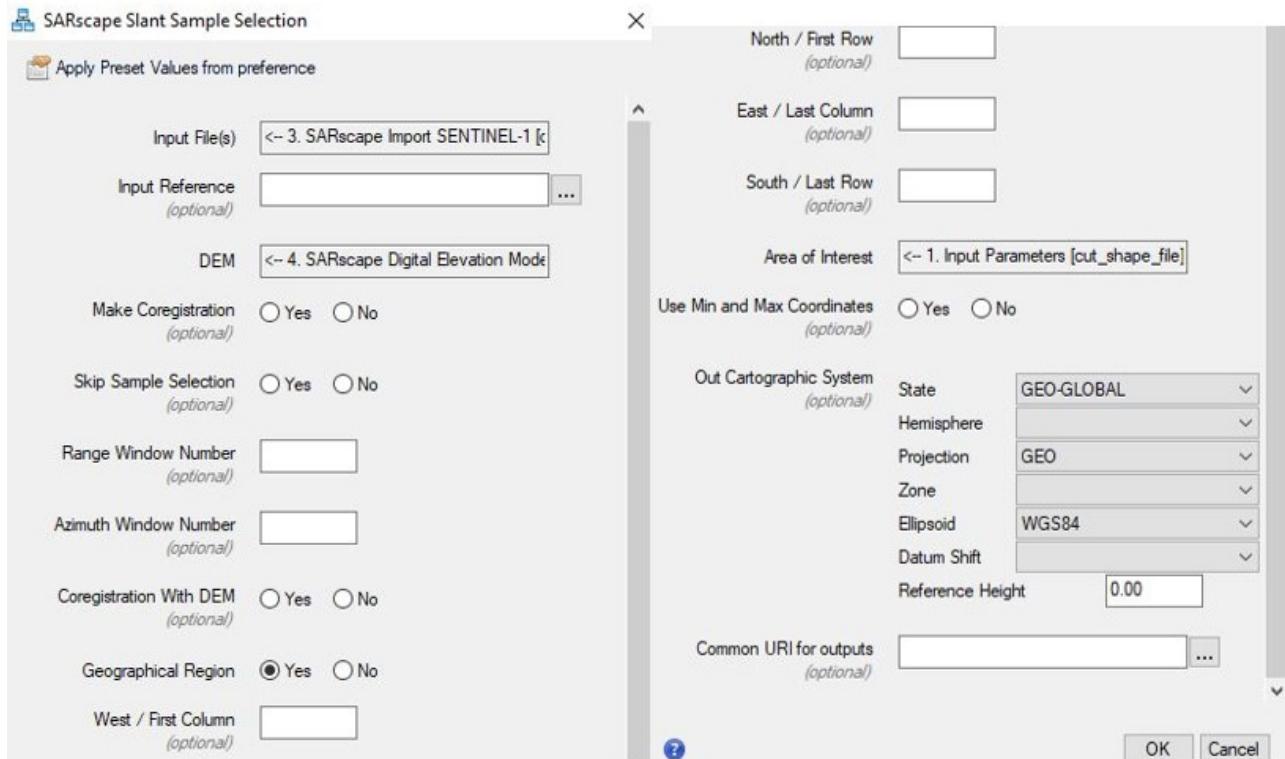
Figure 8 SARscape Slant Sample Selection task panel.

Step 6 SARscape Coregistration

Subsampled data are used as input for the Coregistration process, default parameters will be considered (see Coregistration tool Help).
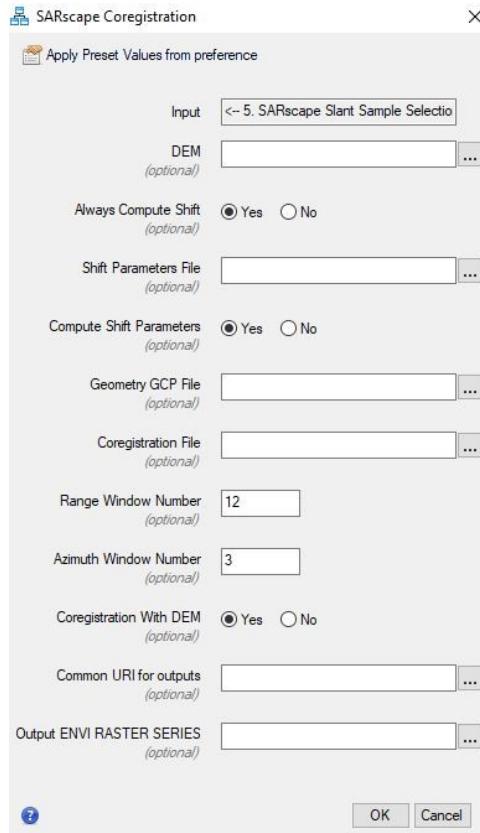
Figure 9 Coregistration task panel.

Step 7 SARscape Despeckle Multi-temporal DeGrandi

The coregistered image is used as input to filter the data (see De Grandi Spatio-Temporal Filtering tool Help) applying the DeGrandi filtering method (Figure 10).
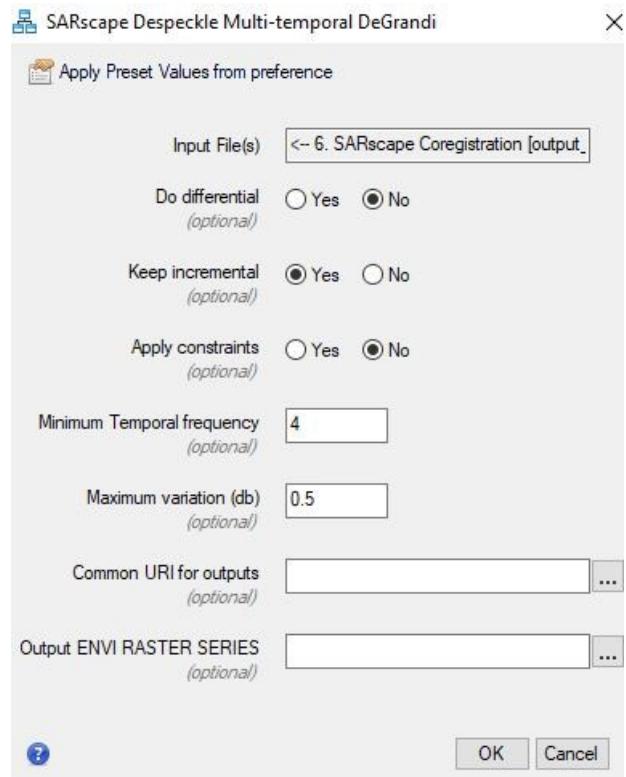
Figure 10 SARscape Despeckle Multi-temporal DeGrandi task panel.

Step 8 SARscape Geocoding and Radiometric Calibration

The filtered data and the DEM allow producing the Geocoded and Calibrated image (see the Geocoding and Radiometric Calibration tool Help). The output is autocompleted since it is one of the outputs defined in the Common URI for outputs.
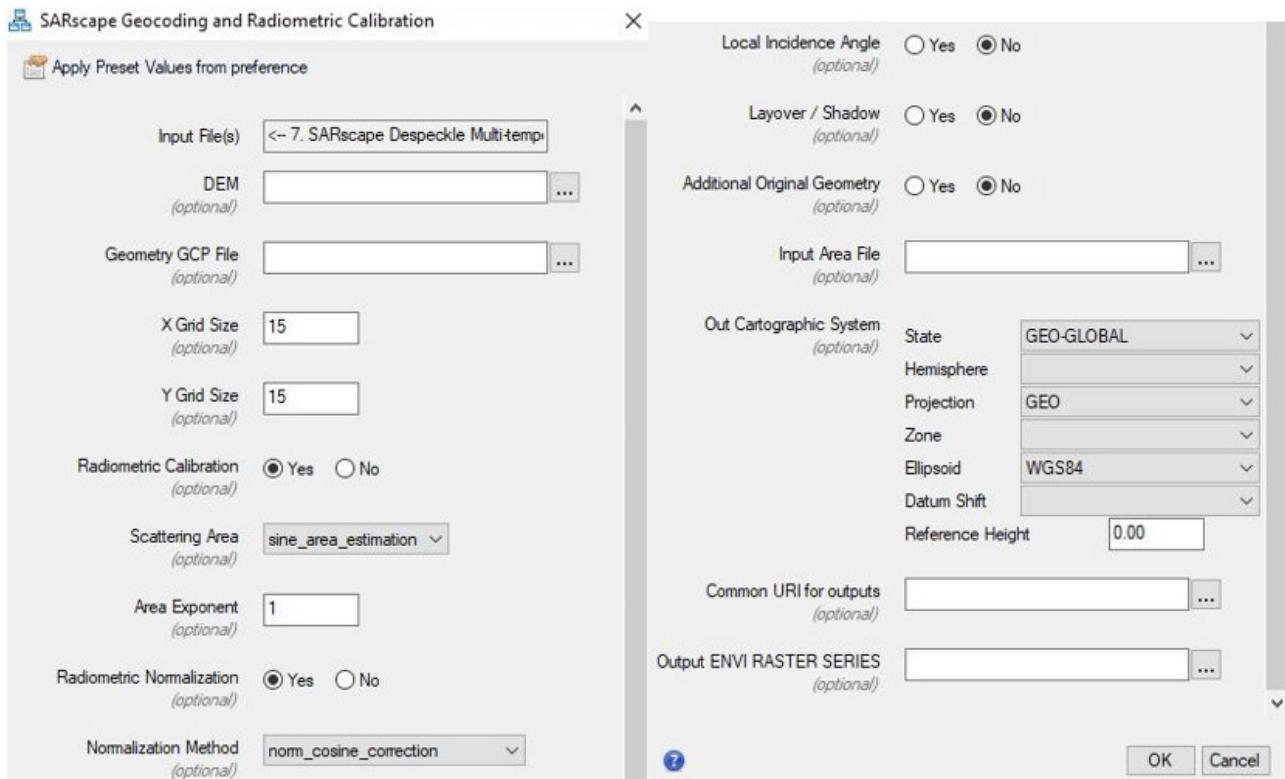
Figure 11 SARscape Geocoding and Radiometric Calibration task panel.

SARscape View SARscapedata

The geocoded data are connected to SARscape View SARscapedata metatask for visualization purposes (see the General Modeler Tutorial for further details).

Step 9 SARscape Multitemporal Features

The geocoded images are used as input to compute the Multi-temporal features (see Multi Temporal Features tool Help). The output has been set in the Common URI for outputs. Features selected for the computation will be created as output. In this example only, the multi-temporal features that are set in preferences will be computed.

View

A View task is connected to the multitemporal features task to show the computed results in ENVI. In this example Covariance Min Gradient RGB is set to be displayed.
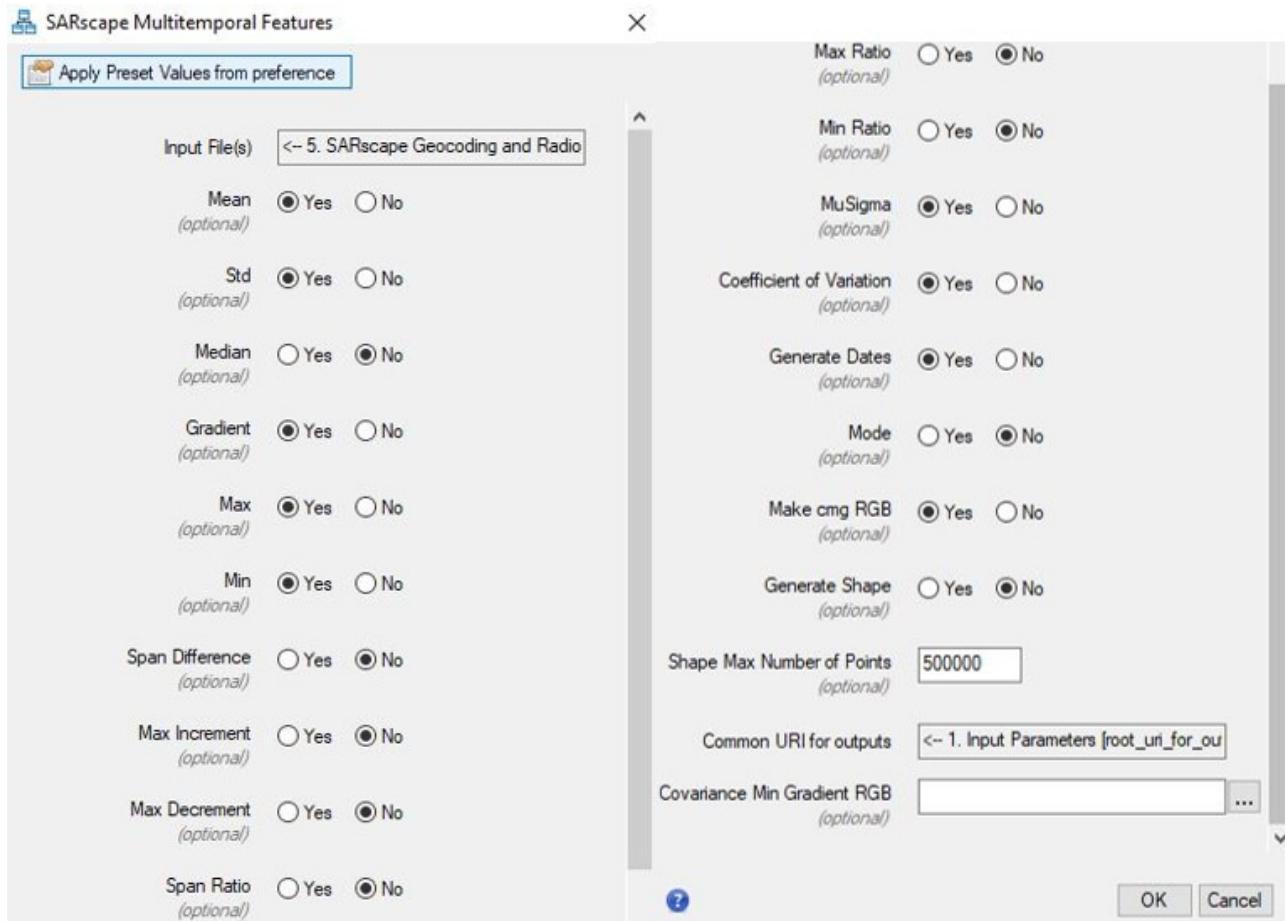
*Figure 12 SARscape Multitemporal Features task panel.*
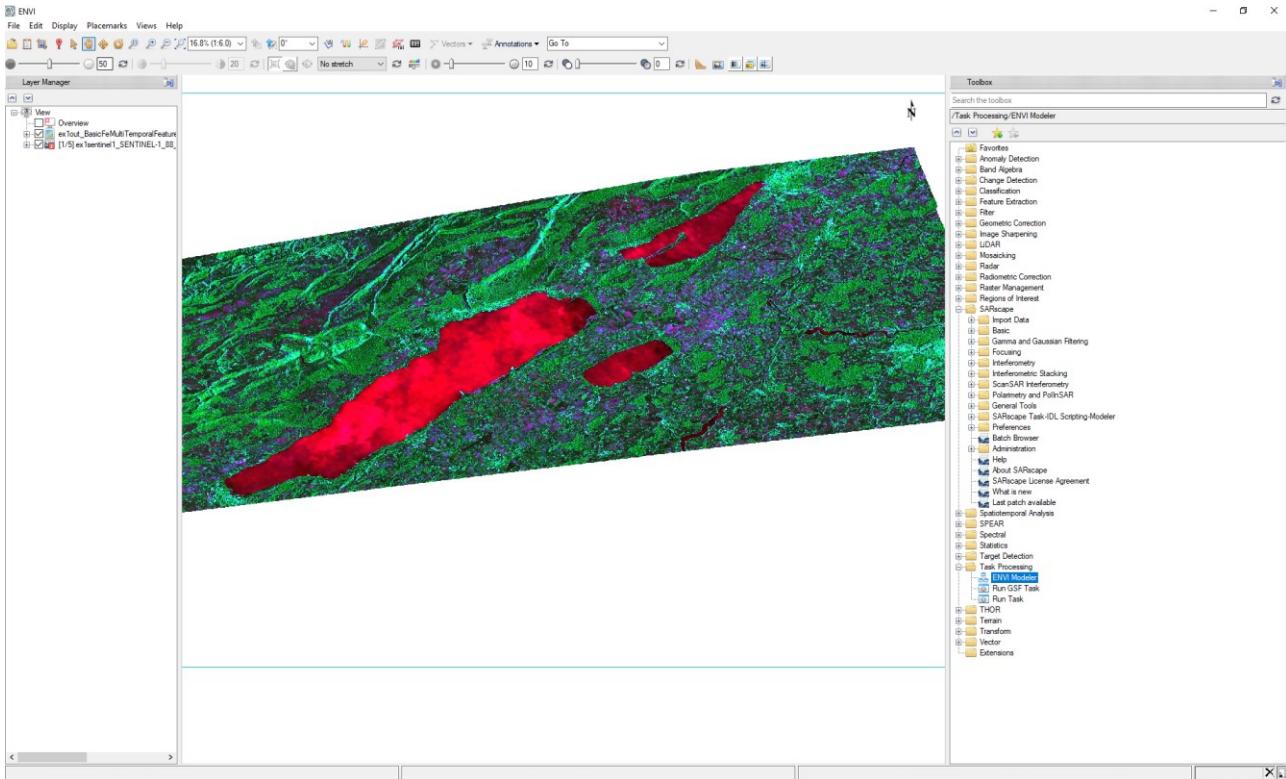
Figure 13 ENVI window shows the output results from the model.

SARscape Output Parameters

The SARscape Output Parameters allows defining the outputs in order to collect them for a potential Metatask.

Once the process is created the model can be saved and used as a function for further processing using Edit> Create task from model.

The model can be used also as MetaTask and saved on disk to be recall in the future from the Task Panel every time users will need it in ENVI Modeler. To save it use Code> Genarate Metatask. It has be saved in ENVI installation folder as .task.

Both the model and task can be shared with other users. Metatasks have to be saved in the disk.

Models can be saved as IDL script in Code > Generate IDL Program.