

Getting started with SARscape Modeler

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Introduction

General information

SARscape Modeler is a tool that allow users to create workflows without knowledge on programming and without writing any code. SARscape Modeler is based on the Visual Programming of ENVI Modeler, for this reason, to become familiar with SARscape Modeler, we recommend reading the Getting Started with the ENVI Modeler <https://www.harrisgeospatial.com/docs/modelergettingstarted.html>.

These paragraphs introduce users to basic functionalities of ENVI Modeler that are necessary to run SARscape Models. Moreover, this document provides some examples, and the corresponding operational descriptions, to independently work with SARscape Modeler.

Tutorial examples refers to SARscape version 5.5, running under ENVI 5.5.1 with a standard (GIS-like) interface installed on Windows 10, 64bit. SARscape.

Users should keep in mind that an advanced knowledge in SARscape (and its tools) is recommended to properly build SARscape models. Setting each input task parameters, and corresponding connections, requires a deep knowledge of SARscape processing steps and of the resulting files as well.

ENVI-SARscape Modeler environment

Graphic interface

ENVI Modeler can be found in:

- ENVI Toolbox, in the Task Processing menu (Figure 1).
- Display (ENVI menu bar) > ENVI Modeler.

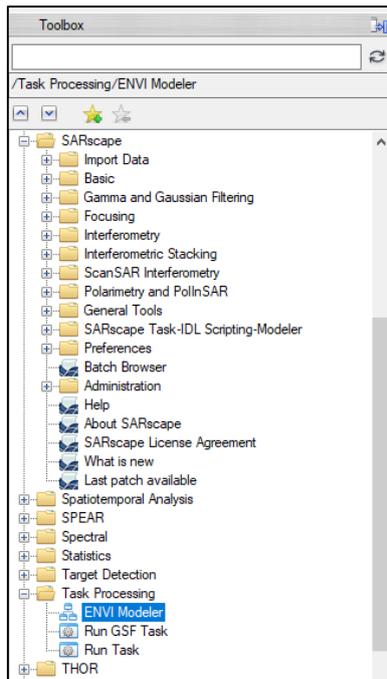


Figure 1 ENVI Modeler in ENVI Toolbox.

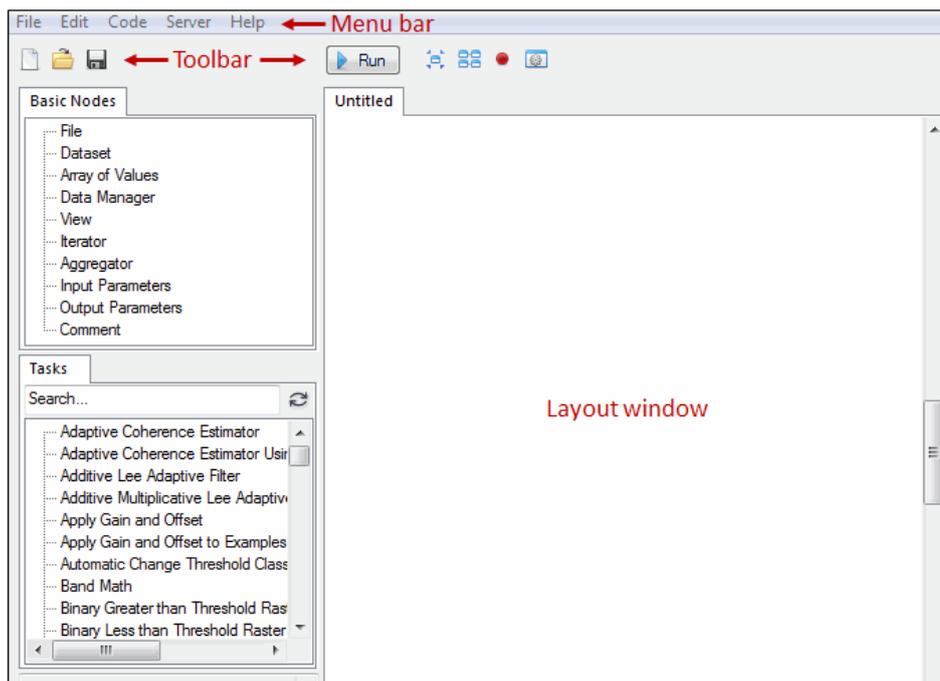


Figure 2 ENVI Modeler user interface (<https://www.harrisgeospatial.com/docs/modelergettingstarted.html>).

To interact with SARscape models and tasks the most important buttons in ENVI are (Figure 2):



to open a new model, to open an existing model, to save a model respectively,

-  to run a model,
-  to add breakpoints,
-  to create a more organized layout,
-  to adjust the task parameters,
-  to see the preset parameters.

Tip: An existing model can also be opened by selecting and drag and dropping it from a folder into the ENVI Modeler Layout.

A model consists of two primary elements: nodes and connectors. A **node** is a basic building block, called task hereinafter; model tasks are characterized by different colors depending on their functionality. **Connectors** are the grey lines that connect tasks to one another. To modify the connector setting, double-click on the connector (a cyan-colored border surrounds the element to indicate it is selected), the Edit Connection Parameters panel suggests convenient connections for each task.

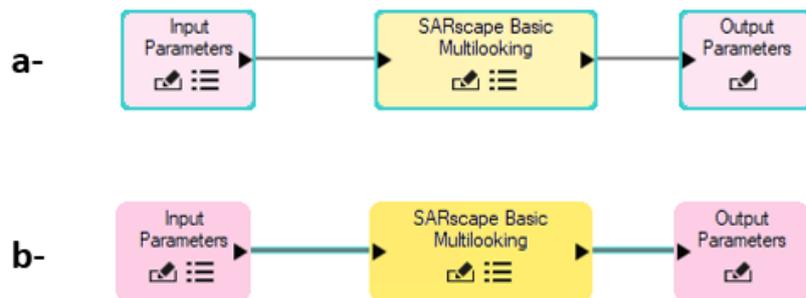


Figure 3 Tasks (a) and connectors (b) in in ENVI SARscape Modeler. A cyan-colored border surrounds the element to indicate it is selected.

Input/Output Parameters can be connected to a task by clicking on the desired available input/output, a line will connect it to the Add New Inputs(s)/Outputs(s) button (Figure 3). In case new inputs/outputs want to be added to the model in a second step, Add New Input(s)/Output(s) button should be selected (Figure 4).

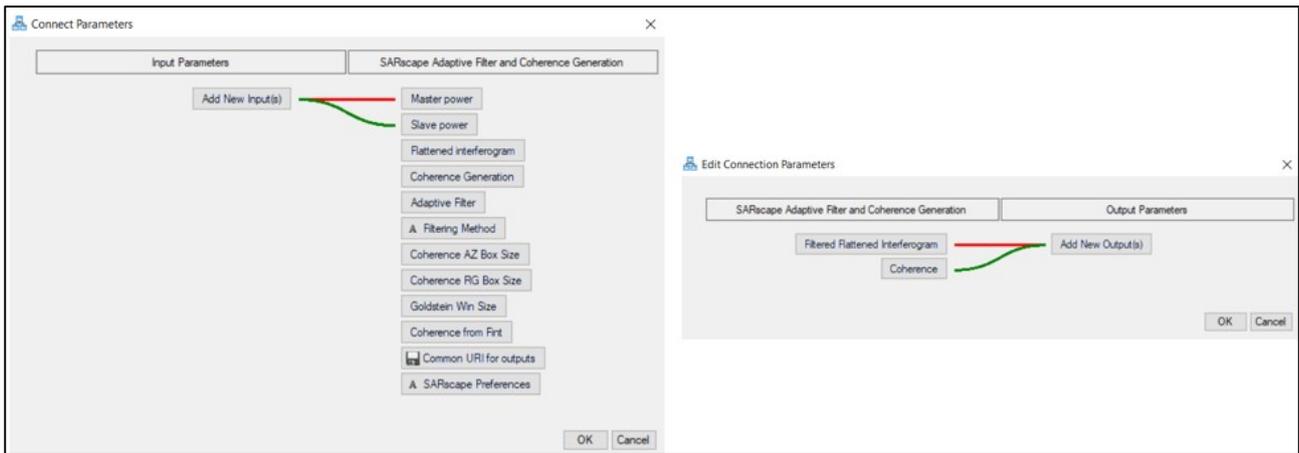


Figure 4 Connect Parameters panel for Input and Output Parameters selection.

Once each task is properly set and connected to its logical SARscape consequent one, the automated workflow is completed (Figure 5) and can be run to obtain the whole processing results. Tasks are colored in green when the process is successfully completed.

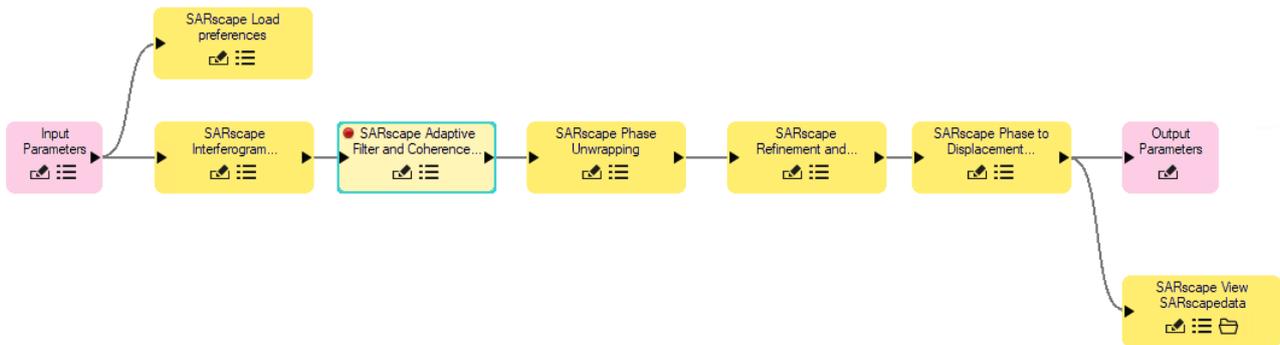


Figure 5 Model example.

Tip: Adding breakpoints  to tasks allows the user to stop the model execution, it allows adjusting parameters and preview results. Breakpoints can only be added to Task nodes (Figure 6). To remove it click on the breakpoint.



Figure 6 Breakpoint in the task.

More information can be found in <https://www.harrisgeospatial.com/docs/modelercreatemodels.html>.

In SARscape Model, nodes are given by the SARscape tasks. In fact, each SARscape tool is available as task in ENVI Modeler and can be find typing the proper name in the Task toolbox (Figure 7). SARscape tasks is characterized by the keyword "SARscape" at the beginning of the task name. A double click, or eventually a drag and drop operation, adds the selected task to the ENVI Modeler panel.

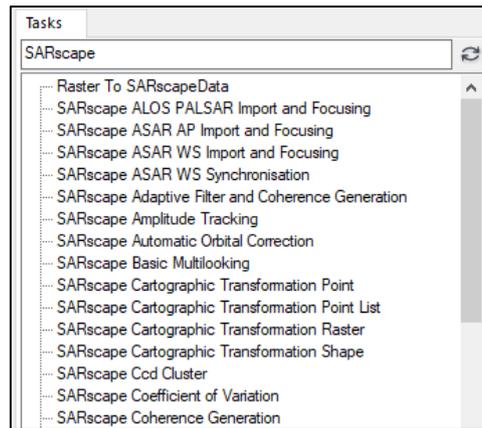


Figure 7 Examples of SARscape Tasks.

Data

Some Typical SARscape data formats and ENVI formats used in SARscape models are described in the panels in Figure 8 and are defined as "Type":

SARSCAPEDATA: are SARscape generated data (.sml, .hdr, raster file);

SARSCAPEDATAARRAY: list of SARscape data

BOOLEAN: data type that has one of two possible values to represent, Yes or No.

STRING: data type characterized by a sequence of characters that is interpreted as text.

DOUBLE: double-precision floating-point data

ENVIURI: ENVI Uniform Resource Identifier.

ENVI RASTER SERIES: ENVI Raster file.

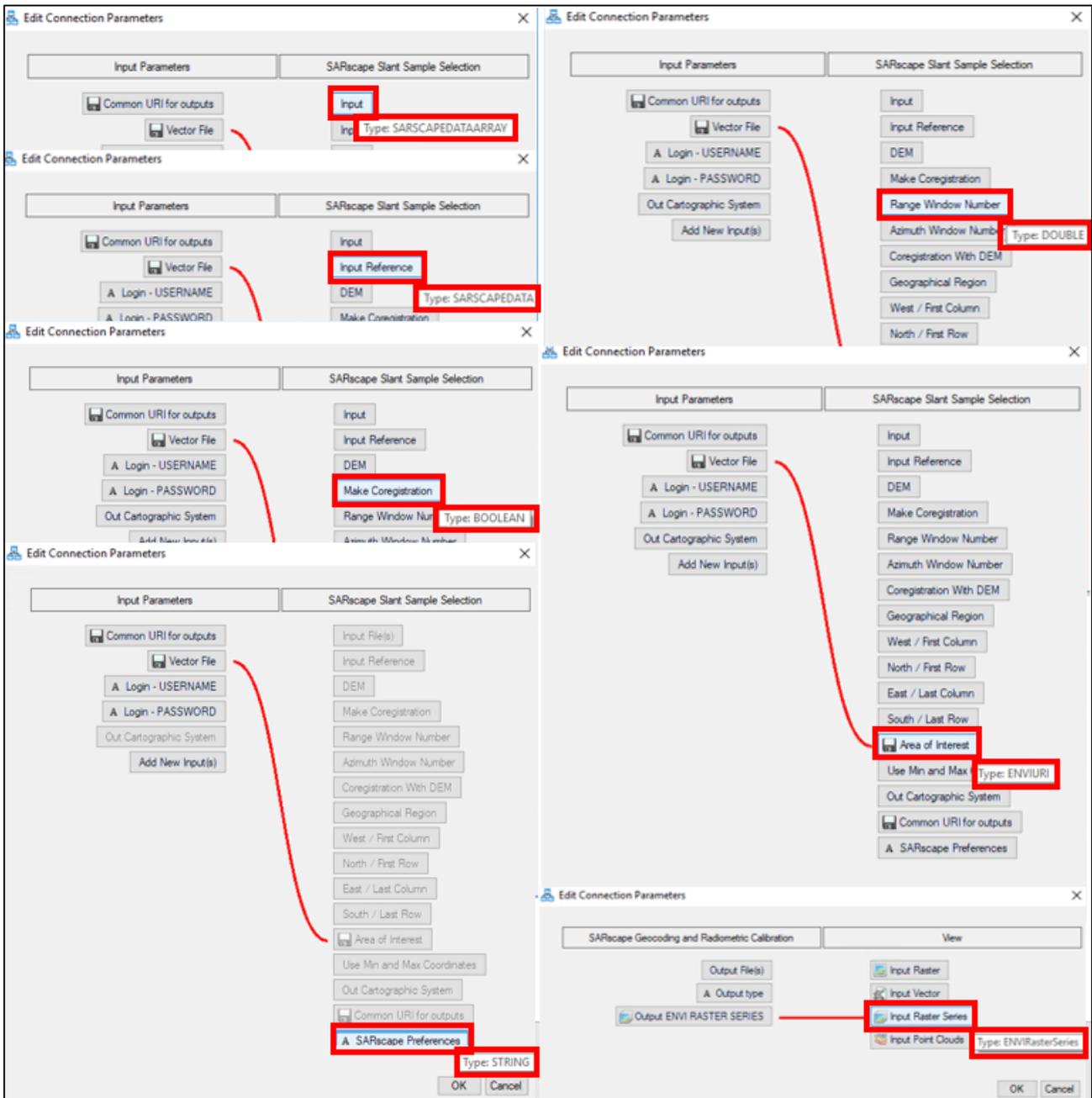


Figure 8 SARscape data format.

Output

Each task output is stored in subfolders in the ENVI temporary folder. The folder name is as follows: SARSTmpDir_07Sep2018_130623, the output file name is defined by "out_". To save task outputs in a specific folder, paths and a root name must be saved in *Common URI for outputs*.

Note: The Default Temporary Directory has to be set in ENVI preferences. ENVI preferences are in File -> Preferences. ENVI Temporary Directory is used to keep intermediary files during SARscape workflow processes (Figure 9).

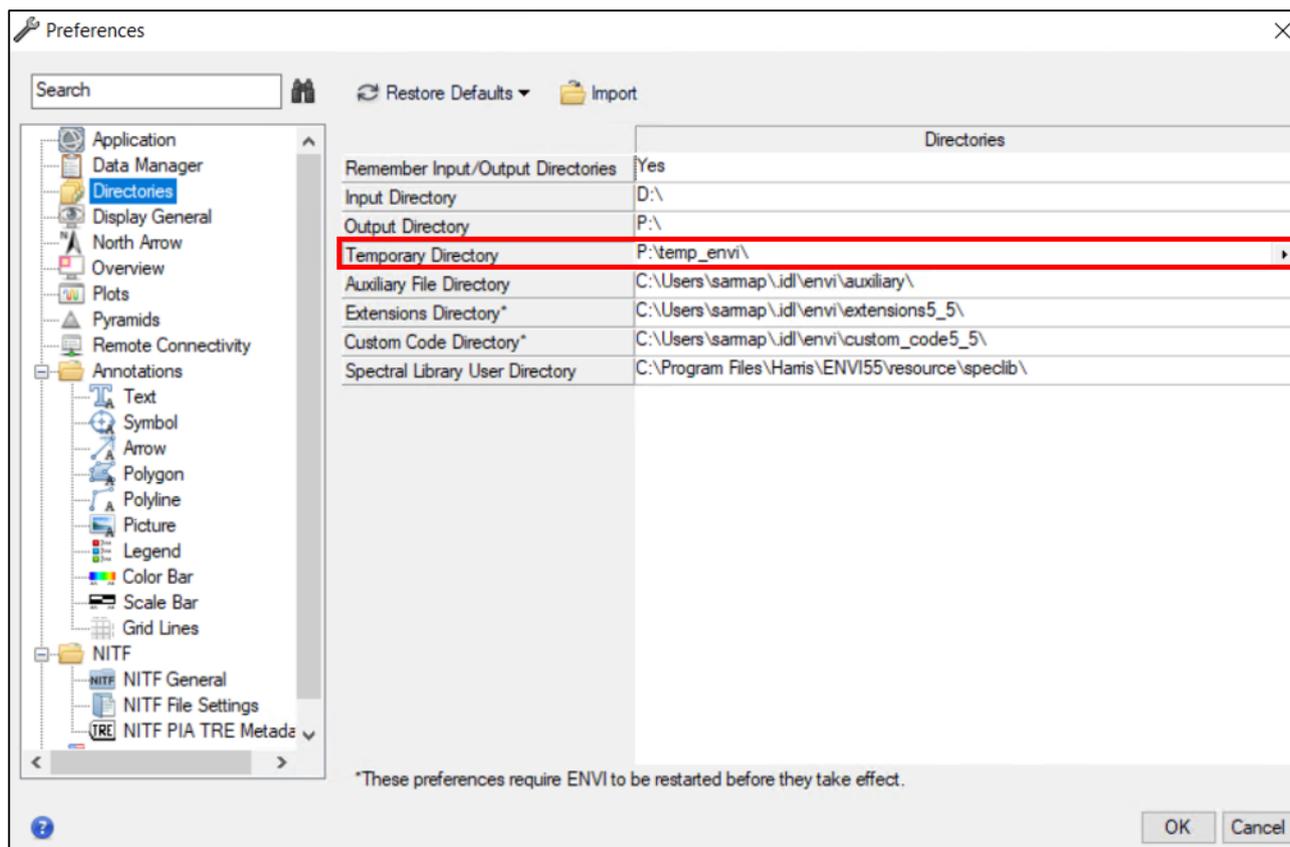


Figure 9 ENVI Preferences / Directories panel. Suggested I/O and Temporary directories.

Preferences

SARscape Preferences should be set before starting with processing. Actual Preferences are always recognized in the task opening. To display the preset preferences the *Apply Preset Values* button is available.

If parameters are modified in a task, the new values are adopted for the processing. However, that task will be always characterized by the actual Preferences since they are not affected by changes.

To set Preferences, SARscape Modeler suggests different options:

1.
 - a) click on the *Apply Preset Values* button and select *Use actual* preferences (Figure 10), which allows users reload the Preferences that have been set from the SARscape Preferences panel, default selection (see http://www.sarmap.ch/tutorials/Getting_started.pdf);
 - b) click on the *Apply Preset Values* and select one of the suggested Preferences settings.
2. Add an .sml file in the panel fields Input common preference file and Input specific preference file, which have been already saved using SARscape Preferences panel, default selection (see http://www.sarmap.ch/tutorials/Getting_started.pdf).

Note: Only the specific preferences can be set during the processing, common preference should be set in ENVI or saved as sml.

Please, see the Preferences common and specific Help.

In case this model will be used for different settings, Preferences have to be modified. For this reason, we suggest connecting the SARscape Load Preference task to the Input Parameters task.

In case the Load Preference task is not included in the model, the Preset Preferences will be used.

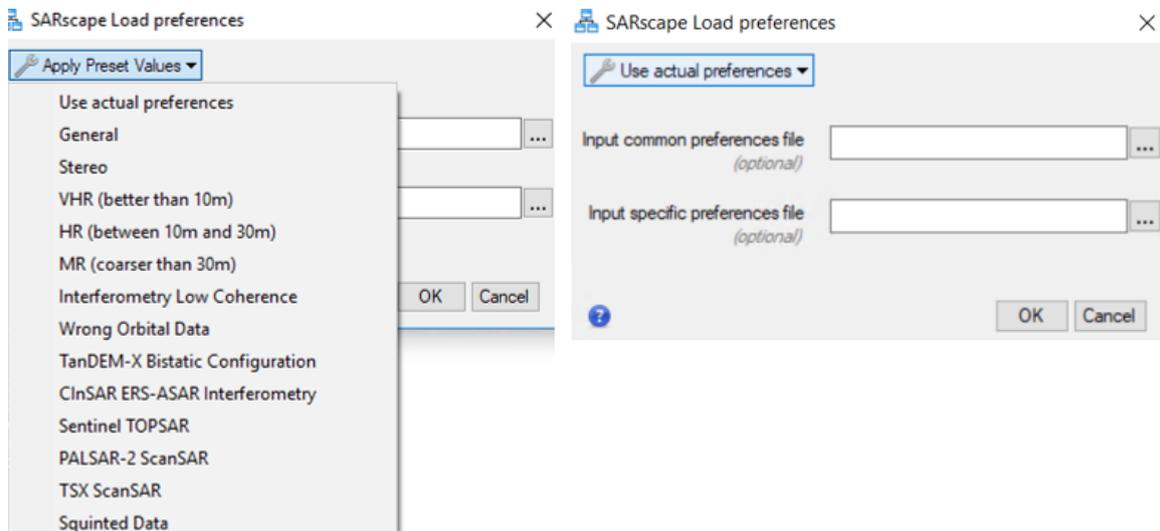


Figure 10 SARscape Load Preferences options.

Task Parameters

To display the default values (default values in a task are values preset in Preferences), users should use the *View Preset Values from preferences*, the preset values in the corresponding dialog box fields will be loaded and displayed as in Figure 11.

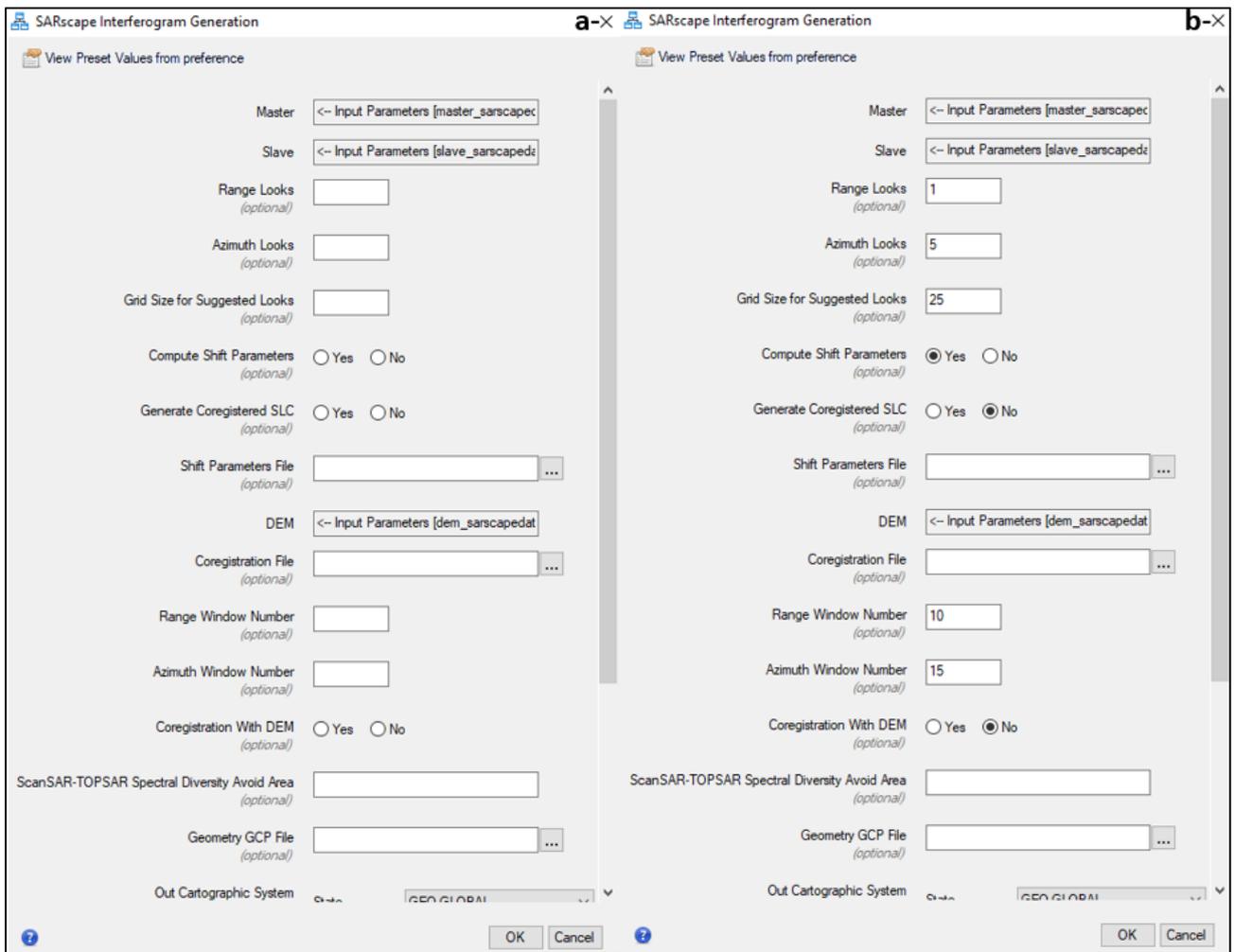


Figure 11 Before and After the Display Preset Values from preferences.

Once a model is created and saved, SARscape Parameters are set and that values are used as default parameters for that model (Figure 11b).

View

To display the task results in ENVI, 3 options are available (Figure 12):

1. SARscapeData To Raster > Iterator > View (only one file can be connected to View, i.e: SARSCAPEDATAARRAY type or SARSCAPEDATA type; Figure 12a);
2. SARscape View SARscapedata: which is a metatask that includes tasks described in the option 1 (only one file can be connected to the view, i.e: SARSCAPEDATAARRAY type or SARSCAPEDATA type; Figure 12b);
3. View (i.e: ENVIRASTERSERIES type; Figure 12c).

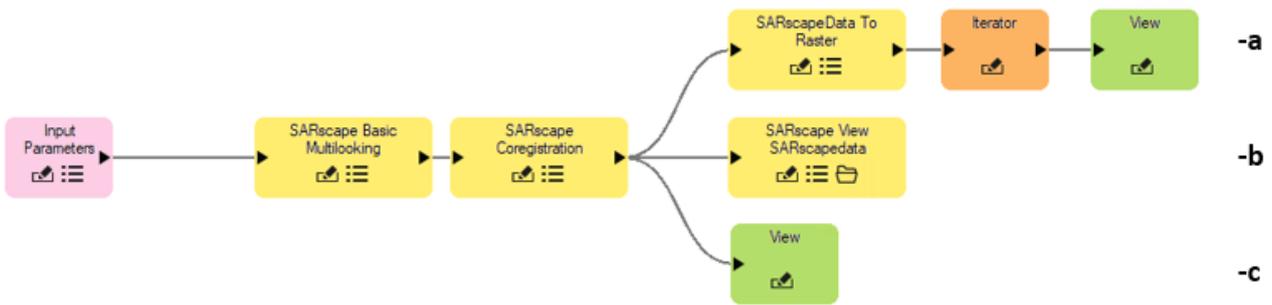


Figure 12 Example of SARscape view options.

Metatask

A Metatask is a task that contains other tasks. Once a model is created, it can be saved and used as a metatask for further processing. To generate a Metatask, Output Parameters has to be included in the model.

Metatask can be created by Edit> Create Task from Model. The entire model is collapsed into a single Task node and in a new Untitled" tab that should be named. Clicking on the folder the whole model can be opened.

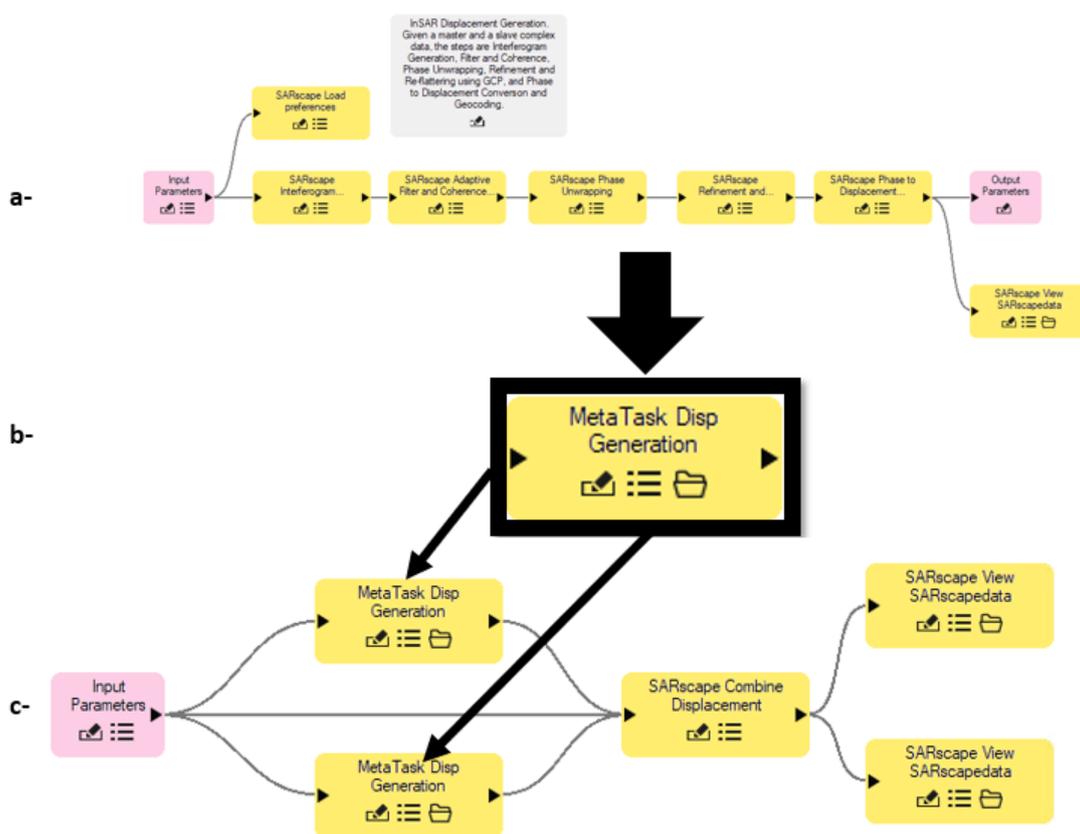


Figure 13 SARscape Metatask: a- Characteristic model look; b- Model collapsed in a Metatask. c- Metatask included in a new model.

The same 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. Metatask has to be saved in the disk.

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

Note: Please, keep in mind that Metatasks that have been relied on ENVI 5.5.1 are compatible with this ENVI version and recentest releases.

Tutorial General Information

Examples of SARscape Modeler workflows can be found 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  specifies 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 guaranteed.