



ENVI[®] SARscape[®] Release Notes

Version 5.6.2

April 2022



What's New in SARscape® 5.6.2

April 2022

The newest release of SARscape – version 5.6.2 – introduces some algorithmic improvements and new features.

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1 What's new

1.1 Highlights



The most meaningful developments are listed here below:

- SBAS: Automatic refinement and reflattening, GCP are now optional and not required anymore.
- Import GACOS: Possibility to use Generic Atmospheric Correction Online Service to improve the Atmospheric Correction within Interferometry and Interferometric Stacking processing.
- Time Series Classification: Possibility to automatically classify the displacement time series according to phenomenological and parametrical analyses.
- Import Sentinel-1: Possibility to import Sentinel-1 data from a zip folder to reduce the disk usage.

1.2 New features

1.2.1 Import Data/SAR Spaceborne/Single Sensor/Spacety

Preliminary support of the data acquired by the HISEA-1 C-Band SAR satellite, made by Spacety. The supported products are:

- SP SLC Spotlight Mode. Slant Range, Single-Look, Complex Products (SLC).
- SM SLC Stripmap Mode. Slant Range, Single-Look, Complex Products (SLC).
- NS SLC Narrow ScanSAR Mode.
- ES SLC Extra ScanSAR Mode.

1.2.2 Import Data/SAR Spaceborne/Single Sensor/SYNSPECTIVE

Preliminary support of the data acquired by the StriX X-Band satellite, made by Synspective. The supported products are SLC Stripmap and Sliding Spotlight.

1.2.3 Import Data/SAR Spaceborne/Import SIDD

Import of SIDD data format is now available. SIDD files are geocoded/calibrated 8 bit data, with a scaling transformation between the original calibrated values and the 0-255 range. SIDD files are mainly used to produce final output information for reporting/informative goals: due to this aspect, any further processing is very limited.

1.2.4 Import Data/Download/ECMWF Era5 Download

This tool allows querying and downloading of (mainly) meteorological data provided by the European Center Medium Weather Forecast (ECMWF). Such information is publicly available and procedurally accessible through a dedicated Web-API (<http://apps.ecmwf.int/datasets/>) that interacts with their

databases. Now, this tool uses the "ERA5" dataset, which contains global reanalysis data from January 1979 to present computed each hour and with a granularity of about 30km.

1.2.5 Import Data/SAR Airborne/UAVSAR

This tool allows to import JPL UAVSAR SLC airborne images, in L-Band, freely available at <https://uavsar.jpl.nasa.gov/>. It is important to note that, so far, SARscape 5.6.2 enables only the processing of amplitude images.

1.2.6 /Import Data/Other Format/GACOS

This tool allows importing Generic Atmospheric Correction Online Service to improve the Atmospheric Correction within Interferometry and Interferometric Stacking processing (GACOS, <http://www.gacos.net/>).

1.2.7 Import Data/DEM Extraction/DEM extraction with reference height

This tool is specifically dedicated to geocode intensity SAR data characterized by the presence of sea water. Images characterized by large areas of sea water can be subjected to geocoding issue due to the different elevation of the sea level within the geoid and the ellipsoid models.

The need to increase the geocoding precision led to retrieve the ellipsoidal height by subtracting the geoid component. The main tool that takes advantage of this new features is Ship Detection.

1.2.8 Basic/Intensity Single Image Workflow

This functionality enables to execute, in a single iteration, the following processing sequence:

- Import SAR Data
- Multilooking
- Single Image Filtering
- Geocoding and Radiometric Calibration.

The final purpose of this processing chain is to enable the generation of geocoded filtered image.

1.2.9 Basic/Feature Extraction/Enhanced-DPSVI

This tool allows to compute an Enhanced Dual Polarization SAR Vegetation Index (EDPSVI) using Dual-Pol data. It estimates the land cover based on the amount of vegetation.

1.2.10 Basic/Coherence Workflows/Coherence CCD Time Line & PWR

This functionality enables to execute, in a single iteration, the following processing sequence:

- Import Generic SAR Data
- Multitemporal Coherence (Time Line).
- Coherence Geocoding

- Powers Geocoding
- Color Composite Generation.

The final purpose of this processing chain is to enable the generation of geocoded power and coherence images.

1.2.11 Basic/Feature Extraction/Ship Features/Coastline Extraction

This tool allows to extract a series of shape files containing the coastline detected in the input images, grouped by tide height.

1.2.12 Interferometric Stacking/Stacking Tools/Time Series Classification

1.2.12.1 Interferometric Stacking / Stacking Tools / Time Series Classification / Phenomenological Analysis

This tool fits the SBAS raster deformation time series using an external temporal phenomenological magnitude (i.e.: M= temperature, rain, etc). It retrieves the best fitting coefficients and its RMS for each pixel in the time series. These coefficients represent different characteristics of the displacement such as speed, acceleration, coupling between both time series and delay.

These results can be then used to perform a displacement classification using the Classification panel.

1.2.12.2 Interferometric Stacking / Stacking Tools / Time Series Classification / Parametrical Analysis

This tool fits the SBAS raster deformation time series using three analytical displacement models (linear, quadratic and sinusoidal). It retrieves the best fitting coefficients and its RMS for each pixel in the time series. These coefficients represent different characteristics of the displacement such as speed, acceleration, oscillation amplitude and frequency.

These results can be then used to perform a displacement classification using the Classification panel.

1.2.12.3 Interferometric Stacking / Stacking Tools / Time Series Classification / Classification

This tool is used to generate a displacement classification based on the goodness of fitting according to the Akaike criterion. Each class of the classification identifies the areas that better fit the model.

1.2.13 General Tools/Annotations

1.2.13.1 Generate Annotations Raster

This panel enables to create the annotations in ENVI View of the geocoded files derived from the following tools:

- Geocoding and Radiometric Calibration
- Phase to Height Conversion and Geocoding
- Phase to Displacement Conversion and Geocoding
- SBAS - Geocoding
- PS – Geocoding

1.2.13.2 Generate Annotations Ships

This tool allows the user to associate a name to each detected target. It takes as input the shape file generated by the SAR AIS Matching tool.

1.2.14 General Tools/Sample Selections/Shape Tiler

This tool is used to cut one or multiple shapefiles into tiles of regular size and alignment.

1.2.15 General Tools/Time Series Analyzer/Coherence Matrix Viewer

This tool is intended to represent the coherence images in a matrix format where the row and columns represent the dates considered for the coherence computation.

It is typically used to analyze the coherence behavior in time series, i.e. Target Detection or growing season for crop monitoring. Thanks the coherence matrix analysis it is also possible to optimize the configuration of SBAS parameters (e.g. Connection Graph filtering parameters, First and Second inversion parameters).

1.2.16 General Tools/Mosaicking/Mosaic Sentinel-1

This tool enables to mosaic Sentinel-1 Slant Range or Ground Range (i.e., not geocoded) SAR products (`_slc_list`, `_gr`), which have been independently imported in SARscape along the same orbit and with the same viewing geometry.

This functionality is intended to generate a single file, in the original SAR viewing geometry, from a set of independently imported frames. Even if this functionality is conceived especially for Slant Range products, it is also suitable for Ground Range data. Data belonging to acquisitions with different time or track are automatically grouped and mosaiced separately.

1.2.17 Preferences/Preferences common/Annotations

This section of the Preference Common pane allows to enable or disable the automatic generation of the annotations, in ENVI View, of the geocoded files derived from the following tools:

- Geocoding and Radiometric Calibration
- Phase to Height Conversion and Geocoding
- Phase to Displacement Conversion and Geocoding
- SBAS - Geocoding
- PS - Geocoding
- Ship Detection
- SAR AIS Matching

1.3 New Tasks

1. [SARsImportSpacetyFormat] Import Spacety
2. [SARsImportSynspectiveStrixFormat] Import Synspective
3. [SARsImportSidd] Import SIDD
4. [SARsToolEra5Download] Download ERA5
5. [SARsImportUavsarFormat] Import UAVSAR
6. [SARsImportGacos] Import GACOS
7. [SARsToolsDEMExtractionReferenceHeight] Reference Height DEM
8. [SARsWF_ToolsGenericFilterSingleImage] Intensity Single Image Workflow
9. [SARsBasicFeEDPSVI] Enhanced DPSVI
10. [SARsToolCoastlineExtraction] Coastline Extraction
11. [SARsstackingUtilityTSModeling] Process TS Parametrical Analysis
12. [SARsstackingUtilityTSPModeling] Process TS Phenomenological Analysis
13. [SARsstackingUtilityTSclassification] Process TS Classification
14. [SARscapeDataToAnnotation] Annotation Creation
15. [SARsShapeToTile] Convert point shapes to tiles
16. [SARsToolsSentinel1Mosaic] Sentinel-1 Ground-Slant Range mosaic
17. [SARsInSARStackSBASGenerateConnectionGraph] Index SBAS Generate Connection Graph
18. [SARsInSARStackSBASGeocode] SBAS Geocoding

19. [SARsInSARStackSBASInterferogramGeneration] SBAS Interferogram Generation and Unwrapping
20. [SARsInSARStackSBASInversionStep1] SBAS Inversion Step1
21. [SARsInSARStackSBASInversionStep2] SBAS Inversion Step2
22. [SARsInsarMultilooking] Insar Multilooking

1.4 Improvements

1.4.1 Import Data/SAR Spaceborne/Single Sensor/Sentinel-1

This tool has been improved with two important new functionalities:

- Generation of a .txt file named "*_progress.txt" whenever the software is stopped or crashes during the import phase. If the user uploads the "*_progress.txt" file during the new import process; the software will import only those files that were not imported before the stop event.
- Possibility to import Sentinel-1 data from a **zip** folder **to reduce the disk usage.**

1.4.2 Import Data/SAR Spaceborne/Single Sensor/ RCM

Possibility to import SLC Spotlight data.

1.4.3 Basic/Feature Extraction/Ship Features/Ship Detection/Coastline Mask

Possibility to upload a land mask shapefile list to retrieve the best coastline for the input image considering tide height information.

1.4.4 Basic/Feature Extraction/Ship Features/Ship Detection/Classification

The identified ships are classified with a neural network trained on Sentinel-1 data in case the input image polarized VV with a resolution of 10 meters (pixel spacing in range and azimuth). The result of such classification (a vector of probabilities) is saved in the output shape file with a column for each ship type recognized by the neural network.

1.4.5 Basic/Feature Extraction/Ship Features/SAR AIS Matching

Compensation of the doppler effect (moving targets) to improve the matching between AIS signal and the detected radar target.

1.4.6 Basic/Intensity Processing/Multilooking

Multilooking option available for Ground Range data.

1.4.7 Basic/Intensity Processing/Filtering/Single Image Filtering

Automatic ENL (Equivalent Number of Looks) calculation and artifacts removal improvement (Lee and Refinement Lee).

1.4.8 Gamma and Gaussian Filtering

Automatic ENL (Equivalent Number of Looks) calculation.

1.4.9 Interferometry/Interferometric Tools/Interferometric Multilooking

Multilooking option available for all the interferometric output files.

1.4.10 Palsar2 spotlight Interferometry

The ALOS Palsar2 spotlight data can now be used for interferometric purposes

1.4.11 Interferometry/Interferometric Tools/Atmospheric Phase Delay Correction

This tool has been improved with the following options:

- Atmospheric pattern removal through the usage of external data (GACOS)
- Topography-related atmospheric pattern removal based on unwrapped interferograms (to be used in case of strong topographic variations and stratified atmosphere).

1.4.12 Interferometric Stacking/PS

This tool has been improved:

- Atmospheric pattern removal through the usage of external data (GACOS, <http://www.gacos.net/>)
- Speedup interferometry, first inversion and second inversion.

1.4.13 Interferometric Stacking/SBAS

This tool has been improved in:

- Automatic refinement and reflattening, GCP are now optional and not required anymore.
- Atmospheric pattern removal through the usage of external data (GACOS)
- Topography-related atmospheric pattern removal based on unwrapped interferograms (to be used in case of strong topographic variations and stratified atmosphere)
- Mask areas in layover/shadowing from interferograms
- Other masks available to remove low coherence areas
- Speed-up refinement and interferometry (multiple parallel unwrapping, parallel k factor computation).

1.4.14 General Tools/DEM Fusion/Point Cloud DEM Fusion

Point Cloud Dem Fusion and gridding renewal which include also Point Cloud Registration for fusion, Point Cloud Filtering and Interpolation Distance Constraint.

1.4.15 Administration/Cluster

Cluster benchmark to check cluster performance on user hardware configuration.

1.5 Third-Party Dependencies

1.5.1 Import Data/SAR Spaceborne/SICD

SARscape is built against the six-library version 3.1.6, which currently supports SICD formats 0.3.1, 0.4.0, 0.4.1, 0.5.0, 1.0.0, 1.0.1, 1.1.0, 1.2.0, 1.2.1, and SIDD formats 1.0.0, 2.0.0, 3.0.0.

1.5.2 Basic/Feature Extraction/Ship Features/Ship Detection

Tensorflow version 2.4.0 has been integrated in the Ship Detection module.

1.5.3 General Tools/DEM Fusion/Point Cloud DEM Fusion

PCL (Point Cloud Library) version 1.10.1 has been integrated in the Point Cloud DEM Fusion module.

1.6 New Operating System

SARscape 5.6.2 is supported on Windows 11 64-bit.

2 Bug fixing

SARscape 5.6.2 includes the bug fixing provided in all the patch released for SARscape 5.6 and the last bug fixing not included in former patches.

[20220329] Bug fix in coregistrating Sentinel-1 data.

[20211230] Bug fix ASF Sentinel-1 Download (linux).

[20211230] Bug fix Shape Combination merge time series.

[20211210] Bug fix Shape Combination. A warning message will appear in case the incidence angle of the input dataset is too similar, without stopping the decomposition process. Error logging improvement.

[20211206] Bug fix Sentinel-1 IW sample selection.

[20211206] Bug fix InSAR OpenCL.

[20211206] Bug fix Import SAOCOM.

[20211206] Bug fix Palsar-2 KC doppler, calibration and task.

[20211206] Management Australia and ETRS89_LAEA_EUROPE.

[20211206] Bug fix repeated add images in SBAS Edit Connection Graph.

[20211206] Bug fix box estimation geocoding with reference height.

[20211206] Bug fix in PS geocoding step.

[20211206] Bug fix in PS updating reference points after subarea editing step.

[20211206] Bug fix Capella Import with complete href.

[20211206] Bug Fix ASF Downloader and MultiDownloader when using a proxy.

[20211206] Add tasks SARsToolsCutImageWrongValues.

[20210922] Upgrades on Lee Filter.

[20210922] Bug fix Capella Import geocoded acquisition time.

[20210922] Bug fix multilook slc_list.

[20210922] Bug fix Import SLC Sentinel-1.

[20210922] Bug fix Cluster crash when coregistration with dem was deactivated.

[20210922] Management of Geographic GCS_JGD_2000 for Japan Cartographic System.

[20210922] Bug fix Geocode Ground Range.

[20210922] Bug fix Geocode LIA generation with optimal resolution method.

- [20210922] Bug fix Capella Import with complete href.
- [20210922] Bug fix generate .kml from shape.
- [20210707] Bug fix Tomography error occurring in the Connection Graph step when the reference image of the interferometric stack is selected by the user.
- [20210707] Bug fix output list.
- [20210707] Spacety Geocoded preliminary support.
- [20210707] Point Target Analysis write in working folder.
- [20210707] Spacety management azimuthTimeInterval.
- [20210707] Bug fix SARscape Shape Displacement Utility task.
- [20210707] Bug fix Interferometry slant range DEM generation.
- [20210707] PS Cluster first inversion for full frame: wrong subareas computation.
- [20210707] GPS linear fit, generate a unique shape file.
- [20210707] Bug fix SBAS with no displacement model.
- [20210707] Bug fix Japanese cartographic systems.
- [20210707] Bug fix Capella GEC-GEO in UPS CS.
- [20210707] Bug fix on SBAS incremental mode: wrong looks written in the report.
- [20210707] Spacety preliminary support.
- [20210520] Bug fixing Ellipsoid management.
- [20210520] Deleted the parameters not used by the Asnaro-2 import.
- [20210520] Add link to Harris Help-Articles-Detail.
- [20210520] Capella management Ascending / Descending from direction annotation.
- [20210520] ESA sentinel download: changed https address.
- [20210520] Capella GEC preliminary support.
- [20210520] Management parameters OPENCL_PLATFORMID, OPENCL_DEVICEID and GENERATE_QL for tasks.
- [20210520] SICD in ENVI Import menu.
- [20210520] Capella SICD bug fixing.
- [20210520] Bug fixing GCP tool.
- [20210520] Bug fixing NovaSAR calibration.

- [20210520] Geocoded Sample selection using image coordinates.
- [20210520] Switzerland Carto System ENVI header.
- [20210520] Bug fixing on selecting output file list.
- [20210331] Bug fixing PS reprojection in vertical direction
- [20210331] Palsar-2 Spotlight frequency demodulation automatic if processing version < 002.028.
- [20210331] New repository for Sentinel-1 auxiliary files
- [20210331] Palsar-2 CF updatinf use https://www.eorc.jaxa.jp/ALOS-2/en/calval/CalibrationFactors_PALSAR2_v201808.pdf.
- [20210305] Bug fixing DEM extraction with cartographic system not equal to GEO-GLOBAL.
- [20210305] Bug fixing TDM 90 extraction: Fill dummy with geoid value.
- [20210305] Bug fixing DEM extraction: Fill dummy before subtract geoid.
- [20210305] Bug fixing sample selection: opportunity to apply NaN value check in a sampled area.
- [20210305] Bug fixing ASF Downloader waiting option (task).
- [20210305] Bug fixing Multi-Downloader waiting option (task). Log information about used plugin.
- [20210305] Bug fixing PS reprojection in vertical and slope direction
- [20210305] Bug fixing Modeler examples.
- [20210305] Frequency Domain multilooking improvement.
- [20210305] Bug fixing on DInSAR Displacement workflow: loaded results.
- [20210305] Palsar-2 Spotlight frequency demodulation.
- [20210305] Sinex support of point list with missing average velocity and time series.

3 End-of-Life (EOL) announcement

With SARscape 5.6.2 the following tools reached the end-of-life:

- ESA SciHub Sentinel-1 Download
- ASF Sentinel-1 Download
- GTOPO30

Both ESA SciHub Sentinel-1 Download and ASF Sentinel-1 Download tools are now included in the Sentinel-1 MultiDownload tool.

With the next SARscape sub-release, the following tools will reach the end-of-life:

- The tool ECMWF will be removed (/Import Data/Download/ECMWF Download) and will be replaced by the tool ECMWF Era5 (/Import Data/Download/ECMWF Era5 Download)
- Geogrid PALSAR-1 data will not be accepted anymore (/Import Data/SAR Spaceborne/Single Sensor/ALOS PALSAR-1 Geogrid).

From the next releases the SARscape Cartographic system management will be subjected to a refactoring.