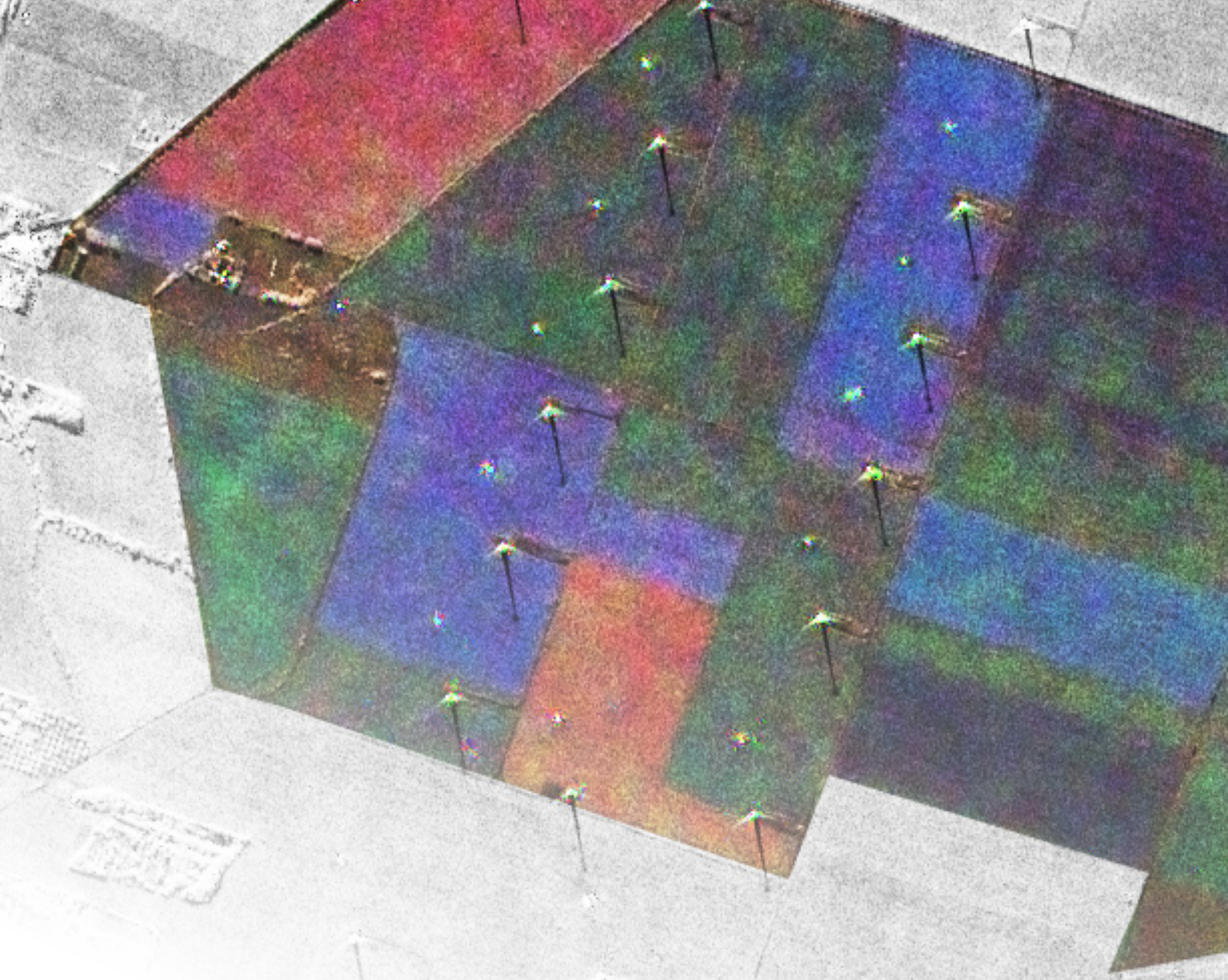


ENVI SARSCAPE®

READ, PROCESS, ANALYZE, AND OUTPUT PRODUCTS FROM SAR DATA.

HARRIS® TECHNOLOGY TO CONNECT, INFORM AND PROTECT™

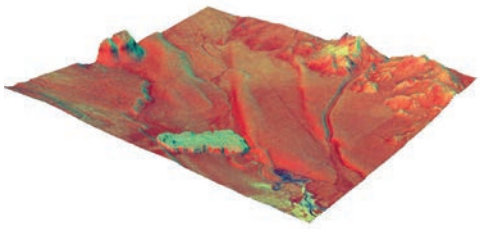
HarrisGeospatial.com

WHEN YOU NEED EVERY PIECE OF THE PUZZLE.

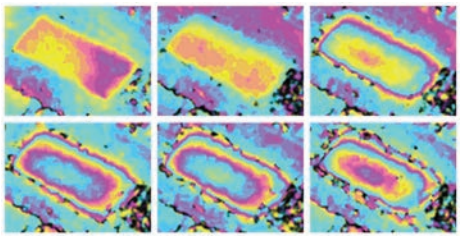
The use of Synthetic Aperture Radar (SAR) data has become increasingly popular in recent years, offering professionals in a wide range of industries a measurable, analytical approach to getting information about an area or objects of interest. SAR data, acquired from airborne and spaceborne platforms, enables the generation of two or three-dimensional products of the Earth's surface. When combined and merged with other data, SAR often adds critical information to your analysis.

GET THE INFORMATION YOU NEED FROM YOUR SAR DATA

ENVI SARscape® allows you to easily process and analyze SAR data acquired from all existing spaceborne and selected airborne platforms. It generates products, while giving you the option to integrate this information with other geospatial products. This unique data analysis capability takes your data from hard-to-interpret numbers, to meaningful, contextual information. As ENVI SARscape modules are integrated with ENVI – the premier image processing and analysis solution – you get the added benefit of image analysis tools and SAR processing functionality in one package.



DEM, based on TerraSAR-X-1 StripMap, Bolivia. ©TerraSAR-X-1 data, Infoterra.



Filtered interferograms (every 11 days) of a building in Barcelona, TerraSAR-X-1 StripMap, 1 fringe ~1.55 cm displacement. ©TerraSAR-X-1 data, Infoterra.



BASIC

Includes a complete set of processing functionalities, enabling the generation of thematic and change detection products based on intensity and coherence.

This module is complemented by:

- Focusing Module
  - From raw to single-look complex data.
- Gamma & Gaussian Filter Module
  - Includes additional SAR-specific speckle filters.

INTERFEROMETRY

Supports the processing of Interferometric SAR and Differential Interferometric SAR data for the generation of Digital Elevation Models (DEMs), coherence, and land displacement/ deformation maps.

This module is complemented by:

- ScanSAR Interferometry Module
  - Offers the capabilities to process InSAR and DInSAR data over large areas (400km by 400km).
- PolSAR/PolInSAR Module
  - Provides a dedicated set of functionalities for the polarimetric and polarimetric interferometric processing of SAR data.

INTERFEROMETRIC STACKING

Based on Small Baseline Subset (SBAS) and Persistent Scatterers (PS) techniques, it determines displacements of point and distributed-targets from long time series of SAR data.

SAR DATA PROVIDES A UNIQUE LAYER OF INFORMATION – EXPOSING NEW DETAILS TO HELP YOU MAKE THE MOST INFORMED DECISIONS POSSIBLE.

ENVI SARSCAPE BASIC

CAPABILITIES

Multilooking

Coregistration

Despeckling

Geocoding and radiometric calibration

Mosaicking

Feature extraction

Segmentation

Classification

ANALYZE THE INTENSITY

The ENVI SARscape Basic Module includes processing functionality for generating airborne and spaceborne SAR products based on intensity and coherence. This is complemented by a multi-purpose tool, which includes a wide range of functions – from image visualisation, to DEMs import and interpolation, to cartographic and geodetic transforms.

The Basic Module provides automated pre-processing tools that allow you to quickly and easily prepare your imagery for analysis and visualization. With the Basic Module, the following processing capabilities are supported:

ACCESSORY MODULES FOR ENVI SARSCAPE BASIC:

FOCUSING MODULE

The Focusing Module generates complex images (SLC) based on a 'ω - Κ' frequency domain algorithm.

It supports:

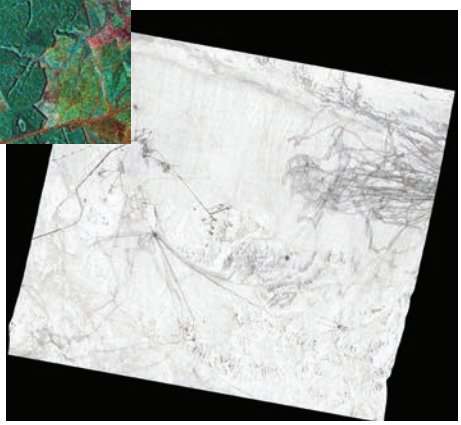
- RS-1/2 SAR
- JERS-1 SAR
- ENVISAT ASAR
- ALOS PALSAR-1 data.

GAMMA AND GAUSSIAN FILTER MODULE

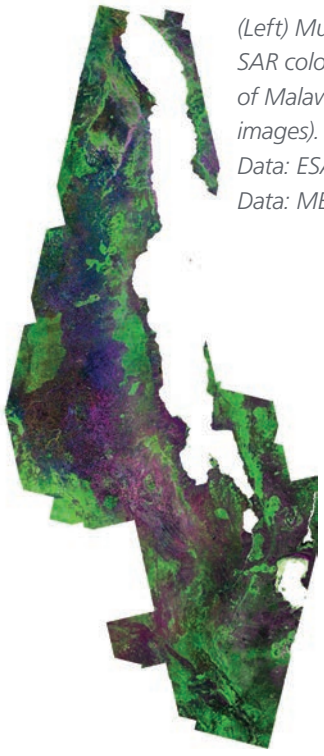
The Gamma and Gaussian Filter Module includes a variety of SAR-specific filters, extending the range of filters of the Basic Module. Algorithms for this module are based on gamma and gaussian-distributed scene models. They are particularly efficient in reducing speckle noise while preserving radar reflectivity, textural properties, and spatial resolution, especially in strongly textured SAR images.



(Left) Interferometric coherence and amplitude False Colour Composite image over South Africa forest area. ©COSMO-SkyMed™ Product - ASI, 2010. All rights reserved. Distributed by e-GEOS.



(Right) Activity MAP Coherence Change Detection (CCD) highlights the activities of living beings. ©COSMO-SkyMed™ Product - ASI, 2010, processed under license from ASI, All rights reserved. Distributed by e-GEOS.



(Left) Multi-temporal SAR color composite of Malawi (160 images). ©ASAR Data: ESA; PALSAR-1 Data: METI - JAXA.

ENVI SARSCAPE INTERFEROMETRY (INSAR/DINSAR)

PROCESSING STEPS

- Coregistration using DEM data
- Interferogram generation
- DEM flattening
- Interferogram adaptive filtering and coherence estimation
- Phase unwrapping
- Phase editing
- Geometry optimization based on ground control points
- Phase to map conversion and geocoding (DEMs)
- Phase to displacement conversion and geocoding (displacement maps)
- Geophysical modeling

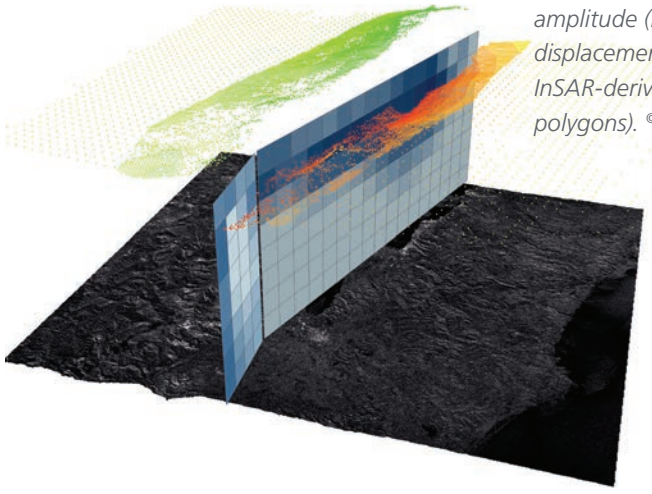
ANALYZE THE PHASE

This module enables the generation of DEMs (InSAR technique) and surface deformation maps (DInSAR technique). State-of-the-art methodology, applied to data acquired from SAR sensors, generate accurate (up to a vertical resolution of few meters) and detailed surface and terrain height products. The DInSAR technique can detect centimeter-scale displacements over time spans of days to years. The interferometry module is applicable in geophysical monitoring of natural hazards like earthquakes, volcanoes and landslides. It is also useful in structural engineering, particularly for the monitoring of subsidence and structural stability.

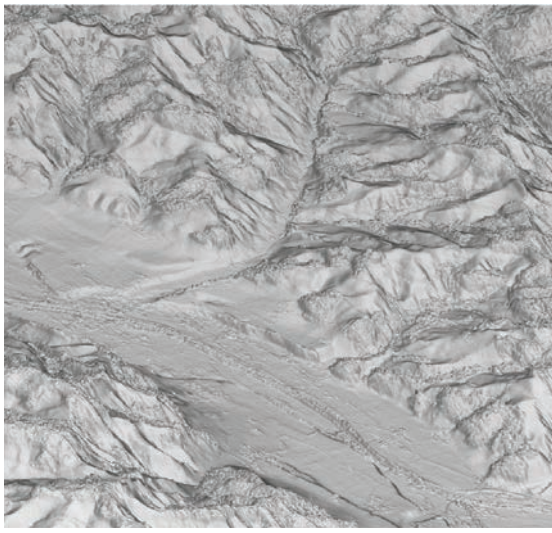
The ENVI SARscape Interferometry Module allows you to process Interferometric SAR (2-pass interferometry, InSAR), and Differential Interferometric SAR (2/3/4-pass interferometry, DInSAR) data.

ACCESSORY MODULES FOR ENVI SARSCAPE BASIC:

The two accessory modules, ScanSAR Interferometry and SAR Polarimetry Polarimetric Interferometry, complement the InSAR/DInSAR Module.



(Left) 1999 Izmit earthquake: SAR amplitude (below), InSAR-derived displacement (points cloud) and InSAR-derived fault model (vector polygons). ©ERS Data: ESA.



(Above) 3D view of an airborne InSAR very high resolution Digital Elevation Model: pixel spacing 0.5m, 1:25'000 map sheet of an area in Switzerland. ©Airborne Data: Aerosensing.

ENVI SARSCAPE INTERFEROMETRIC STACKING

CAPABILITIES

Analyze extended/natural features:

- Volcanic or seismic activity
- Landslides

Analyze localized structures/man-made features:

- Subsidence
- Building failures

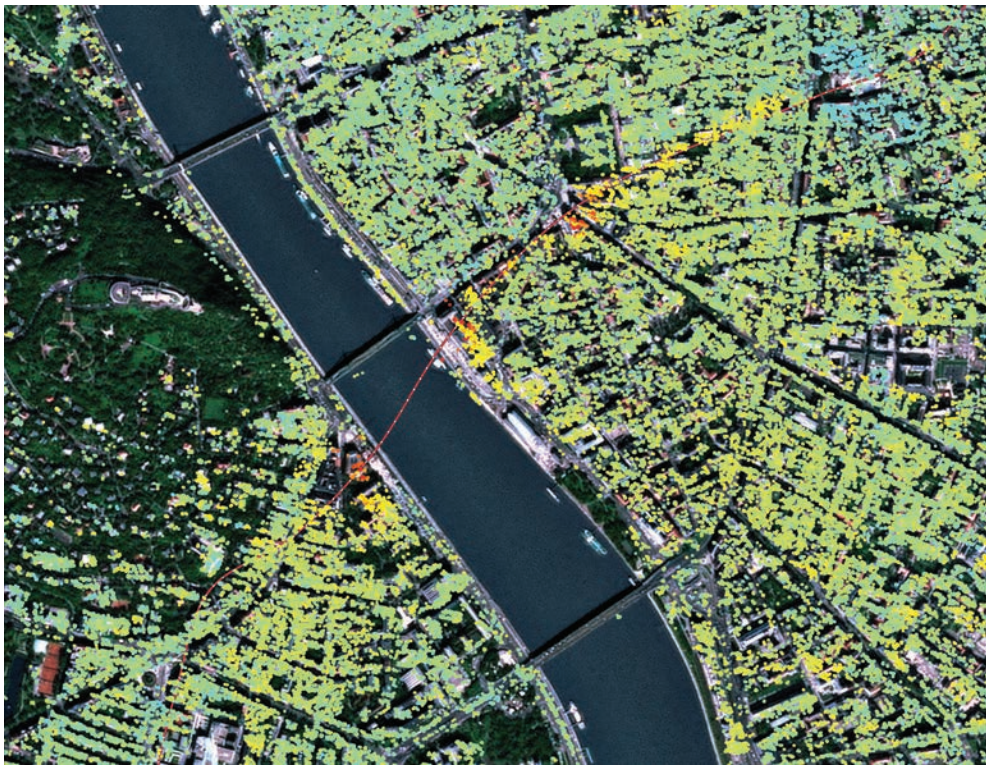
ANALYZE PHASE TIME-SERIES

The Interferometric Stacking Module integrates point-based (PS-like) and area-based (SBAS-like) techniques for the processing of interferometric stacks. This combined approach enables users to obtain accurate results on both point and distributed targets.

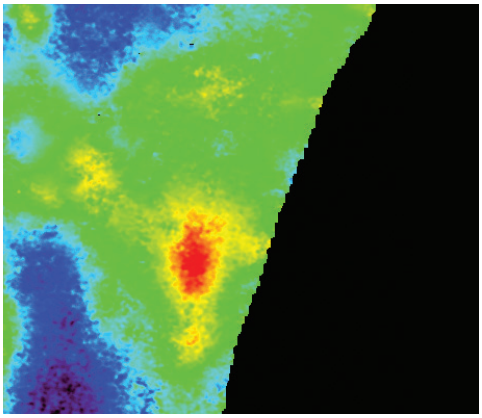
- Persistent Scatterers (PS)
  - Enables users to detect very small displacements (mm scale) and to infer the deformation velocity - and its variation over the time - in particular for very stable (man-made) reflectors that might have independent displacements in respect to the surrounding areas.
- Small Baseline Subset (SBAS)
  - A complementary method that exploits Differential Synthetic Aperture Radar interferometry (DIfSAR) techniques to analyze stacks of SAR acquisitions to extract small deformations over large areas, when no point targets are identified but large, correlated displacements occur over natural targets

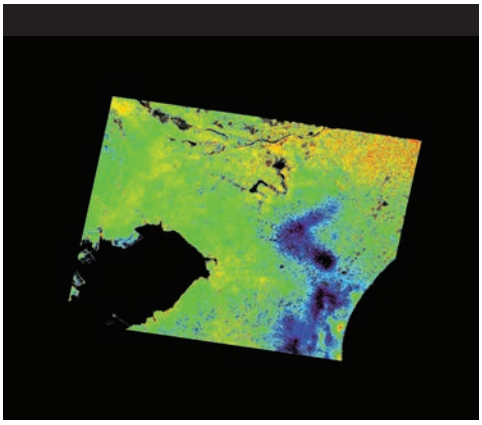
By combining these two approaches, it is possible to analyze deformation phenomena that affects both extended and localized structures related to natural or man-induced phenomena.





Average displacement rate (color scale between -7 and +7 mm/year), of an area in the city of Budapest, related to the excavation of a new metro station. ©TerraSAR-X data: DLR - Astrium GEO; processing: Astrium GEO.





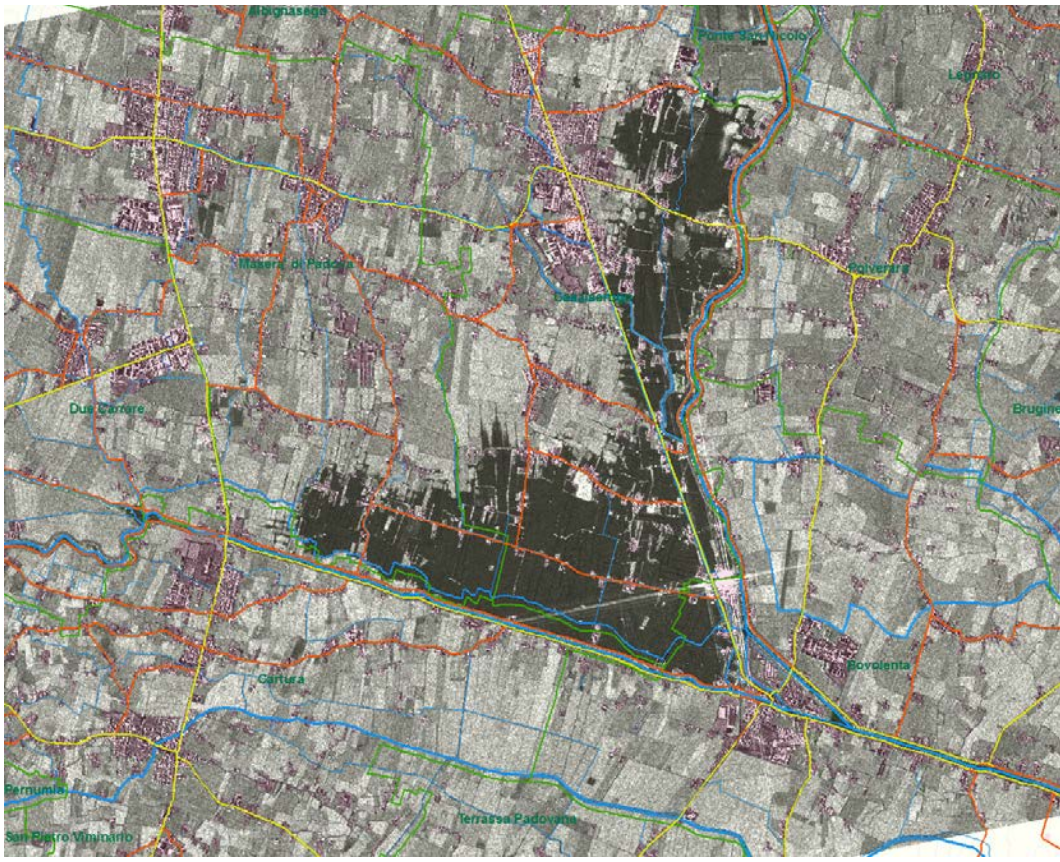
2003-2010 average displacement rate (color scale between -15 and +5 mm/year) of an area around the cities of Tokyo and Chiba, Japan, due to gas extraction. ©ALOS PALSAR-1 data: METI - JAXA.

OVERVIEW

Process and analyze SAR data acquired from all spaceborne and airborne platforms

Transform your data from hard-to-interpret numbers to meaningful, contextual information

Integrate information from SAR data with other geospatial products for a more complete picture



FOR MORE INFORMATION:

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Email: geospatialinfo@harris.com

Phone: 303.786.9900

About Harris Corporation

Harris Corporation is a leading technology innovator that creates mission-critical solutions that connect, inform and protect the world. The company's advanced technology provides information and insight to customers operating in demanding environments from ocean to orbit and everywhere in between. Harris has approximately $8 billion in annual revenue and supports customers in 125 countries through four customer-focused business segments: Communication Systems, Space and Intelligence Systems, Electronic Systems, and Critical Networks.
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