BEAM and BEST Software tools

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4 September 2007, Lecture D2L5-1

ESA EO user toolboxes

Basic ERS & Envisat Atmospheric Toolbox

Basic ERS & Envisat (A)ATSR and MERIS Toolbox

Basic ERS & Envisat SAR Toolbox

Polarimetric SAR Data Processing and educational tool

Basic ERS & Envisat Atmospheric Toolbox

This afternoon, 16:30-18:30, Simon / Araújo

Tomorrow, Forest-Agriculture 12-13:30, Minchella

This afternoon, 16:30-18:30, Pottier

PRACTICALS

- http://earth.esa.int/resources/softwaretools/

- BEAM = Basic ERS & Envisat (A)ATSR and MERIS Toolbox

BEAM

- BEAM = collection of executable tools + application programming interface (API) developed to facilitate the utilisation, viewing and processing of MERIS, (A)ATSR and ASAR data.

VISAT	**Scientific tools** (Java):
BEAM's **VIS**ualization and **A**nalysis **T**ool	format conversion, atmospheric corrections etc…

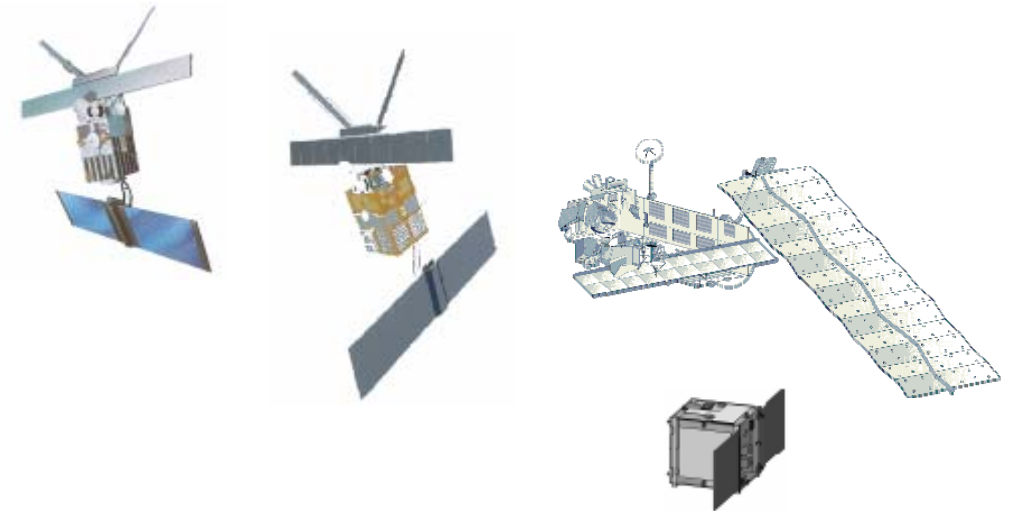
- BEAM = developed in Java, available for all common platforms (Windows, Linux, Mac OS X, Solaris…)

- Open source project

Brockmann Consult GmbH

Instruments supported

- MERIS
- (A)ATSR
- (A)SAR
- CHRIS (Proba)



- AVNIR2, PRISM (ALOS)
- MODIS
- AVHRR
- Landsat TM

- **VISAT: Visualization and Analysis Tool**

Visualization

Import/Open Product
Colour Palette
Bitmask overlay
…

Analysis (basic)

Reflectance Spectrum
Pins
Profile
Export to Excel
ROI and Statistics

Real Band/Virtual Bands
Expression editor
Bitmasks
Band Arithmetic
…

More advanced

Co-registration of MERIS and AATSR products
Ortho-rectification
Generation of Level 3 products
…

DIMAP format

- **DIMAP** (SPOT-Image) = simple data input/output format
- ⇨ easy to import ENVISAT data in other imaging applications

- **BEAM-DIMAP** = standard I/O product format for VISAT & Scientific Tools

- Data product composed of:
- 1 single **product header** file with the suffix .dim (XML) containing the product meta-data
- 1 **directory** with the same name plus the suffix .data containing plain binary raw image files for each band. Each geophysical band in the data product is represented by a single image.

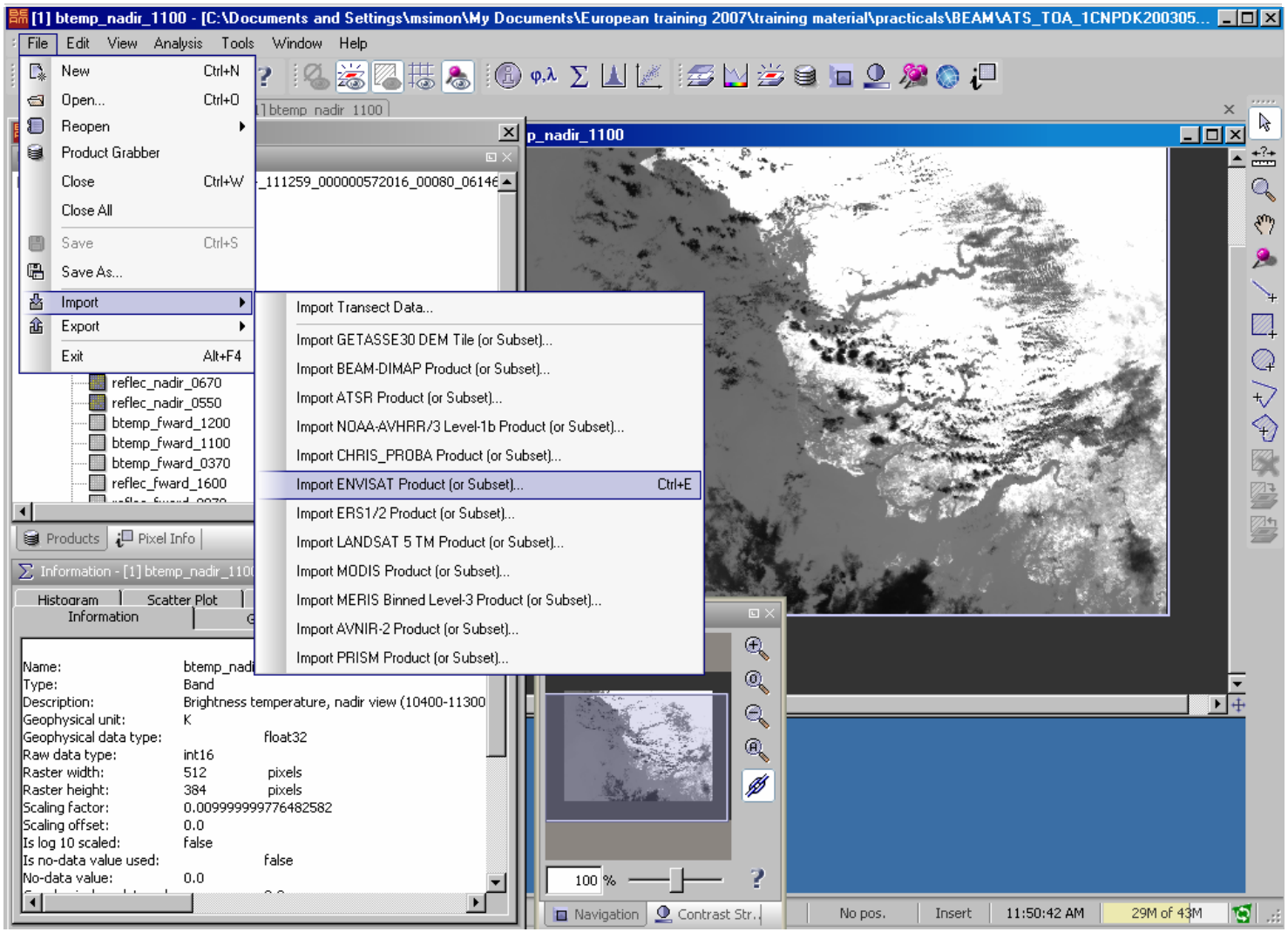
+ extra image header per band, .hdr
+ = ENVI header (⇨ compatible with ENVI)

- Version 4.0 (April 2007)
  - High-Level Architecture Revision
  - Modernised VISAT User Interface
  - Module Manager (install, update and uninstall modules)
  - Help for Access to Data Sources
  - New Issue Tracking and Community Wiki

- Version 4.1 (Autumn 2007)
  - Geo-coding by ground control points incl. interactive tools in VISAT
  - Automatic and manual Co-Registration

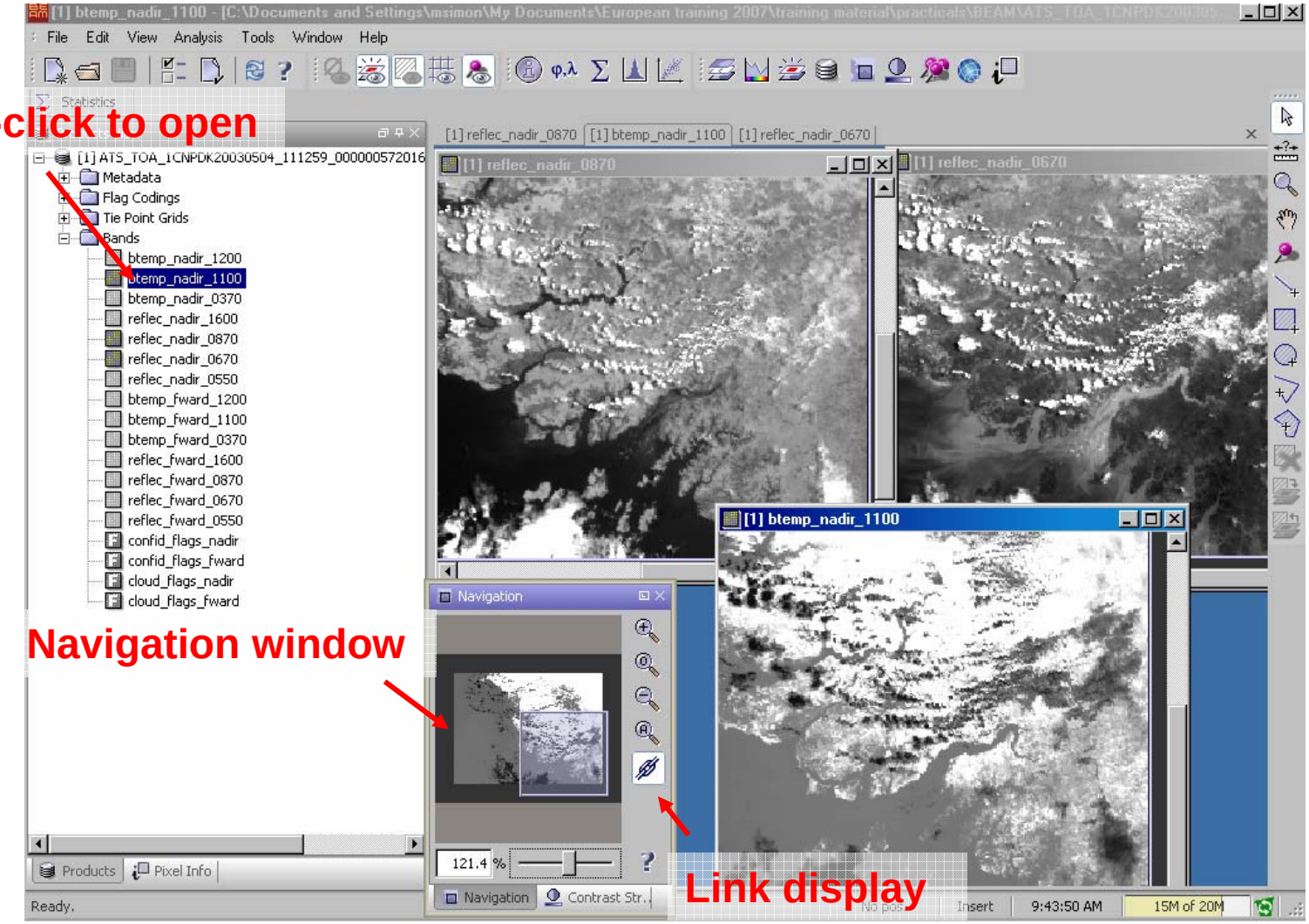
File Edit View Analysis Tools Window Help

File: Import products

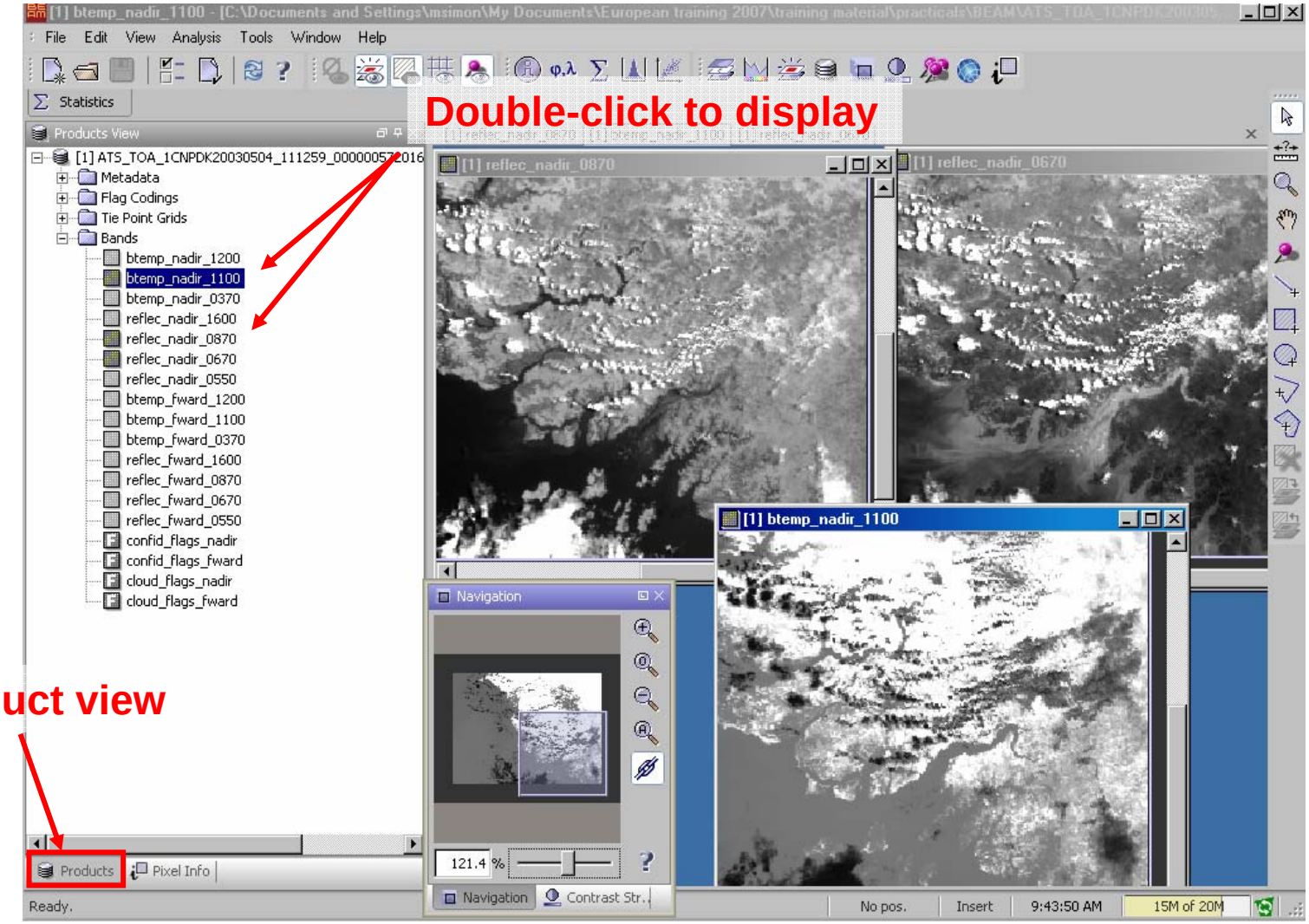


File Edit View Analysis Tools Window Help

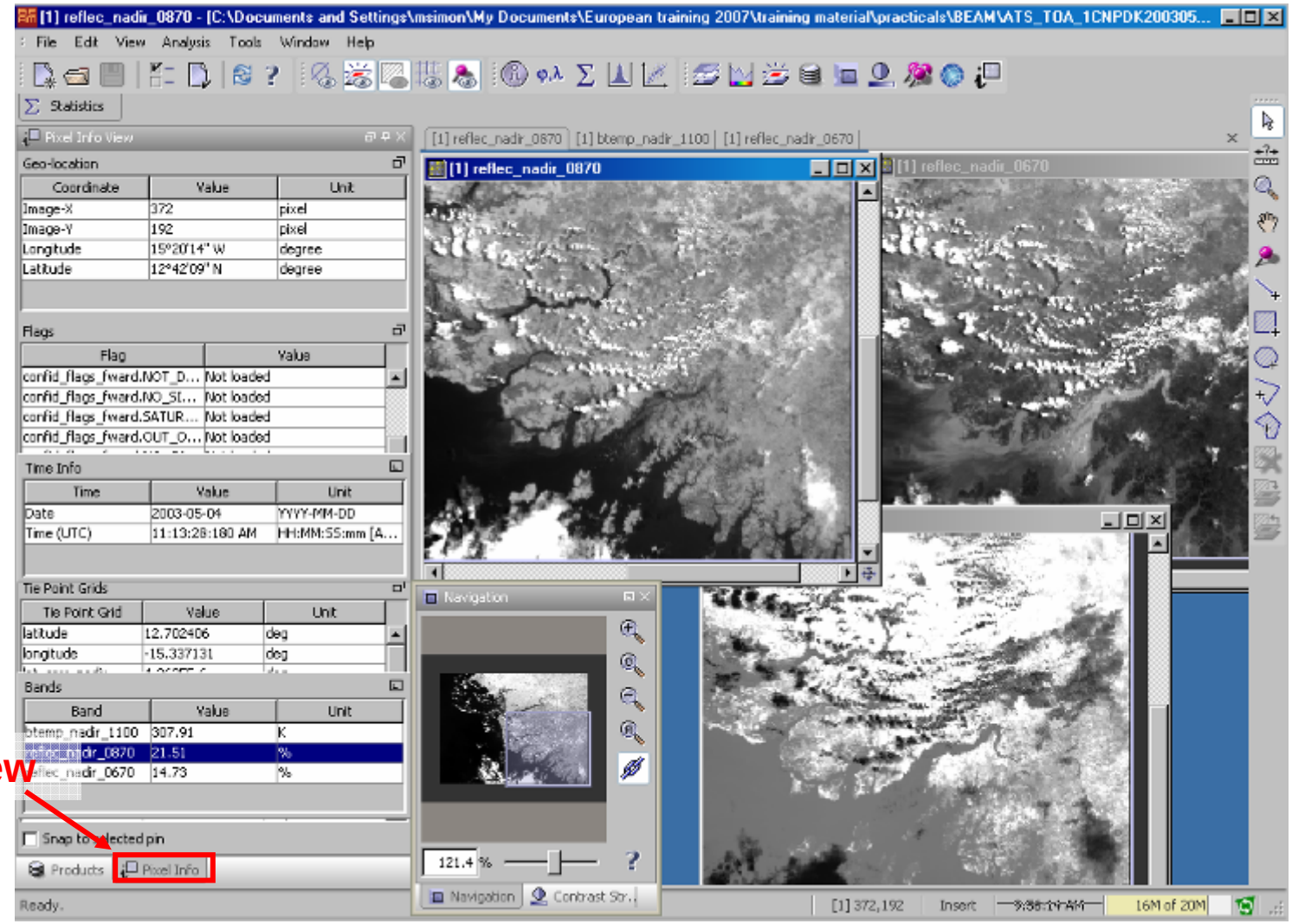
Visualize bands



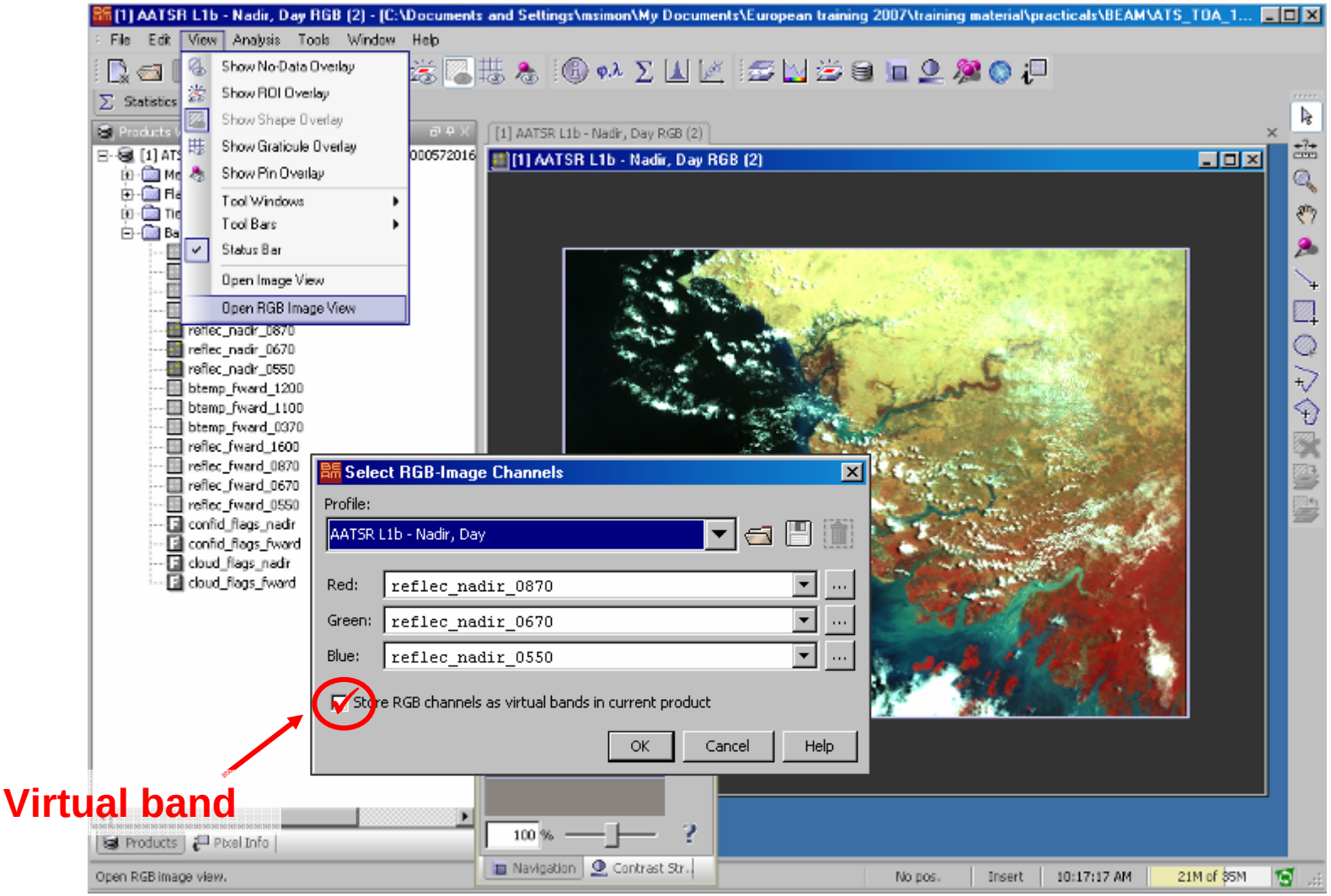
Product view – Pixel view



Product view – Pixel view

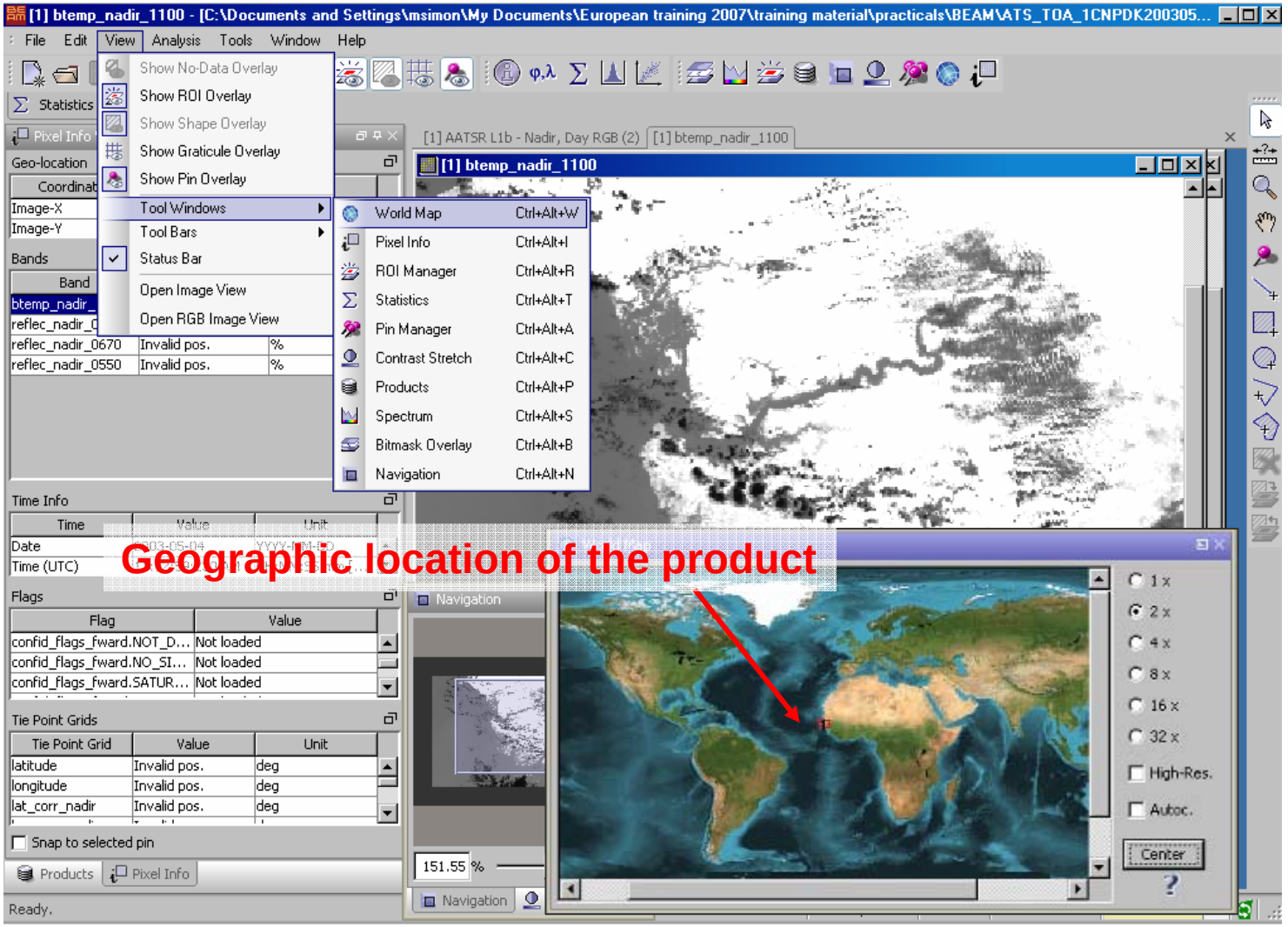


Visualization tool: RGB image

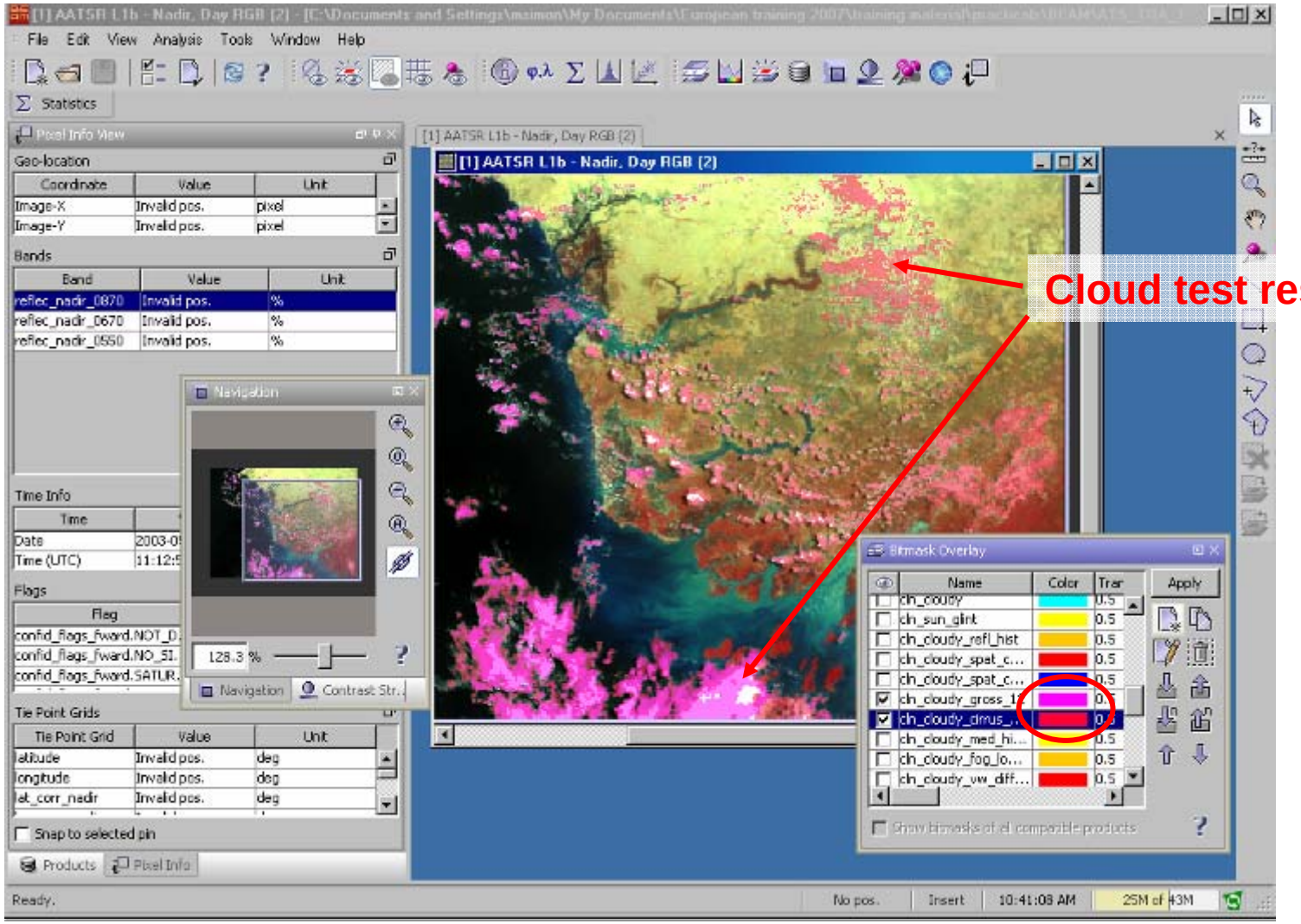


File Edit View Analysis Tools Window Help

Visualization tool: World map

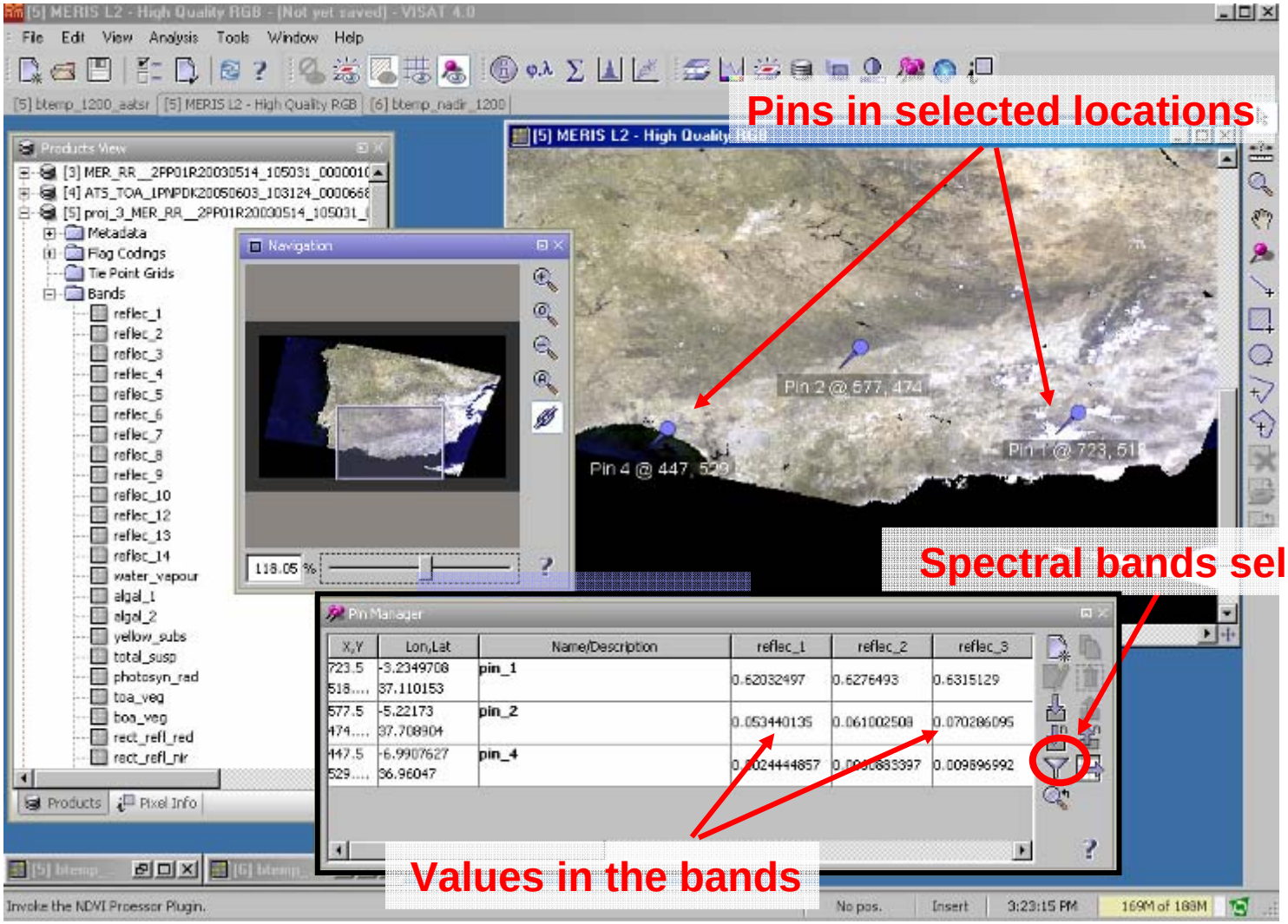


Visualization tool: Bitmap overlay



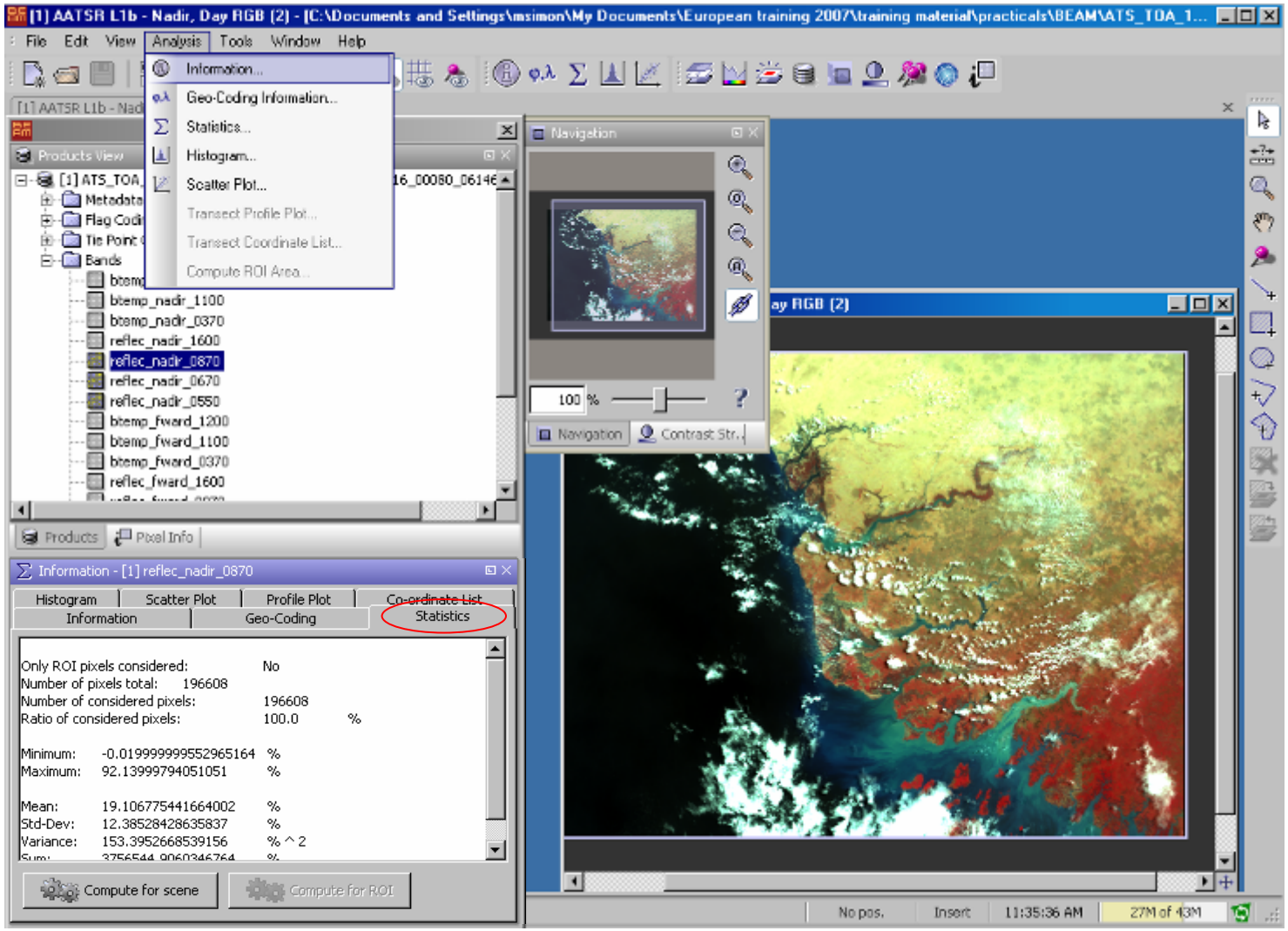
File Edit View Analysis Tools Window Help

Visualization tool: Pin Manager

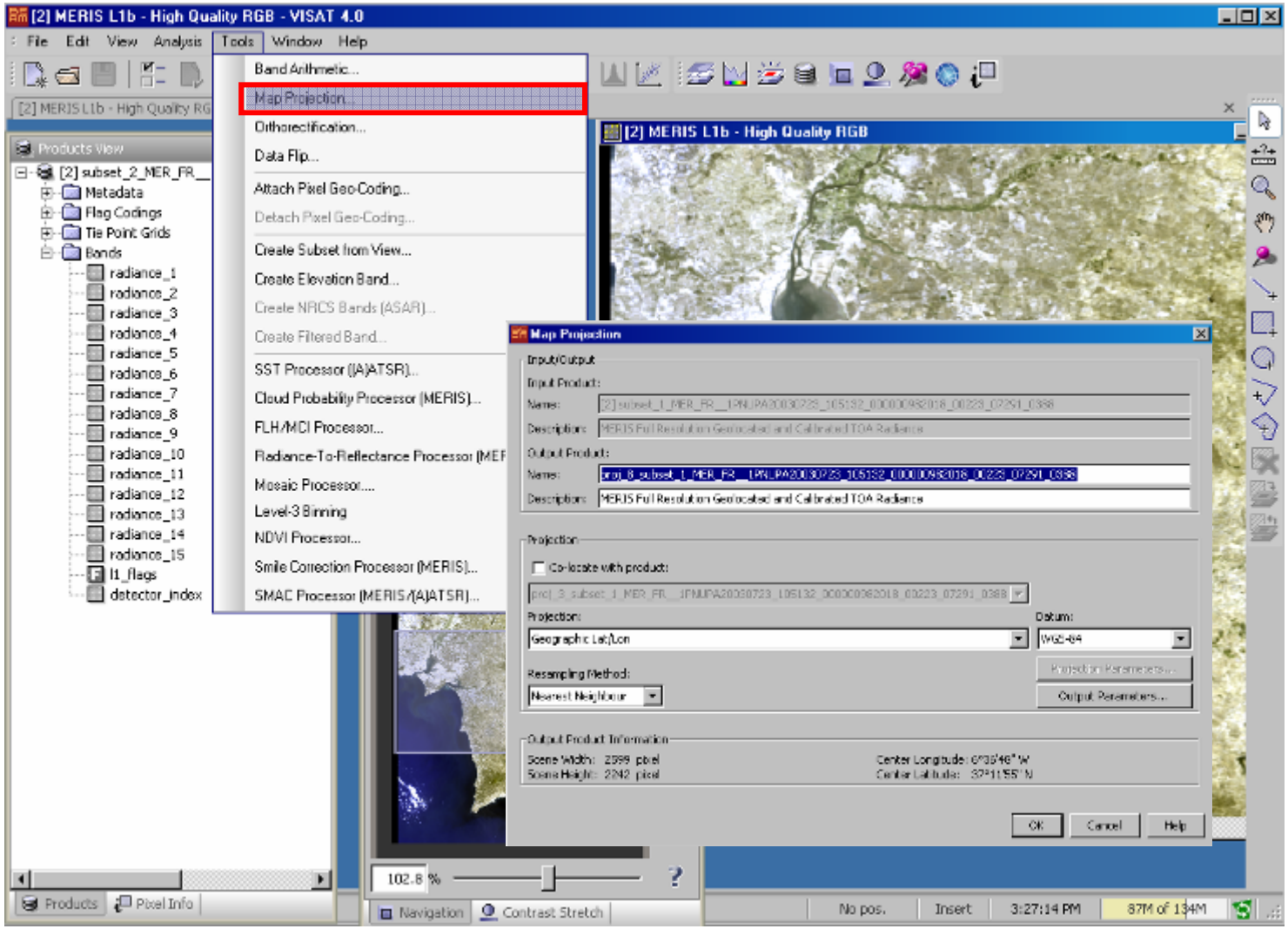


File Edit View Analysis Tools Window Help

Analysis tools: information, statistics

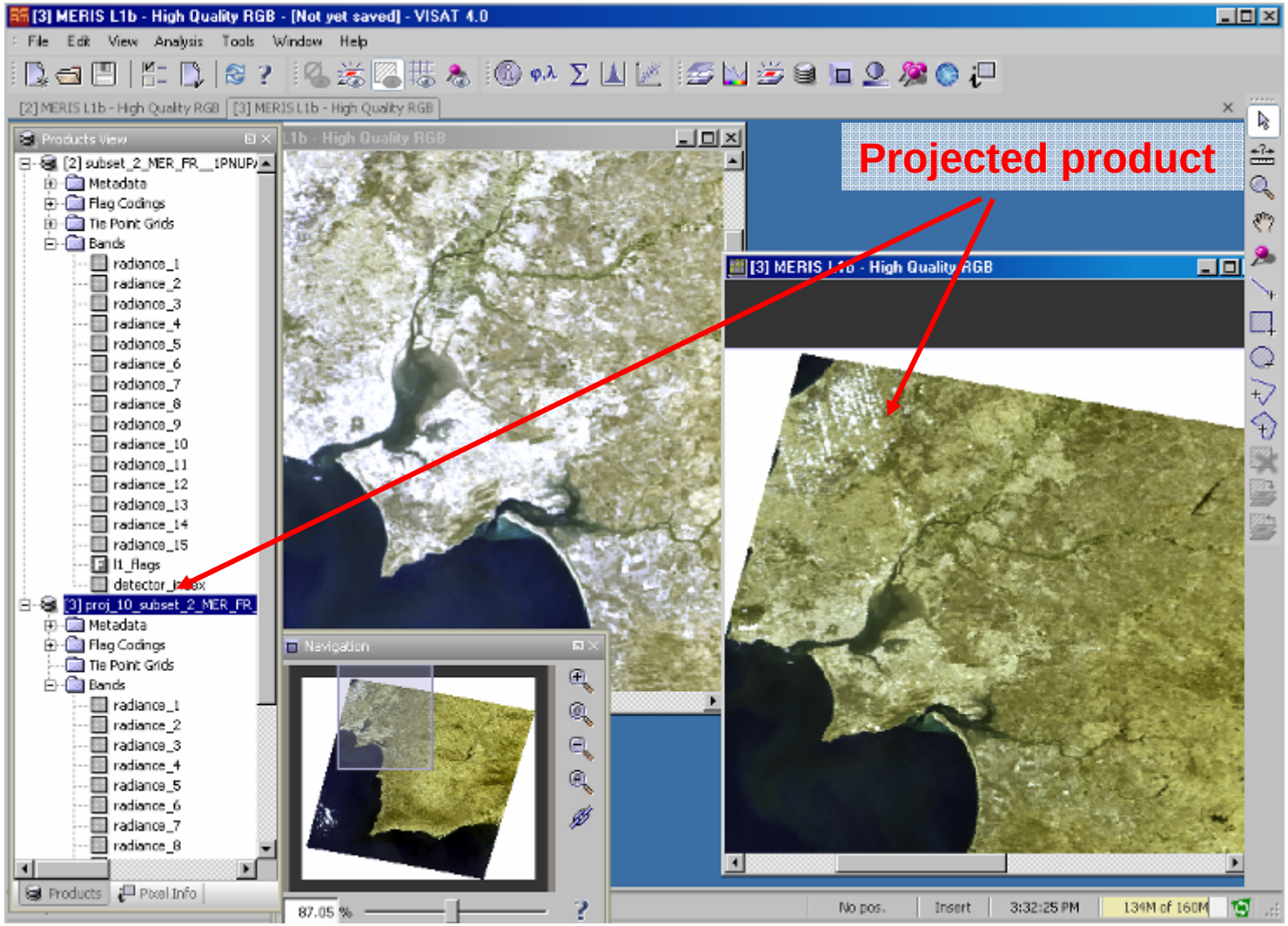


Processing tools



File Edit View Analysis Tools Window Help

Processing tool: Map projection

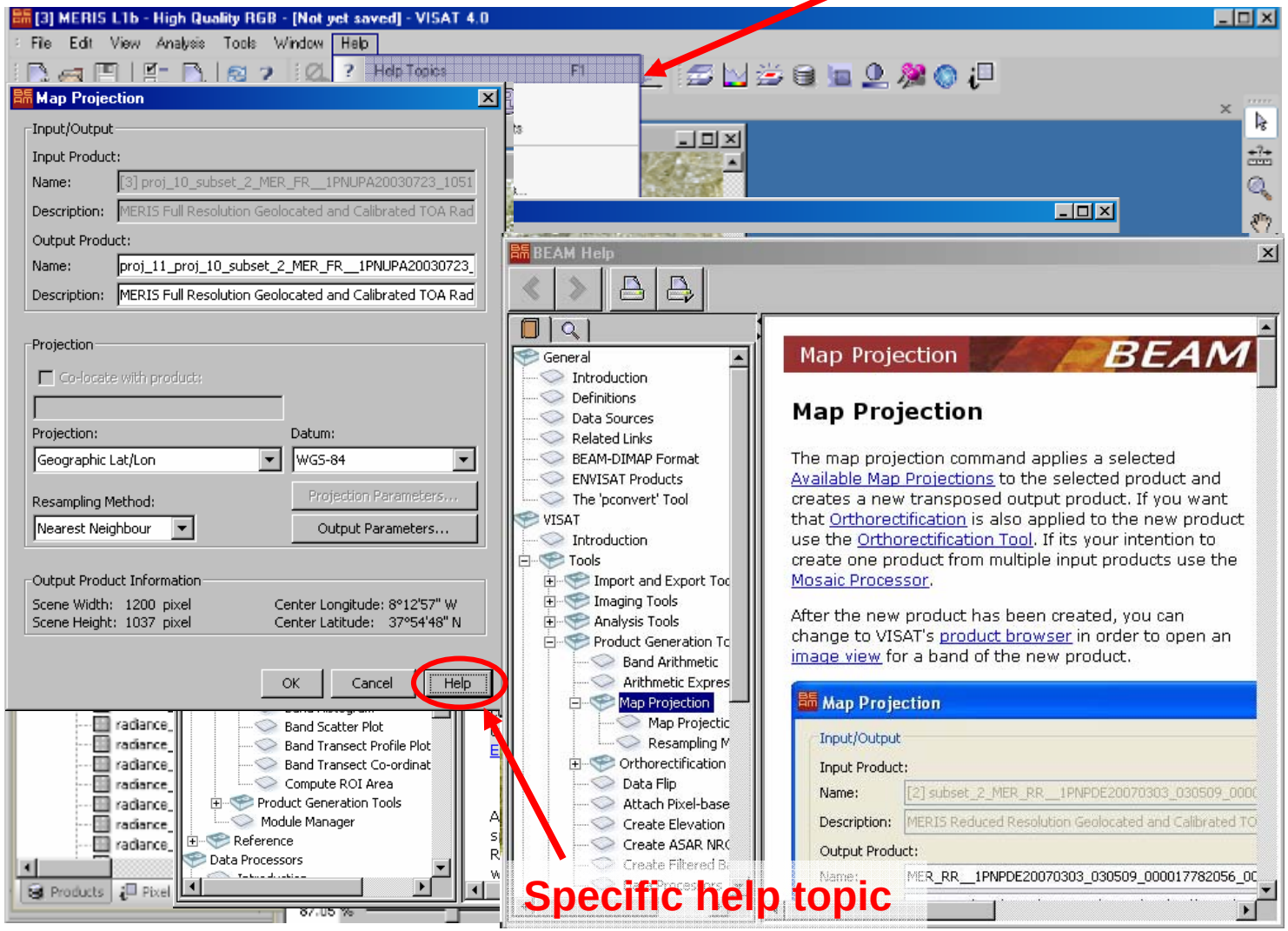


And also:

- **Band Arithmetic,**
- **Data fusion between two products…**

More this afternoon!

VISAT Help


File Edit View Analysis Tools Window Help
General help menu
[3] MERIS L1b - High Quality RGB - [Not yet saved] - VISAT 4.0
Map Projection
Input/Output
Input Product:
Name:
Description:
Output Product:
Name:
Description:
Projection
Projection:
Geographic Lat/Lon
Datum:
WGS-84
Resampling Method:
Nearest Neighbour
Projection Parameters...
Output Parameters...
Output Product Information
Scene Width: 1200 pixel
Scene Height: 1037 pixel
Center Longitude: 8°12'57" W
Center Latitude: 37°54'48" N
OK
Cancel
Help
BEAM Help
General
Introduction
Definitions
Data Sources
Related Links
BEAM-DIMAP Format
ENVISAT Products
The 'pconvert' Tool
VISAT
Introduction
Tools
Import and Export Tools
Imaging Tools
Analysis Tools
Product Generation Tools
Band Arithmetic
Map Projection
Orthorectification
Data Flip
Attach Pixel-based
Create Elevation
Create ASAR NRC
Band Scatter Plot
Band Transect Profile Plot
Compute ROI Area
Product Generation Tools
Module Manager
Reference
Data Processors
Products
Pixel
Map Projection
BEAM
Map Projection
The map projection command applies a selected Available Map Projections to the selected product and creates a new transposed output product. If you want that Orthorectification is also applied to the new product use the Orthorectification Tool. If its your intention to create one product from multiple input products use the Mosaic Processor.
After the new product has been created, you can change to VISAT's product browser in order to open an image view for a band of the new product.
Map Projection
Input/Output
Input Product:
Name:
Description:
Output Product:
Specific help topic

BEAM community

Set of communication tools provided by the BEAM development team to the user community trough the BEAM Website.

- Includes:
  - FAQs
  - Plug-Ins provided by users / developed as technology studies (e.g. *SEBS plug-in, D1La6, Bob Su*)
  - wish-list: proposals for new improvements/developments for next BEAM releases.

- **More on BEAM this week:**
- Hands-on introduction this afternoon (D3PA & D3PB)
- Land Use Land Cover (D3PA, Mário Caetano)
- Water resources (D5PA, Bob Su and Jose Moreno)
- …

- **And further:**
- http://earth.esa.int/beam
- info@brockman-consult.de

BEST = Basic ERS & Envisat SAR Toolbox

BEST

- **BEST** = collection of software tools developed to facilitate the use of ESA SAR data.
- BEST = pre-processing tool only, no advanced SAR processing

- **Input data:**
  - ASAR (Advanced Synthetic Aperture Radar) onboard Envisat
  - AMIs (Active Microwave Instrument) onboard ERS 1&2

- **Output data:**
  - TIFF, GeoTIFF, BIL…

- **Platforms:**
  - Windows™ 98/2000/ME/NT/XP, LinuX, Solaris2™.

Toolbox Functionalities

- Data Import and Quick Look
- Data Export
- Data Conversion
- Statistics
- Resampling
- Co-registration and Coherence Generation
- Radiometric Resolution Enhancement
- Calibration

Toolbox Functionalities

Data Import and Quick Look

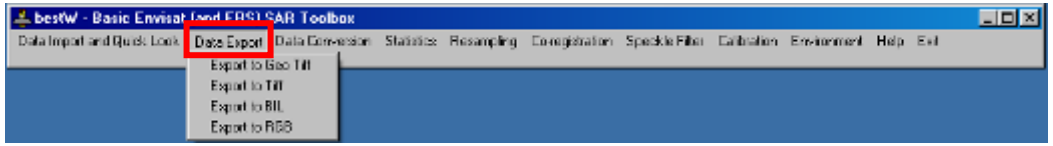
Extract data from Envisat ASAR and ERS SAR products held on any media (CD-ROM/DVD/EXABYTE/hard disk) in a standard ESA format

Import TIFF and GeoTIFF images, generic raster data and ancillary data

Quick Look tool for generating reduced-size TIFF images of datasets directly from original products or from files created by BEST in internal format.

Data Export

Converting data from the Toolbox's internal format to the common image formats TIFF, GeoTIFF or BIL, to allow visualisation of processing results. Data may be exported as a single channel, as a RGB false-colour composite or in multi-channel binary files.



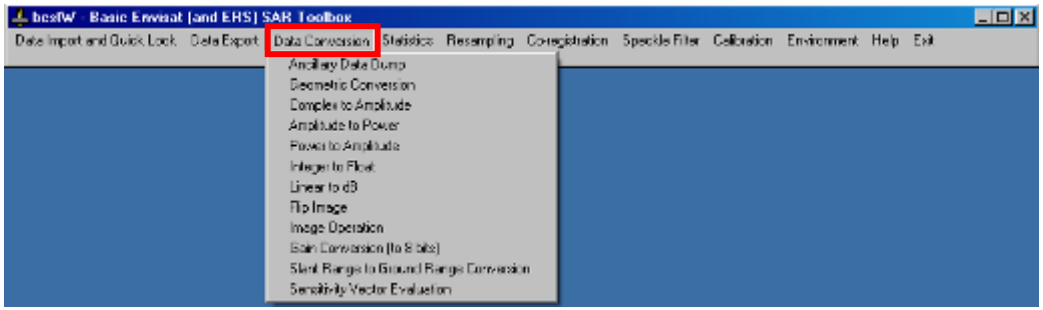
Toolbox Functionalities

Data Conversion

Convert between different image formats (e.g. Complex to amplitude, amplitude to power etc.) and perform basic mathematical operations on images.

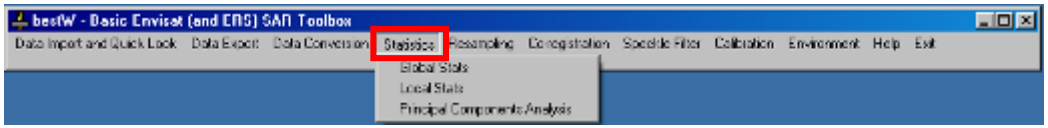
Also for altering image orientation (flipping) and transforming data from slant range to ground range.

Additional tool for calculating the sensitivity vectors for points in an image.



Statistics

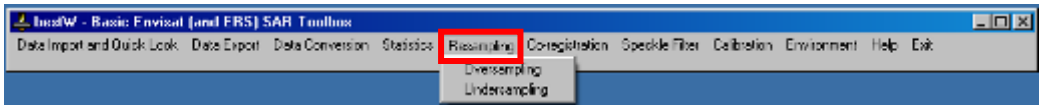
Calculate global or local statistical parameters from real image data and compute the principal components of multi-dimensional datasets.



Toolbox Functionalities

Resampling

Over- and under-sampling (both spatial and spectral)

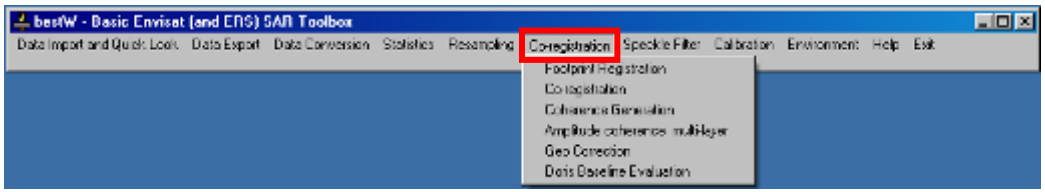


Co-registration and Support for Interferometry

Automatic co-registration of both real and complex images and evaluation of associated residuals, quality and coherence values.

Also for generating an optimised coherence image and computing the interferometric altitude of ambiguity.

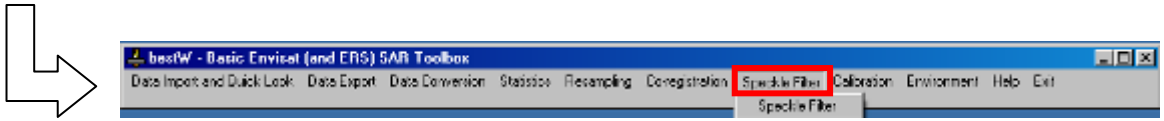
Additional tools for deriving orbital baselines from pairs of DORIS files and geometrically correcting ASAR medium resolution products.



Toolbox Functionalities

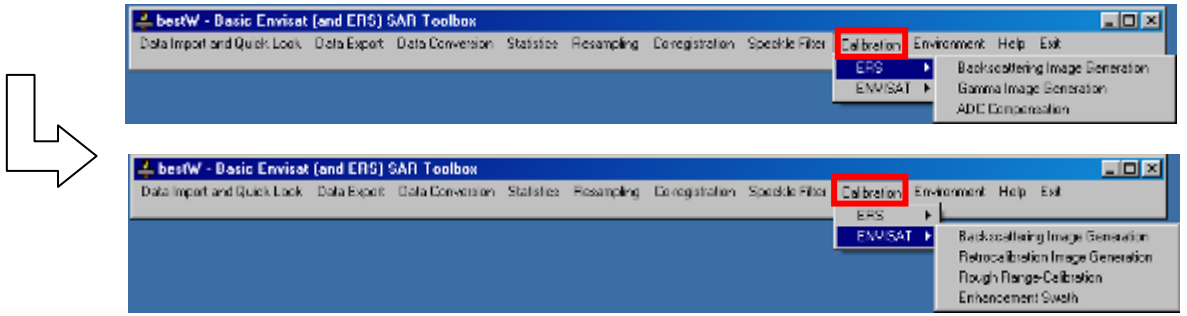
Radiometric Resolution Enhancement

A Gamma MAP speckle filtering tool for increasing the radiometric resolution of the backscatter image. The filter can be used with real or complex images and has a range of parameters configurable by the user.



Calibration

Algorithms for performing various levels of radiometric correction to an input image, including the generation of an image in which the pixel values represent the backscattering coefficient.
The calibration tool is based for ERS on the document "Derivation of backscattering coefficient in ERS SAR PRI images (version 2.c)", for ENVISAT on the document "Absolute Calibration of ASAR level 1 products generated with PF-ASAR".
Also for replacing the antenna pattern used to calibrate an ASAR product (retro-calibration) and enhancing ASAR Wide-swath images by correcting incidence angle effects in range and smoothing the steps between ScanSAR sub-swaths.



More on BEST this week

- Forest-Agriculture (D3PB, Part 1, Andrea Minchella)
- Forest-Agriculture (D3PB, Part 4, Thuy Le Toan)
- …

- Questions? Andrea Minchella

And further:

- User guide: overview, detailed functionality descriptions, examples
- ***http://earth.esa.int/best***

Thank you