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→ 4th ADVANCED TRAINING COURSE IN LAND REMOTE SENSING

ESA & Third Party Toolboxes: BEAM

Earth Observation Toolbox and Development Platform

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1–5 July 2013 | Harokopio University | Athens, Greece

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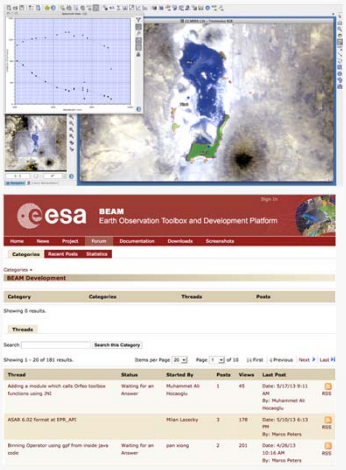
BEAM in a nutshell

BEAM is a tool for the exploitation of optical data:

- VISAT visualisation and analysis Tool
- More than 30 data processors
- SMOSBox, Globtoolbox, ChrisBox
- NEST and SeaDAS 7 built on BEAM API

BEAM is an **open source** Java platform for the development of remote sensing applications:

- Java API, Graph Processing Framework
- User support: Plug-ins, issue tracker, wiki
- Supported by ESA, started 2002



History of BEAM

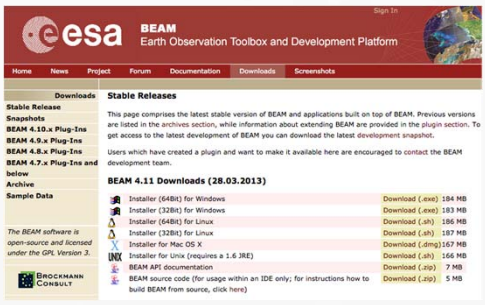
- Initial release in 2002
- Originally for display, analysis and processing of MERIS and AATSR products
- Current version: 4.11 (released 28.3.2013)

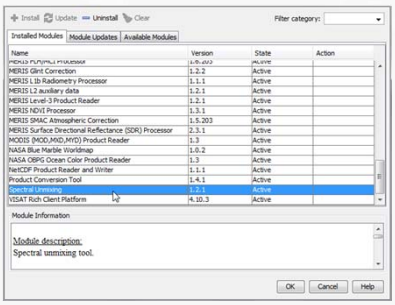
User driven evolution:

- Increasing number of basic functions
  (clustering, spectral unmixing, time series analysis, change detection)
- Increasing number of processors and plug-ins
- Increasing number of functions for terrestrial applications
- Growing support of products and formats
  (ALOS-AVNIR, CHRIS PROBA, Spot-VGT, VIIRS, Landsat-5; geoTIFF, NetCDF, HDF-EOS, shapefiles)
- Re-design of large image handling
  (image tiling, pyramids)

Install and update

- Download and install BEAM from
  envisat.esa.int/beam or brockmann-consult.de/beam
- l and update specific modules and processors in VISAT
  : `Help / Module Manager…`





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BEAM tools structure

VISAT:

- Interactive data analysis and visualisation tool
- Scripting console

GPT (Graph Processing Tool):

- Batch-mode executables for all data processors

Java-API:

- Full access to all BEAM classes
- Use and expand BEAM through GitHub

Python, C-API:

- Full translations of Java-API available from autumn 2013
- C-library available for access to N1 format

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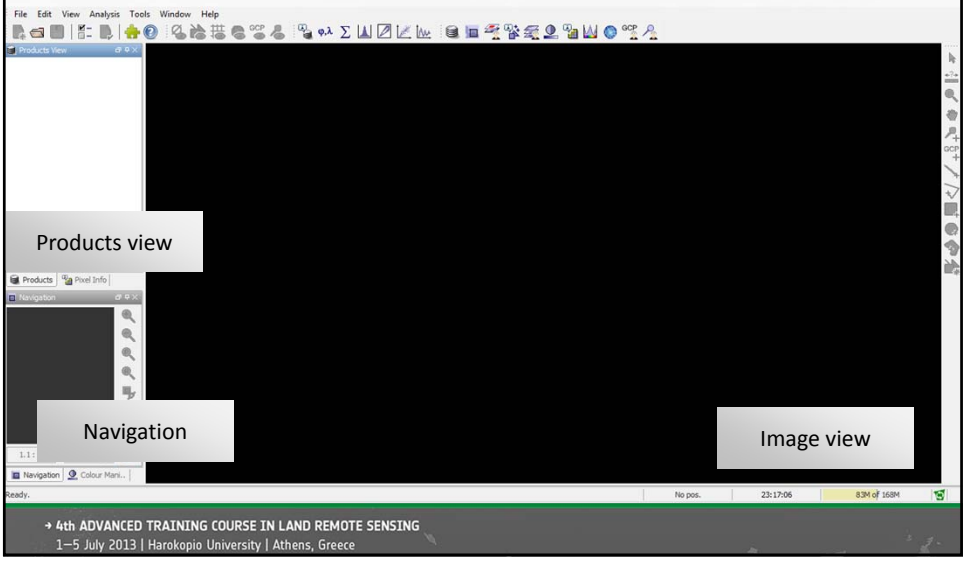
VISAT graphical user interface



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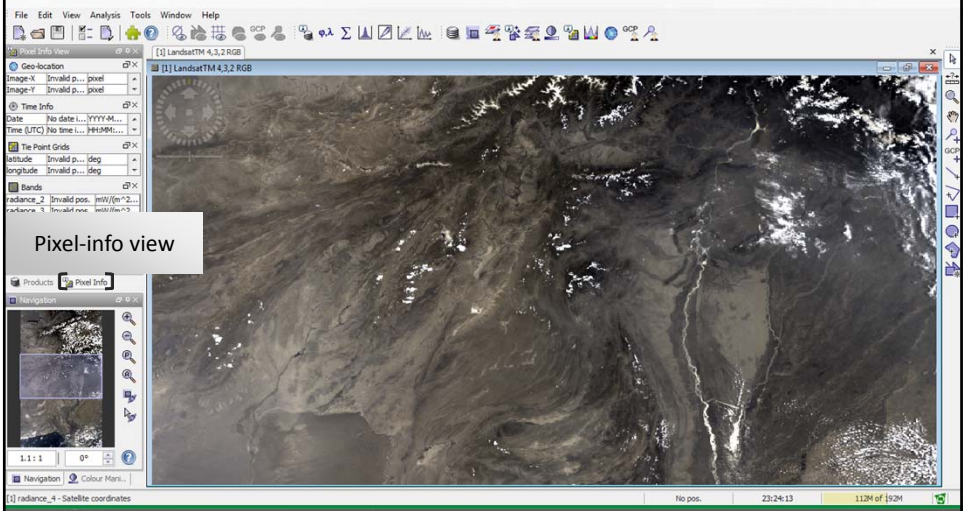
VISAT graphical user interface



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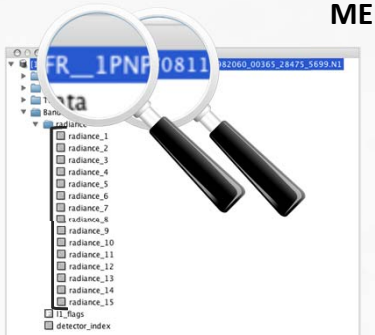
MERIS products tree



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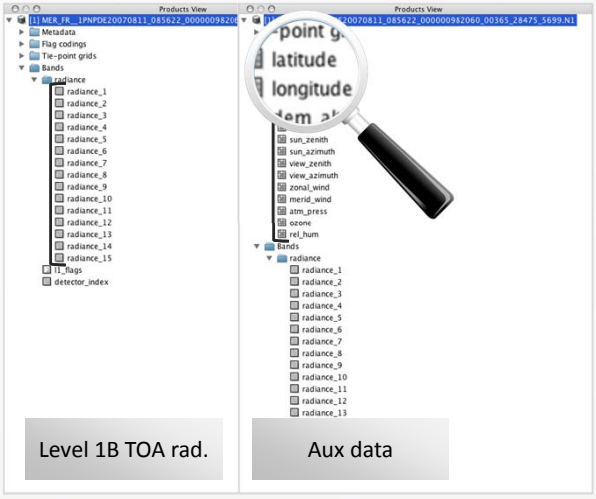
MERIS products tree



Level 1B TOA rad.

Aux data

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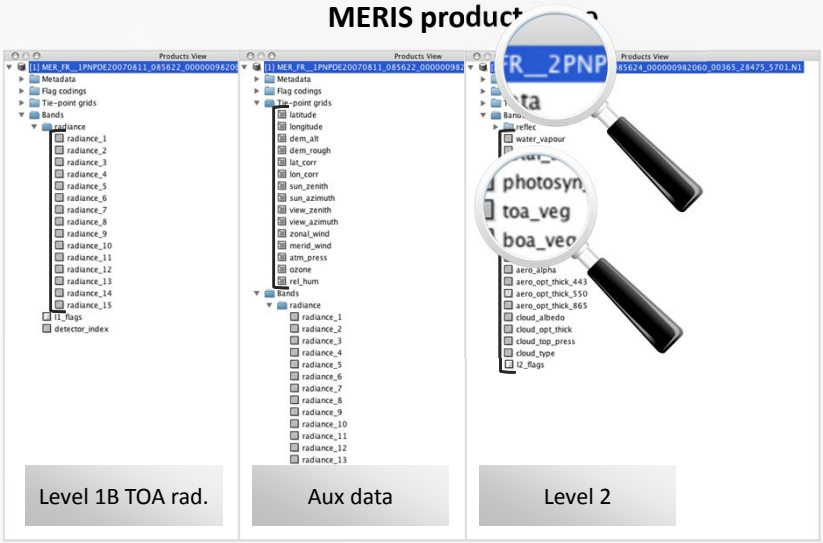
MERIS product



Level 1B TOA rad.

Aux data

Level 2

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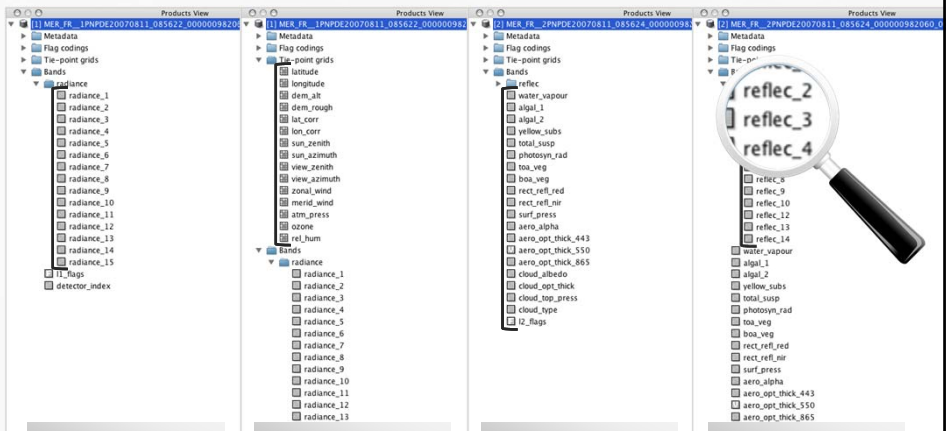
MERIS products tree



Level 1B TOA rad. | Aux data | Level 2 | Level 2 BOA refl.

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Getting started in VISAT

Open product:

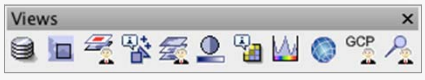
- `File / Open Product…`
  e.g. MER_FR__2PNPDE20070811_085624_000000982060_00365_28475_5701.N1

Open view:

- on product name / `Open RGB image view...`
  Opens `VISAT - Select RGB-Image Channels Dialogue`
- 2x on band name
  Opens greyscale view of band

Customize view:

- `View / Tool Bars / ✓ Views Tool Bar`
  When accidentally closed



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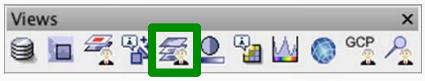
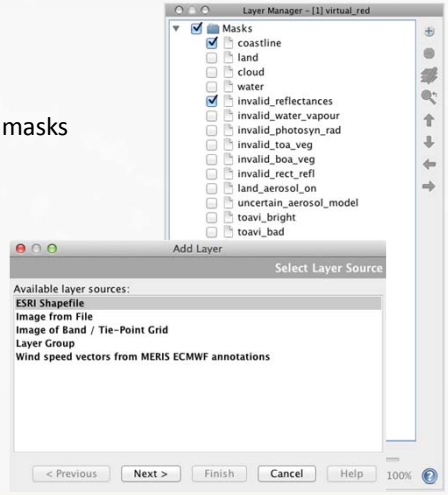
Layer Manager



- Lists displayed image, vector data and masks
- Checkboxes set visibility
- Set layer stacking order
- Add new layer to product



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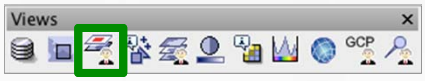
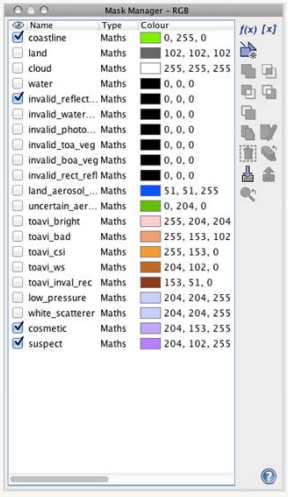
Mask Manager



- Lists all binary mask arrays
- Masks are math expressions defined for available data layers
  (e.g. `invalid_toa_veg=l2_flags.LAND AND l2_flags.PCD_15`)
- Set visibility, colour and transparency
- Display properties apply *only to the active view*



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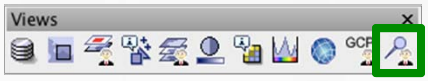
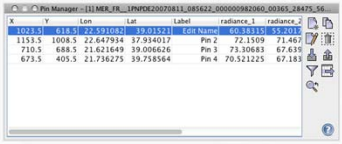
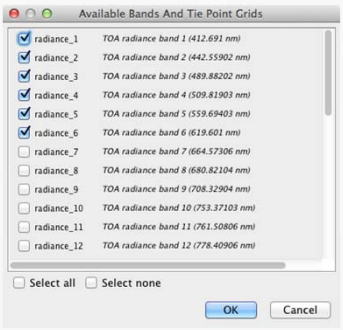
Pin Manager



- Add, edit and delete pins in xml-tables
-  place pins (or enter exact Lon/Lat)
-  open available bands list
- Checking bands adds value columns to `Pin Manager` list





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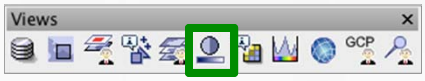
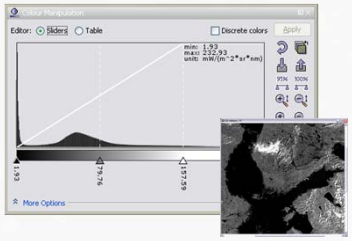
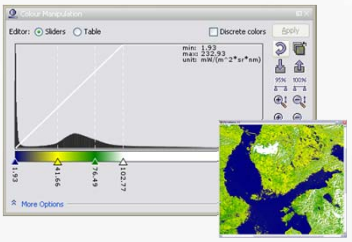
Colour Manipulation



- Different options for greyscale and RGB views
-  between sliders / `Add new slider`
  (only for greyscale images)
-  on slider or value
  to choose any colour and exact values
-  `Apply` button
  to apply the colour palette to the image view
- Export colour palette
  `File / Other Exports / Colour Palette as File`
  `File / Other Exports / Colour Legend as Image`





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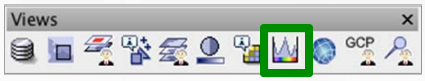
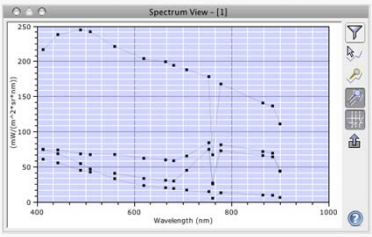
Spectrum view





- Display spectrum at cursor position or for one or several selected pins
- Select bands
- Export spectra to csv

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Tools menu

Preprocessing and geometry:

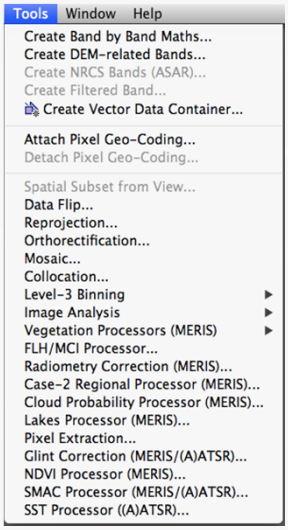
- Radiometry Correction (MERIS)…
- Orthorectification…, Mosaic…

Processing algorithms (>30 in total):

- Vegetation Processors (MERIS) / …
- SMAC Processor (MERIS/(A)ATSR) …

Image analysis:

- Image Analysis / …



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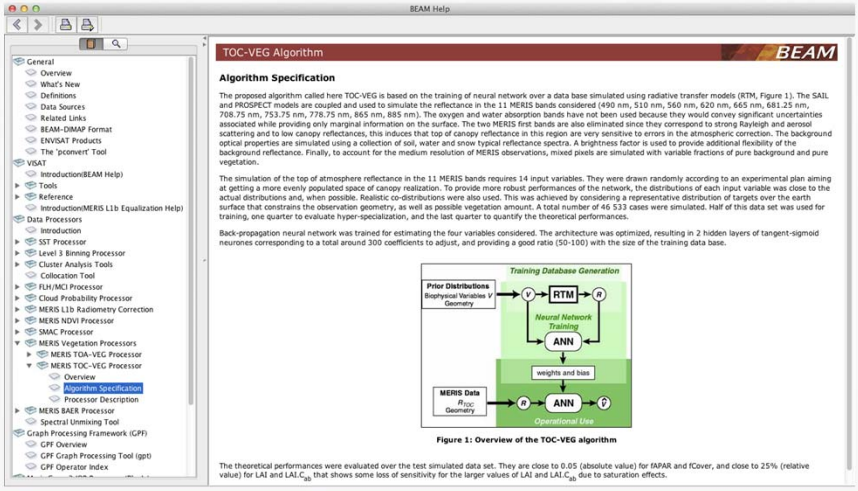
BEAM Help: TOA-VEG Algorithm



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Sentinel 2 and 3 exploitation tools

Sentinel 2:

- L1B & L1C reader (fully supporting all BEAM functions)
- L1B in satellite coordinates
- L1C UTM projected tiles
- Atmospheric correction processor
  (surface reflectances and aerosol properties)

Sentinel 3:

- L1b & L2 (land [ESA], water [EUMETSAT]) OLCI reader
- L1b & L2 SLSTR reader
- Synergy products reader
  (L1c synergy product, L2 advanced surface reflectance product)
- SPOT VEGETATION continuation products reader

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