INTRODUCTION TO BEAM SOFTWARE

The objective of this introduction is to give you an opportunity to manipulate the BEAM software and try the various basic functionalities before starting the application-oriented practical sessions.

Preliminary steps (already performed for you)

1. **Install** BEAM 4.0 from http://www.brockmann-consult.de/beam/downloads.html

   a. Download installer file beam-4-installer.exe

   b. Execute the file, use default settings

   c. This creates a directory under Program files called beam-4.0 that contains all files and applications

2. **Download** a sample MERIS image (for example the full resolution one on Portugal, http://www.brockmann-consult.de/beam/sample_products.html), save it with its original name under ./landtraining07

3. **Download** a sample AATSR product from the same location, save it to the same folder

4. **Unzip** the downloaded files

1. **Launch** VISAT

- Shortcut BEAM on the desktop

- Otherwise C:\Program Files\beam-4.0\bin -> visat.exe
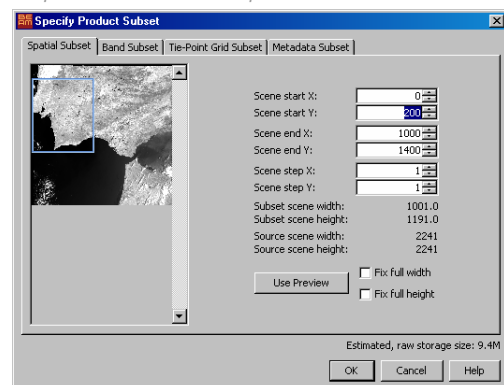
- Click **No** when asking for new version check

File menu

2. **Import** two files (File -> Import -> Import ENVISAT product)

- Files Location:

  C:\ESA\Day2\BEAM-data

- ATSR product:
  ATS_TOA_1CNPDK20030504_111259_000000572016_00080_06146_0157.N1

- MERIS Full Resolution product:
  MER_FR___1PNUPA20030723_105132_000000982018_00223_07291_0388.N1

- "Big" product, click Yes to create a subset:

  Spatial Subset Start X = 0, Start Y = 200, End X = 1000, End Y = 1400

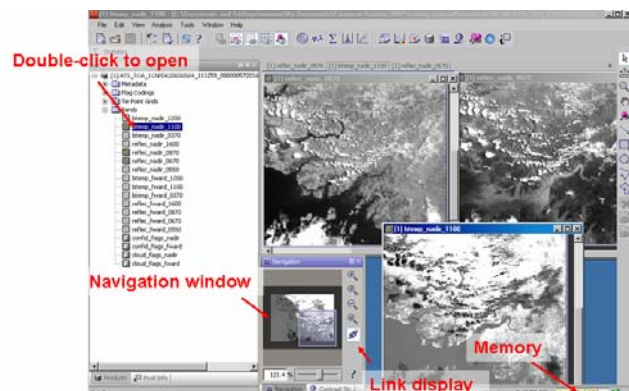 (New subset product: Click OK)

View menu

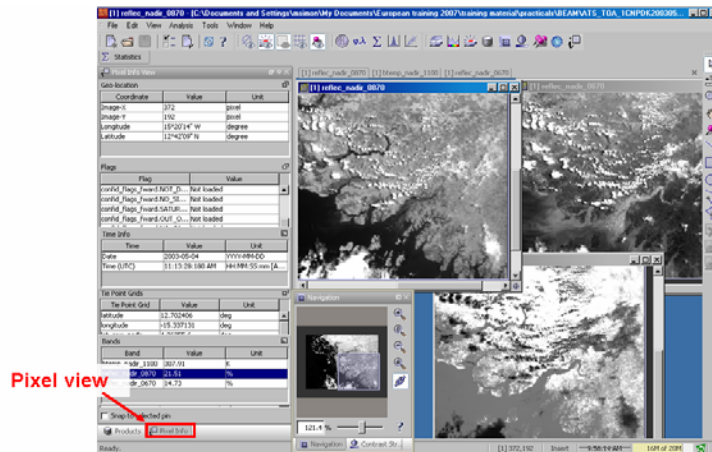1. **Image display**: Double-click on a band to open and display it.

2. **Navigation Window** (View -> Tool Windows -> Navigation)

- Use the Navigation window (zoom in, zoom out, link displays)

- Notice that only compatible views can be linked
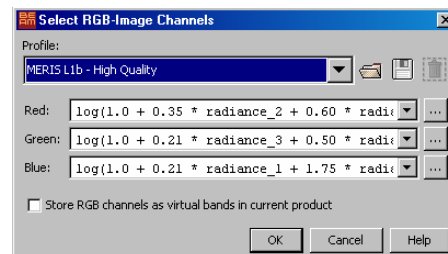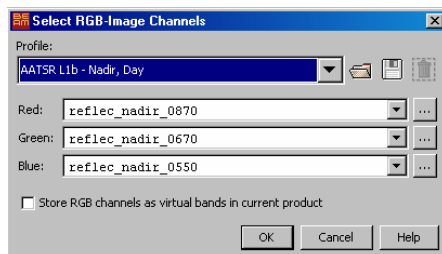
- Notice the memory allocation

3. **Toggle between Product view and Pixel view**:

- Product view (metadata, flags, tie point grids, bands)

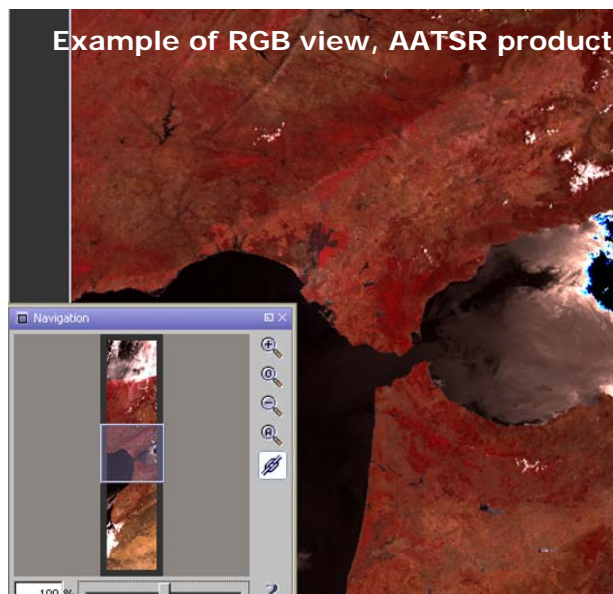- Pixel view: Individual pixel values, instantaneous values for all bands open

4. **RGB Image View** (View -> Open RGB Image View)

- Choose one of the products

- Default RGB settings for each type of image (AATSR, MERIS)

- Notice the mathematical expressions for MERIS; can be stored as virtual bands

- For MERIS, try (R,G,B) = (rad_14, rad_7, rad_5)

Example of RGB view, AATSR product

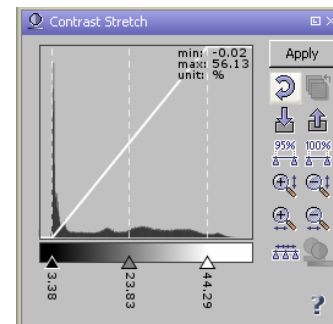## 5. **World Map** (View -> Tool Windows -> World Map)

- Localize the image(s) open on the world map, see if they overlap
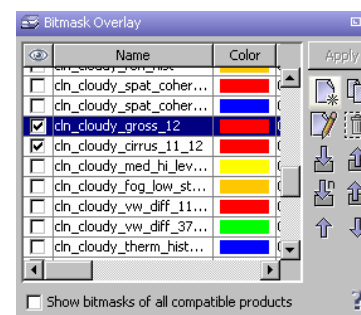

Geographic location of the product

6. **Contrast stretch** (View -> Tool Windows -> Contrast Stretch)

- Used to adjust the rendering of a band histogram
- Try adding colour information to one MERIS spectral band, click Apply when you're ready
- Add some sliders, try the various functions
- Reset settings

7. **Bitmask Overlay** (View -> Tool Windows -> Bitmask Overlay)

- Open AATSR reflec_nadir_0670 band
- In the Bitmask Overlay window, select

      cln_cloudy_gross_12

      cln_cloudy_cirrus_11_12

- Modify the bitmask colours and transparencies

- Note that the bitmask list varies with image selected (ATSR / MERIS)

8. **Pin Manager** (View -> Tool Windows -> Pin manager)

- Select a few pins on one image
- Choose a few spectral bands for these pins (funnel-shape icon)
- You can export the band values at pin points by right-clicking the table

9. ROI Manager (View -> Tool Windows -> ROI Manager)

- Select a ROI on one band: geometric, value rang[e]
- Try different types of ROIs

ROI Manager

Include pixels in geometric shape | Apply

Include pixels in value range
Min: 0.0   Max: 1.0

Include pixels by condition

Include pixels under pins
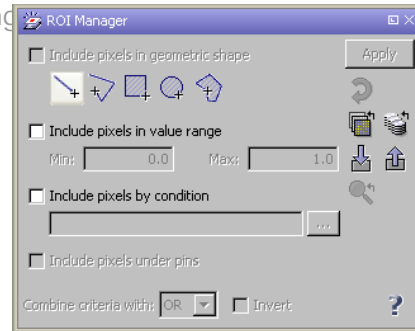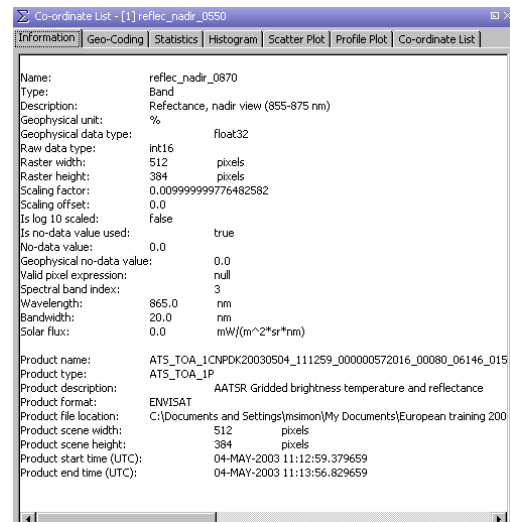
Combine criteria with: OR   Invert   ?

Analysis menu

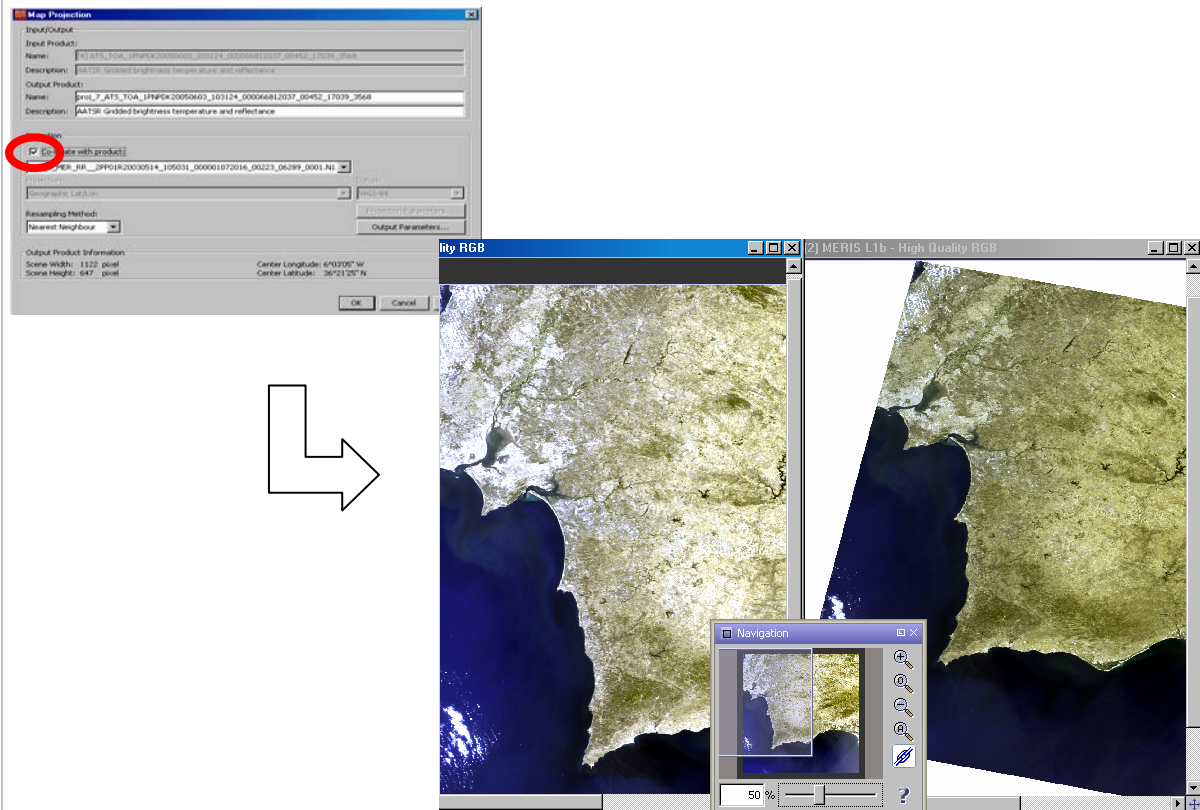### 1. Information, Statistics, Histogram (Analysis -> Information)

- Select a band
- Open the Information/Statistics/… window: common interface
- Compute statistics for the whole scene
- Compute for ROI, try various ROIs
- Right-click to copy Data to Clipboard
- Import in an Excel file

Co-ordinate List - [1] reflec_nadir_0550

Information | Geo-Coding | Statistics | Histogram | Scatter Plot | Profile Plot | Co-ordinate List

Name:	reflec_nadir_0870
Type:	Band
Description:	Refectance, nadir view (855-875 nm)
Geophysical unit:	%
Geophysical data type:	float32
Raw data type:	int16
Raster width:	512 pixels
Raster height:	384 pixels
Scaling factor:	0.009999999776482582
Scaling offset:	0.0
Is log 10 scaled:	false
Is no-data value used:	true
No-data value:	0.0
Geophysical no-data value:	0.0
Valid pixel expression:	null
Spectral band index:	3
Wavelength:	865.0 nm
Bandwidth:	20.0 nm
Solar flux:	0.0 mW/(m^2*sr*nm)
Product name:	ATS_TOA_1CNPDK20030504_111259_000000572016_00080_06146_015
Product type:	ATS_TOA_1P
Product description:	AATSR Gridded brightness temperature and reflectance
Product format:	ENVISAT
Product file location:	C:\Documents and Settings\msimon\My Documents\European training 200
Product scene width:	512 pixels
Product scene height:	384 pixels
Product start time (UTC):	04-MAY-2003 11:12:59.379659
Product end time (UTC):	04-MAY-2003 11:13:56.829659

Tools menu

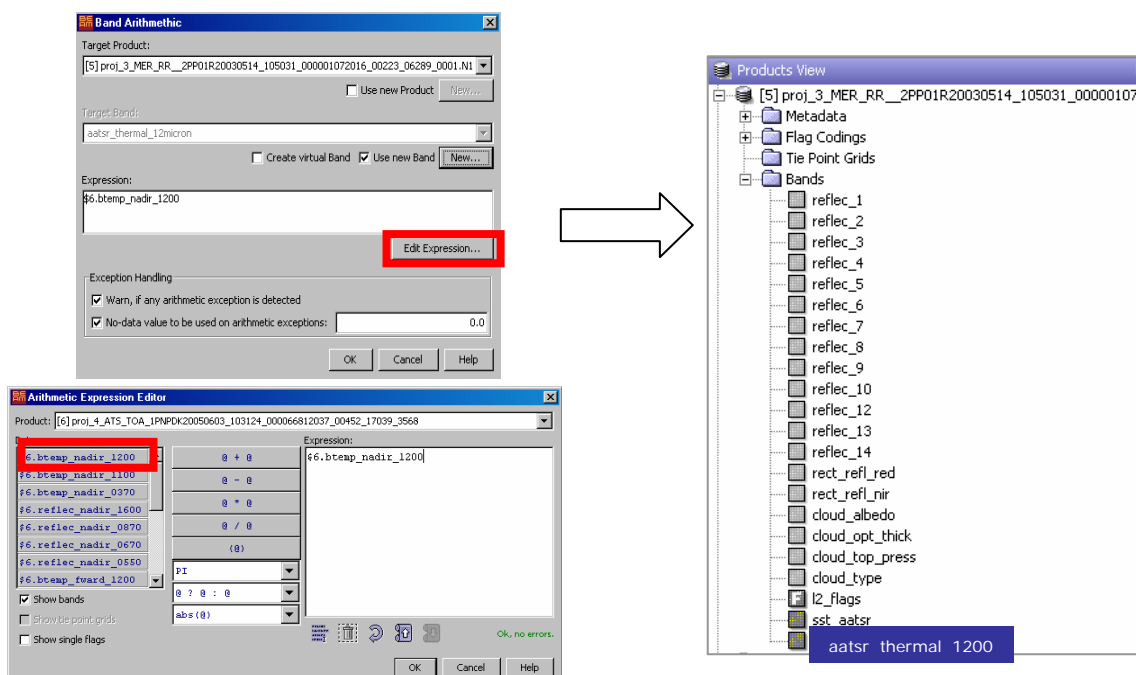### 1. Map projection, image co-registration

- Close all files
- **Import** MERIS level 2 product
  MER_RR___2PP01R20030514_105031_000001072016_00223_06289_0001.N1
- **Open** AATSR product saved in DIMAP format (File -> Open)
  ATS_TOA_1PNPDK20050603_103124_000066812037_00452_17039_3568.dim
- **Project** MERIS product (Tools -> Map Projection, Default settings, OK)
- **Co-Register** AATSR product with projected MERIS product (check the co-locate option, OK)
- Notice the newly created projected products on the Products view

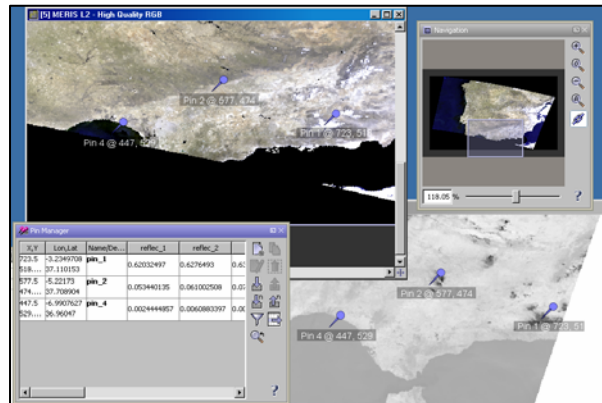## 2. Adding a new band from AATSR to MERIS

Add a thermal band from AATSR to the MERIS product:

- Tools -> Band Arithmetic

- Select projected MERIS product (proj_MER)

- Target band: New band, call it aatsr_thermal_12micron

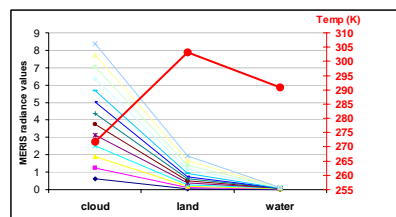- Edit Expression, select AATSR product, select $6.btemp_nadir_1200, OK

3. Comparing values from different pin points

- Open the Pin Manager (View->Tool windows->Pin Manager)

- Select one Pin over a cloud, one pin over water, one pin over land in the area of overlap between the two products

- In the Pin manager use the Filter to select all MERIS spectral bands + aatsr_thermal_12micron

- Right-click, copy to clipboard, copy into an Excel file

- Represent on an Excel file the bands response for all 3 pins.

- Plot the thermal band on the secondary axis.

  Notice the added-value of having a thermal band available (e.g. cloud signature)

4. More Band Arithmetic (Tools -> Band Arithmetic)

- Select the MERIS product

- Compute the NDVI, where NDVI = (NIR-RED)/(NIR+RED), i.e. in the case of MERIS (radiance_10-radiance_6)/(radiance_10+radiance_6)

- Save it as a new band / virtual band (less memory)

- Compare with other possible expression

  NDVI = (radiance_13-radiance_7)/(radiance_13+radiance_7)