

# BEAM Toolbox

## Practical Session

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### Exercise 1A – display and navigate

- Open MERIS products:  
Level 1: MER\_FR\_1PNPDE20070811\_...\_N1  
Level 2: MER\_FR\_2PNPDE20070811\_...\_N1
- Display L1 image as false colour image
- Display L2 TOA\_VEG product as greyscale image
- Tile and synchronize product views  
Window / Tile Evenly  
Synchronize view button (see Navigation view window)
- Apply Colour Manipulation to both views

Band	Wavelength [nm]	Band width [nm]	Spatial res. [m]
1	413	10	300
2	443	10	300
3	490	10	300
4	510	10	300
5	560	10	300
6	620	10	300
7	665	10	300
8	681	7.5	300
9	709	10	300
10	753	7.5	300
11	760	3.75	300
12	778	15	300
13	865	20	300
14	885	10	300
15	900	10	300




### Exercise 1A – procedure


- Open products

Menu bar: File / Open Product

- Display false colour image

 L1B Product name, Open RGB image view, Profile = MERIS L1B - 13, 5, 1

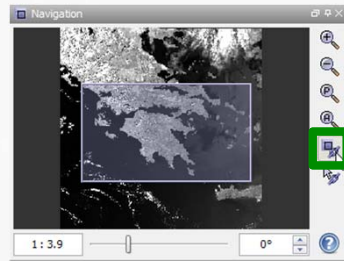
- Display greyscale image

 band TOA\_VEG in expanded L2 Product / Bands

- Tile and synchronize views

Menu bar: Window / Tile Horizontally

Navigation view, synchronize compatible product views



### Exercise 1A – procedure

- Colour Manipulation for greyscale view

Open colour manipulation window

Add sliders (right mouse button on bar between sliders)

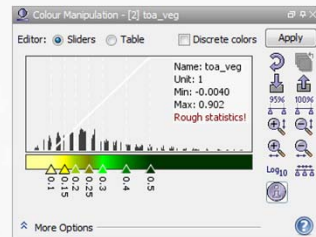
Drag contrast stretch sliders to adjust

**Alternative:** Click on number and type a slider value

Assign colour (left mouse button on slider)

**Alternative:** Set editor to table and enter RGB colour codes

**Optional:** Import/export colour schemes



- Colour Manipulation for RGB view

Contrast stretch in 3 colour fields (Red - Green - Blue)



### Exercise 1B – analysis and statistics

- Draw polygon around burnt area
- Identify affected pixels by application of an arithmetic expression  
Assume NDVI thresholds of -0.05 and 0.1  
Exclude pixels flagged as clouds  
Create burnt area mask
- Calculate statistics for affected area  
Calculate NDVI histogram and arithmetic mean  
Compute burnt area



### Exercise 1B – procedure

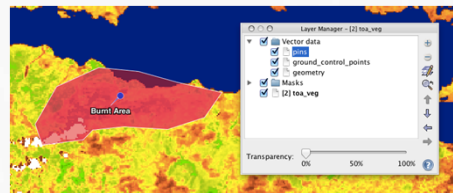
- Draw polygon around burnt area



Use Polygon drawing tool  
Double click to finish polygon



**Optional:** Open Layer Manager  
to view the polygon as layer and mask



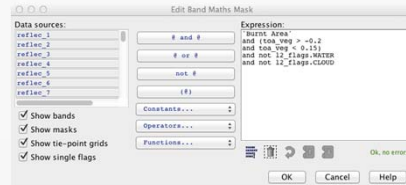
- Apply arithmetic expression



Double click geometry layer's name  
in Mask manager to rename 'burnt area'



New logical band maths expression  
Check 'Show ...' boxes to add data sources



e.g. 'Burnt Area' and (toa\_veg > -0.2 and toa\_veg < 0.15) and not 12\_flags.WATER and not 12\_flags.CLOUD

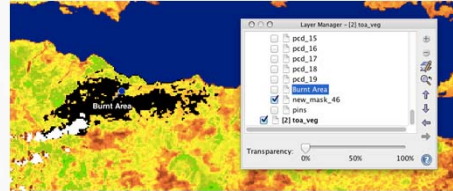
### Exercise 1B – procedure

- Review arithmetic expression



Open Mask Manager  
Edit band math expression

*Optional:* Iterate and enhance expression



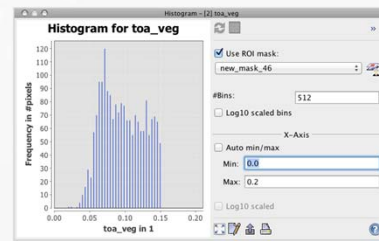
- Calculate statistics of burnt area



Select TOA\_VEG in product view  
Display Histogram, use ROI mask



Display Statistics, use ROI mask



### Exercise 2 – land cover classification

- Load Sentinel-2 simulation product  
From [www.apex-esa.org/content/sentinel-2-simulation](http://www.apex-esa.org/content/sentinel-2-simulation)  
Resampled and upscaled APEX airborne spectrometer data, acquired 26 June 2010
- Define study area  
As a subset or ROI
- Apply classification algorithms  
Unsupervised K-means or EM clustering  
Linear spectral unmixing

Band	Wavelength [nm]	Band width [nm]	Spatial res. [m]
1	443	20	60
2	490	65	10
3	560	35	10
4	665	30	10
5	705	15	20
6	740	15	20
7	783	20	20
8	842	115	10
9	865	20	20
10	945	20	60
11	1375	30	60
12	1610	90	20
13	2190	180	20

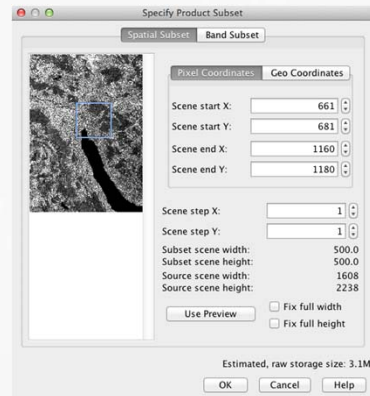
## Exercise 2 – procedure

- Load Sentinel-2 simulation product

Display true colour RGB (bands 4 - 3 - 1)  
 Display false colour RGB (bands 9 - 3 - 1)  
 Evaluate other bands in greyscale views

- Define study area

Choose a 500 by 500 pixels test site  
 Tools / Spatial Subset from View...  
**Alternative:** Draw a rectangular polygon for use as ROI



## Exercise 2 – procedure

- Perform K-means cluster analysis

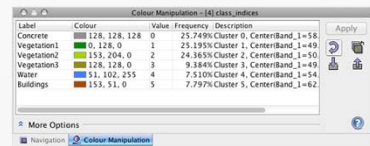
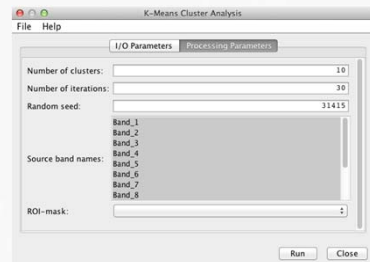
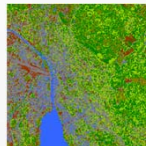
Tools / Image Analysis /  
 K-means Cluster Analysis...

Select all bands as input  
 Apply ROI-mask if no subset has been prepared

- Interpret output



Set colours and cluster names according to  
 presumed land cover type



### Exercise 2 – procedure

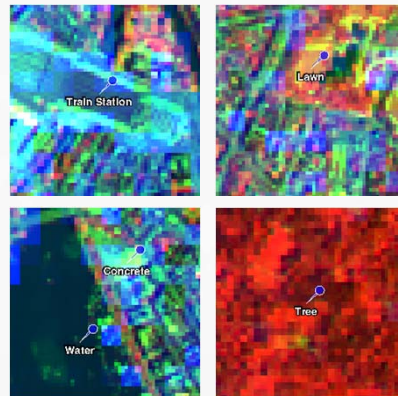
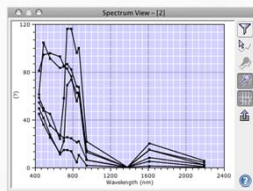
- Prepare spectral unmixing



Place pins in endmember locations  
Apply Label names in Pin Manager



Display spectra in all pin positions  
Export to endmember.csv

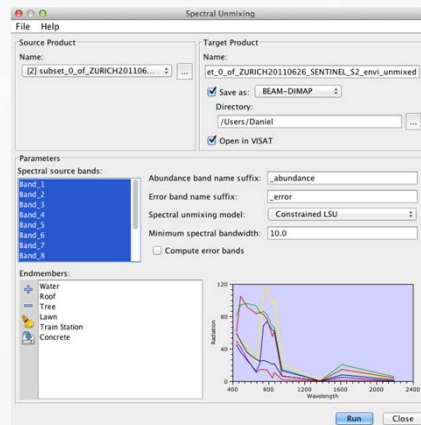


### Exercise 2 – procedure

- Perform spectral unmixing

Tools / Image Analysis /  
Spectral Unmixing...

Select all bands as input  
Import endmember.csv





## Exercise 2 – procedure

- Interpret output



Set low abundance as black and high abundance as colour

Checked patterns may occur because bands of different spatial resolutions are used in the analysis.

