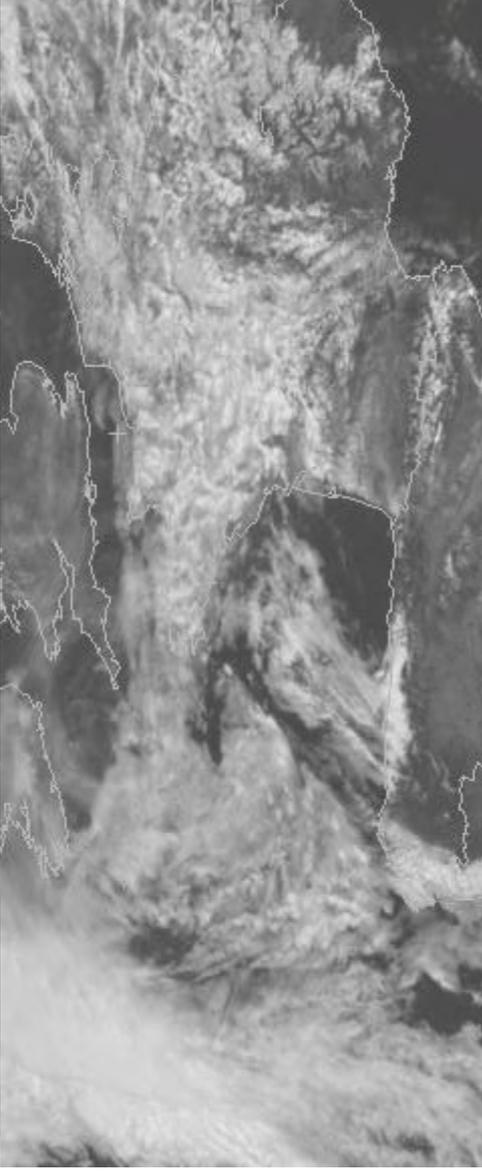
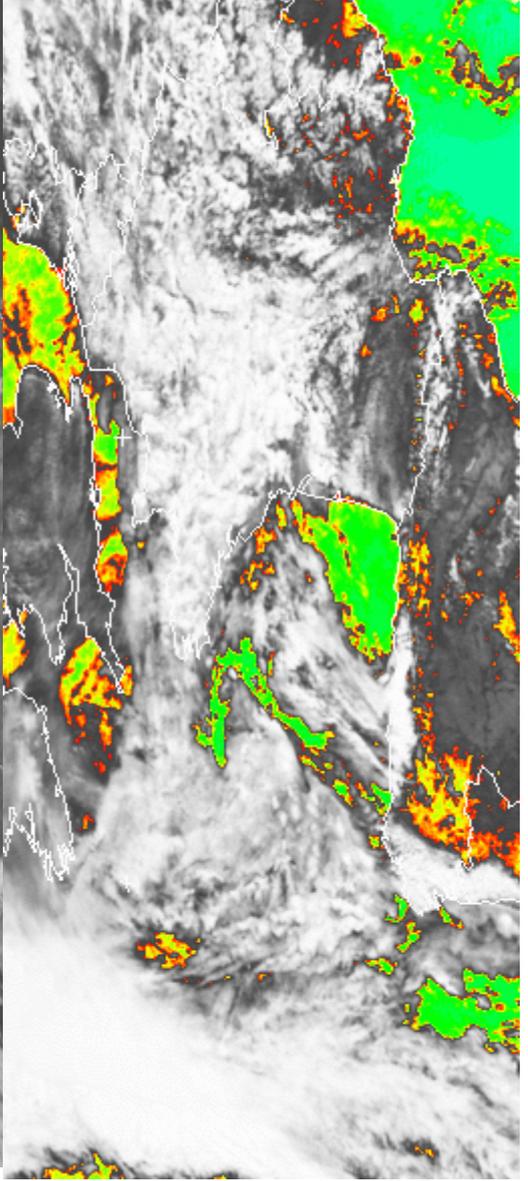


## Linear rendering



## Gamma correction



## Colour slicing



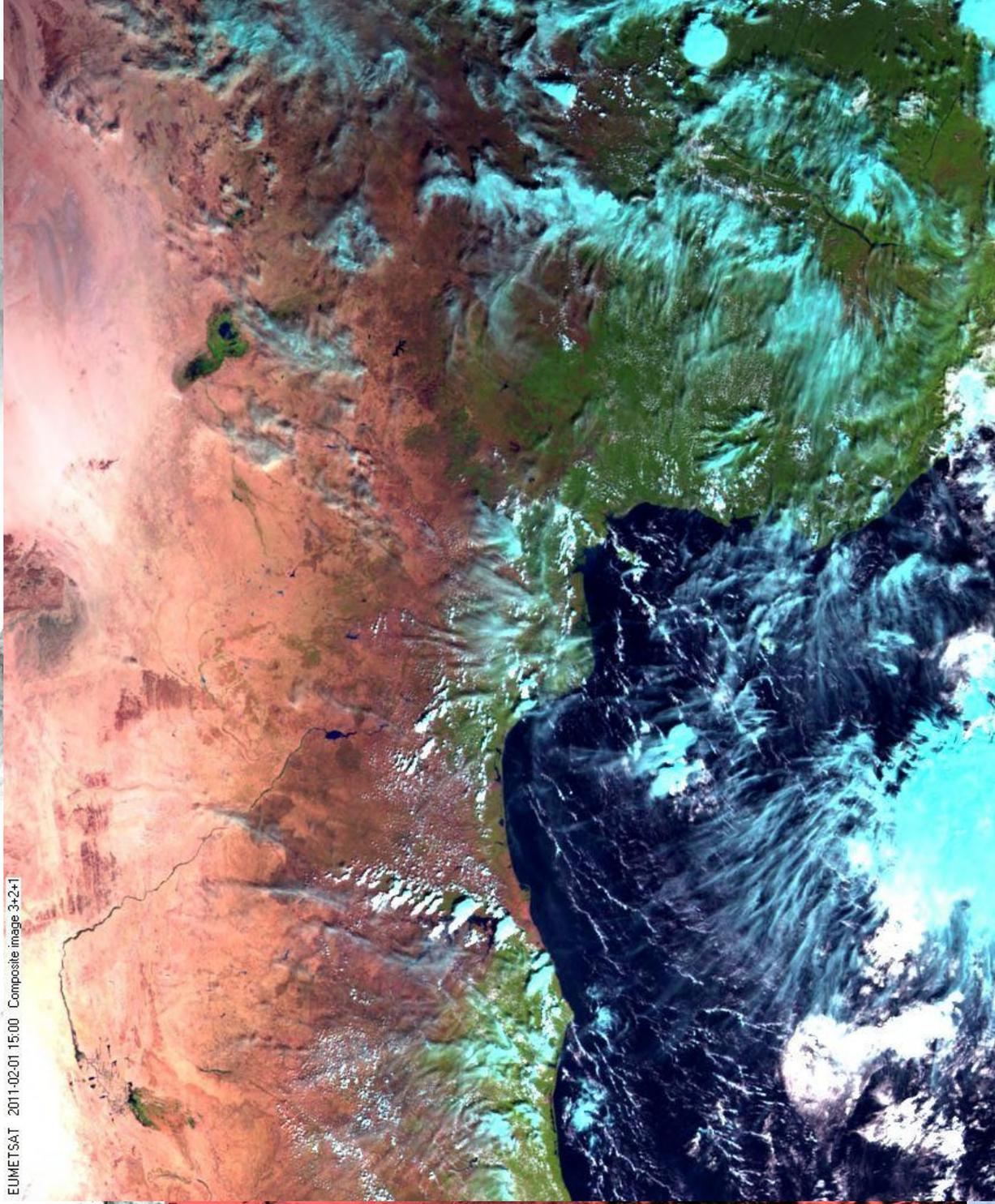
# Combining solar channels

EUMETSAT 2011-02-01 15:00 Single Channel 1

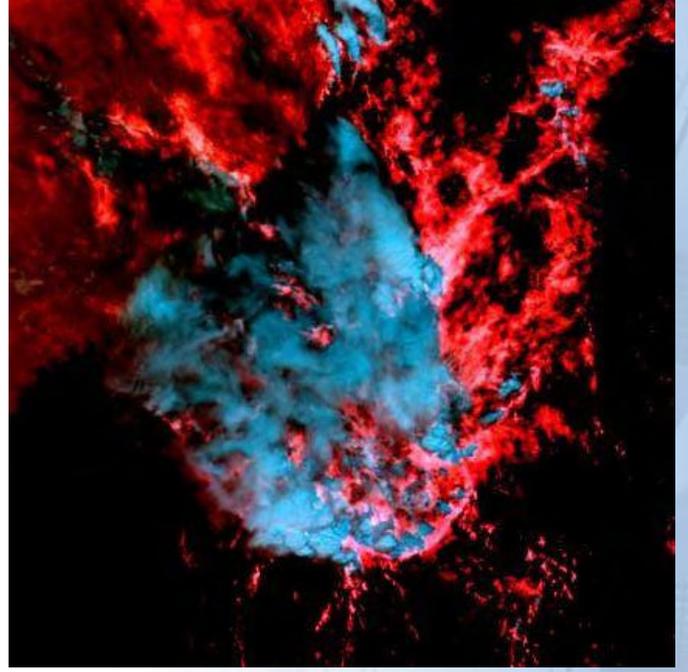
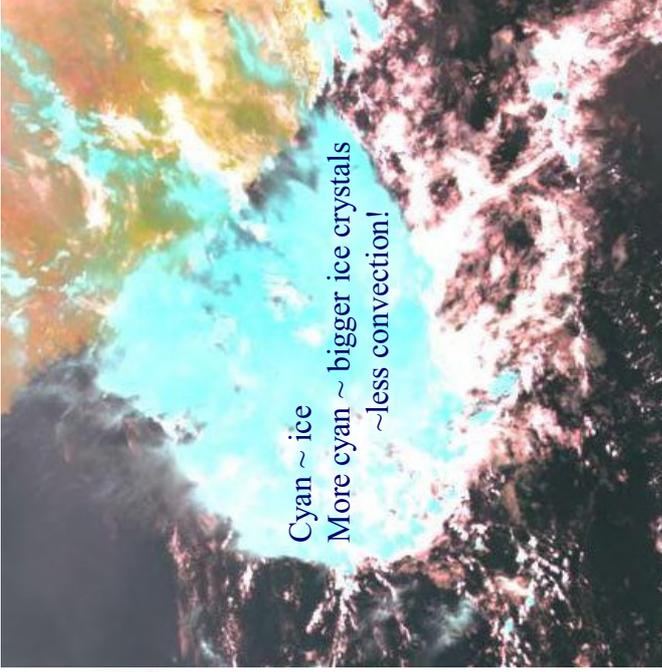
EUMETSAT 2011-02-01 15:00 Single Channel 2

EUMETSAT 2011-02-01 15:00 Single Channel 3

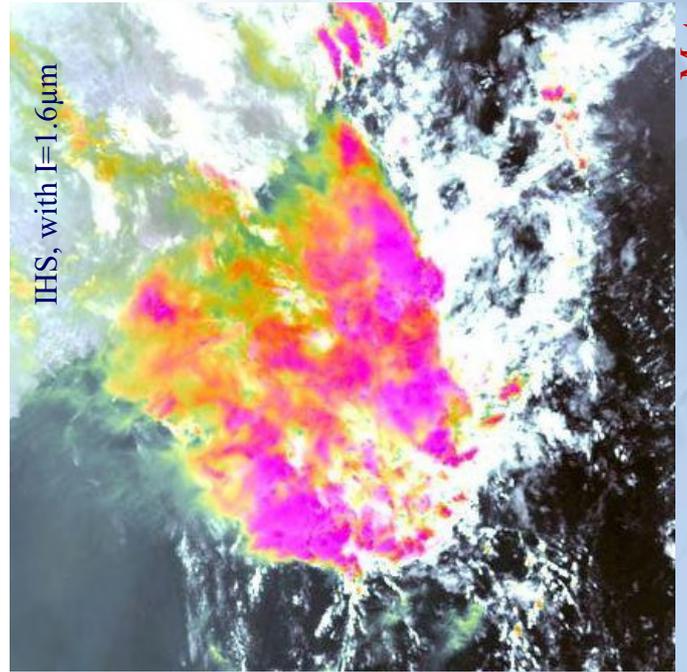
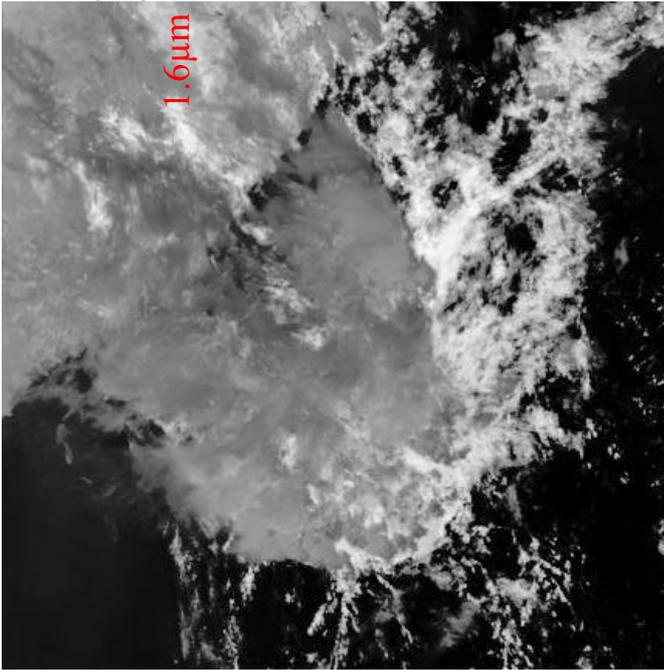
EUMETSAT 2011-02-01 15:00 Composite image 3+2+1



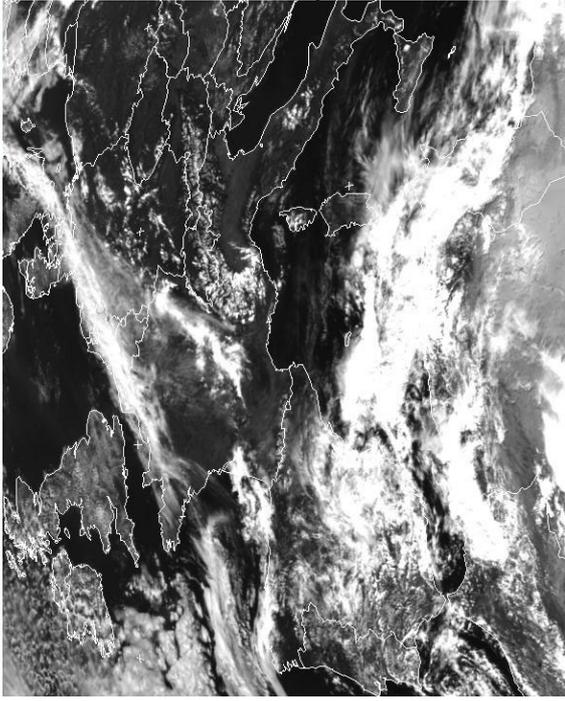
Meteosat solar channels



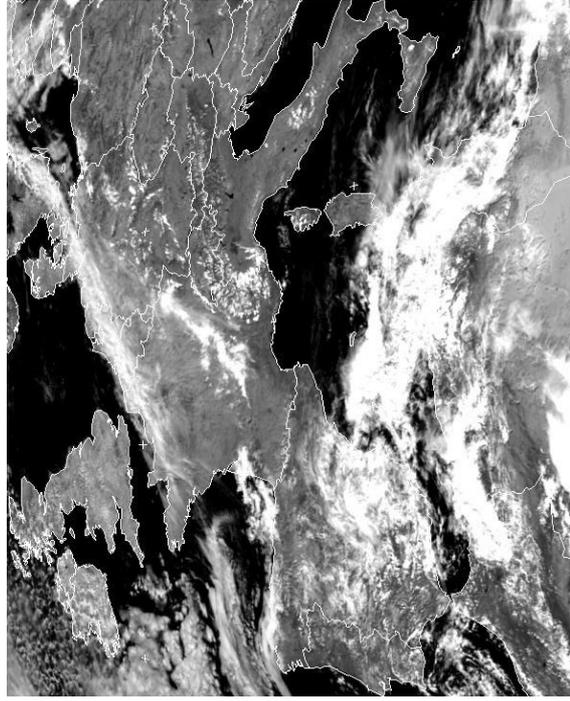
RGB=321 → enhancement



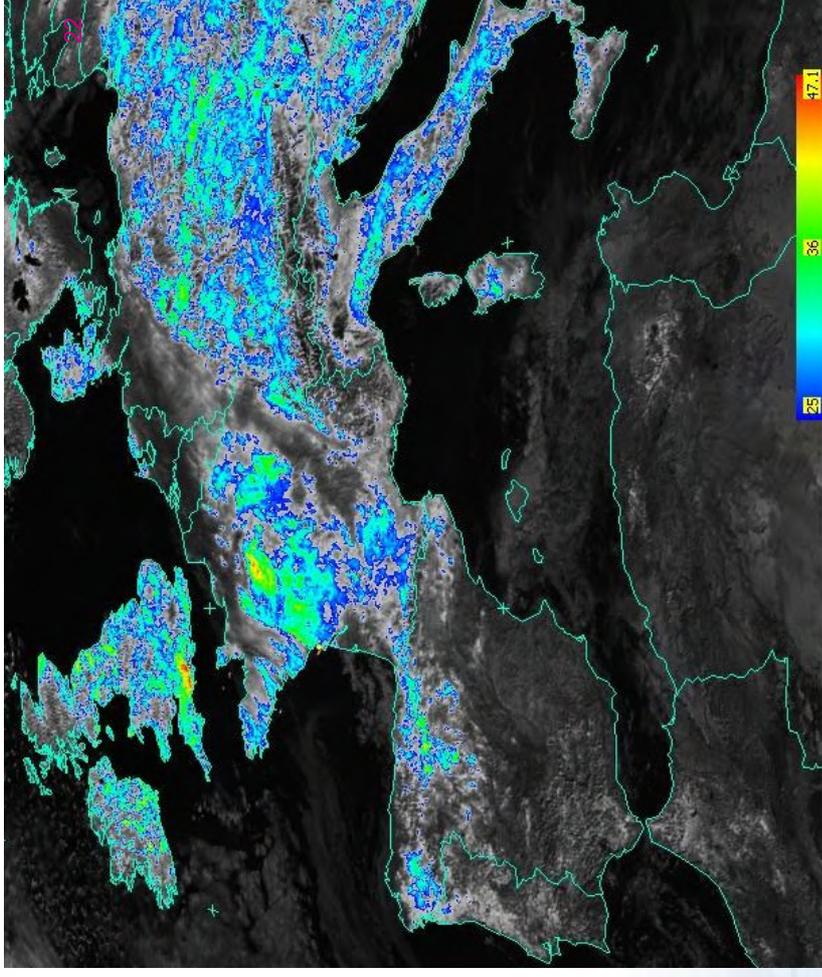
# Solar channel differences over land



**VIS0.6**



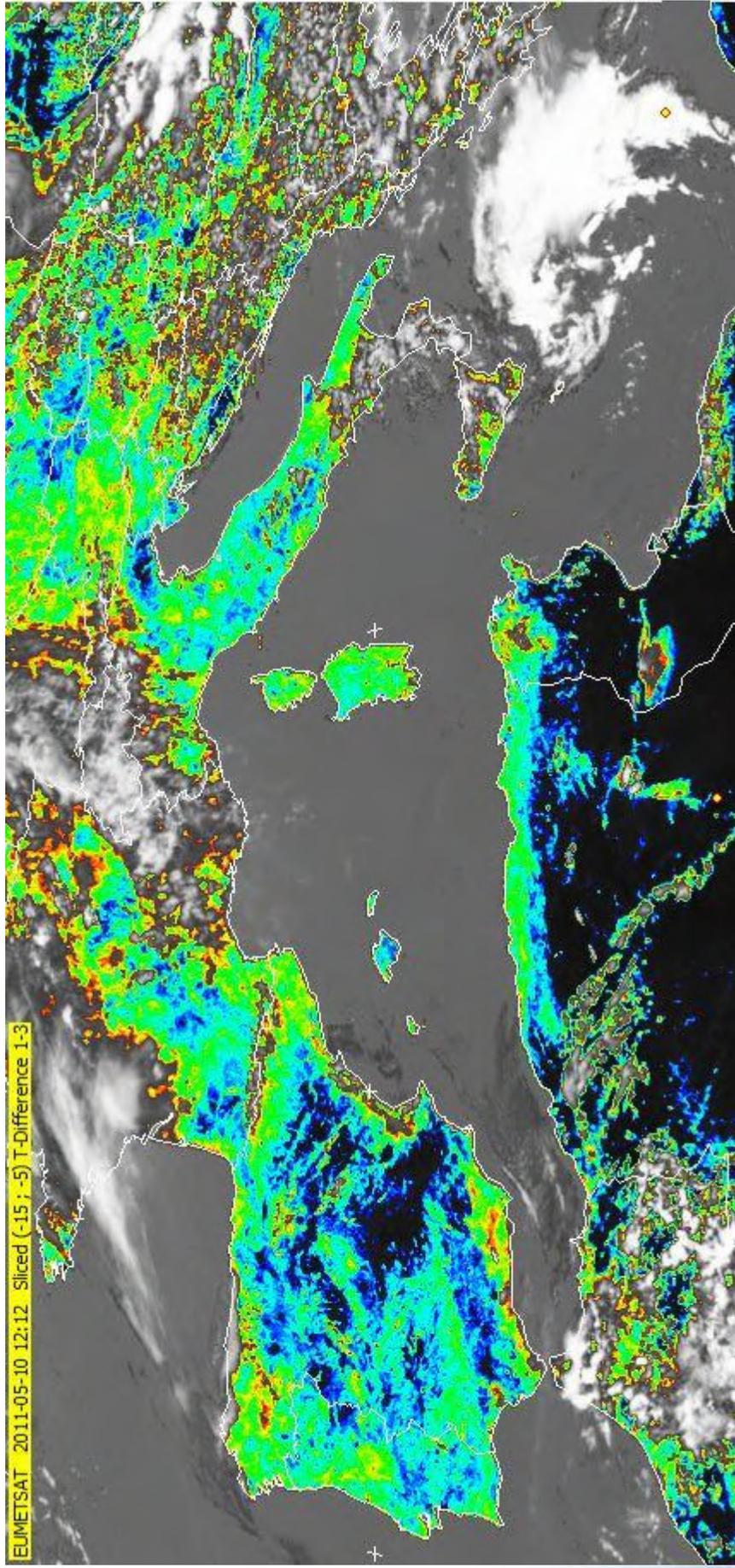
**VIS0.8**



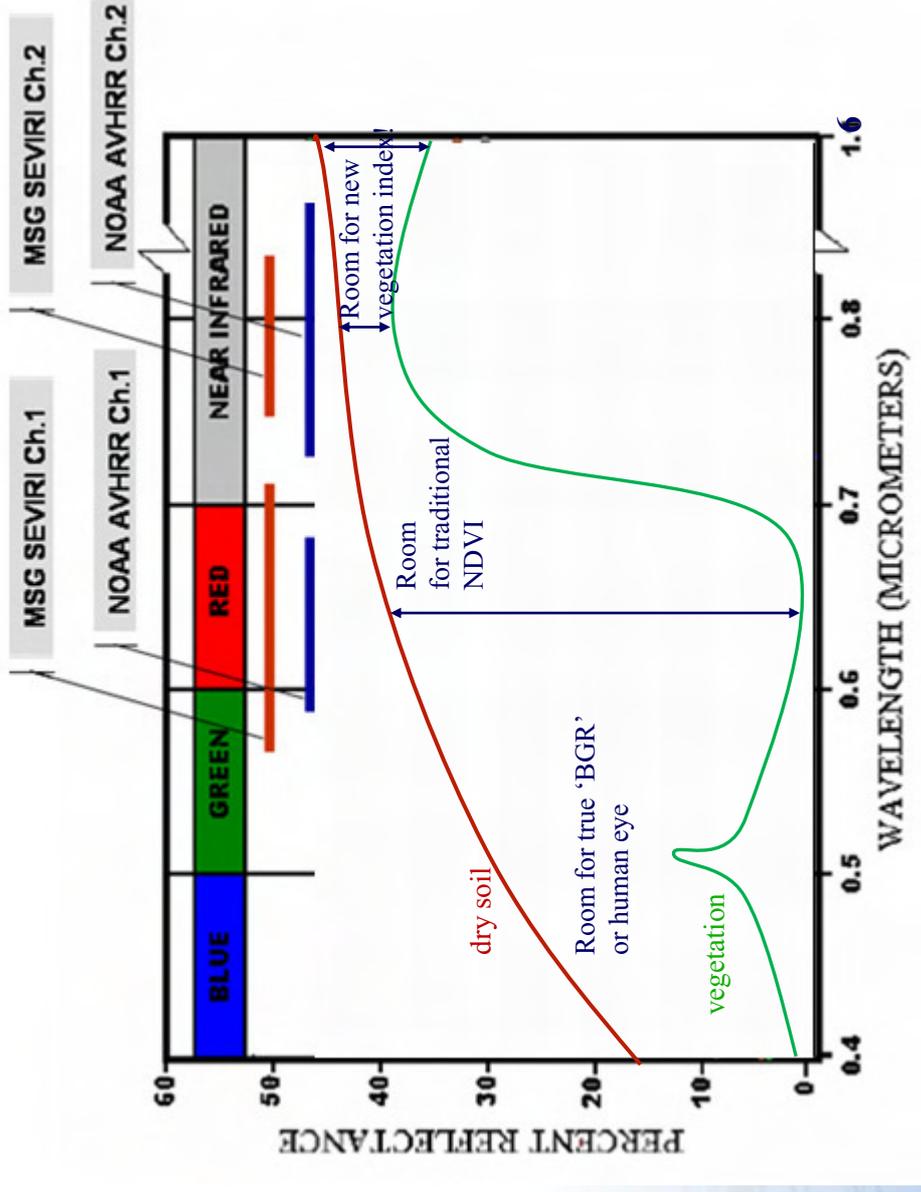
**VIS0.8 – VIS0.6 Meteosat 2011-05-19 09:30 UTC**

- VIS0.8: higher land surface contribution, especially over vegetated areas
- The difference can be sliced to remove cloud, by restricting to non-cloud high values (+25% ... +50%)

Or with 1.6 $\mu$ m

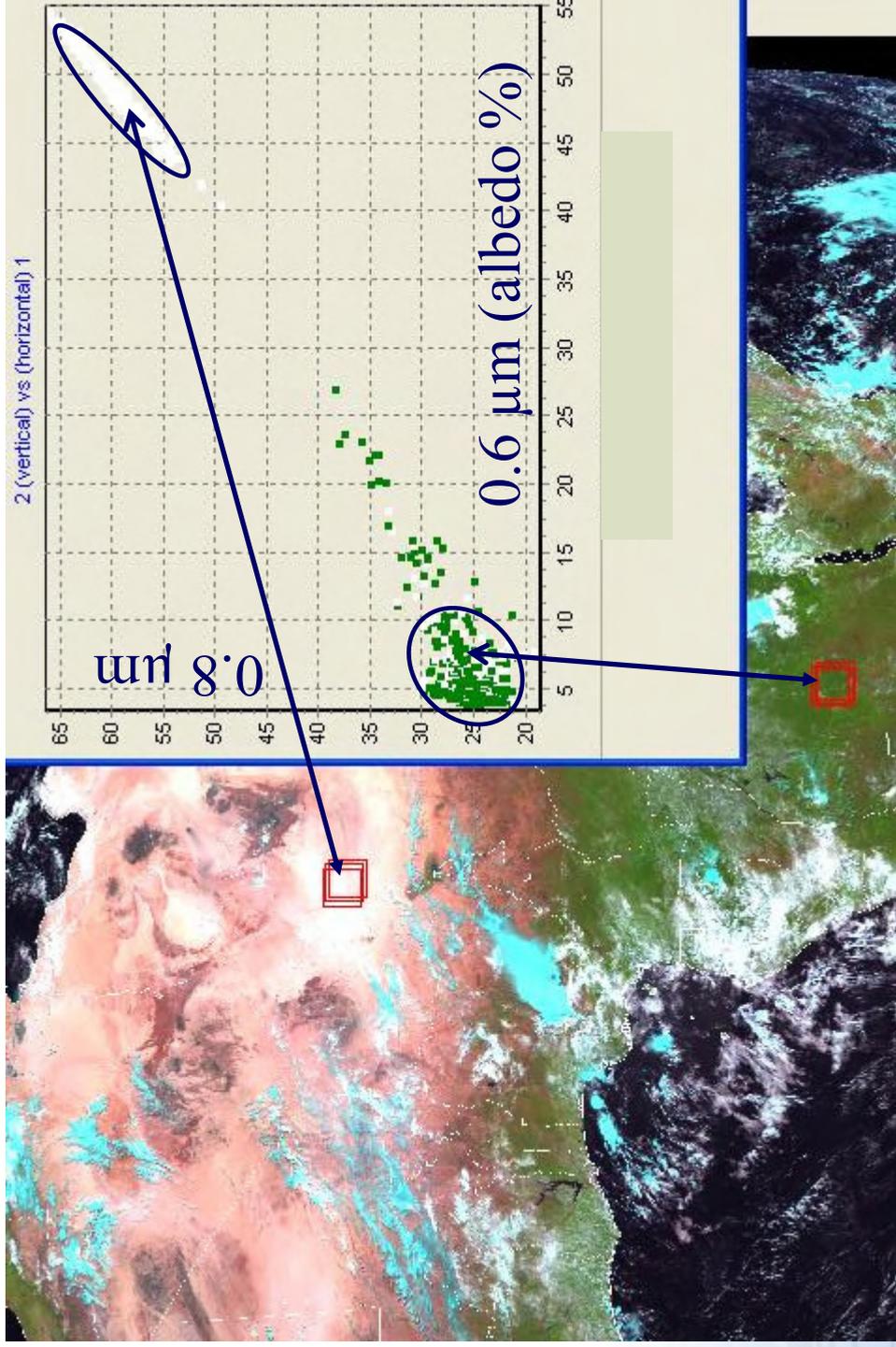


# Vegetated and dry soils



The vegetation response to wavelengths in our colour perception is similar to those between 0.6 $\mu$ m to 1.6 $\mu$ m: **happy coincidence!**

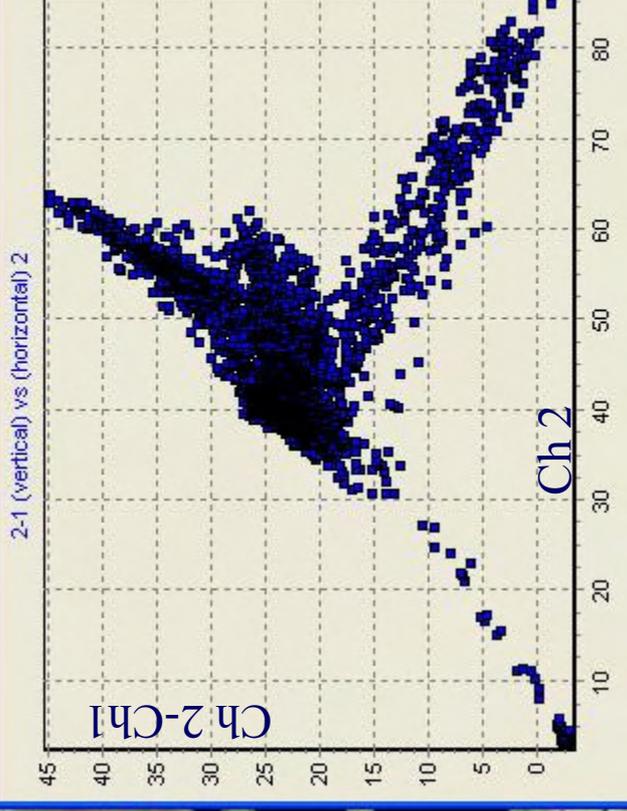
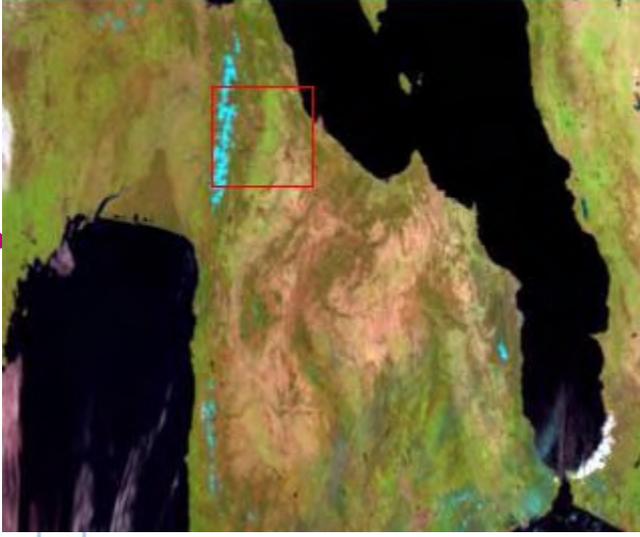
# Desert and tropical forest in the solar channels



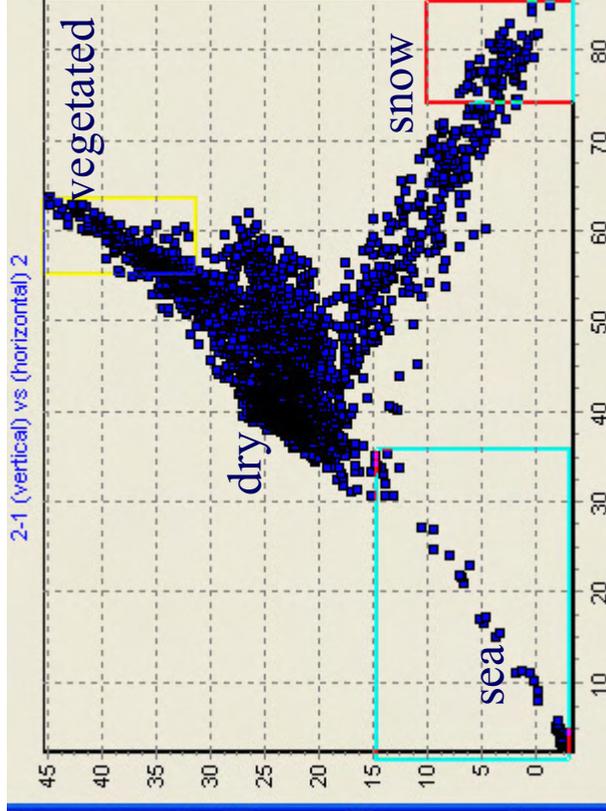
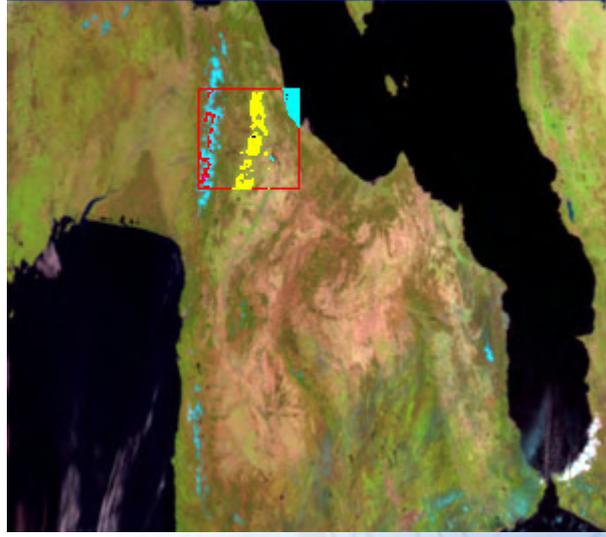
Normalized vegetation index =  $(2-1)/(2+1)$

# Exercise: identify the clusters in the 0.6 and 0.8 $\mu\text{m}$ channels

Meteosat-9  
RGB Natural  
colours  
2008-04-06  
12UTC



Where are  
the growing  
vegetation  
pixels on  
the graph?



# LAND SURFACE ANALYSIS SATELLITE APPLICATIONS FACILITY



Home [landsaf.meteo.pt](http://landsaf.meteo.pt)

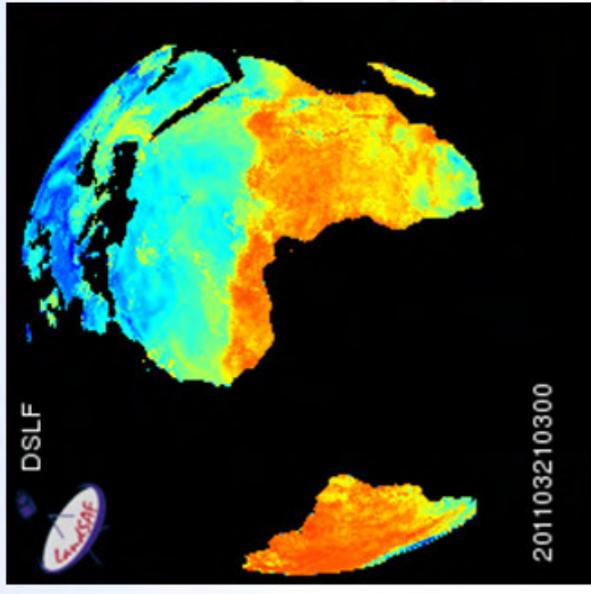
The scope of Land Surface Analysis Satellite Applications Facility (LSA SAF) is to increase benefit from EUMETSAT Satellite (MSG and EPS) data related to:

- Land
- Land-Atmosphere interaction
- Biospheric Applications

The LSA SAF performs:

- R&D Programs.
- Operational Activities

- Generation
- Archiving
- Dissemination



[See colour legends...](#)

of land surface related products.

Latest News:

- **Important** IM Archive system maintenance. [see more...](#)
- **Important** IM Archive system maintenance. [see more...](#)
- Information LSA SAF Outage [see more...](#)
- Information LSA SAF Outage [see more...](#)
- Update MSG Images [see more...](#)

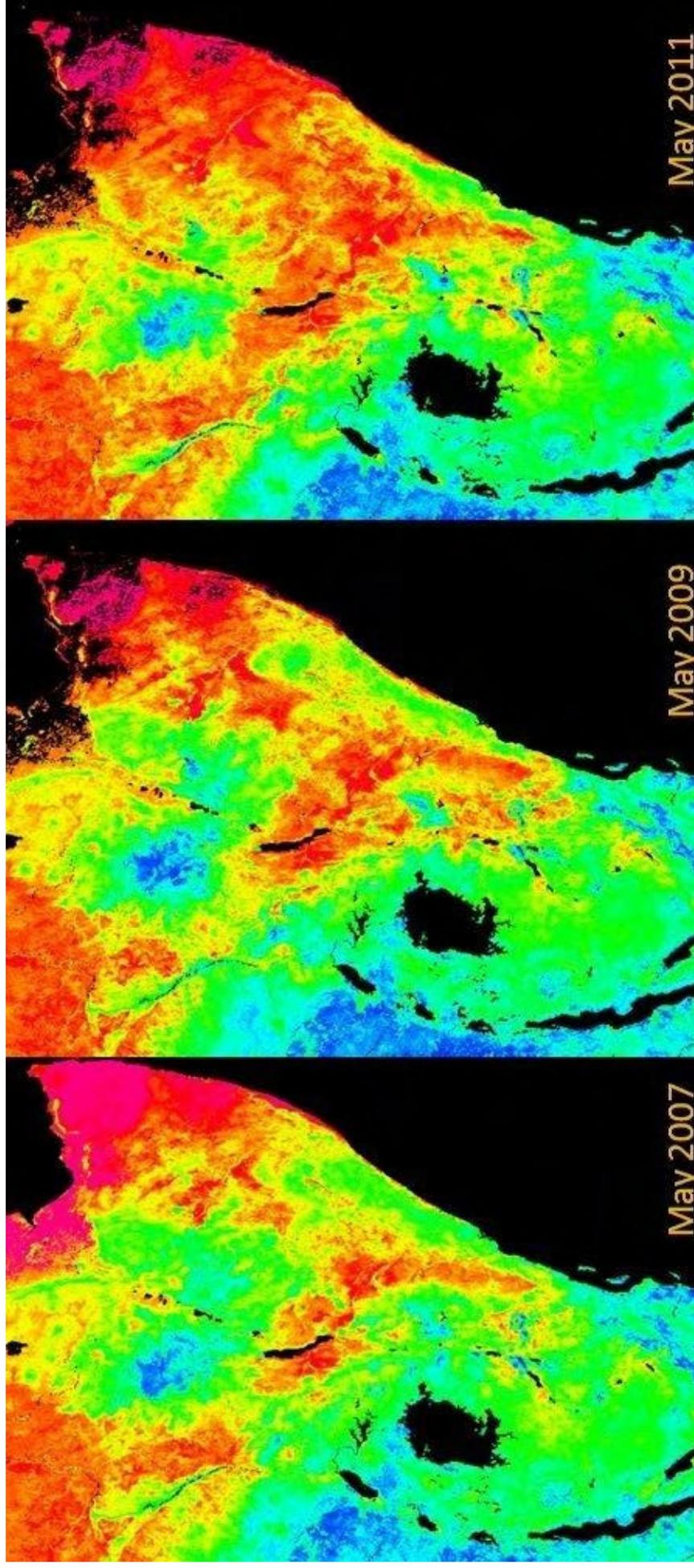
Product Development Status:

MSG/SEVIRI based products  
Wild Fires

- Fire Radiative Power - PIXEL
- Fire Radiative Power - GRID
- Vegetation Parameters
- Fraction of Vegetation Cover
- Leaf Area Index
- Fraction of Absorbed Photosynthetic Active Radiation
- Snow Cover
- Snow Cover (daily)
- Snow Cover (15 mins)
- Other
- Bi-Directional Reflectance Factor
- Land Surface Emissivity
- Albedo
- Surface Albedo
- MSG Ten Day Surface Albedo
- Land Surface Temperature
- Land Surface Temperature (15 mins)
- Down-welling Surface Fluxes
- Down-welling Surface Short-wave Radiation Flux
- Down-welling Surface Long-wave Radiation Flux
- Daily Downward Surface Shortwave Flux
- Daily Downward Surface Longwave Flux
- Evapotranspiration
- Evapotranspiration (30 mins)
- Daily Evapotranspiration

# Drought evolution in Somalia

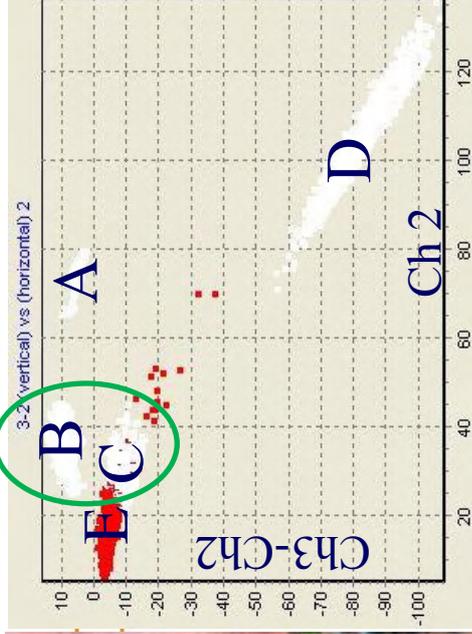
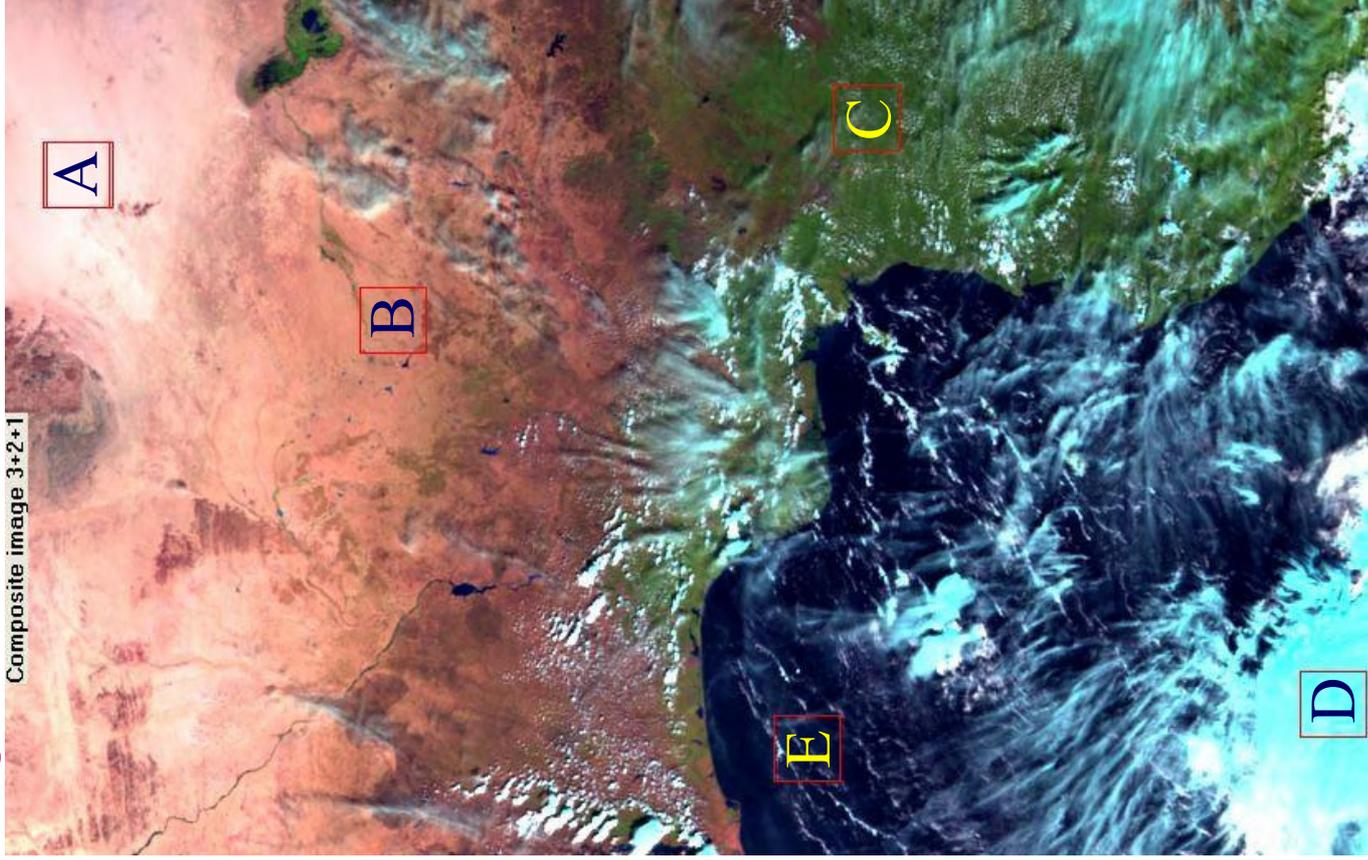
29



Source: Land SAF archive, fraction of vegetation

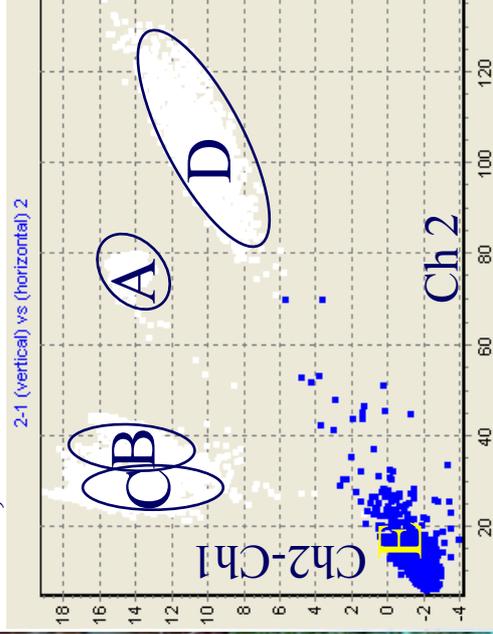


# Dry soil shows brown in the natural RGB!



Index  $(3-2)/(3+2)$   
 B (dry) = 12%  
 C (vegetated) = -20%

Now, 2-1 in vertical. Your turn!



Index  $(2-1)/(2+1)$   
 B (dry) = 25%  
 C (vegetated) = 40%

1.6 $\mu$ m reflects better than 0.8 $\mu$ m on dry ground,  
 but worse in vegetated areas



# Which kind of soil or cloud is at the arrow point?

32



Fog

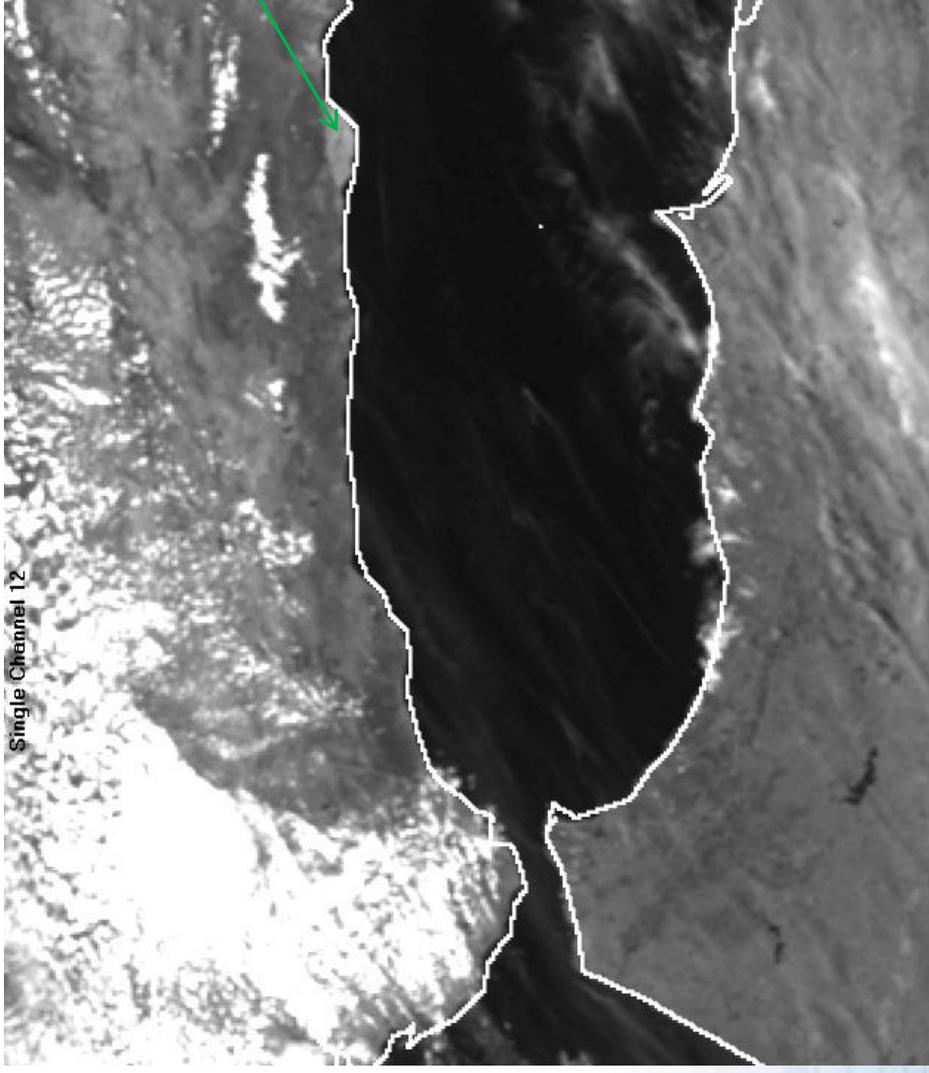
Sand

Glass

Cirrus

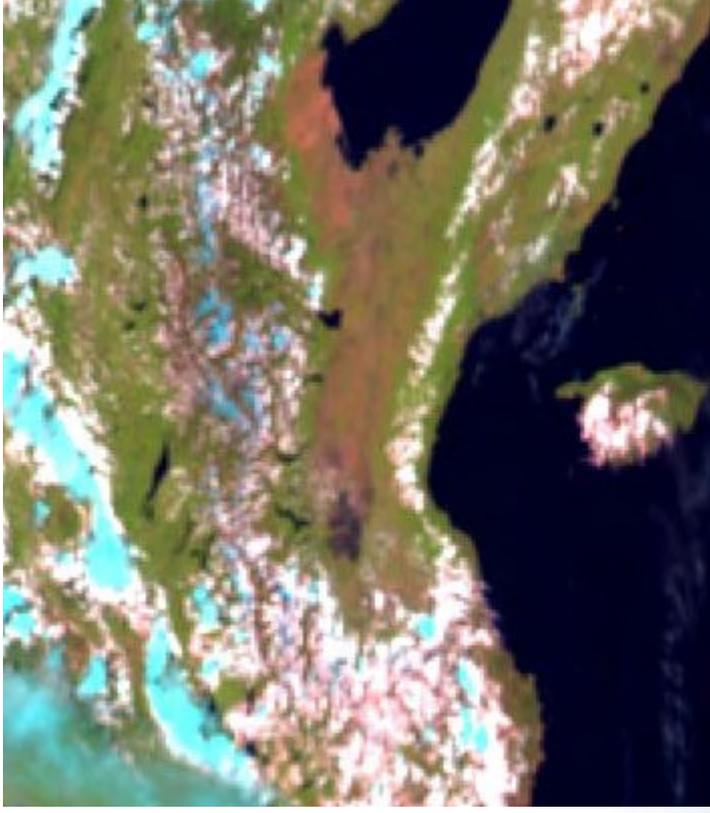
Smoke

Litter

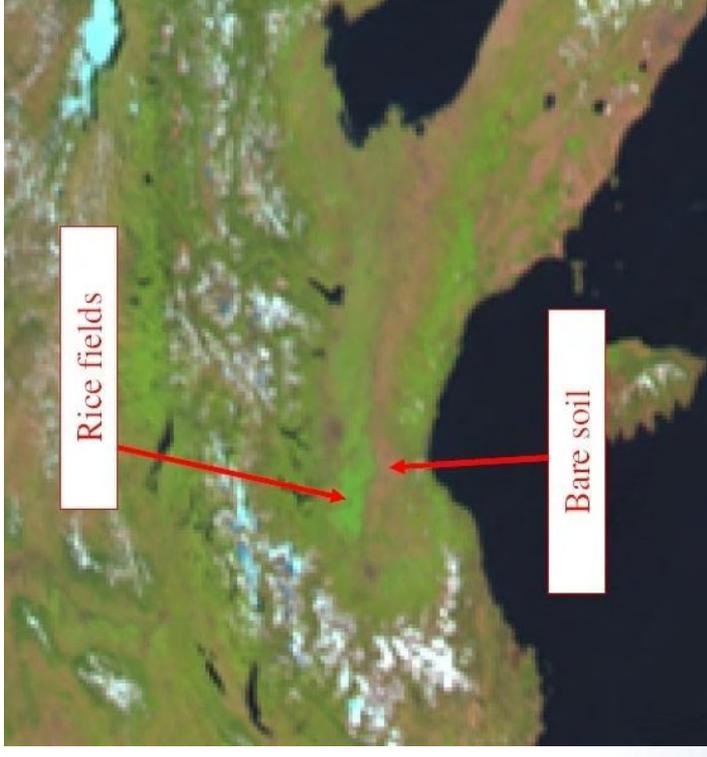


Meteosat HRV 2010-May-08 12:00

# Vegetation monitoring

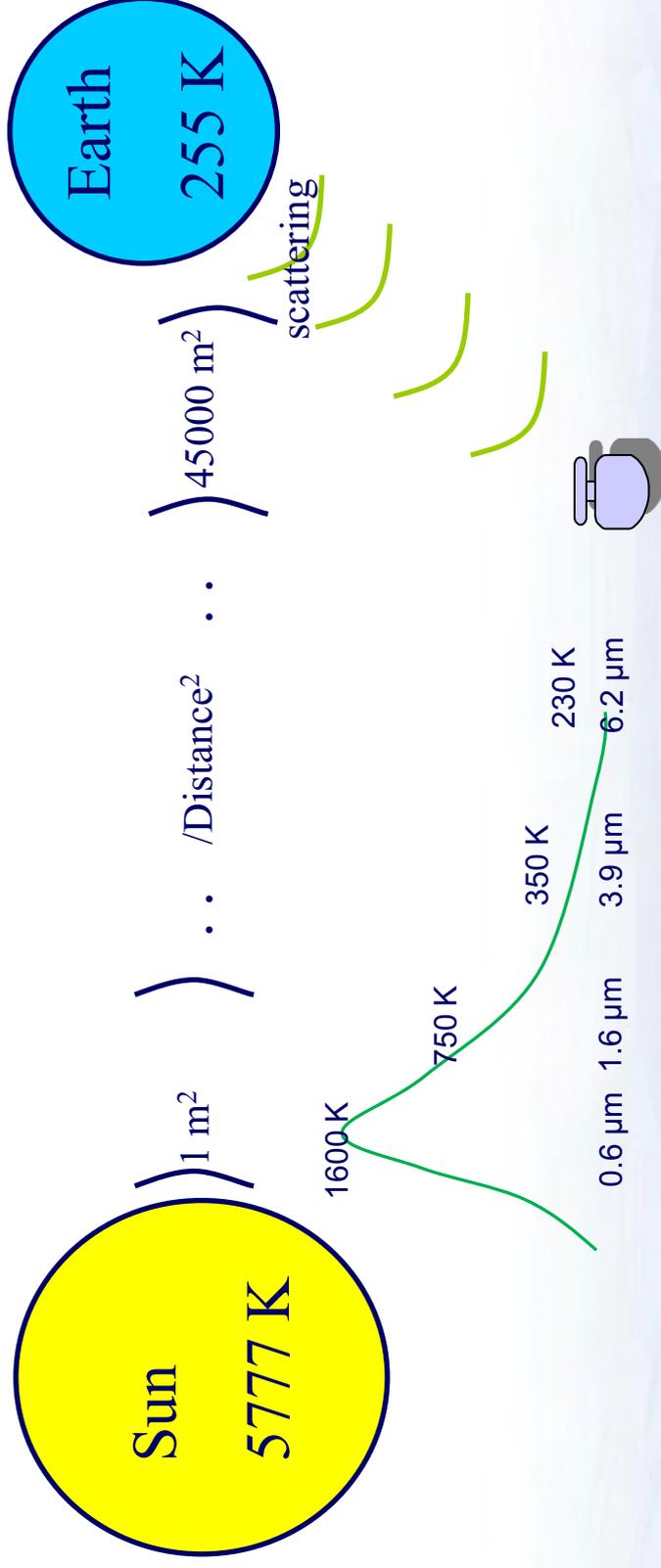


May 2011 Rice fields flooded



Aug 2003 Meteosat Natural RGB

# The sun disc is brighter than cloud!



- Sun radiation density at the Earth is that of black bodies at much lower temperatures than its source at 5777 K
- The brightness ratio between the sun disk and bright cloud, 45000 times, is due to the dispersion of radiation as it travels in all directions.
- At 3.9 μm, Earth **emitted** radiation competes with **reflected** solar radiation.

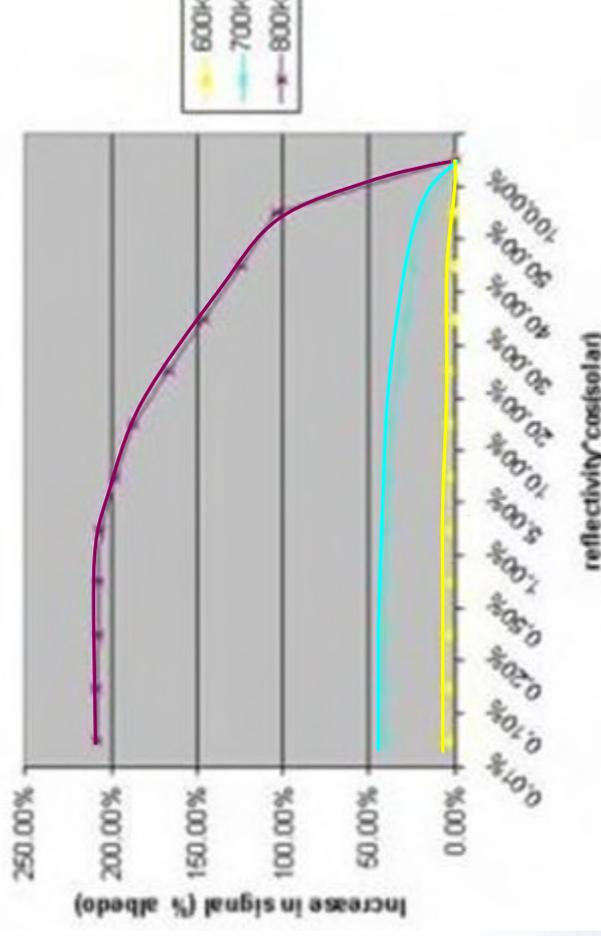
# Emission sources in the solar channels



Karthala, Met-8, 29 May 2006, 12:15 UTC  
Natural colours RGB 1.6 $\mu$ m 0.8 $\mu$ m 0.6 $\mu$ m



Thermal impact on reflectivity at 1.6 $\mu$ m

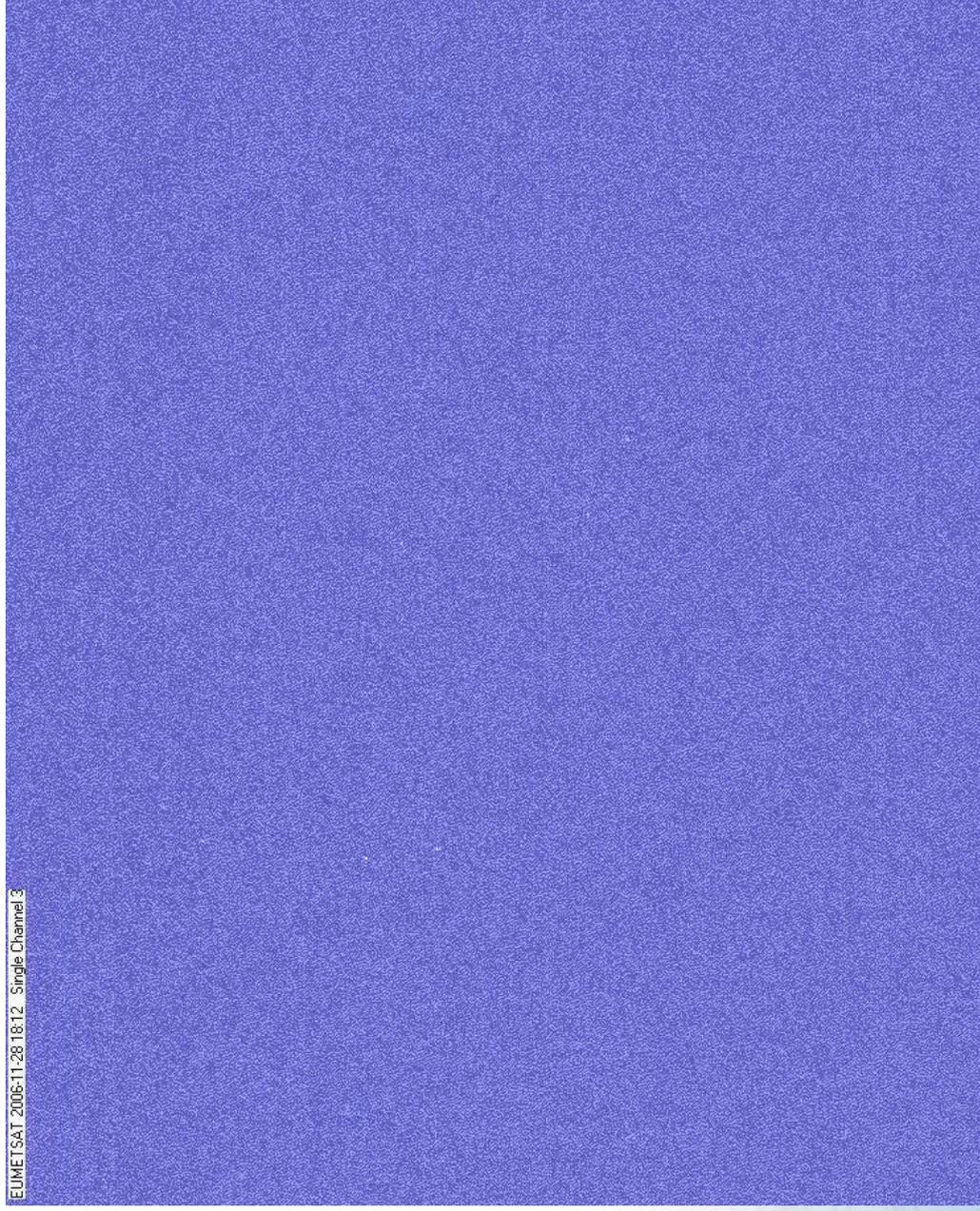


- **Very hot sources (e.g. lava ) emit as much as the sun contribution and enhance 1.6 $\mu$ m signal**
- Sun contribution at 1.6  $\mu$ m is equivalent of a black body at 750K
- Big fires can be detected at night at the 1.6 $\mu$ m channel

# Big fires at 1.6μm, night time

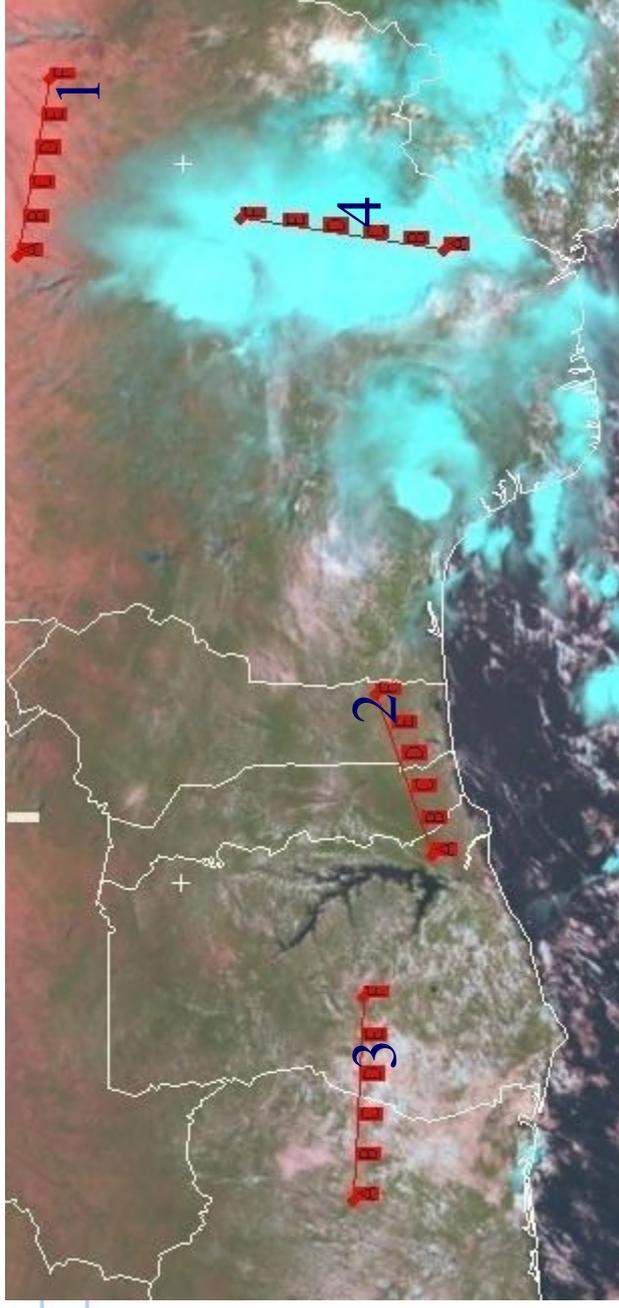


EUMETSAT 2006-11-28 18:12 Single Channel 3





# Cloud in the solar channels



38

ch3 ch2 ch1 composite



1. Dry
  2. Vegetation
  3. Thin cloud above vegetation
  4. Thick cloud
- Scene “3” is a weighted average of scenes “2” and “4” with the cloud fraction 0.8 μm is the most reflected radiation by cloud or vegetation, not by dry grounds (1.6 μm)
  - Ice cloud is less 1.6 μm reflective than liquid cloud