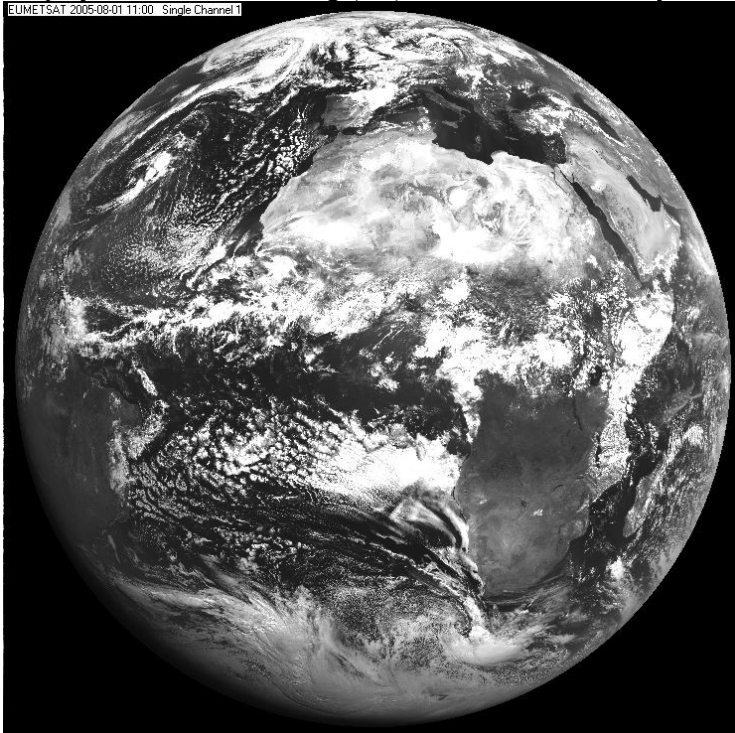


GUIDE FOR THE PRACTICAL USE OF ‘NUBES’

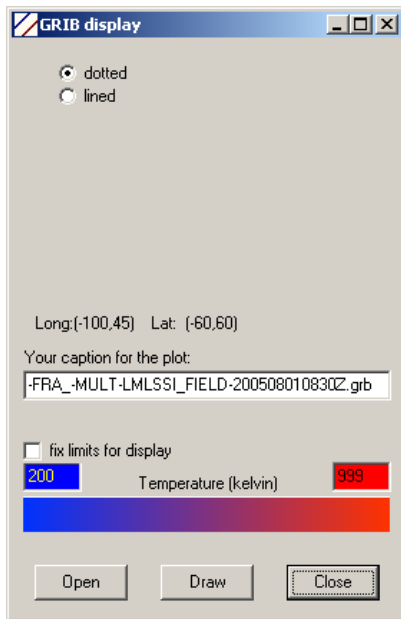
1. Grib visualisation.
2. Use of the scatter plots
3. Extreme enhancement for imagery
4. Display of AVHRR
5. Transects
6. Programming products
7. IASI profiles

1. Grib visualisation

Let us load an image from around midday, so that the whole satellite field is visible even in the solar channels. We move the Resolution slider to the left, to get the most coarse resolution. Then Open a native file (Ctrl+O) and Display channel 1. Choosing (0,0) as coordinate centre, you will see this:

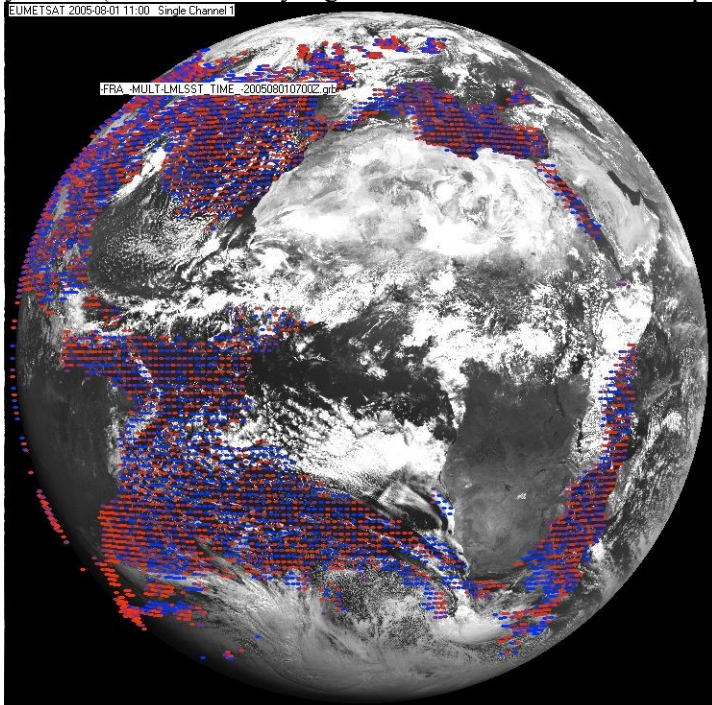


Now you wish to superimpose a GRIB field, like those provided by the Ocean and Sea Ice SAF, which are automatically put into the subdirectory “osis” of your Nubes installation. Use the option Plots/GRIB and SST (Ctrl +Alt+S), which opens the form:

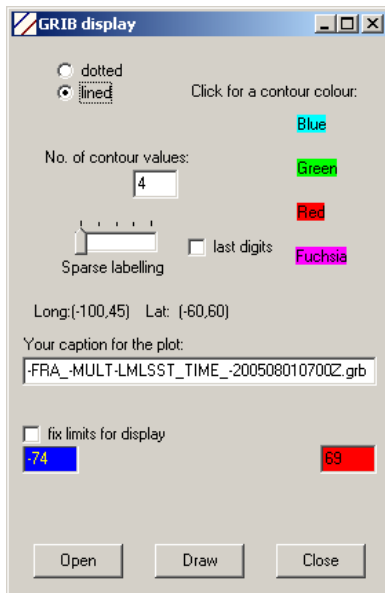


There you find two options for the plot: “dotted” puts colour circles on the grid points, “lined” creates a standard isoline drawing. The button Open will take you to choose the directory containing the GRIB file. Nubes puts grib files into the subdirectory “osis”. The button Draw will produce the colour circles, with a colour dependent on the proximity to the limit values in the two number boxes in that form. A value close to the left hand side value will be blue.

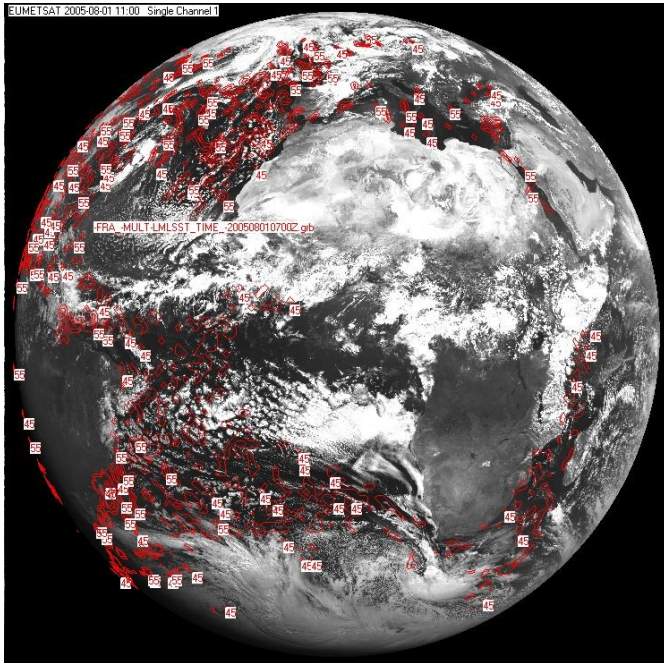
If the tick box “fix limits for display” is ticked, only the range of values in between will be shown. If not, the program searches for the extreme values in the set and modifies the user choice for the limits. To make sure that you show every value in the set, you can choose –99999 and 99999 as limits in the number boxes. After pressing Draw, you see (note that cloudy regions are excluded in OSI SAF products):



If you click on the “lined” option, the form changes appearance, but remains similar:



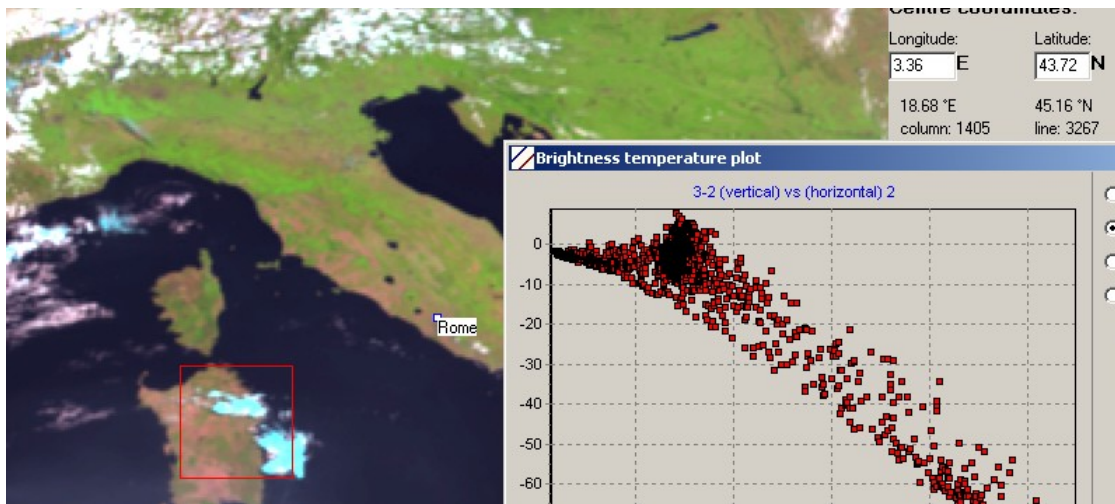
Now you click on a colour for the lines, a number of contour values to draw, how many times do you wish the labels (“sparse labelling”), and if you prefer the last digits as label. Some exercising will clarify these options. The result could be:



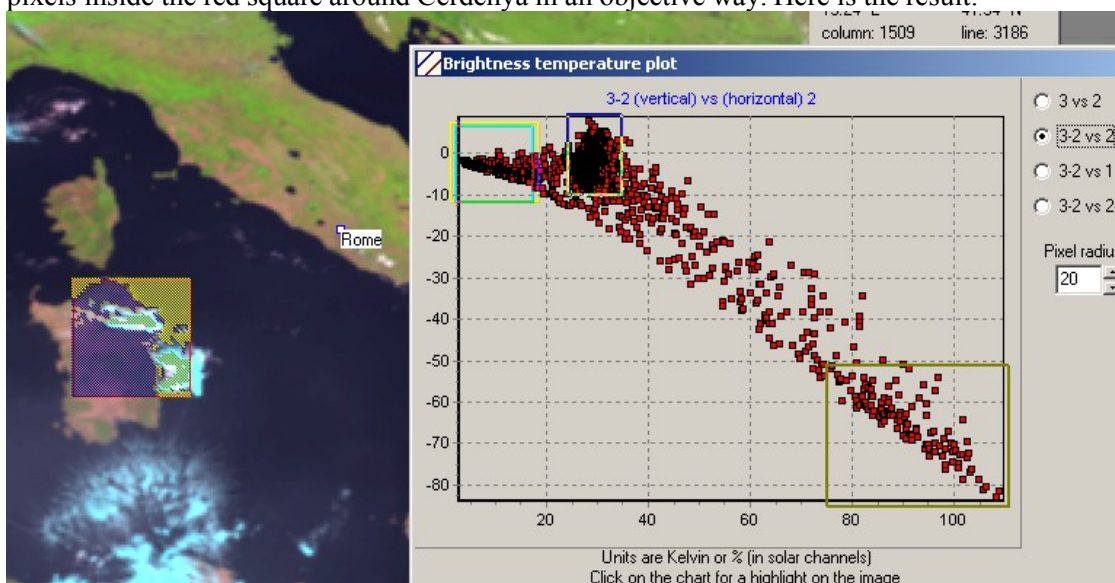
Normally, you should try the plottings on gray images, but technically, it works the same with any combination or difference of channels, or for smaller regions even in the high resolution visible.

2. Use of the scatter plots

Let us have a look at the inspection tool in Nubes, invoked by Ctrl+Q. From the menu, you will see it as Plots/ (Temperature scatter). The parenthesis indicates that you should not use the menu for it, since the result is for the region around the cursor when you invoke it. Use Ctrl+Q on the position where you wish to inspect the calibrated values at several channels. On any image or portion of image you will get information on the channel numbers typed in the RED, GREEN and BLUE boxes on the right-hand side of the display window. You can get a difference value or a channel value for the axis, by clicking on the right side buttons of the “Brightness temperature plot” form.



If we now click on the plot (right-hand side) the corners for the ranges we wish to highlight, we can classify the pixels inside the red square around Cerdanya in an objective way. Here is the result:



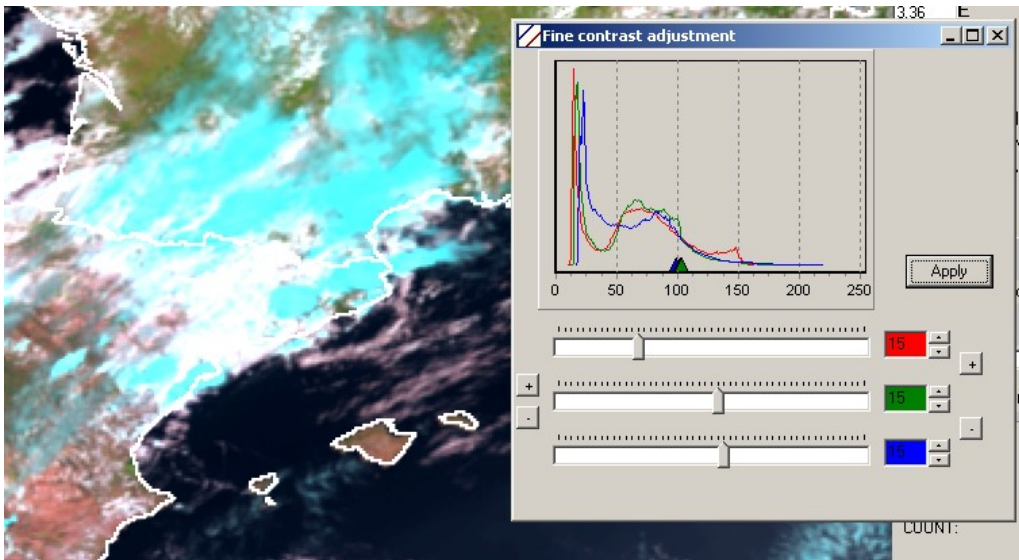
The three rectangles on the plot contain land pixels, sea pixels and cloud pixels, respectively. The scene is now classified according to the information in the solar channels 2 and 3. More precisely, according to the difference between 3 (at 1.6 μm) and 2 (at 0.8 μm), as ordinate, and the value in channel 2, as x-axis.

Other choices for the classifiers allow cloud phase determination (channels 3 and 4), cloud top temperature (channel 7, 9 and 10) or even atmospheric instability in clear areas (channel 11). Please see the Eumetsat interpretation guide for MSG data.

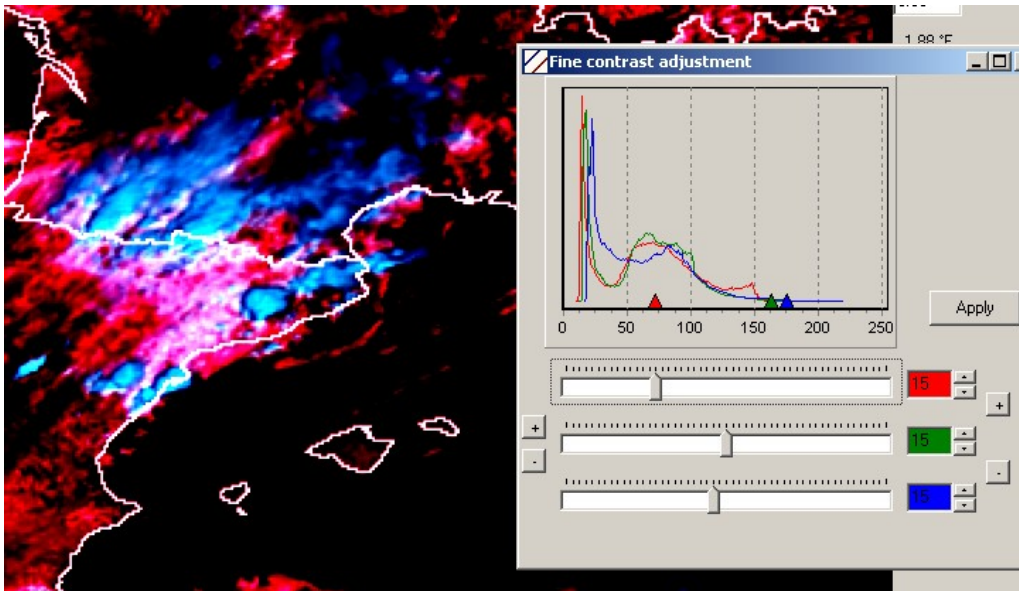
3. Extreme enhancement for imagery

The human eye cannot encompass all the information in an image at a glance. Enhancement is required to appreciate the information on the ground in an image, or to focus on the highest storm tops. The function High Contrast (Ctrl+Alt+C) responds to that need.

Invoking it produces the “Fine contrast adjustment” form. In the example the cloudy region is not explicit as for the dangerous thunderstorm. Another enhancement is needed: the user can move the sliders behind the location of the triangles in the region to be enhanced. In addition, the width of the enhancement (small or big range of coloured values) can be reduced with the number boxes on the right of the form.



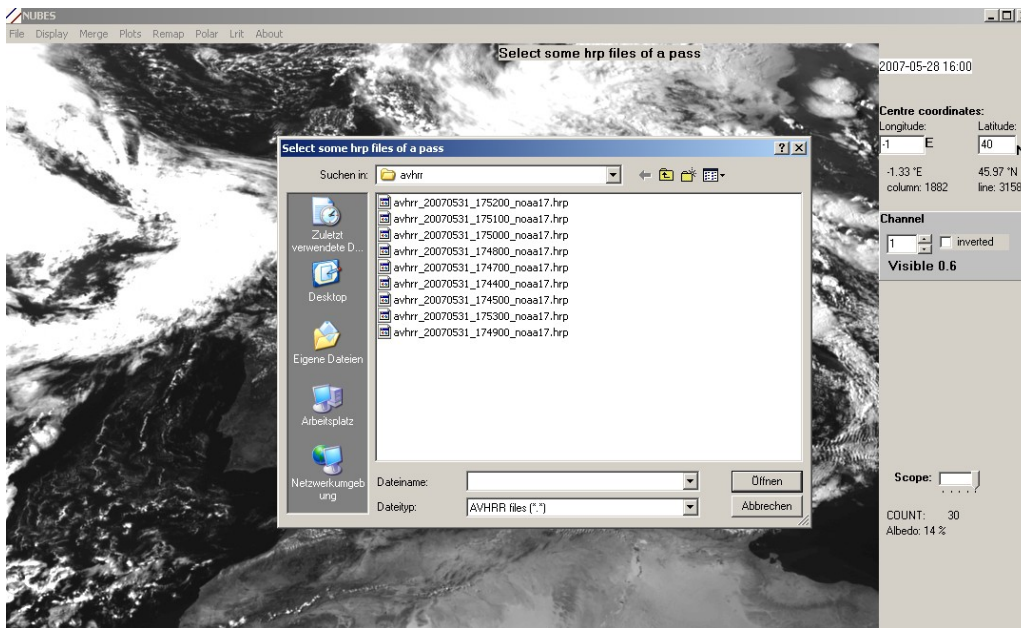
After such manipulations, or pressing the button Apply, we will get an enhancement of the cloudy area, where we can tell cloud from thunderstorm:



Ctrl+E toggles to the original global enhancement. It is a useful function when the emphasis is in the regional detail, which could be a dust storm, the preferred location for fish in the sea or the convective developments in the atmosphere.

4 Display of AVHRR

Eumetsat retransmits data from NOAA satellites captured by stations in the northern hemisphere, under the programme EARS (see in www.eumetsat.int). This files arrive through the Eumetcast Data Channel 4. The program Start places them in the avhrr directory. When invoking the function Polar/Display (Ctrl + Alt + V) we are referred the first time to that directory.

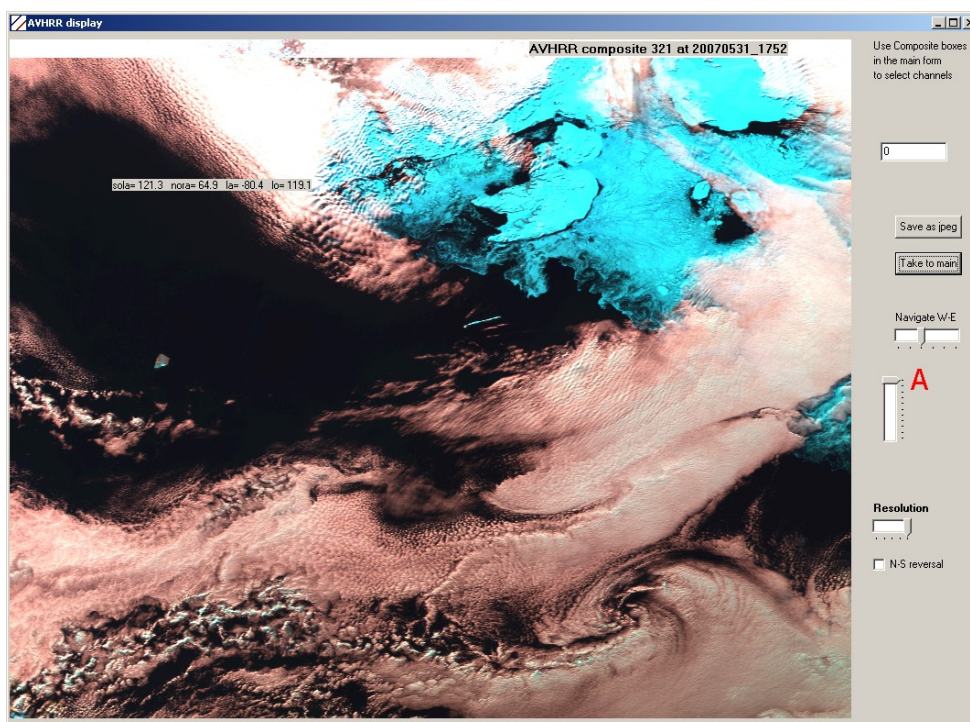


We choose one or more connected segments (each file corresponds to a few minutes of a NOAA pass over the station) and choose Open. That action invokes a new menu for the displays, which we can navigate with the help of two rulers in the area **A** of the display. The choice of colours for the composite is inherited from the main menu. A text superimposed on the image indicates the solar elevation at the time of the image, the angle between the vertical and the North, and the central latitude and longitude.

A lower ruler allows the reduction of the image resolution to allow more granule files to be displayed simultaneously.

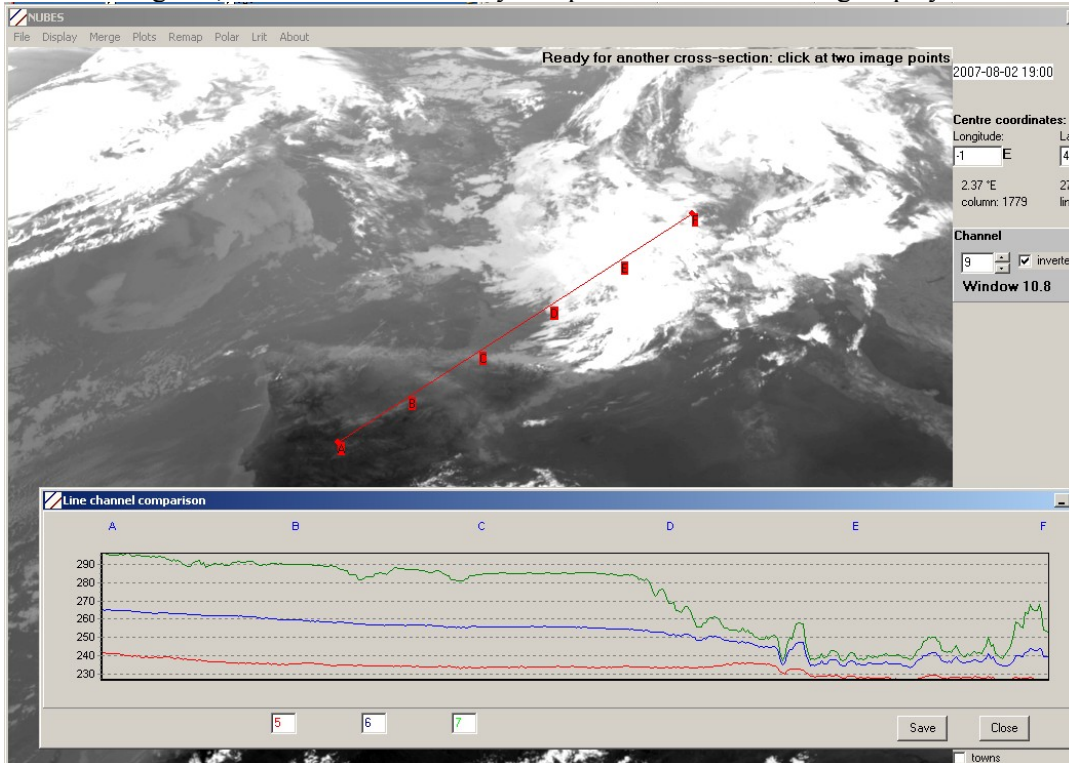
This function includes the presentation of AVHRR segments from Metop and other types of data from different instruments in Metop. For them, some old orbit data has been added to the program, which asks for newer values Epoch (UTC) from the web, for example at <http://www.heavens-above.com/orbitdisplay.asp?lat=50.83&lng=3.3&alt=0&loc=&TZ=CET&satid=29499>

For Metop data, the solar coordinates and north orientation relative to the display are given on the upper line.



5 Transects

Transects are comparisons of brightness (in the infrared) or albedo values along a straight line on an MSG image. To generate them, right-click the mouse over the display and choose Transect. First time, it shows an information line. After clicking OK, the user will choose any two points and the following display will show:



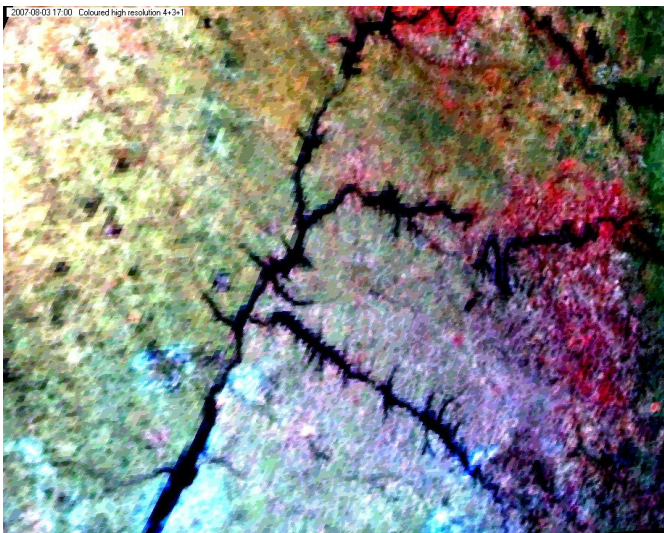
The letters A, B, C, D, E, F on the image correspond to the values for the same letters in the new window: Line Channel Comparison. The vertical index indicates here Kelvin at the three channels: Channel 5 ($6.2\ \mu\text{m}$) in red, channel 6 appears in blue, channel 7 in green. (This is not a colour composite, but just the arbitrary colours assigned to lines depicting the channel values along the straight line). Then the user may click on any other two points and try to understand the reason for the differences between channels.

6 Programming products

If you wish, as part of your operations, the regular generation of products (colour composites, reprojections, slicing, etc.) with the 15 minute cycle of the Meteosat imagery, you should invoke under File the option Product setup (Ctrl+Alt+P), which leads you to the following menu:

You can here start programming the characteristics of your products (centre, scope, if zoomed or not, with colour enhancement for a range of values, i.e., “slicing”).

According to the menu, you wish a close monitor, every 15 minutes, on an area close to (LON=-50°, LAT=-15°) which works during the day in the best resolution and focuses on ground and cloud characteristics. You may choose “high resolution” and use the boxes on top to specify the channels to colour that image. Mercator and Zoomed can be good options. The graphic shows that setup for the menu, which results, through Show_it_now, in an image like this:



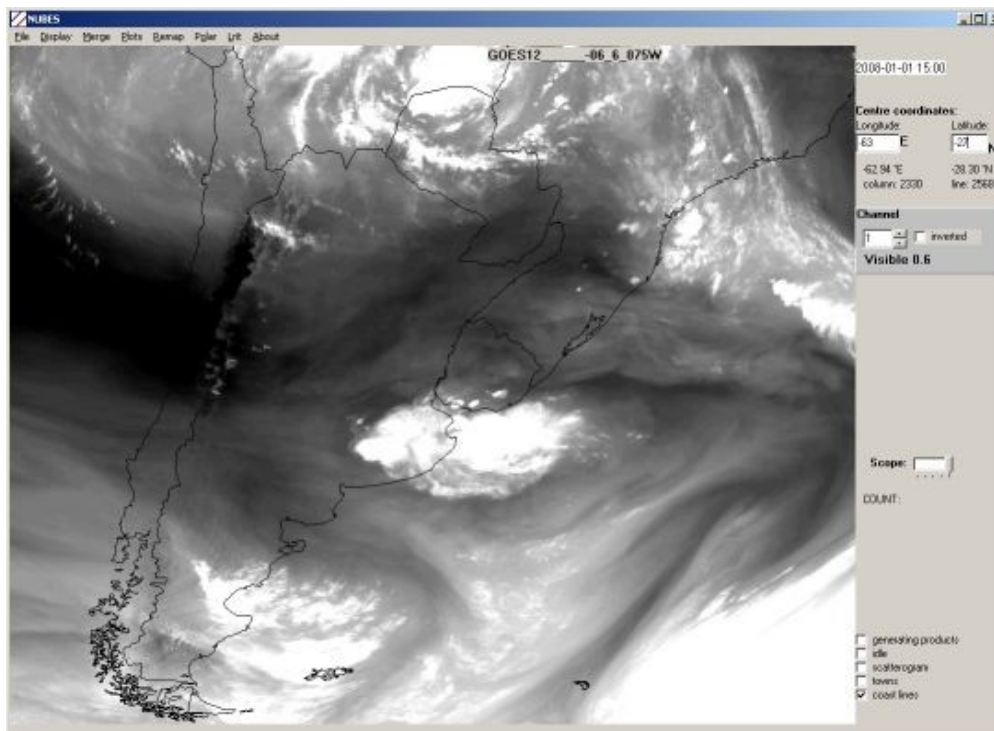
You will need to modify the values in the Mercator menu (Ctrl+M) to get the right scope for your area of interest, and manipulate the coordinate limits. After that effort you should save it with a name, like Paraná, with the button Add_entry, which includes a specification of the actual limits in the Mercator menu. The button Add_entry puts your request in the list of products generated every 15 minutes for the last Meteosat image. Remember to mark the “generating products” tick box to enable it.

For some types of product, you can convert gray values into colour, to highlight particular ranges of cloud temperature or ground albedos indicating harvest ripeness. That is the point of the tick box “Slicing”. When you click in the box, you are offered a range in the usual units: Kelvin for single channels in the infrared (from 4 to 11), and percentage of albedo in the solar channels 1,2,3 and 12. You can colour differences between channels in those units, too. For instance, the difference channel4-channel9 will be in Kelvin, and the difference channel2-channel1 in % of albedo, an index of vegetation.

Even GOES-E images can be saved as products and generated regularly. For that, you choose the last option as in the window above and the central coordinates. In the case of GOES-E, the channels are assigned like this:

- 0: Standard RGB composite based on channels at 0.6 μ m, the difference (3.9-10.7) and 10.7 μ m
- 1: Single image at 0.6 μ m
- 2: at 3.9 μ m
- 3: at 6.6 μ m
- 4: at 10.7 μ m

Any GOES images, even from GOES-W can be displayed with the help of the shortcut Ctrl+Alt+D based on the indications of the main menu where applicable. This function is still under development. Here is one example of displayed result:



7 IASI profiles

Recently, EUMETSAT has included sounding data from a Metop interferometer called IASI. The way to invoke them is through the menu Plots/BUFR/Profiling or its shortcut Ctrl+Alt+T. You choose one of the BUFR files of the type IASI...tw... and, if the area corresponds to the displayed Meteosat image, you will see in colour dots the values for ground temperature. If the area is not displayed under Meteosat, a coordinate indication is provided. Once the coloured dots appear in the image, right-clicking will allow to enable the vertical display on particular geographical locations in the coloured area: they are humidity and temperature profiles retrieved from the BUFR file.

Several files can be consecutively presented, but only for the last one you can visualise the profiles at different locations, defined by a click of the mouse.

NOTE: This guide is in continuous evolution. We appreciate any comments for its construction at support@prapro.com

