HDFLook/HDFLook MODIS Handbook

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NAME

HDFLook /HDFLook-MODIS
HDF data files visualization and graphic analysis
(Hierarchical Data File NCSA)

DESCRIPTION

HDFLook is a comprehensive application for viewing NCSA HDF v.4.x and HDF-EOS 2.x science datasets. HDFLook is designed to interface with a larger analysis environment called *Msphinx* . HDFLook is supported on several UNIX workstation platforms, and includes a well designed graphical user interface based on X11.

HDFLook-MODIS is a new multifunctional data processing and visualization tool created for HDF-EOS Land, Ocean and Atmosphere MODIS Products. It can be run in several modes: as separate stand alone software, as part of integrated shell called *Msphinx* or through command files. HDFLook-MODIS is a result of joint collaboration between LOA USTL, France, and GES DAAC and is based on the very popular HDFLook tool philosophy. Created as a flexible modular tool, is it easy to update, add new features, and is free to users obtaining it from the NASA GES DAAC and LOA URL's.

Main features of HDFLook-MODIS are:

- Accessing and visualization of all swath (level-1, and 2) and gridded (level-3 and 4) MODIS radiometric and geolocation, atmosphere, land, and ocean products and binned (level-3 and 4) MODIS products;

- Re-mapping of swath data to world map. Geo-projection conversion. Re-projection of the initial projection into several pre defined selection; - Interactive and batch mode capabilities;

- Subsetting features - availability of parameter, band, and spatial subsetting; - Multi-granule processing - Mosaic and stitch capabilities;

- Displays ancillary/data attributes;

- Capability of producing enhanced false and true color (RGB) images with option of map and grid overlays;

- Data conversion- from scaled quantities to physical units. Format conversion- HDF-EOS to ASCII, Binary, JPEG;

- Aerosol and other ancillary data available from the ground based sun photometer measurements (AERONET data base) for the atmospheric correction and validation of some atmospheric products.

Disclaimer
We have made every effort to provide user accurate functioning software. However it is preliminary in nature all aspects are not fully tested.
User's feedback is welcome to improve this software.

SYNOPSIS

HDFLook [options]

HDFLook [options]	*starts HDFLook in interactive mode.*
HDFLook [options] filename	*starts HDFLook in interactive mode with a file on input.*

OPTIONS

-Zoom 75 allows to reduce or increase the size of the Motif widgets. In the example a reduction factor of 75% will be applied. Warning! It will be necessary to modify the default font size in the following line of the HDFLook.ad file:
HDFLook*FontList: "-Adobe-Courier-Bold-r-Normal-*-12-*-*-....."
in order to adjust the size of the character font to the size of the widgets.(page 11)

-Help prints this handbook on your terminal.

-List list the SDS content of the HDF file and quit.

REMARKS

* A directory (.HDFLook), containing the initialization files, is created under the user's $home directory. It allows the software to keep trace and restart on the last used file.

* The option **-zoom** can be integrated into HDFLook.ad; For that purpose, modifies the line:
HDFLook_bin*zoom: 100

* When reducing windows, do not forget to select a smaller font in HDFLook.ad:
HDFLook*FontList: "-Adobe-Courier-Bold-r-Normal-*-12-*-*-*-*-*-*-*"
The Unix command: "xlsfonts" can help you to select a suitable font.

Main characteristics

- Visualization of the HDF contents for the following formats:
  - SDS (Scientific Data Set)
  - Vfiles
  - "Raster images" 24 bits or 8 bits with look up table.
- Visualization of slices of data: up to 6 indexes
- Display of the files attributes
- Automatic detection of particular filling values (mask)
- Extraction and dump of binary files stored as simple matrices of (lines $\times$ columns)
- Display data sets as ASCII pages of numbers
- Plot of transects and histograms on image planes
- Plot of SDS records
- Production of images and graphics PostScript prints.

with command lines

- extract the ancillary data of a SDS.
- print a PostScript image
- export (Raw or calibrated) SDS records to binary files
- export (Raw or calibrated) SDS records to HDF files
- export RGB images to jpeg files
- export RGB images to hdf files

On HDF-EOS MODIS format:

- build reprojected SDS mosaic to binary files
- build reprojected RGB mosaic to binary files

Connected to Msphinx:

- send to Msphinx all (raw or reprojected) MODIS data and then use the Msphinx command lines to build sophisticate outputs.

with the AERONET data base

In conjunction with the AERONET data base, HDFLook is able to provide a fast validation of the aerosol algorithm by downloading directly the AERONET Optical thickness value for the corresponding MODIS visualized granule.

Contents

1 BASIC FUNCTIONS

GENERAL RULES

When installing HDFLook on your computer, the HDFLook.ad file is placed in the system directory:

/usr/lib/X11/app-defaults

by the superuser. It must be readable by all users.

If you can't modify the file, you can implement it locally by using the command:

xrdb -merge HDFLook.ad

In the panels, use the left mouse button to select the options, to activate the push buttons or to point to a position on the request of the software.
Any character string in an editor can be selected using the same button and then pasted into another editor using the central button.

At the first use of HDFLook, the user has to define two environment variables with:
- the absolute path of the directory containing the coast, river maps data files.
- the absolute path of the directory used temporary files.

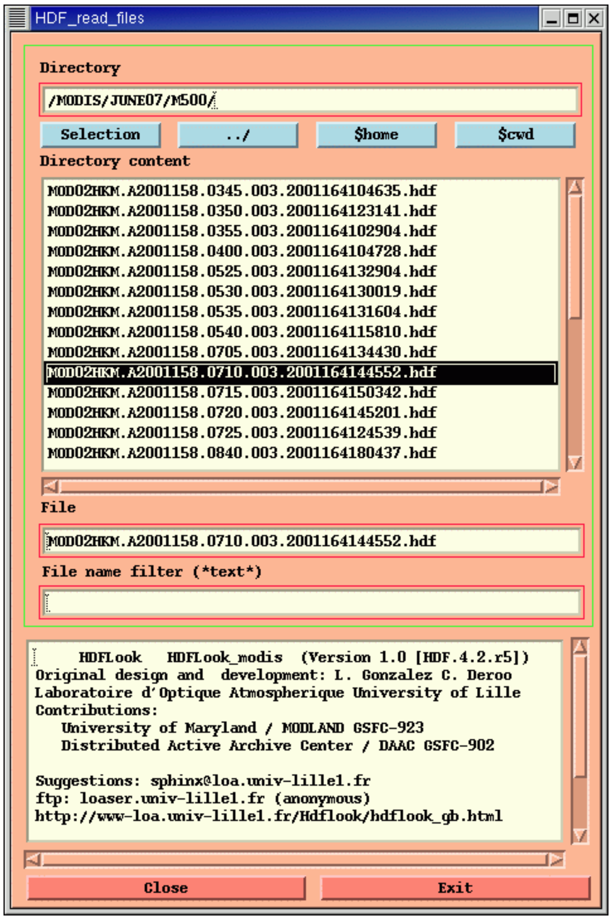
, for example: in csh:

setenv HDFLOOKMAPS /usr/local/Maps
setenv HDFLOOKTMP /usr/tmp

or , for example: in sh:

HDFLOOKMAPS=/usr/local/Maps ; export HDFLOOKMAPS
HDFLOOKTMP=/usr/tmp ; export HDFLOOKTMP

1.1 Files Read



1.1.1 Working Directories

The working directory is shown in the editor at the top of the window. You can directly type a new directory in the editor (and press return) or click on the desired directory in the Unix file structure displayed.

Selection Moves to the editor directory and refreshes the file scrolled list.

.. Moves a directory upwards.

$home Loads your home directory.

$cwd Loads the directory from which HDFLook is being run.

To select a file you can type its name in the editor "file" or click on its name in the list of the files. The editor "File name filter" allows you to sort out files matching a specific string (Unix Notation). The sorted files appear at the top of the list followed by the remaining files.

ex:

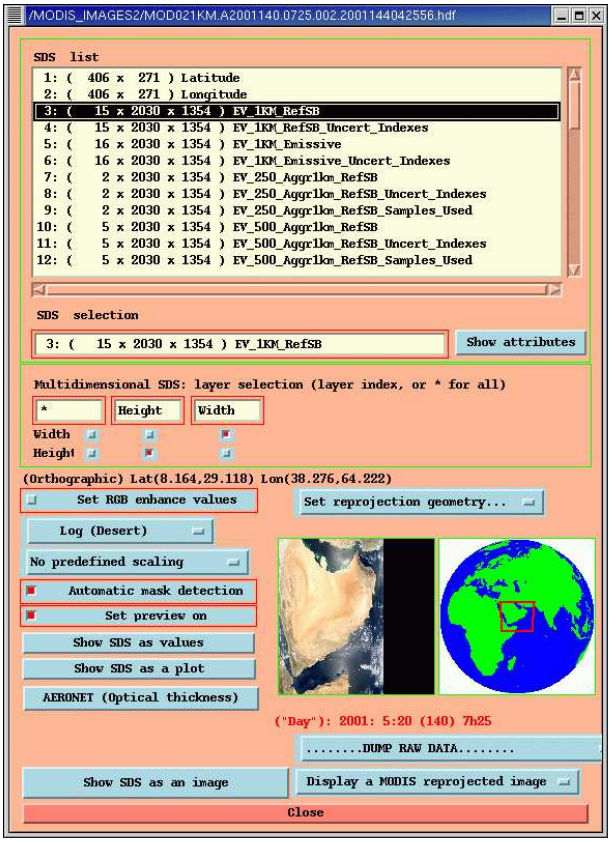
Type:	the head of the list will be:
⋆data	all the files ending with "data".
data⋆	all the files beginning by "data".
⋆data⋆	all the files having "data" in their name.

When you select one of the HDF files in the *"Directory content"* list:

* The widget *"HDF (raster image) content"* may show a list of all of the 8 bit encoded images with their own look up table or the 24 bit images in true color. You may select one of those images and activate *"Show the selected raster image"* to visualize it.
See §1.3 for details of this menu.

* A new widget is opened with the
"Name_of_last_directory/Name_of_file"
as title and shows the other records: SDS and Vdata of the HDF main file.

1.1.2 Description of selection Menu



The window *"SDS list"* shows the name of the various SDS and Vdata records contents in the HDF file

By choosing one of the records and selecting "show attributes", the resizable window *"HDF_attributes"* appears; it contains the information record associated to the SDS file. Important parameters include the type of data, the calibration, the mask values:

Data type	16-bit unsigned integer
long_name	Land Reflectances Averaged on 10x10 Pixel Array
scale_factor	10000
add_offset	0
valid_range	0, 30000
_FillValue	90000

<u>Options of the Menu:</u>

- "No predefined scaling"
  Several options allow the user to apply the scale factors set by attributes (Scale_factor , add_offset). These factors are not always implemented.
- "Automatic mask detection"
  This option allows the user to generate in primary colours the constant value area introduced as mask values into the images.
- "...DUMP RAW DATA..."
  - This option allows the user to create files containing various image slices, in binary without headers or trailers. An ASCII file, with the attribute .met, containing the characteristics of the created files is added.
    For example: for this SDS :
    3: (5 x 2708 x 130) EV_500_RefSB
    Is going to generate 5 files of 2708 lines of 4060 columns

    EV_500_RefSB_1
    EV_500_RefSB_2
    ⋮
    EV_500_RefSB_5

    and a file:

    EV_500_RefSB_2708x4060.met
  - "Dump a selected SDS on HDF file..."
    This option extracts a SDS to a HDF file with the indexes by slices.
- "Show SDS as values"
  This option dumps the files in the same geometry shown in the main display window "Show SDS as an image" (for example an image 4x100x100 will be represented as a global image (2 raw images x 2 column images). The user can enlarge the window *HDF_show_values* to display more data.

Rigth bottom sliders allow the user to move into a 50×50 sub-matrix. Left and top sliders allow the user to move the 50×50 sub-matrix into the global image.

```
 File size 260X100 Show size 79 -> 129 X 20 -> 70
       01-  79:01-  80:01-  81:01-  82:01-  83:01-  84:01-  85:01-  86:01-  87
01-  20:
01-  21:
01-  22:
01-  23:
```

The first line shows the sub-matrix position in the global image and means that, in the total image (260×100 pixels), the values are shown from column 79 to column 129 and from line 20 to line 70.

The column notation at the top of the window:
01- 79: Where 01 is the number of the image (X) in the global image,

79: the number of the column within this image
The line notation at the top of the window:
01- 20: Where 01 is the number of the image (Y) in the global image,

20: the number of the line within this image

Data can be viewed in several types:

- Decimal (default)
- Hexadecimal
- Binary
- Character

- "Show SDS as a plot"
  When this option is activated, a new menu appears: **HDF_plot_SDS_indexes**. This menu is detailed in §1.2.2.

- "Show SDS as an image"
  When this option is activated: the image is shown and a new menu appears: **HDF_set_stretch**.

  This menu allows the user to adjust a part of the Look Up Table. It allows also the user to fix values as masks or to modify the colors of masks. This menu is detailed in §1.4.

If you have launch *HDFLook* from *Msphinx* , another menu is available:

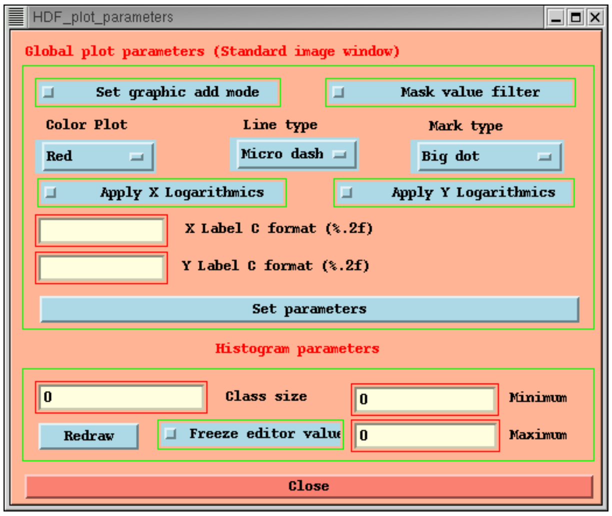
- "...SEND RAW DATA..."

This menu is detailed on page 51.

1.2 Graphic menus and windows

1.2.1 HDF_plot_parameters

This menu is called by Curve→ Settings or by Plot→ Plot defaults.



- to adjust the properties of global parameter plots.

  - the colour *"Color Plot"*
  - the type of line *"Line type"*
  - the type of mark *"Mark type"* (cross, dot, ...)
  - the format of the labels.
    The C language formulation is used: %[.precision]conversion

precision:	number of decimals for the formats f, e and E
	number of digits for the formats g and G (6 per default)
conversion:	g universal notation (i.e. d, f, or e)
	G universal notation (i.e. D, F, or E)
	f decimal notation (i.e. ' [-]dddd.ddd')
	e exponential notation (i.e. ' [-]d.ddde+dd')
	E exponential notation (i.e. ' [-]d.dddE+dd')

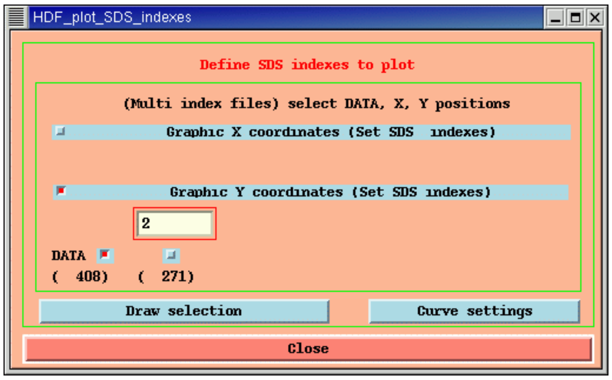
    example:

12.65978	%g	⟹ 12.6598
	%f	⟹ 12.659780
	%.3f	⟹ 12.660
	%.2e	⟹ 1.27e+01
	%.0f	⟹ 13
	%+.1f	⟹ +12.7
12.00	%g	⟹ 12

  - switch X or Y units into logarithmics scale *"Apply X Logarithmics"*
  - select *"Set graphic add mode"*: any new plot will be added in the plot window.
  - check the *"Mask value filter"* to discard the points defined as mask values.

1.2.2 HDF_plot_SDS_indexes

This menu is called by Show SDS as a plot.

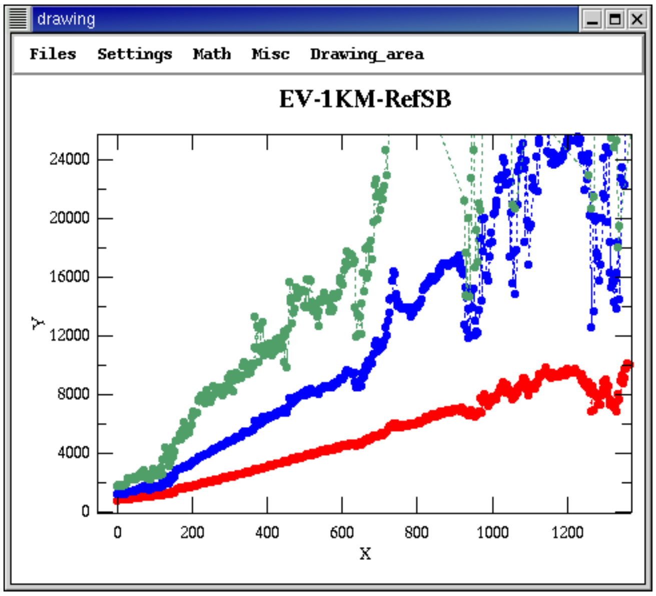


- To realize simple lines or columns plots of an image.
  Just fill the editors with the line and column to plot, select which index is the data to plot, and click on *"Draw selection"*.

  For example, the SDS 3: (2 x 100 x 130) Avg_Refl, so 2 slices 100 x 130

  - First example: single transect plot
    Deselect the toggle *"Set X index"*
    Select the toggle *"DATA"* corresponding to the index 130
    Type 1 in the editor corresponding to the index 2
    Type 2 in the editor corresponding to the index 100
    "Draw selection"
    The line 2 of the slice 1 will be plotted.
  - Second example: bidimensional plot
    Select the toggle *"Set X index"* and *"Set Y index"*
    In the X definition part:
    type 2 in the editor corresponding to index 2
    type 2 in the editor corresponding to index 100
    In the Y definition part:
    type 1 in the editor corresponding to index 2
    type 2 in the editor corresponding to index 100
    "Draw selection"
    The line 2 of the image 2 will be drawn versus the line 2 of the image 1.

1.2.3 Plot Window



In the plot window, a serie of menus allows the user to:

Files Menu

"Files→ Print"	prints the plots
"Files→ Extract"	extracts the values as an ASCII file named "ExtractData" "ExtractData01" etc...

Settings Menu

"Settings→ Title"	modifies the axes titles and the main plot title (see figure 1.1)
"Settings→ Plot setting"	modifies the curve's parameters
"Settings→ Axis setting"	modifies the axis's values

Math Menu

"Math→ Statistics" calculates simple statistics on the plotted data. For example:

Points	: X 1 108	Y 1 108
Minimum	: 3.8856e+01	0.0000e+00
Maximum	: 1.8100e+02	1.2900e+02
Sum	: 1.0206e+04	6.5920e+03
Mean	: 9.4498e+01	6.1037e+01
RMS	: 1.1701e+02	7.3086e+01
Average Dev.	: 6.7279e+01	3.5061e+01
Variance	: 4.8062e+03	1.6312e+03
Standard Dev.	: 6.9327e+01	4.0388e+01
Skewness	: 4.4947e-01	2.3394e-01
Kurtosis	: -1.8144e+00	-1.3607e+00
Integral	: 0.0000e+00	4.3402e+03

See the figure 1.4

"Math→ Smooth&fit" performs smoothings and regressions

- Polynomial regression
- Smooth
- Spline

To find the constant terms of an equation starting from initial conditions:

- Levenberg Marquardt fit method

The user can define an interval of study, fill the editors *"X start" "X end"*. After the fit, he can choose from the options:

- "Add to graph": adds the fitted curves to the plot
- "Replace curves": allows the user to replace the original values by the fitted values in the defined interval of study

See the figure 1.5

Misc Menu

"Misc→ Clear Window" erases all plots

Drawing_area Menu

"Drawing_area→ Zoom"	enlarges a part of the plot
"Drawing_area→ Rescale"	returns to the initial scales
"Drawing_area→ Show values"	shows values selected with the mouse in the plot window. To stop the loop, press any of the mouse button.
"Drawing_area→ Clear area"	erases the points of a mouse selected zone: select an area by dragging with the left mouse button.

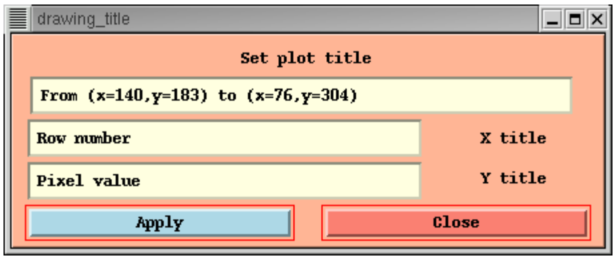


Figure 1.1: Set axes titles and the main plot title

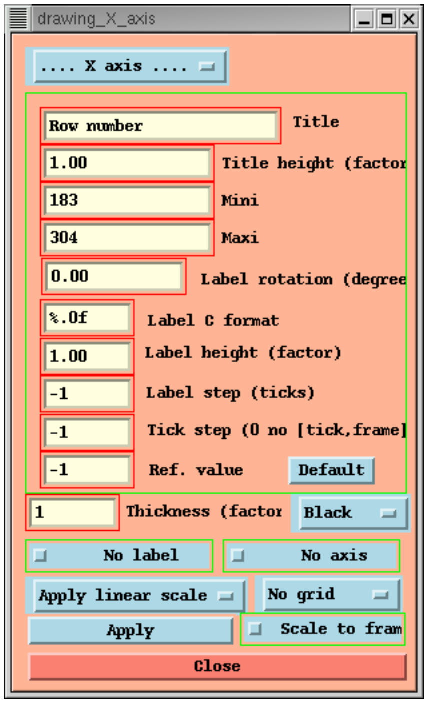


Figure 1.2: Set axes parameters

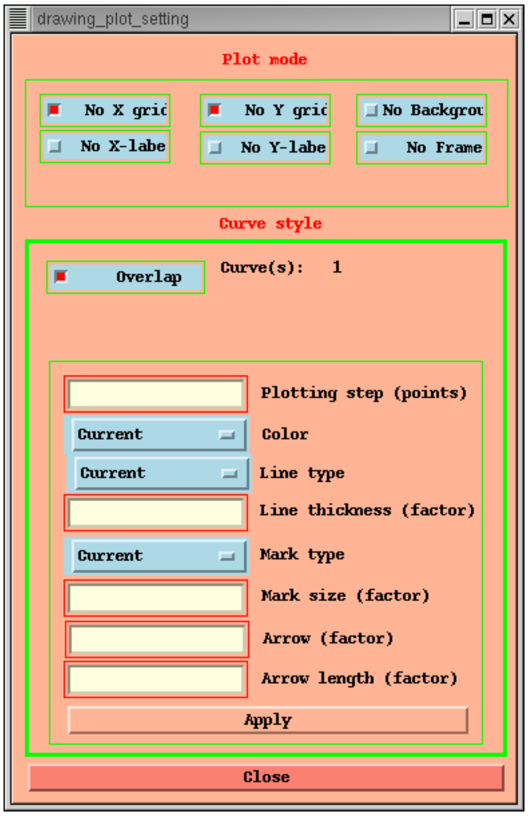


Figure 1.3: Set curves parameters

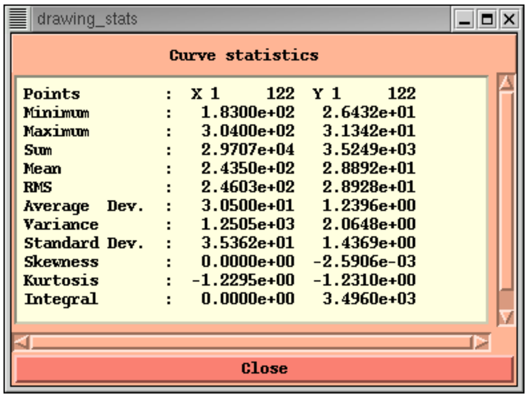


Figure 1.4: Curve statistics menu

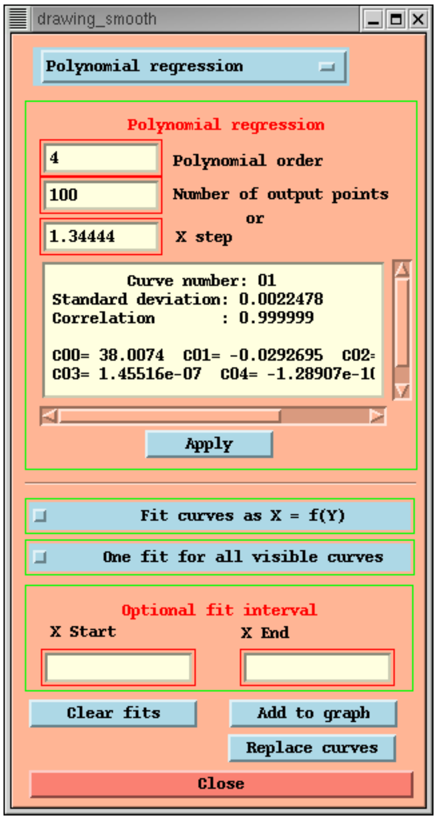
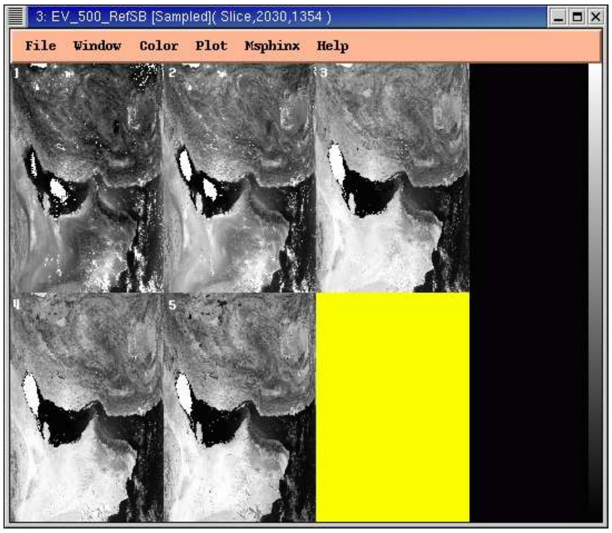


Figure 1.5: smoothing and regression menu

1.3 Image Visualization

Main window of Image Visualization



File Menu

- FILE→ READ
  Executes the main menu to read HDF files (see the §1.1).

- FILE→ PRINT

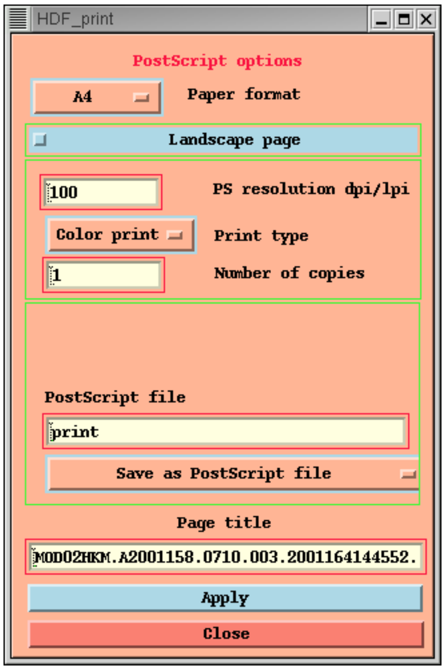
  Starts the print menu for the image display: *HDF_print*.

  This choice generates PostScript files sent directly to a printer or stored on disk:

  - Send to printer
  - Save as PostScript file
  - Save as Encapsulated PostScript file (preferred format for insertion of the result in a document (Word, Tex, etc..))

  This choice contains various options concerning:

  - the paper size
  - the type of printing: Portrait or Landscape
  - the type of printer (grey scale or color) and its resolution in "dots per inch"
  - the number of copies



- FILE→ CLOSE
  This choice closes the image window.

Window Menu

- WINDOW→ ZOOM
  Enlarges a mouse selected zone of the image.

- WINDOW→ FULL IMAGE
  Returns to the initial image after a zoom.

- WINDOW→ SCROLL ZOOM
  Creates a small scroll window:

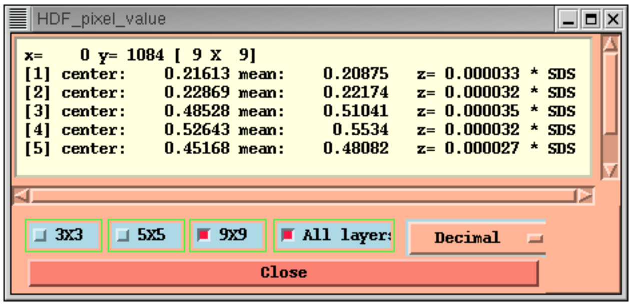
  - The middle button selects the area in the main window
  - The left button enlarges the area to show
  - The right button reduces the area to show

  If the toggle *"Freeze contrast"* is set, the images are always computed with the same minimum and maximum. Otherwise, minimum and maximum are computed for each selection and the contrast changes at every selection.

  The red cross in the scroll window shows the pixel whose value is printed in the editor. You can click pixels in the scroll window to display their values.

  To stop the scroll window visualization the XWindow Close panel is used.

- WINDOW→ CURSOR VALUES



  Displays a small 3x3 or 5x5 or 9x9 zone of values. Click in the main image to change the pixels displayed.

  The values can be displayed in Decimal, Hexadecimal or Binary. In the case of a SDS with more than two indexes, the option *"All layers"* switches the display to slice mode.

Color Menu

- Color→ Contrast stretch
  Activates the menu *HDF_set_strech* See the §1.4.

- Color→ Color palette
  Changes the Loop Up Table. (14 Loop Up Tables are implemented)

Plot Menu

- Plot→ transect
  Draws, using the mouse, a radial in the main image and plots the values as a curve.

- Plot→ histogram
  Draws a zone in the image and computes the histogram of the values. The menu *"HDF_plot_parameters"* (see below) allows the user to fix the minimum and maximum of the histogram and the size of the classes. Do not forget to filter the masked values in some case using the option *"Mask value filter"*

- Plot→ defaults
  Launches the menu *Hdf_plot_parameters* detailed in §1.2.1.

Msphinx Menu

HDFLook , launched by *Msphinx* , allows you to exchange data. Two modes are avalaible:

- direct transfer of data for small volumes.
- creation or modification of Msphinx project. The transfers will use the Msphinx project with data planes stored on disk.

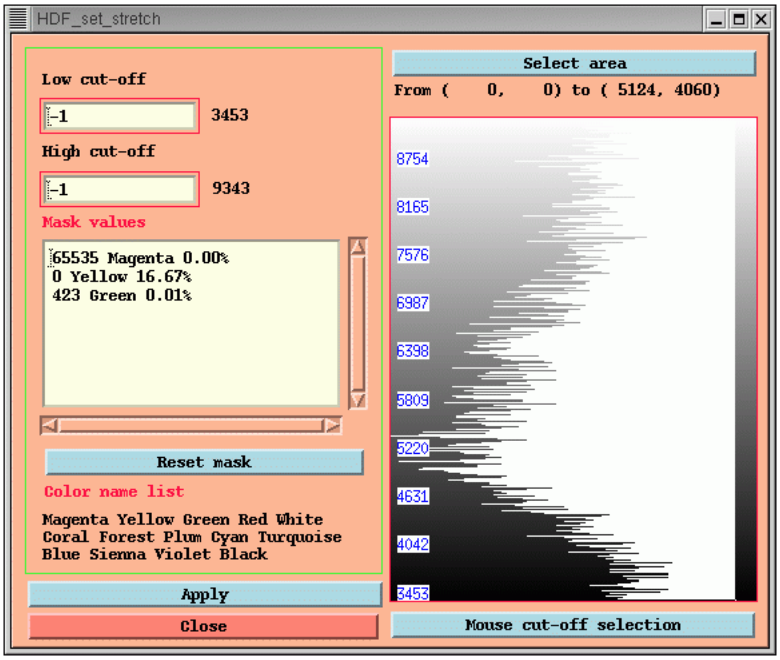
More explanations in the chapter 2.16.2.

Help Menu

Shows the electronic version of this manual.

1.4 Look-Up Table Stretch

Color→ HDF_set_stretch



- Modification of the range of the data displayed:

  - *"Low cut-off" "High cut-off"*
    If the two values are identical (for example: -1) the data is automatically stretched between the two values printed in the right of the editors (1% and 99 % of the data). A histogram shows the distribution of the data with regard to the 256 levels of the color scale.

    Fill the *"Low cut-off" "High cut-off"* editors and execute *"Apply"*. The main window shows the new range of data, split in 256 levels of colour.

  - *"Select Area"*
    You can select one area of the image to compute the histogram showing the correlation between data and colour.
    Activate *"Select Area"*
    Select the zone in the main window using the button mouse.

  - *"Mouse cut-off selection"*
    You can fill the editors *"Low cut-off" "High cut-off"* using the histogram; activate *"Mouse cut-off sélection"*; draw a vertical line in the histogram window on the interesting range and execute *"Apply"*.
    To return to the original computed values just clear or fill the editors *"Low cut-off" "High cut-off"* with an identical value, then select *"Apply"*.

– Change the mask values filter:
  The list *"Mask values"* shows the masks values with their colour and the approximate percentage of pixels concerned, for example:

  ```
  90000      Magenta     41.95%
  ```

  You can add a value by typing it in the list, eg:

  ```
  50000      Red
  ```

  Then activate *"Apply"*; giving us:

  ```
  90000      Magenta     41.95%
  50000      Red          0.00%
  ```

  There are no pixels having a value of 50000. You can change the colour directly in the list, for example:

  ```
  90000      Yellow
  ```

  then activate *"Apply"*; the mask turns to yellow. To return to the initial values, activate the button *"Reset mask"*.

2 HDFLook_MODIS

Description

HDFlook is designed to recognize different MODIS HDF-EOS files. The action of clicking on the file name will open several MODIS additional menus and options.
Three types of images can be displayed:

- RGB composite
- thermal anomalies composite
- thermal composite
- SWIR composite
- single plane (LUT) image

The user is able to visualize with reprojection or not.

Level1B	A RGB composite standard atmospheric corrected image*.
	A RGB composite "thermal" anomalies.
	A RGB composite "thermal"†.
	A single plane.
Mod09	A RGB composite standard atmospheric corrected image.
	A single plane.
Other products	A single plane (with latitude, longitude SDS records).
Other products	A single plane (reprojected SDS records).

Level1B (1km): The software tries to find latitude,longitude SDS records with the best accuracy in the corresponding Level1B (500m, 250m) or MOD03 HDF files. (if not, the software uses the coarse latitude,longitude SDS records to compute the 1km resolution. See appendix A.1 for accuracy evaluation.)

*Standard atmospheric corrections are applied to the MODIS visible bands in order to facilitate the interpretation of the RGB images. We applied Rayleigh scattering correction assuming a standard pressure that is adjusted with altitude using a coarse Digital Elevation Model (ETOPO5) and ozone transmission correction.
For Rayleigh scattering, the computation of the correction terms uses a subroutine from 6S optimized for speed and accuracy, (Vermote and Tanre,1992).
For ozone absorption, we assume a Beer-Bouguer law and the optical thickness integrated in the spectral band was pre-computed using the 6S code (Vermote et al.,1997).

†Band 31 in red, band 29 in green, band 20 in blue

Level1B (250m): To build a RGB image, the software needs the Level1B 1km or MOD03 HDF files and the Level1B 500m HDF files.

Important: to help HDFlook to find the other Level1B or MOD03 files, the user must fill the "Set associated directories" textlist with the path of the different directories containing the HDF corresponding files.

MODIS Options

The *"file menu contents"* shows a map with the granule location. Several text labels give the latitude and longitude location, the HDFLook current selected projection, the internal HDF-EOS flags (day, night, mixed).
warning: HDFlook does not change the SDS original data structure: night data are flipped (north-bottom, south-top).

This menu works using several other options selected in the menus or with buttons. The explanations are below.

2.1 Enhance RGB image

This menu defines the color scale used in the RGB image mode:

2.1.1 Enhance RGB image

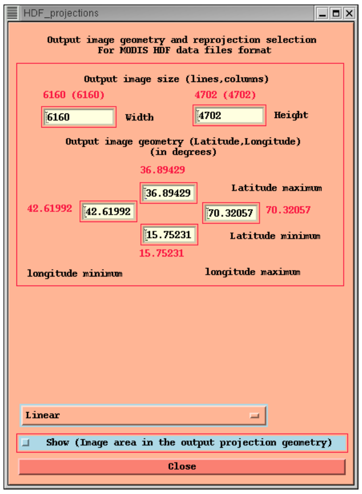
The user can enter his own low and high cut values for each band. The low value will be the intensity 0 of the color, the high value will be the intensity 255 of the color.

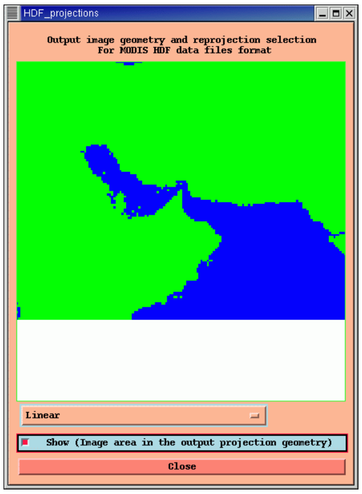
2.1.2 Set RGB mode to ...

- Set RGB mode to linear
- Set RGB mode to log
- Set RGB mode to coarse log
  In this mode, the atmospheric corrections are not applied and the (blue color) Rayleigh effect can be seen.

2.2 Reprojection

2.2.1 Reprojection geometry



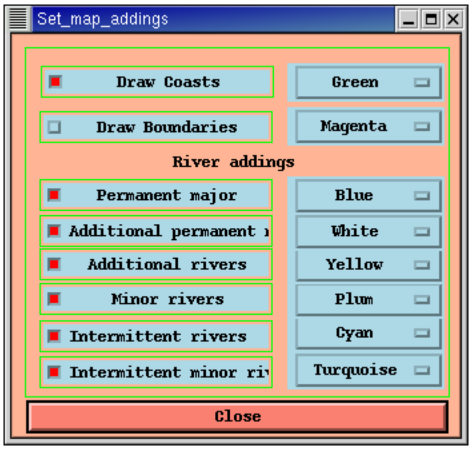


The most important menu. The user is able to select a projection and then to visualize a fast result by activating the option “Show (Image area in the output projection geometry)” but also to define the output geometry (latitude,longitude) and the output image size (line, colunm) for the export menus (DUMP...,SEND...)

Set associated directories

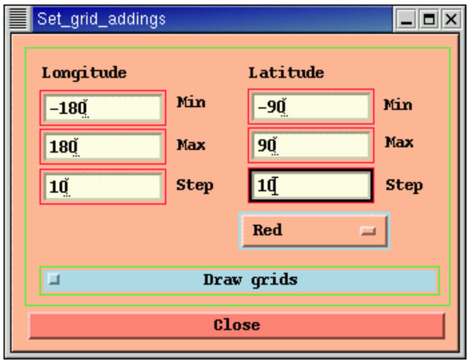
Allows the user to add his favorite directories to find easily the specific MODIS files as MOD03,MODOCL2 etc..

Set map addings



Adds to the displayed image several projected countours from implemented data files. (MGBOUNDARIES_MAP, MGRIVERS_MAP_$\star$, MGWORLD_MAP) At the first use of HDFLook, the user has to define an environment variable with the path of the directory containing those data files.
ex: in csh:
setenv HDFLOOKMAPS /usr/local/Maps
or ex: in sh:
HDFLOOKMAPS=/usr/local/Maps ; export HDFLOOKMAPS

Set grid addings



Adds to the displayed image the latitude and longitude grids.

2.3 No predefined scaling

This option allows the user to apply the scale factors set by attributes. (Scale_factor , add_offset) (These factors are not always implemented).

2.4 Automatic mask detection

This option allows the user to generate in primary colours the constant value area introduced as mask values into the images.

2.5 Set preview

If this option is activated, each HDF-EOS (Level1B,MOD09) file selection will display a small RGB image to show the granule.

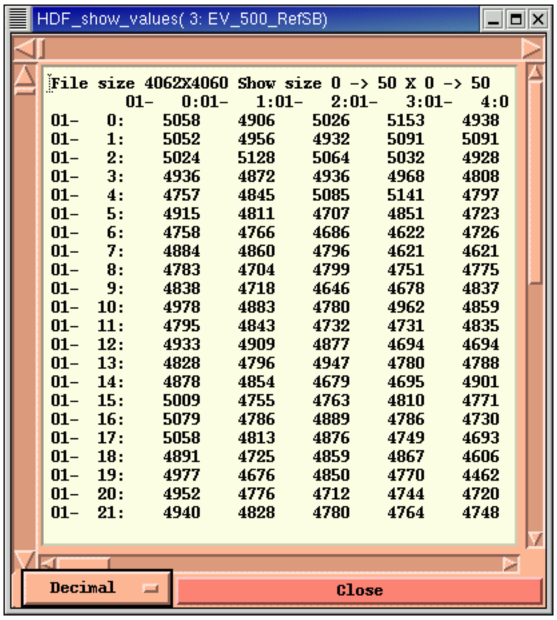
2.6 RGB defaults

A set of three stretch values is provided for the RGB enhance image to make a fast test.

* Standard
* Desert
* Pole

2.7 Show SDS as values

This option dumps the files in the same geometry shown in the main display window "Show SDS as an image" (for example an image 4x100x100 will be represented as a global image (2 raw images x 2 column images). The user can enlarge the window *HDF_show_values* to display more data.
The right and the bottom sliders allow the user to move into a 50×50 sub-matrix (See §1.1.2).



2.8 Show SDS as a plot

When this option is activated, a new menu appears: **HDF_plot_SDS_indexes**. This menu is detailed in §1.2.1.

2.9 AERONET

When this option is activated, a new menu appears: **Msky_look**.
This menu is detailed page 75

2.10 Send raw data

This menu appears when HDFLook is sent by *Msphinx* . It allows the user to send one or several SDS to the *Msphinx* data structure. Two modes, raw data or reprojected data, are allowed. In this case, the maps can be added in the graphic overlay of *Msphinx* .

- "Quick ..." is related with the SDS selected in the "SDS list" of the HDF file content panel.

- "Advance ..." is used for several SDS selections.

"Send raw data" options are available for any HDF file. The user is able to send raw or calibrated data. No sampling is allowed.

2.10.1 Quick send to Msphinx

The SDS selected in the SDS list will be sent.

The user is able to select the *Msphinx* plane and geometry where the data will be dropped in the *Msphinx* memory. Two labels (width, height) show the size of the SDS to be sended. If the SDS doesn't fit the cell geometry defined in the editors (x,y,width,height), the option "Fit file size to cell" can be activated. When a SDS is more than two dimensions and no value is done in the third dimension (for example: *,height,width) the user can create a single *Msphinx* plane with all the image slices (as the option "Show SDS as an image") or use several Mpshinx planes starting from the defined "Plane nb" activating the option "Send by layers".

Warning: if the data type (char,float) does not match the *Msphinx* data plane definition, the data will be transformed to the *Msphinx* data plane with, perhaps, a lost of accuracy.

See the §3.0.1 for more explanations.

2.10.2 Advance data send...

Advance data send will modify or create a complete *Msphinx* project with the data stored on disk space. See the §3.0.2 for more explanations.

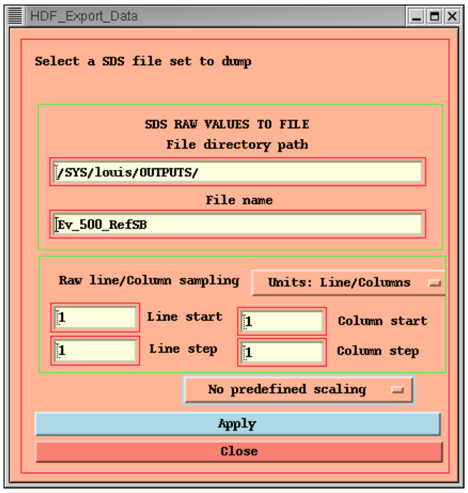
In RAW mode, the cell width and height can be larger than the dimensions of the different SDS selection.

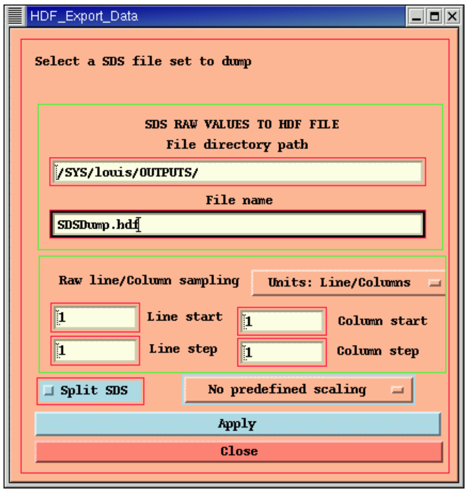
2.11 Dump raw data

This menu is related with the SDS selected in the "SDS list" of the HDF file content panel.

Dump raw data options are available for any HDF file.

2.11.1 Dump on file





- Dump a selected SDS to file ...
- Dump a selected SDS to HDF file ...

The user is able to sample the data by selecting start lines,columns and step lines,columns. For the MODIS/EOS format, the units can be entered in degrees (latitude,longitude). Data can be dumped as geophysical parameters in a floating point file.

2.11.2 MODIS reprojected image

This menu works using several other options selected in the menus "Set projection geometry","Enhance RGB image","RGB defaults"

- Create a JPEG(RGB) Image ...
- Create a HDF (RGB) Image ...
- Create a (RGB) MOSAIC Image...
- Create a JPEG(USER RGB) Image...
- Create a HDF(USER RGB) Image...
- Create a (USER RGB) MOSAIC Image...

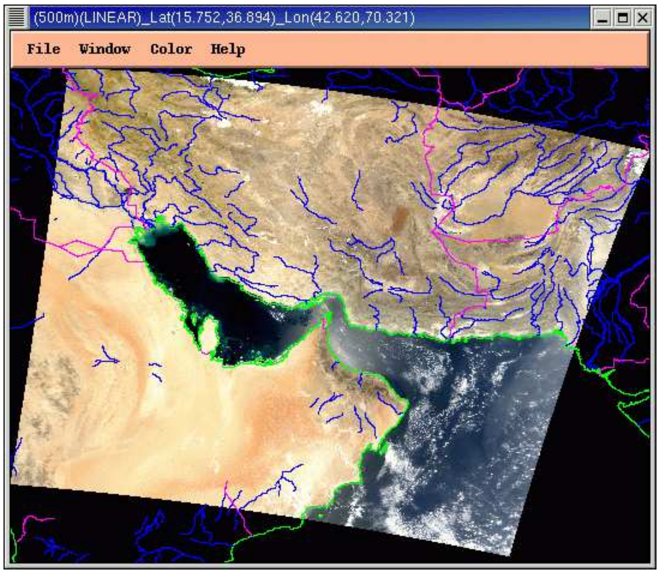
  In the menu "Set projection geometry", the user will define the global space (latitude, longitude) for the final mosaic and the matrix size (lines, columns). All the granules will overlap on the selected area location and size.

- Create a SDS JPEG Image ...
- Create a SDS HDF Image ...

  In these menus, you can add a Color Scale with the corresponding annotations into the image. The label list contents the labels of the scale in the format: pixel value (0→ 255), annotation. (annotation is a value like "23.12" or text such as "clouds").
  Options:
  "Compute new label list."
  Compute a list of labels according with the image units. (If you change the scaling in the SDS content menu you have to activate this function to compute a new list).
  "Up/left side."
  Default annotation are on the bottom or right side of the color scale. This option change to Up or Left side.
  "Create scale."
  Create or move the scale in the image window.
  "Apply change."
  If any option is modifided, select *"Redraw scale"* to validate the change.

- Dump a selected SDS on file ...
- Dump a selected SDS on HDF file ...
- Dump a selected SDS (MOSAIC) ...

2.12 Show SDS as an image



2.13 Display a MODIS reprojected image

2.13.1 Show (RGB) image

This option builds for the level1B or Mod09 files a RGB composite image using band 1 (250m) ,band 4 (500m), band 3 (500m).
(See Standard atmospheric algorithm correction [1] & [2].)

2.13.2 Show (RGB) thermal anomalies

This option builds for the level1B or Mod09 files a RGB composite image.

The thermal anomaly RGB is using MODIS band 6 corrected reflectance in the green, band 7 corrected reflectance in the blue and the reflectance computed from band 20 (3.75μm) in the red. In band 20, the reflectance is computed following the method developed by Roger and Vermote for AVHRR [3]. This method is modified for MODIS by taking advantage of water vapor inversion using band 18 and 19 [4] and the derived reflectance validated by comparison to the full inversion of the reflectance. Qualitatively, the RGB thermal composite is a very useful and simple way to locate fire activity (see appendix A.4), where the thermal energy released by fires is interpreted as an extra reflectance contribution at 3.75μm (see [5] for details) and produces "red" spot on the image, the relative intensity of the red is directly proportional to the size and temperature of the fire.

2.13.3 Show (RGB) thermal image

The thermal RGB is using MODIS band 31 in the Red 290K-275K, band 29 in the Green 280K-270K, band 20 in the blue 300K-285K. See the example in appendix A.3.

2.13.4 Show (RGB) SWIR composite

The thermal RGB is using MODIS band 4 in the Red 545-565nm, band 6 in the Green 1628-1652nm, band 7 in the Blue 2105-2155nm.

The high absorption by ice at 1628nm makes it appear clearly in red in contrast with liquid water clouds in white due to lower absorption.

2.13.5 Show one layer

Show the selected SDS record.

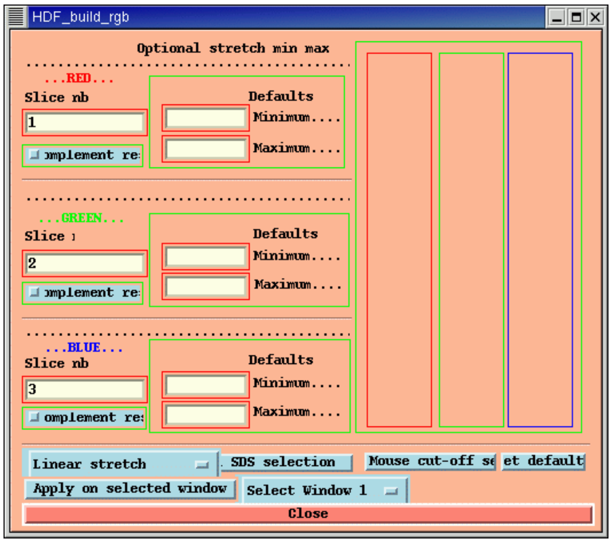
2.14 RGB User composite

2.14.1 RGB IMAGE BUILDER

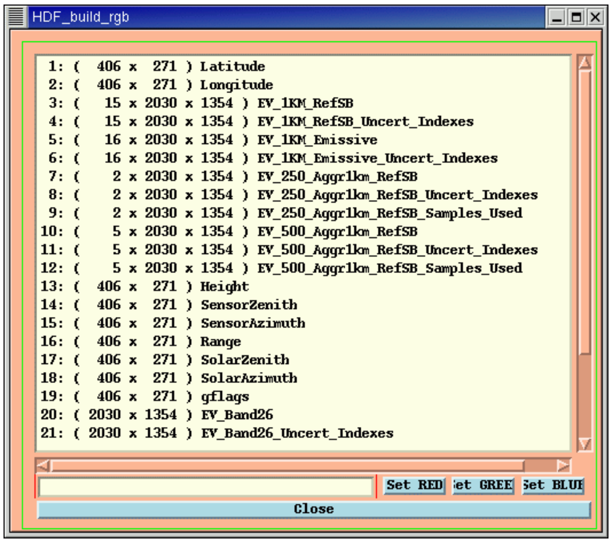
This menu allows to create a RGB image merging 3 SDS of any size and deep. Up to 10 windows can be created with different combinations (all the windows have the same size and projection style).

Step by Step example:

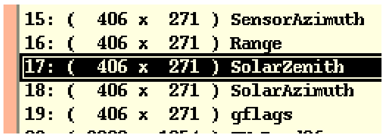
Start the "Show (RGB) User defined" option from the "Display a MODIS reprojected Image" menu



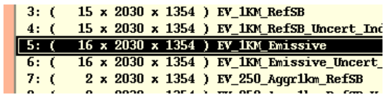
Click the "Multi SDS selection" button to link data to RGB planes
SDS selection menu:



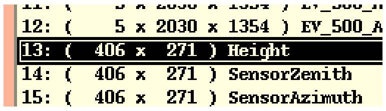
Select a SDS and link the SDS to the Red or Green or Blue image planes:



The solar zenith angle will be the red plane



The MODIS emissive chanel will be the green plane



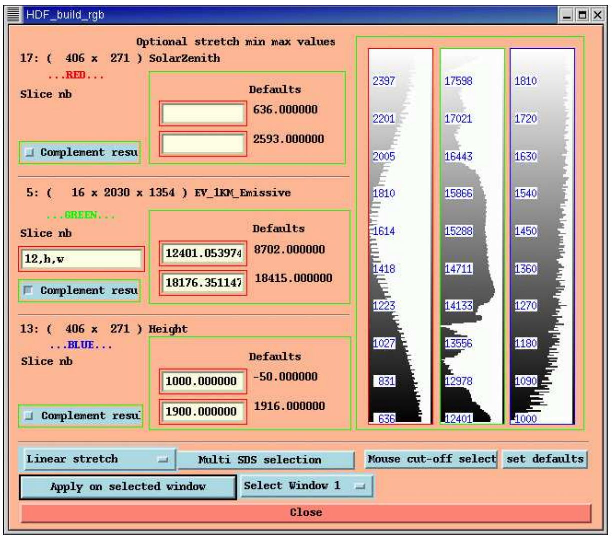
The height will be the blue plane

Close the menu and select the final options:

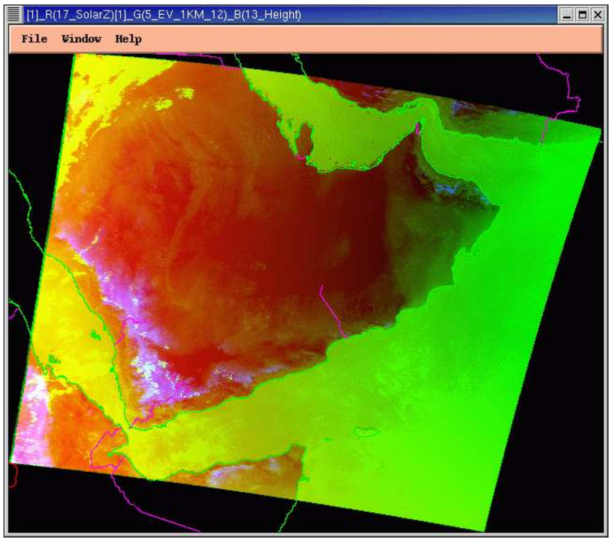
1. The slice number from 1 to 15 of the SDS EV_1KM_Emissive (note: the notation 12,h,w is not necessary in this case). This notation is used to help the software to choice the image width and height indexes from complex data sets.

2. Complement Green bank: 0 will be 255

3. Select min max threshold for the Green and Blue banks

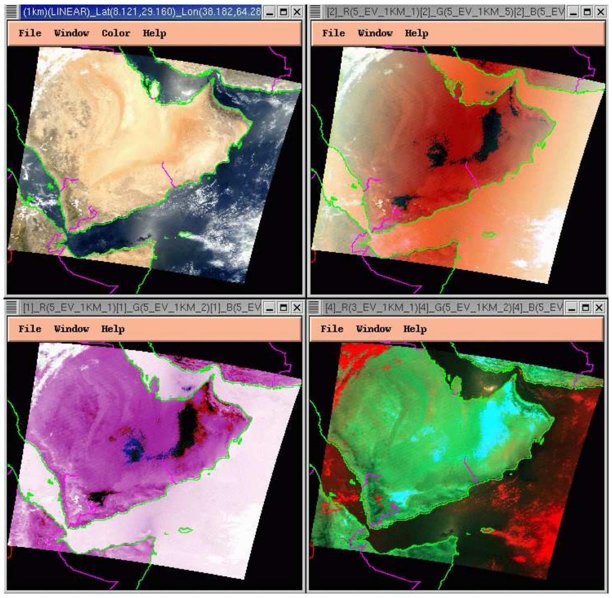


RESULT: The selected SDS have different pixel size and deep, the final image is in linear projection width coast map and boundaries.



Another example using 4 display windows

3 images are built with emissive bands and one (Upper left) with reflective Solar bands



2.15 CERES SSF Product

Quick Tour to visualize CERES SSF product.

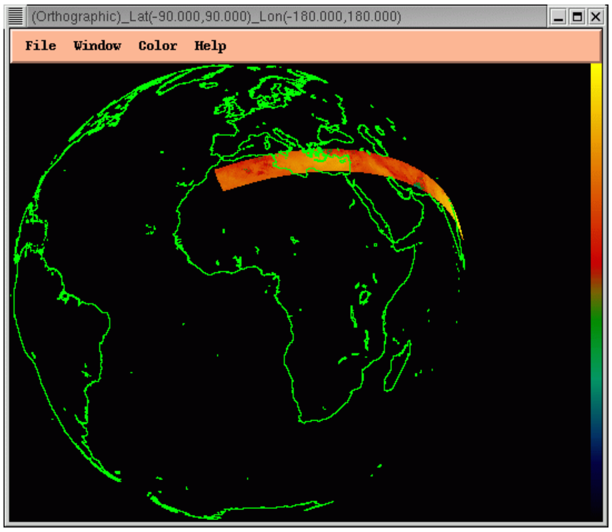
2.15.1 Underlying Principles

each CERES observation is projected over a 20x20 km2 regular grid (or 10x10 if TRMM) according to 'nearest neighbor' techniques. Only the position of the FOV center is taken into account and not the exact footprint shape. This simplification is satisfactory for number of applications. The grid values can be saved for external computations. Once the projection is done, all the powerful functions of the software are available.

2.15.2 Interactive Mode

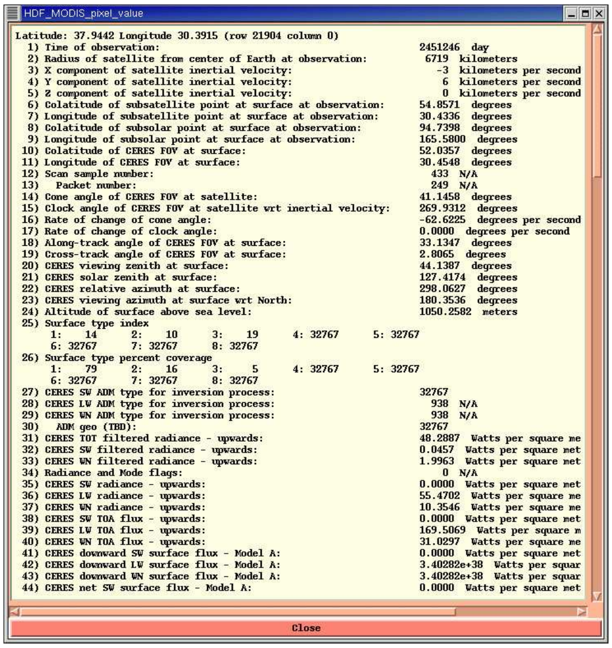
- select a HDF SF file in the "HDF_read_files window" (explore your directories with ../ , $home, $cwd)

- a new window "CERESSSF/CERES_FILE" opens showing the available parameters to be selected (close the 'attributes' window of minor interest),
  example of parameter : 39 is the LW TOA flux
  other example: 122 is the mean imager radiance over full CERES FOV
  if 122 is selected , the SDS has 2 dimensions with 5 slices, choice 4 for example which corresponds to the VIRS 10.8 channel, with the SET MAPPING button, you can choose the projection geometry (linear, mollweide, ..) and other grid and map options, go to the button "Display a CERES reprojected image" then "show a layer"



- two windows will then appear the map window with a title according to the projection: linear, mollweide, . the "HDF_set_stretch" to change the color ranges through the histogram

- in the map window, the window submenu gives zoom and cursor value facility the HDF_pixel_value is powerful since all the parameter data are listed (see example below). The map can be printed or saved as PS or EPS files.



2.15.3 Batch Execution

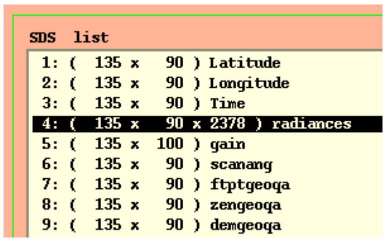
Using HDFLook with command files is also available. The execution is achieved with the command "HDFLook command_fileX.com " Herewith enclosed many examples: you have just to peek up and to adapt to your problem. (See the details in §B.1).

2.16 AIRS Product

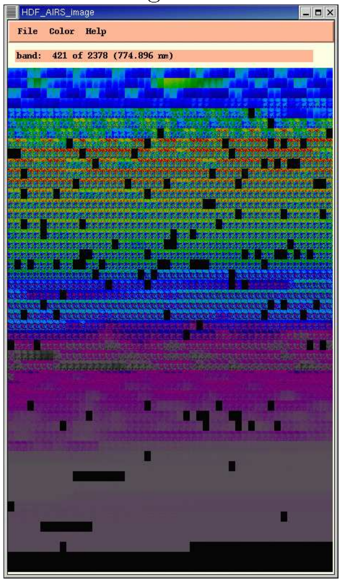
Quick Tour to visualize AIRS product.

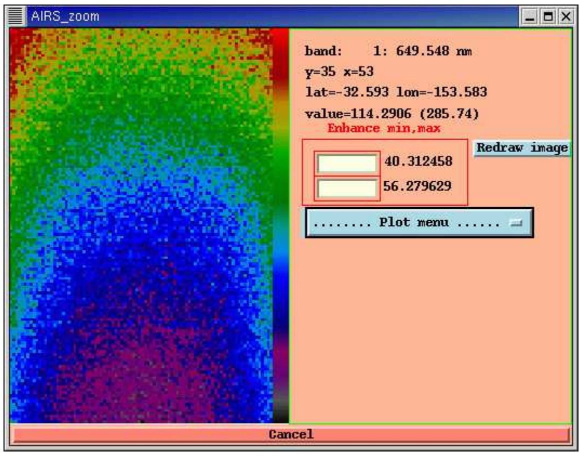
2.16.1 Step by Step

- Within the SDS LIST, select a large AIRS Dataset, select the scaling and the mask, then click on "Show SDS as an image"

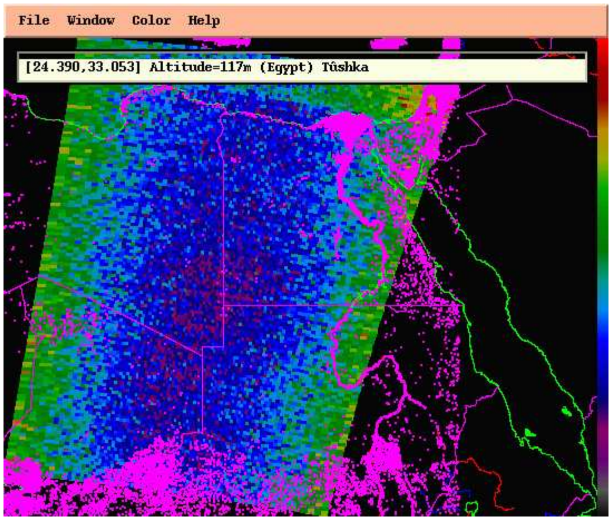


  Two panels appear: one for the band selection the other one for the data analyze. Missing data is clearly visible. A click on a small rectangle loads the AIRS_zoom panel with the wavelenght data.



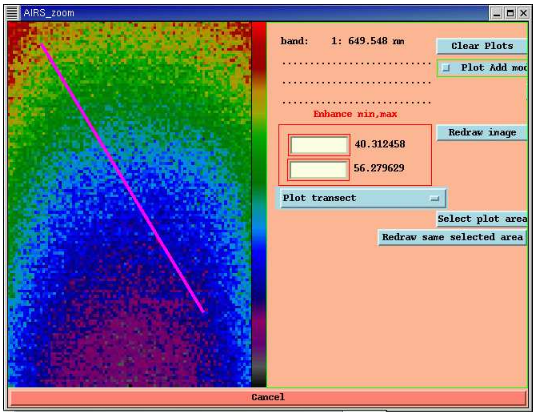


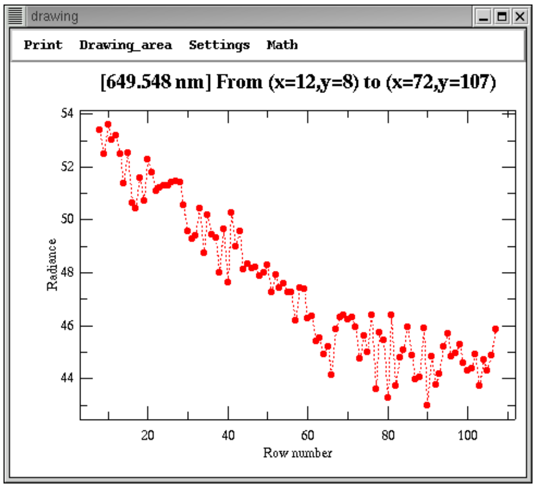
- All windows are sensitive
  Selected pixels and drawings are allowed in any image panel of the software.
  - In the AIRS zoom panel the image geometry is the original SDS geometry.
  - However the user is able to reproject a band "Show one layer" from the "Display AIRS reprojected image" menu.
  - The new window will be sensitive to all AIRS analyze input options.



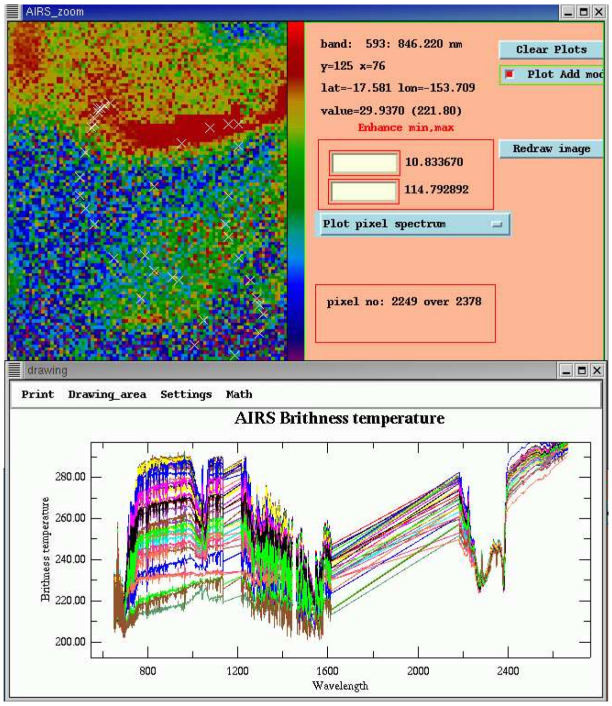
Reprojected band with coast (green), boundaries (magenta) major rivers (red) and human activity (magenta)

- Plot Transect
  - Select "Plot transect" from the "Plot menu"
  - Select "Select plot area" and draw a line into the zoom image





- Plot pixel spectrum
  - Select "plot add mode pixel"
  - Select pixels

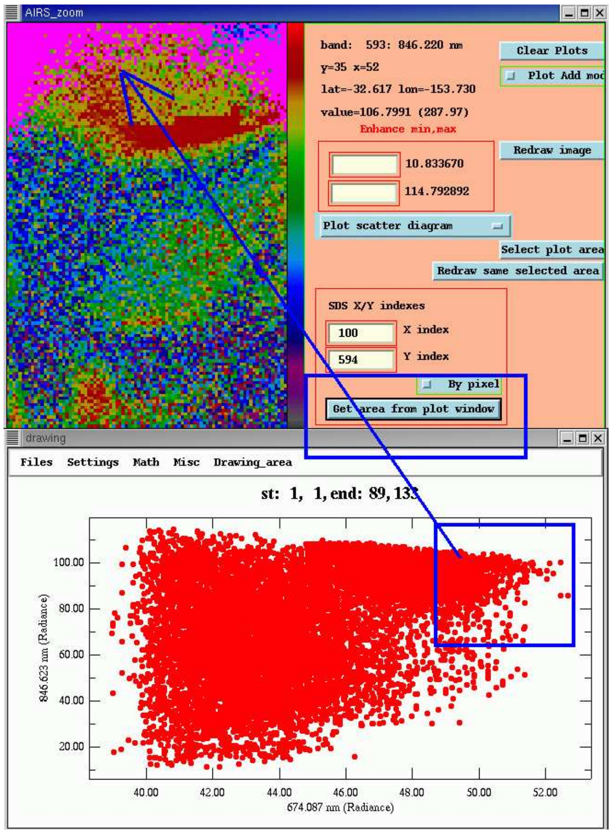


- Plot scatter diagram
  - Fill the editors with the X and Y band number
  - Select a plot area
  - The “By pixel option” is used to plot the diagram pixel by pixel

The “Get area from plot window” is used to visualize the pixels having specific x/y properties.

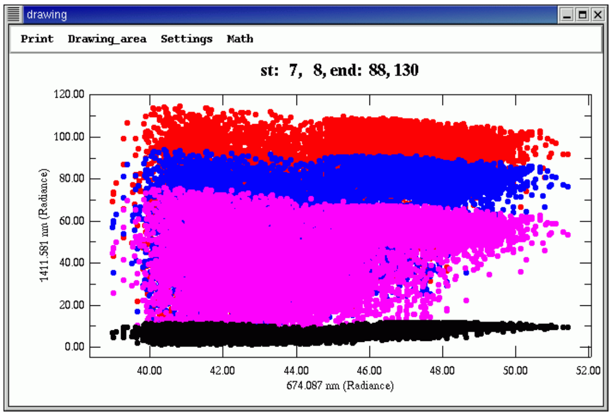
- Click on the “Get area from plot window” button
- Select on the plot window an area of interest

The corresponding pixels appear colored in magenta on the image window:



Select "Plot add mode"

- change the Y index editor by 1000, click the "Redraw same selected area"
- change the Y index editor by 1200, click the "Redraw same selected area"
- ... etc...



2.16.2 Batch Execution

Using HDFLook with command files is also available. The execution is achieved with the command "HDFLook command_fileX.com " Herewith enclosed many examples: you have just to peek up and to adapt to your problem. (See the details in §B.4).

3 HDFLook and Msphinx

Communications with Msphinx

Sending images, read by *HDFLook* , to *Msphinx* is possible if you have launched *HDFLook* from *Msphinx* . If you have launched *HDFLook* alone, the menus will be drawn in half tone or hidden.

2 modes are available:

* the direct transfer of data for small volumes.

* creation or modification of Msphinx project. The transfers will use the Msphinx project with data planes stored on disk.

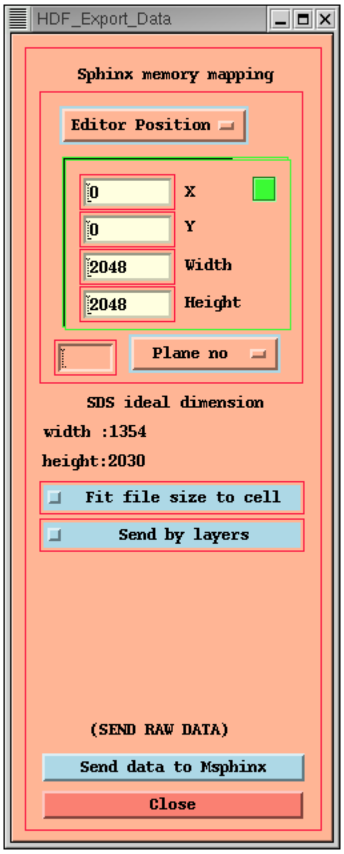
3.0.1 Quick send to Msphinx

This menu is called from *"Quick send to Msphinx"* in the SDS window or from *Msphinx→ Send to Msphinx* in the main image window.

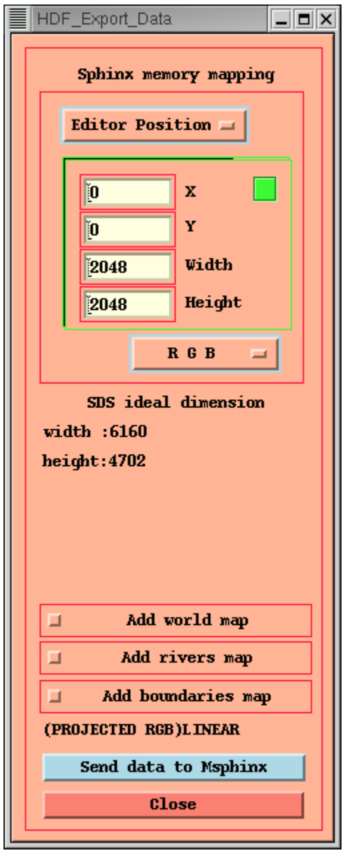
This menu presents the particularity to convert the data read by *HDFLook* in the type (char, short, int) of data of the selected Msphinx plane intended to receive data. (Warning in the truncation of data)

Warning: under certain circumstances, after sending data to the Msphinx data planes, the image visualisation into Msphinx does not appear. Start the Msphinx menu "Display→ Enhance display" and activate "Apply" to rebuild the output image.

From standard HDF:



From MODIS SDS:



- Choose Msphinx's geometry

  To fill the editors of *Msphinx* reception geometry (X,Y,Width,Height) you can use:

  - Directly the editors *"Editor position"*
  - The *Msphinx* cells *"Grid position"*
  - An area selected with the mouse in the main *Msphinx* window *"Mouse position"*
  - *"Fit file size to cell"*
    Adjust the size of the SDS image to the *Msphinx* cell's geometry by sampling lines and columns.

- Select the data plane

  - Red plane
  - Green plane
  - Blue plane
  - RGB plane
  - Plane no (1$\rightarrow$ 4095)

- Choose image to send

  the default option is the transfer of the image displayed in the HDFLook's main window (respecting the selected zoom or in image mosaic). In the case of a SDS with more than 2 indexes (mosaic of images), if you activate *"Send by layers"*, a SDS slice will be transferred to the first receiving plane of *Msphinx* and on the following ones (always respecting the selected zoom).

- Activate: "Send data to Msphinx"

3.0.2 Advance data send

Advance data send will modify or create a complete *Msphinx* project with data stored on disk space.

This method will be generalized for the comparison of satellite data from different experiments. We have to work on improving its efficiency. This menu is called from the selection menu (see the §1.1.2 or in §2.10 in the MODIS chapter).

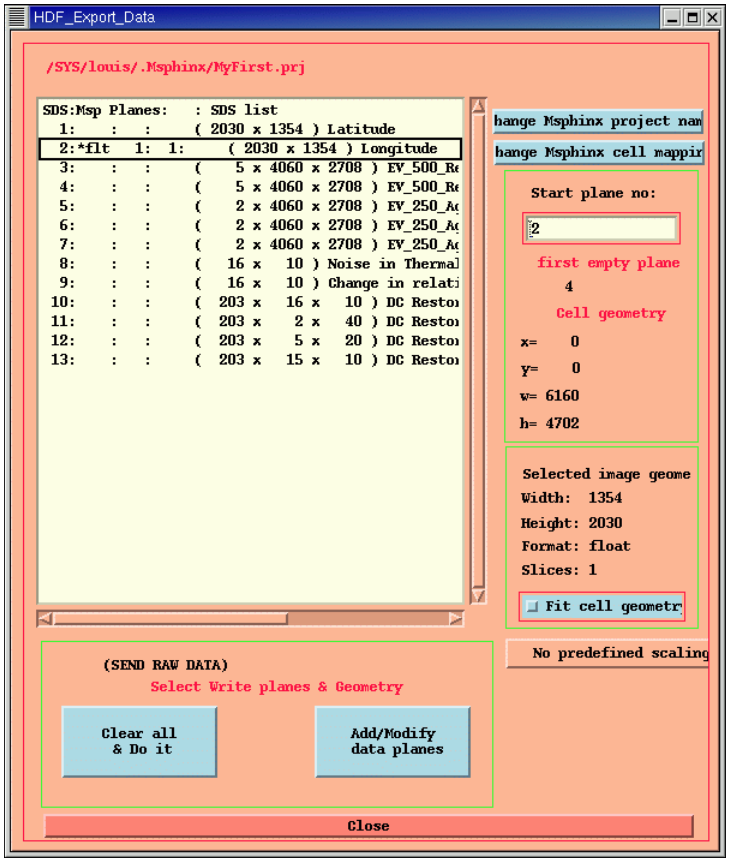
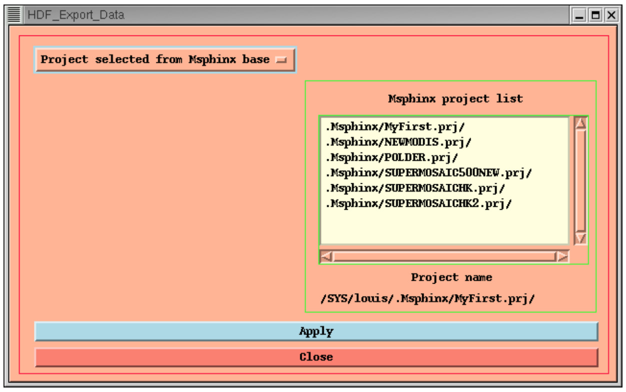


Figure 3.1: The "Advance data send" menu (See also figure 3.2)

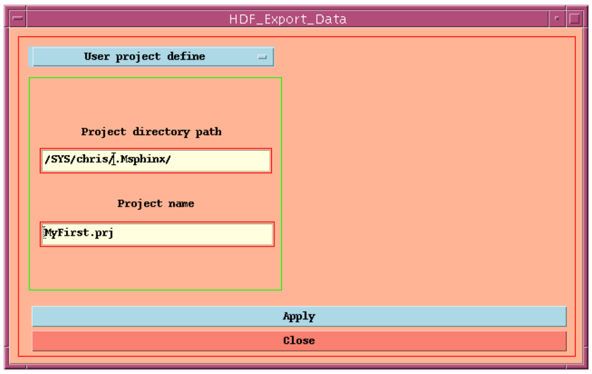
The menu, step by step:

1. At the top left,the name of the current project is printed. You can activate *"Change Msphinx project name"* to modify it.

   Two options:



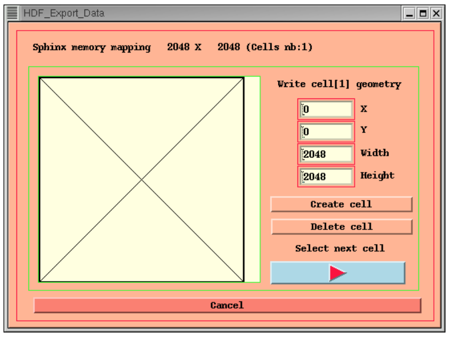
"Project selected from Msphinx base"
The list of existing projects is shown. Select a project.Activate *"Apply"*: the new geometry is displayed in the panel.



"User project define"
You can fill the 2 editors *"Project directory path"* and *"Project name"* Then activate *"Apply"*.
If the directory of the project is not $home/.Msphinx, a symbolic link is automatically created in the directory $home/.Msphinx to point at the new project.
The default geometry will be the geometry of the SDS image selected.

2. you have to introduce the geometry of the image reception in the data planes of *Msphinx* :

   Activate *"Change Msphinx cell mapping"*



   - directly fill the editors: X, Y, Width, Height
   - using the arrow, *"Select next cell"* will suggest you the places of possible arrangement taking into account the size of the image and the existing cells of the project.

3. **Fill the editor** *"Start plane no"* with the number of the first data plane which you want to fill. A list allows you to see planes already containing

images and their data type. Please note: in this working mode, there is no conversion of data if truncations are possible. The transfer will be made only if the plans of *Msphinx* data already filled can contain the new data without truncation. For example:

SDS:16 bits →	Msphinx plane 32bit integer →	no problem
SDS: 32 bits real →	Msphinx plane 16 bits →	impossible

At the bottom, on the right, you will find the characteristics of the SDS to be transferred:

`Width:        Height:        Format:        Slices:`

4. A toggle *"Fit cell geometry"* allows images to be fit to the size of Msphinx's cell by sampling lines, columns.

5. Activate:
   - *"Clear all & Do it"* will erase all existing data.
   - *"Add/Modify data planes"* will add images.

Attention! if your SDS has more than 2 indexes, the images will be loaded from the plan number filled in the editor *"Start plane no"* and then in the following ones.

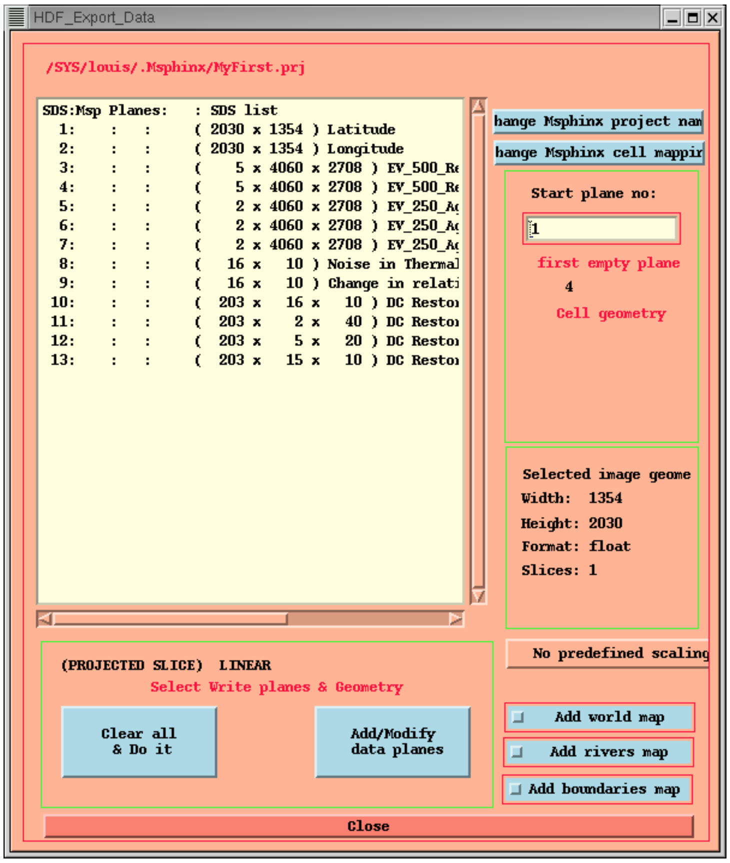


Figure 3.2: The “Advance data send” menu from MODIS data

4 HOW TO – Fast examples

4.1 Send raw data to MSPHINX

1. Start HDFlook from Msphinx.

2. Select a HDF-EOS File.

3. Start "advance data send" "... SEND RAW DATA ..."
   All the HDF/SDS content is listed.

4. Select "Change Msphinx project name"

   - Select "User project define"
   - Type LOA in the editor "Project name"
   - Start "Apply"

5. Select "Change Msphinx cell mapping"

   - type 1000 in the editor width
   - type 1000 in the editor height
   - Start "create cell"
   - Start "Cancel"

6. Type 1 in the editor "Start plane nb"

7. Select "Fit cell geometry"

8. Select some SDS's from the List.
   At each selection the software shows the type of data and the "from and to" planes of *Msphinx* .
   If a selection error is made, just click again on the erroneous SDS and this one is deleted from the selection.

9. Apply "Clear all & do it"

At the end, select in the *Msphinx* window "Work on-¿Set view planes". *Msphinx* will show the filled planes and their contents.

4.2 Create a JPEG image on disk

1. start HDFLook
2. select a modis LEVEL1B 1km file:
3. set reprojection geometry
   - select "linear"
   - fill width editor with 1000
   - clear height editor (it will keep the proportion w/h)
     Warning: in linear mode, if the image is over the pole, fill also the height editor with 1000
   - select "show (Image area in the output projection geometry)" (Just to see a map with the area)
4. "set RGB mode to log" ("Enhance RGB" image menu)
   - set (RGB Defaults menu) to "Pole" for an image over snow Please note: Select "Standard" for an image over land
5. "Show MODIS (RGB)" (Display a MODIS reprojected image menu)
6. start "Create a JPEG(RGB) Image" ("...... Dump raw data menu ....." "... MODIS REPROJECTED IMAGE ...")
7. "Apply" in the menu HDF_Export_Data

Exit HDFLook
xv the_image_file
cat the_image_file.met

5 BACKGROUND CAPABILITIES

SYNOPSIS

HDFLook Commands_file_name

5.1 General Functions

5.1.1 Options of the command file

#	This character comments a line of the file.
\	This character means that the next line is a continuation line.
|	This character means choice of options.
[ ]	These characters mean optional argument.

5.1.2 General Functions

Verbose	set/unset verbose mode
send_system	execute an unix shell. for example: send_system "cc ../DEMO_DRAW/send_draw_com.c -o ../DEMO_DRAW/send_draw_com -lm; ../DEMO_DRAW/send_draw_com MYIMAGE"
send_exit	stop the HDFLook program (Useful in the mode Msphinx command block Send_HDFLook)
MODIS_geometry_print	/tmp/MOD09* (print the area in longitude, latitude, and the global area between images)
anciliary_print	print the SDS meta data

5.1.3 Adding anciliary data

To add or to clear an entry to the GLOBAL HDF or to the SDS anciliary record:

add_global_attr	**info= type= value=**
add_sds_attr	**info= type= value=**
clear_global_attr	
clear_sds_attr	

Examples:

```
add_global_attr info="LOA-USTL"  type=UCHAR  value="Lille 1km RGB image"
add_global_attr info="Latitude"  type=FLOAT  value=52.05
add_global_attr info="Longitude" type=FLOAT  value=.05
```

5.1.4 Generic extraction commands

To create files from SDS/HDF (See MODIS function for details)

export_raw_SDS **FileName= Index=**1 **LineStart=**2 **LineStep=**2 **ColumnStart=**2 **ColumnStep=**2 **Scaling=**

export_raw_SDS_to_HDF **FileName= OUTPUTSDSname= Index=** **LineStart=**2 **LineStep=**2 **Scaling=** **ColumnStart=**2 **ColumnStep=**2 **SplitSDS=**Yes

To *Msphinx* data planes

export_raw_SDS **plane=**1 **X=**0 **Y=**0 **Index=**1 **LineStart=**2 **LineStep=**2 **ColumnStart=**2 **ColumnStep=**2

5.1.5 Setting Inputs/Output for all commands

clear_data	clear all options
set_home_directory	/tmp
set_map_directory	/tmp/Maps
set_tmp_directory	/tmp
set_output_directory	Output Directory Name
set_input_directory	Input Directory Name

(note: Several input directories can be implemented: one by set_input_directory command)

set_input_HDF_file Input File Name

for example: set_input_HDF_file /home/louis/MODIS_IMAGES/MOD09CRS.hdf finds directly the image.
for example: set_input_HDF_file MOD09A1.A2001065.h16v07.003.2001189204039.hdf searches fisrt under the user's directory then under the several set_input_directories

Implemented for the MOSAIC commands:
for example: Filename=/home/louis/MOD09*.hdf finds directly all the MOD09... files under /home/louis/
for example: Filename=MOD09*.hdf finds directly all the MOD09.. under the user's directory (the research over all set_input_directories is not implemented to avoid dramatic input errors).

5.1.6 Projection

This functions sets the TO projection geometry.

set_projection_to_geometry	**WidthTo=**1000	
	HeightTo=50	
	PixelSizeXTo=1000	in meters: replace the WidthTo
	PixelSizeYTo=1000	in meters: replace the HeightTo
	ProjectionTo="LINEAR"	TO projection name
	LatitudeMinTo=-90.0000	TO projection geometry
	LatitudeMaxTo=90.0000	
	LongitudeMinTo=-180.0000	
	LongitudeMaxTo=180.0000	
	[**EXTRA PARAMETERS=**valeur]	Projection style dependent

projection name [extra parameter nb]:

`LINEAR,`	`POLDER,`	`GOODE,`	`MOLLWEIDEEA,`
`HAMMER[2],`	`AZIMUTHAL[1,2],`	`LAMBERT[1,2],`	`MILLER[2],`
`MOLLWEIDE[2],`	`ORTHOGRAPHIC[1,2],`	`ROBINSON[2],`	`SINUSOIDAL[2],`
`VANDERGRINTEN[2],`	`WAGNER7[2],`	`MODIS[2,7,8,9],`	`NOPROJECTION`

extra parameter list name:

1	`CenterLatitudeTo`	center latitude
2	`CenterLongitudeTo`	center longitude
3	`FirstStandardParallelTo`	first standard parallel
4	`SecondStandardParallelTo`	second standard parallel
5	`XOffsetInMetersTo`	x offset in meters
6	`YOffsetInMetersTo`	y offset in meters
7	`SphereRadiusTo`	ex: 6371007.18100
8	`RowsTo`	ex: 86400
9	`RightJustifyTo`	0 or 1

ex: ProjectionTo="LAMBERT" CenterLatitudeTo=-45 CenterLongitudeTo=150

5.1.7 Geotiff Implemented Projections

Projection	HDFLook name	Geotiff name
Linear	LINEAR	CT_Equirectangular
Azimuthal Equidistant	AZIMUTHAL	CT_AzimuthalEquidistant
Lambert Azimuthal equal area	LAMBERT	CT_LambertAzimEqualArea
Miller Cylindrical	MILLER	CT_MillerCylindrical
Orthographic	ORTHOGRAPHIC	CT_Orthographic
Robinson	ROBINSON	CT_Robinson
Sinusoidal	SINUSOIDAL	CT_Sinusoidal
Van Der Grinten	VANDERGRINTEN	CT_VanDerGrinten

5.2 Build RGB Image

These commands allow you to buikd RGB images with several bands (Reflectance, Thermal, Thermal anomalies).

5.2.1 General Options

For the set_image_background option, only 4 backgrounds are available. For the images created from SDS with a lut: color= lut index (0 to 255).
The CloudsRGBEnhance option enhances the white cloud pixels in the RGB images. The Day/Night option filters the day or night granules. The DayBoth option is Day and Both granules. The NightBoth option is Night and Both granules. The PixelSize option selects the pixels with a size ¡= n * central pixel size. The AutoAdjust option computes projection domain and shift longitude when image cross right of left boundary. The SwitchImage option is only used in create jpeg or geotiff images switch to RGB composite THERMAL if night. SWIR means ShortWave InfraRed bands 4 6 7 of MODIS. The set_MODIS_pixel_filter option (Just for MODIS/AIRS level1B granules) keeps or suppresses pixels with solar zenith angles ¡ 87.00.

set_image_background	**Color=**White [Grey0|Grey1|Black]
set_image_background	**Color=**128
set_image_RGB_composite	Visible [Visible|ThermalAnomalies|Thermal|SWIR] (Visible is the default).
set_image_RGB_composite	USERRGB **SDSNameR=**"EV_1KM_RefSB" (or) **SDSNoR=**1 **IndexR=**1,height,width **ComplementR=**Yes **minR= maxR =** **SDSNameG=**"EV_1KM_RefSB" (or) **SDSNoG=**1 **IndexG=**2,height,width **ComplementG=**Yes **minG= maxG =** **SDSNameB=**"EV_1KM_RefSB" (or) **SDSNoB=**1 **IndexB=**3,height,width **ComplementB=**Yes **minB= maxB =**
set_misc_options	**CloudsRGBEnhance=**Yes|No
set_misc_options	**OnlyDay=**Yes|No **OnlyNight=**Yes|No **DayNight=**Yes|No **DayBoth=**Yes|No **NightBoth=**Yes|No
set_misc_options	**PixelSize=**2
set_misc_options	**AutoAdjust=**Yes|No
set_misc_options	**SwitchImage=**Yes|No
set_misc_options	**AddGranuleBorder=**Yes|No **Color=** Green **Linewidth=**1
set_MODIS_pixel_filter	Level1bRGBSolarAngle

5.2.2 Build RGB Images

create_MODIS_JPEG_image	**Filename= width= height= Enhance= RGBMode= Quality= LatitudeMin= LatitudeMax= LongitudeMin= LongitudeMax=**
create_MODIS_GEOTIFF_image	**Filename= width= height= Enhance= RGBMode= LatitudeMin= LatitudeMax= LongitudeMin= LongitudeMax=**
create_MODIS_HDF_image	**Filename= width= height= Enhance= CompressMode=**JPEG **Quality=**.75 **LatitudeMin= LatitudeMax= LongitudeMin= LongitudeMax=**
create_MODIS_RGB_image	**Filename= width= height= Enhance= LatitudeMin= LatitudeMax= LongitudeMin= LongitudeMax=**
create_MODIS_RGB_Mosaic	**Filename= Enhance= ClearFile=**Yes|No **BottomPixelFiller=**2 **CreateJPEG=**Yes|No **CreateGEOTIFF=**Yes|No
create_MODIS_RGB_HDF_Mosaic	**Filename= OUTPUTSDSname= Enhance= ClearFile=**Yes|No **BottomPixelFiller=**2 **CreateJPEG=**Yes|No **CreateGEOTIFF=**Yes|No

The “BottomPixelFiller” value duplicates the pixel at the bottom of the image to fill holes.
The “CreateJPEG” value creates a jpeg image of the final mosaic.

Note: several methods to enhance the RGB image can be used:

* RGBMode:

- **RGBMode=**”Linear”
- **RGBMode=**”LinearStandard”
  (level 1B)
  Standard Atmospheric corrections + scaling 0 to 2000
- **RGBMode=**”LinearDesert”
- **RGBMode=**”LinearPole”
- **RGBMode=**”Log”
- **RGBMode=**”LogStandard”
  (level 1B)
  Standard Atmospheric corrections + scaling 5.5 to 8.3
- **RGBMode=**”LogDesert”

- **RGBMode=**"LogPole"

- **RGBMode=**"AutoCorrelation"

* **Enhance=** valeur
  value percent darker -10 or brighter 10 (10 % less or more)

* **minR=**value **maxR=**value **minG=**value **maxG=**value **minB=**value **maxB=**value
  pixel is stretched between min and max

* **RGBMode=**"AutoCorrelation"
  This specific algorithm is based on the Louis Gonzalez image collection results: http://www-loa.univ-lille1.fr/gallery/index_uk.html

For each function, the list of authorized addings:

create_MODIS_JPEG_image	only the color scale can not be added.
create_MODIS_HDF_image **create_MODIS_GEOTIFF_image** **create_MODIS_RGB_image**	add_earth_icon, add_maps, add_grids (in "quick" mode, when the function "resize" is not used)
create_MODIS_RGB_Mosaic **create_MODIS_RGB_HDF_Mosaic**	add_earth_icon (with the "CreateJPEG=yes" option, all the addings are authorized)

5.3 Build 8bit Image

5.3.1 General Options

select_SDS	**SDSName=**"EV_1KM_RefSB" | **SDSnb=**1 **Index=**1
set_image_background	**color=**White [Grey0|Grey1|Black]
set_color_scale_name	"GREY" (see below the Color Lut Names)
set_SDS_enhance	**min=**1000 **max=**5000 stretch the data to match the lut (0→ 255 colors) min→ 0 max→ 255

LOOK UP TABLE

```
Color Lut Name:      GREY, RAINBOW0, RAINBOW1, RAINBOW2, RAINBOW3, RAINBOW4,
                     GEODESIC, SEISMIC, TOPOGRAPHIC, ADDITIVE, CEE, X11,
                     GREY16, RAINBOW16, NONE
```

ARRAY INDEX

index : a value points to a SDS element, the character (*) performs a loop on the index value.

for example: 15 x 2030 x 1354
Data set name: 'EV_1KM_RefSB' [15 x 2030 x 1354]
index=2 points to the second slice (2034X1354)

for example: 10 x 11 x 360 x 180
index=5,3 points to the 5 X 3 slice (360X180)

for example: 10 x 11 x 360 x 180
index=5,* points to the 5 X (1 to 11) slice (360X180)

for example: 2030 x 1354 x 10
index=0,0,3 points to the third slices (2030X1354)

warning: for the command export_MODIS_raw_SDS an option is added to index= (default matrix dimensions are ..,height,width..). The user is able to swap the matrix using: index=width,height,3 (in the ex: 2030 x 1354 x 10 the array no 3 will be swapped)

5.3.2 Build a single plane Image

create_MODIS_SDS_JPEG_image	**Filename= width= height= Index=**1 **Scaling= Quality=** **LatitudeMin= LatitudeMax=** **LongitudeMin= LongitudeMax=**
create_MODIS_SDS_GEOTIFF_image	**Filename= width= height= Index=**1 **Scaling=** **LatitudeMin= LatitudeMax=** **LongitudeMin= LongitudeMax=**
create_MODIS_SDS_HDF_image	**Filename= width= height= Index=**1 **Scaling= CompressMode=**JPEG **Quality=**.75 **LatitudeMin= LatitudeMax=** **LongitudeMin= LongitudeMax=**

For these two functions, all the additions can be used. The scaling can be used to compute the labels values in the add_scale_to_image function (below).

5.4 Addings

The function below adds a small earth icon in the jpeg image

The location units are in line,column when the icon is added on an image, the units are in cm when the icon is added on a paper page (the lat/long coordinates allow you to draw a rectangle on the icon other than the granule's)

add_earth_icon	**xto= yto= width= height= LatitudeMin= LatitudeMax= LongitudeMin= LongitudeMax=**

The functions below add a earth map and lat/long grids with labels.

add_maps	**Coastlines=**Yes|No **Boundaries=**Yes|No **Linewidth=** **CoastlineColor=**Green **Boundary-Color=**Magenta	
	Rivers=Yes|No **RiverColor=**Blue	means ALL rivers
	[**RiversRank1=**Yes|No **ColorRank1=**]	Permanent major rivers
	[**RiversRank2=**Yes|No **ColorRank1=**]	Additional major rivers
	[**RiversRank3=**Yes|No **ColorRank1=**]	Additional rivers
	[**RiversRank4=**Yes|No **ColorRank1=**]	Minor rivers
	[**RiversRank5=**Yes|No **ColorRank1=**]	Intermittent major rivers
	[**RiversRank6=**Yes|No **ColorRank1=**]	Intermittent minor rivers

add_grids **color=**Red **Linewidth=**
LatitudeMin= LatitudeMax= LatitudeStep=
LongitudeMin= LongitudeMax= LongitudeStep=

add_latitude_labels **ForegroundColor=**"RED"
BackgroundColor="TRANSPARENT"
Border=0 **FontName=**"Bell.ttf"
SizeFactor=1.0 **Rotation=**0.
Format="%.2f" **LabelStep=**
Longitude=
LatitudeMin= LatitudeMax=
LatitudeStep= LatitudeRef=

add_longitude_labels **ForegroundColor=**"RED"
BackgroundColor="TRANSPARENT"
Border=0 **FontName=**"Bell.ttf"
SizeFactor=1.0 **Rotation=**0.
Format="%.2f" **LabelStep=**
Latitude=
LongitudeMin= LongitudeMax=
LongitudeStep= LongitudeRef=

Note: LatitudeRef/LongitudeRef=
If the reference value is set, the scale will be computed from/to this value.

The function below adds a text to a jpeg image.
If the "X" and "Y" values are integers, the units will be in lines and columns; if they are floating point, the units will be in percentage of the width/height of the image.

add_text **X= Y= ForegroundColor=**"RED"
BackgroundColor="TRANSPARENT" **Border=**0
FontName="Bell.ttf" **SizeFactor=**1.0 **Rotation=**0.
text="THIS IS A SIMPLE TEST"

The function below adds a color scale only on a SDS jpeg oor geotiff image. The values "X, Y, Width, Height" are the location and the size of the scale. If these values are integers, the units will be in lines and columns; if they are floating point, the units will be in percentage of the width/height of the image.

The C language formulation is used for the *TextFormat* value.
The *UpLeftSide* value is the label position (the default is bottom or right).
The *Labels* list is a SDS value followed by text between quotes or an independant value written with the given format.
If the "Labels" string is empty, the values and the texts will be computed.

add_scale_to_image	**X= Y= Width= Height=** **TickColor=**Red **ForegroundColor=**White **BackgroundColor=**Red **TextFormat=**"%.2f" **FontName=**Courb.ttf **SizeFactor=**2.0 **UpLeftSide=**Yes|No **NoTicks=**Yes|No **Labels=**" 25 1.00 30 Clouds ... "

The label list contents the labels of the scale in the format: pixel value (0→255) annotation. (annotation is a value like "23.12" or text such as "clouds"). Tip: if the labelString is "computed" the label value will be computed. ex: the computed value will be the SDS value calibrated:
Labels=" 25 computed 130 computed 250 computed"
ex: the position in the scale will be computed:
Labels=" computed 1.5 computed 2.5 computed.5"

For these two functions, all the additions can be used.

Add a frame to the output jpeg image

add_image_frame	**Size= Red= Green= Blue=** **FrameColor=**"red" **FontName=**""Bell.ttf" **TitleColor=**"Red" **TitleSizeFactor=**2.0 **TopTitle=**"My file" **BottomTitle=**"My file"

Adding validity

The following addings are implemented in all image jpeg,geotiff and PS files generation.

* add_earth_icon
* add_maps
* add_text
* add_grids
* add_latitude_labels
* add_longitude_labels
* add_scale_to_image

The addings do not affect create_MODIS_SDS_Mosaic and create_MODIS_SDS_HDF_Mosaic data planes but are included in the outputs generated by the options **CreateJPEG=**yes **CreateGEOTIFF=**yes

The command create_MODIS_RGB_Image has only add_earth_icon implemented.

5.5 Export of SDS data

5.5.1 General Options

WARNING: if select_SDS with Index= is used suppress all Index= of the action commands: export_raw_SDS ... create_MODIS_SDS_Mosaic ... export_MODIS_projected_SDS ... export_MODIS_raw_SDS etc..)

You have two modes to select indexes.

- direct mode in the "ACTION" command line: create_MODIS_SDS_JPEG_image Filename= width= height= Index=1 Scaling= Quality=
- select mode using the "SELECT_SDS" command: select_SDS SDSName="EV_1KM_RefSB" Index=1,height,width and nothing in the action mode create_MODIS_SDS_JPEG_image Filename= width= height= . Scaling= Quality=

IF BOTH ARE USED THE INDEX OF THE ACTION OVERLAPS THE SELECT_SDS INDEX

select_SDS	**SDSName=**"EV_1KM_RefSB" | **SDSnb=**1 **Index=**1
ancillary_print	Print the meta data of the SDS record and HDF file.

5.5.2 Export commands

if scaling is used, the result files will be in floating point.

LEVEL 1B REFLECTIVE SOLAR BAND	**scaling=**"Reflectance" **scaling=**"Radiance"
GENERAL	**scaling=**"y=a(x-b)" **scaling=**"y=ax+b"

for LEVEL1B: 250m and 500m data geolocation files in raw mode:
Export the latitude longitude SDS at 250m or 500m accuracy.
set_misc_options **ExpandGeolocation=**Yes|No
for LEVEL1B: 1km Emissive channels bands (20,21,22,23,24,25,27,28,29,30,31,32,33,34,35,36) Compute brightness temperature in Kelvin or Celsius
set_misc_options **BrightnessTemperatureKelvin=**Yes|No
set_misc_options **BrightnessTemperatureCelsius=**Yes|No

export_MODIS_raw_SDS	**FileName= OUTPUTSDSname=**"MySDS" **SplitSDS= Index=**1 **LineStart=**2 **LineStep=**2 **Scaling= ColumnStart=**2 **ColumnStep=**2
export_MODIS_raw_SDS	**FileName= OUTPUTSDSname=**"MySDS" **SplitSDS= Index=**1 **LineStart=**2 **LineStep=**2 **LatitudeMin= LatitudeMax= LongitudeMin= LongitudeMax=**
export_MODIS_projected_SDS	**FileName= OUTPUTSDSname=**"MySDS" **Index= LatitudeMin= LatitudeMax= LongitudeMin= LongitudeMax=**
create_MODIS_SDS_Mosaic	**Filename= Index=**1 **scaling= ClearFile=**Yes|No **BottomPixelFiller**=2 **CreateJPEG**=Yes|No **CreateGEOTIFF**
create_MODIS_SDS_HDF_Mosaic	**Filename= OUTPUTSDSname= Index=**1 **scaling= ClearFile=**Yes|No **BottomPixelFiller**=2 **CreateJPEG**=Yes|No **CreateGEOTIFF**

The "BottomPixelFiller" value duplicates the pixel at the bottom of the image to fill holes.
The "CreateJPEG" value creates a jpeg image of the final mosaic.

Export to HDF file:

export_MODIS_raw_SDS_to_HDF	**FileName= Index= LineStart=**2 **LineStep=**2 **ColumnStart=**2 **ColumnStep=**2 **SplitSDS=**Yes|No
export_MODIS_raw_SDS_to_HDF	**FileName= Index= LineStart=**2 **LineStep=**2 **LatitudeMin= LatitudeMax= LongitudeMin= LongitudeMax=**
export_MODIS_projected_SDS_to_HDF	**FileName= Index= SplitSDS=**Yes|No **LatitudeMin= LatitudeMax= LongitudeMin= LongitudeMax=**

Remarks:

- If width or/and height are equal to zero, the other values will be computed keeping the lat/lon size ratio
- For the Mosaic, the size and geometry of the projection space are done by the set_projection_to_geometry function
- select_SDS must be made after set_input_hdf_file

5.6 Postscript capabilities

send_to_printer	**Command=**"lp -d Myprinter"	
	Type=Color	Color Black&White
	PaperFormat=A4	A4 A3 B5 USLetter USLegal
	dpi=200	PS resolution dpi
	Copies=1	
	Orientation=Portrait	Portrait Landscape
	print=SDS	SDS RGB(thermal or visible)
	PageTitle="Title"	
send_to_PS_File	**FileName=**"./print.ps"	
	Type=Black&White	Color Black&White
	PaperFormat=A4	A4 A3 B5 USLetter USLegal
	dpi=200	PS resolution dpi
	Copies=1	
	Orientation=Portrait	Portrait Landscape
	print=SDS	SDS RGB
	PageTitle="Title"	

Under construction

- set_MODIS_pixel_filter Cloudy
- set_BorderLightning Yes|No BorderWidth=50

5.7 In conjunction with Msphinx

5.7.1 Create RGB images into a MSPHINX project

In Msphinx architecture, the maps are drawn in a specific view plane overlapping the image planes.

add_Msphinx_maps **Coastlines=**Yes|No **Rivers=**Yes|No **Boundaries=**Yes|No **CoastlineColor=**Green **RiverColor=**Blue **BoundaryColor=**Magenta

Create a RGB image for the Msphinx project in use (dataplanes on disk Msphinx option).
THE WORD Plane= REPLACES THE WORD Filename=
if Plane = -1 the image is sent to the R,G,B planes in use
if Plane = 2 Red will be the plane 2, Green plane 3, Blue plane 4

create_MODIS_RGB_image **Plane=**-1 **X=**0 **Y=**0 **Width= Height= Enhance= LatitudeMin= LatitudeMax= LongitudeMin= LongitudeMax=**

Create a RGB image for the Msphinx project in use (dataplanes on disk Msphinx option).
if Plane is not defined, the image is sent to the R,G,B planes in use.
if Plane = 2 Red will be plane 2, Green plane 3, Blue plane 4.

create_MODIS_RGB_Mosaic **Plane=**1 **X=**0 **Y=**0 **Enhance= ClearFile=**Yes|No

5.7.2 Send a SDS to a MSPHINX project

create a SDS image into the Msphinx project in use (dataplanes on disk Msphinx option).
THE WORD Plane= REPLACES THE WORD Filename=

export_MODIS_raw_SDS	**Plane=**1 **X=**0 **Y=**0 **Index=**1 **LineStart=**2 **LineStep=**2 **ColumnStart=**2 **ColumnStep=**2
export_MODIS_projected_SDS	**Plane=**1 **X=**0 **Y=**0 **Width= Height= Index= LatitudeMin= LatitudeMax= LongitudeMin= LongitudeMax=**
create_MODIS_SDS_Mosaic	**Plane= X=**0 **Y=**0 **Width= Height= Index=**1 **ClearFile=**Yes|No

5.7.3 Dump values from SDS or Vdata files

A set of commands allows you to dump values from SDS or Vdata files. To get the list of the SDS or Vdata available in the HDF file use:

HDFLook -List file.hdf

The first command "Pixel_dump_set" fixes the SDS or VData and how to print. The second command "Pixel_dump" fixes the pixels to print.

See below the description of command words :

linefeed	print a linefeed in the output file
DataNb=yes	add the number of values before printing the values
ColumNb=10	print a linefeed after ColumNb values
SDSName=""	dump the SDS
VDName=""	dump the VData record
SDSNo=	dump the SDS number (according with the HDFLook SDS number, see: HDFlook -list) This option is not available for Vdata records
Index=	Select the index values to be printed in the selected SDS
IndexDescription=	Description of the array indexes (codes: i=index w=width h=height and number to fix slices) ex: i,w,h or w,h,1,i
format="%.4f"	Select a format (C notation)
scaling=	Select type scaling mode Scaling options : scaling= "Reflectance" (if any) scaling= "Radiance" (if any) scaling= "None" Raw data scaling= "y=ax+b" scaling= "y=a(x-b)" scaling= "y=ax" scaling= "Y=10**(AX+B)" if the scaling option is missing, HDFLook will do his best to scale the data

"Pixel_dump_set" This command creates the print line from the various SDS.

Examples:

- With SDS data sets

Pixel_dump_set **SDSName=**"EV_250_Aggr1km_RefSB"
Index=1 **scaling=**Reflectance **format=**"%.4f"
SDSNo=6 **Index=**1,2 (i,w,h) **scaling=**Reflectance
linefeed
SDSNo=3 **Index=**1 **scaling=**Radiance
SDSNo=6 **Index=**1,2 (i,w,h) **scaling=**Radiance
linefeed
SDSNo=9 **scaling=**"NONE"
SDSNo=10 **format=**"%.6f"
SDSNo=11
SDSNo=13
SDSNo=14

- Width VData sets

Pixel_dump_set **VDName=** "Data Capture End Date (YYYYMMDD)"
format="%.0f"
LINEFEED
VDName="Date (YYYYMMDD)" **datanb=**yes **format=**"%.0f"
LINEFEED
VDName= "Time (HHMMSS)" **datanb=**yes **format=**"%.0f"
LINEFEED
VDName="Temperature/pressure profiles : Current Temperature (K)"
format="%.4f"
datanb=yes **Columnb=**10
LINEFEED
VDName="Composite Ozone profiles : Ozone Concentration (cm-3)"
datanb=yes **Columnb=**10
LINEFEED
VDName="Chappuis Ozone profiles : Ozone Concentration (cm-3)"
datanb=yes **Columnb=**10

"Pixel_dump" This command selects the pixels from one location or an area (Square or defined by 4 points)
With Vdata, no pixel selection is allowed just do: pixel_dump FileName= "OUT2"

Examples:

Pixel_dump FileName="OUT2" LatitudeMin=26.7725 LatitudeMax=26.8000 LongitudeMin=72.4727 LongitudeMax=72.5000
Pixel_dump Annotation="Lille" LatitudeMin=26.7 LongitudeMin=72.4727
Pixel_dump Point=26.7,72.4 Point=26.8,72.4 Point=26.8,72.5 Point=26.7,72.5
Pixel_dump Point=26.7,72.4
Pixel_dump LCPoint=100,200
Pixel_dump LCPoint=100,200 LCPoint=110,210

Note: "IndexDescription" must be tested, functions not implemented for binned data and specific input projection. "IndexDescription" is tested on level 1b... and SAGE data sets

5.8 FAST EXAMPLE

Pick up an example into a simple file called aa.com, modify the HDF file name and do: HDFLook aa.com.

(LEVEL1B) BUILD A POSTSCRIPT QUICK LOOK

```
clear_data
set_input_hdf_file              MOD021KM.A2000265.1145.002.2000267053723.hdf
set_projection_to_geometry      ProjectionTo="linear"
set_image_RGB_composite   VISIBLE
send_to_PS_File  FileName="./printlinear.ps" Type=Color PaperFormat=A4  dpi=200\
                 Copies=1 Orientation=Portrait print=RGB \
                 PageTitle="MOD021KM.A2000265.1145.002.2000267053723" RGBMode="LOG"
```

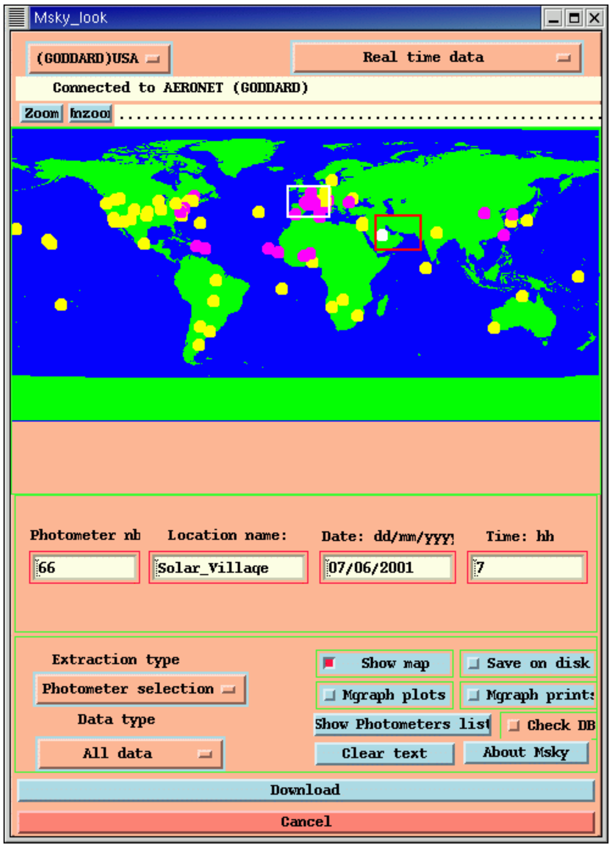
(LEVEL1B) BUILD A POSTSCRIPT QUICK LOOK WITH A SMALL ICON SHOWING THE GRANULE AREA OVER THE POLE

```
clear_data
set_input_hdf_file              MOD021KM.A2001114.1445.002.2001127221453.hdf
set_projection_to_geometry      ProjectionTo="noprojection"
add_earth_icon                  xto=3 yto=3 width=3 height=3
set_image_RGB_composite   VISIBLE
send_to_PS_File  FileName="./printnoreppole.ps" Type=Color PaperFormat=A4  dpi=200 \
                 Copies=1 Orientation=Portrait print=RGB \
                 PageTitle="MOD021KM.A2001114.1445.002.2001127221453" RGBMode="LOG"\
                 minR= 8.3 maxR = 9.3 minG= 8.3 maxG = 9.3 minB= 8.3 maxB = 9.3
```

6 AERONET data base

This software allows the user to download data from the Aeronet data base.

6.1 Main menu



Two indentical databases are implemented:

- At LOA USTL France
- At GSFC USA

Use the upper left menu to select the data base that you want to use (You can switch from one to the other at any time).

6.1.1 Extraction type menu

- *"Photometer selection"*
  The extraction is carried out for the specific photometer at the date (filling the *"Date: dd/mm/yyyy"* editor) and time selected by the user (if the field *"time"* is empty the extraction will be done for the day).

- *"Area selection"*
  The extraction is carried out for a specific area and date (filling the *"Date: dd/mm/yyyy"* editor) and time selected. The user is able to fill the latitude or longitude editors or can use the *"show map"* option and directly select a zone with the mouse (if you do not see the sites of the photometers on the map, push the button *"Show Photometers list"*).

6.1.2 Data type menu

Select the data which you want to subset:

- Optical thickness
- Size distribution
- Refraction index
- Polarization
- All data

remark: The plot option just works with "All data" or "Optical thickness" selection.

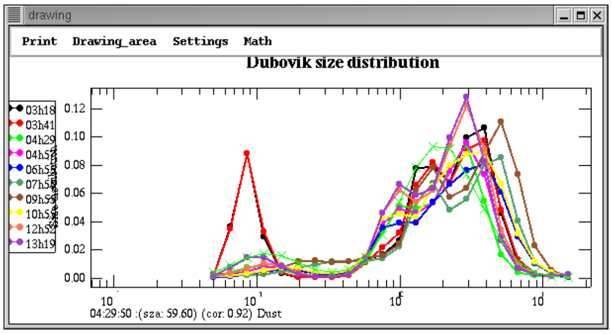
6.1.3 Toggle and button options

- "Show map"
  This option draws a world map with the selected day operational photometers (Yellow Non polarized, Magenta with polarization data).

- "Save on disk"
  This option dumps the display area into a disk file "MskyResult". If the file exists, it will be appended.

- "Mgraph plots"
  This option draws the results using 4 windows:

  * Angström coefficients
  * Optical thickness
  * Dubovik size distribution
  * Polarization ratio



- "Mgraph prints"

  This option creates a command file for a plot software called *Mgraph* . If *Mgraph* is implemented on your system, the job is automatically launched and a second file (a PostScript file) is created with the plot page results. You have to send the PS file to your printer or use "Ghostview" to see the print.

- "Show Photometers list"

  Display the operational photometers for the input date. (Enlarge the "Photometers_list" panel.) The following things are printed:
  The number and the name of the photometer, its location and the number of measurements available. If you click on a specific line, the photometer characteristics are replaced in the "Msky_look" panel.

- "Clear text"

  Clear the display area.

- "About Msky"

  Print the advertisement and help file.

- ***"Check DB"***

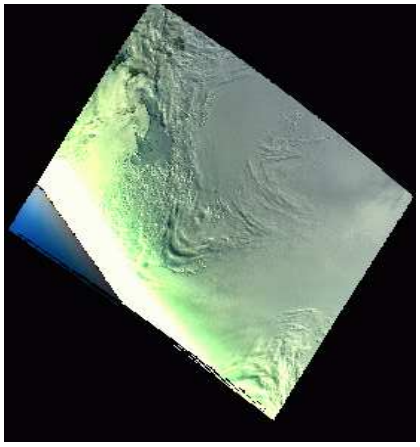
  This is a very important option; after the first extraction, the software uses a memory cache to avoid multiple connections to the data base.
  If you change the data base type, you will retrieve the same data from the memory cache. The toggle "Check DB" forces download again from the data base and rebuilds the memory cache for this extraction.

See the §1.2.3 for the complete explanations of the use of plot window.

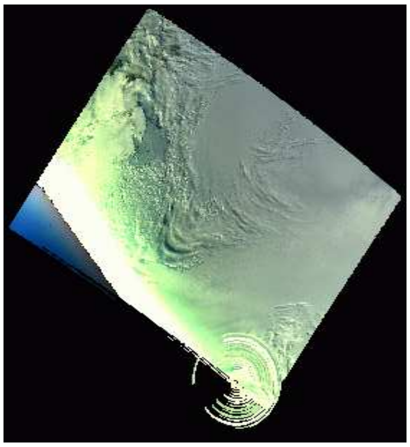
A appendix

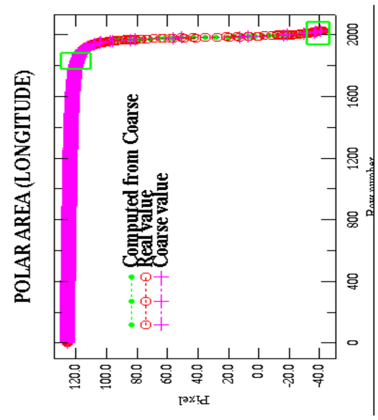
A.1 Coarse Latitude Longitude interpolation

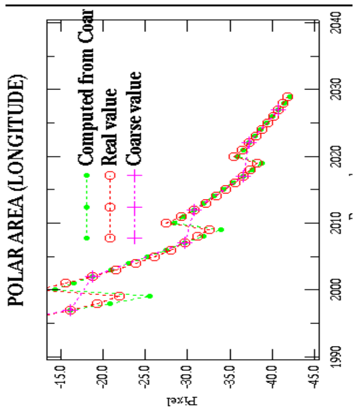
1km real values (orthographic projection)

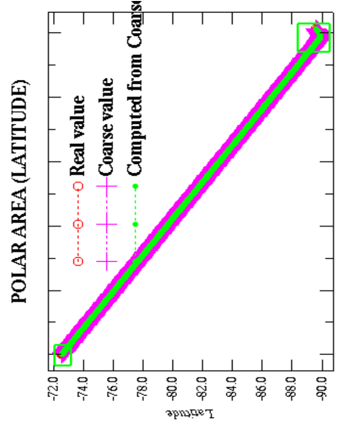


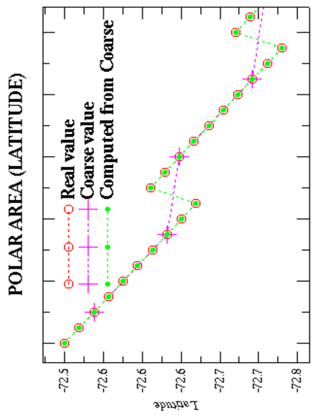
1km computed from coarse (orthographic projection)

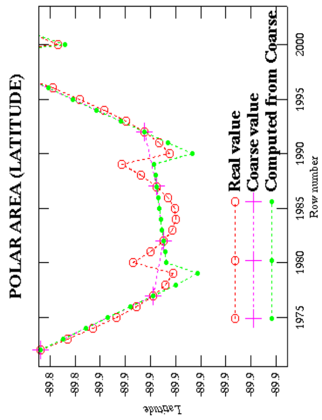






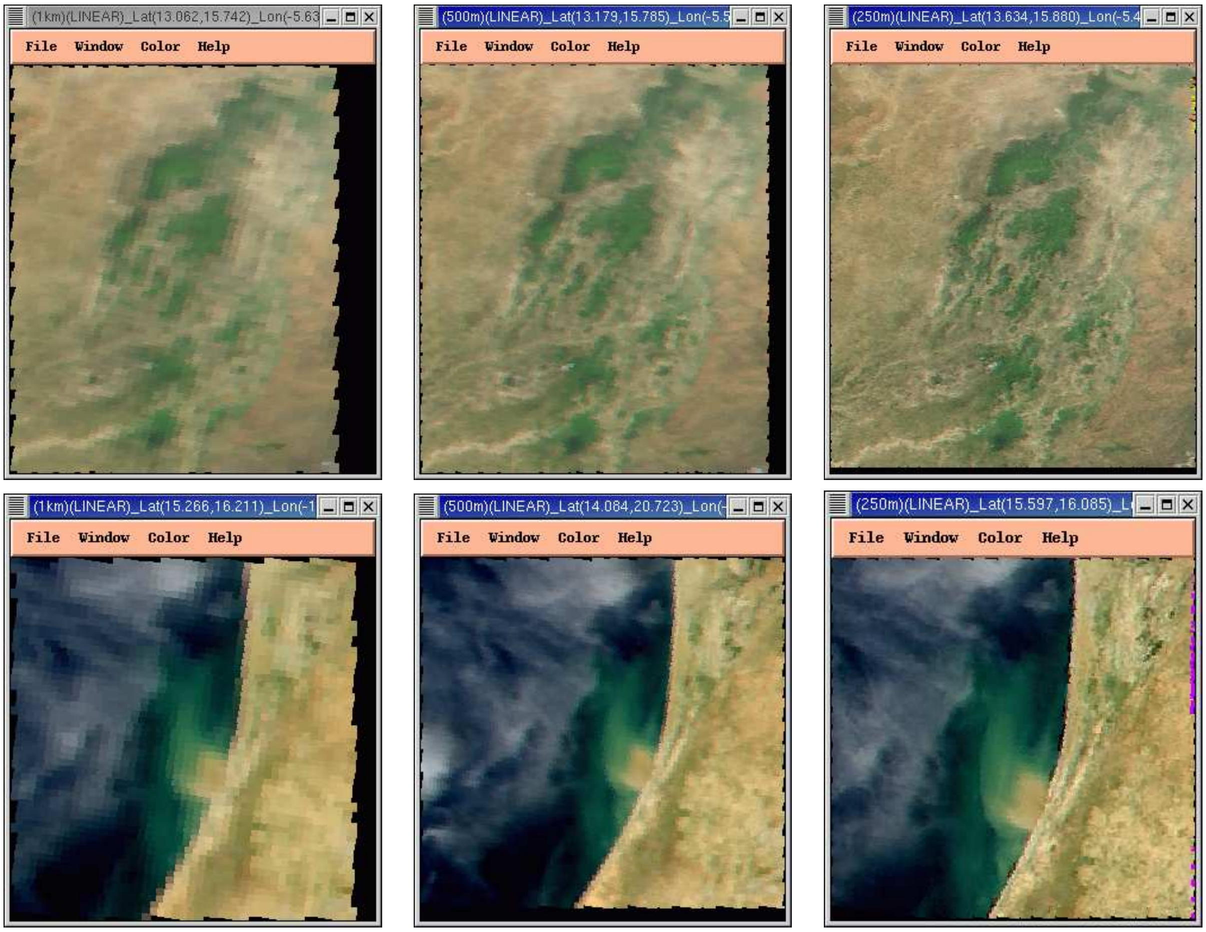






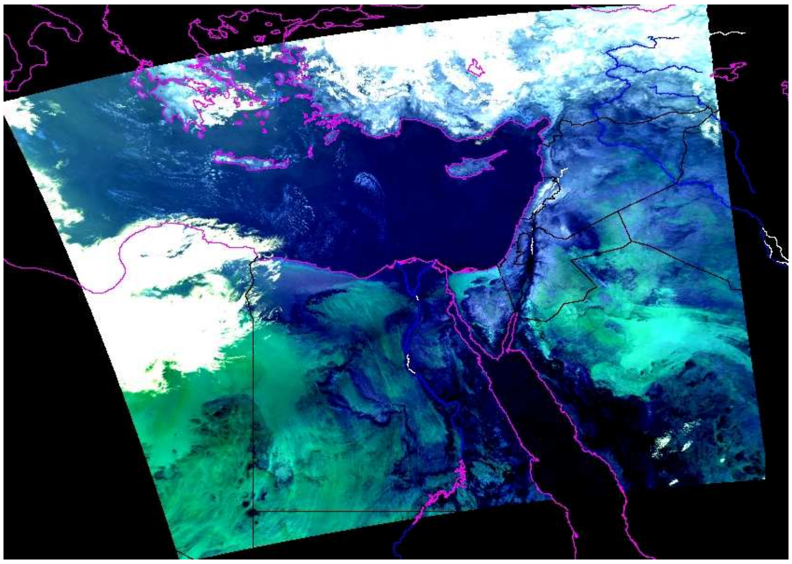
A.2 Level 1B corrected reflectance

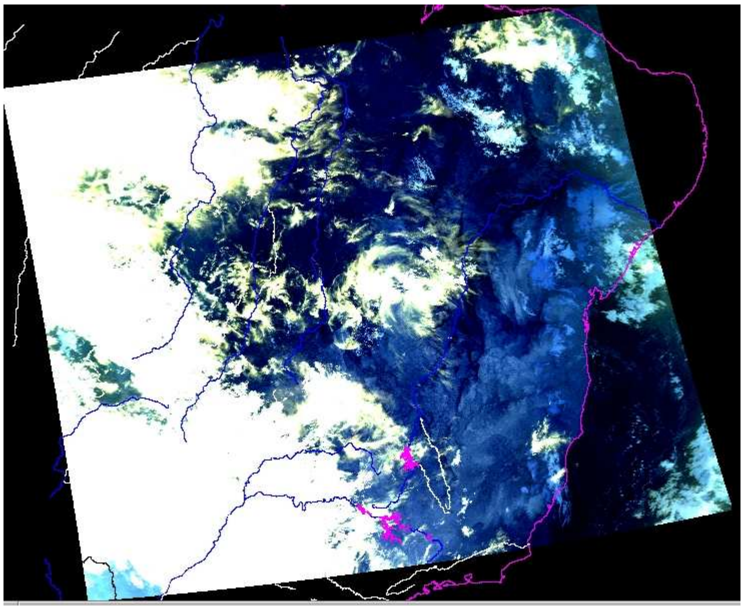
1km **500m** **250m**



A.3 Thermal composite

These are two thermal RGB images acquired during nightime 2002 141 (Brazil, Nile Delta) using these settings:band 31 Red 290K-275K, band 29 Green 280K-270K, band 20 B 300K-285K. You can clearly see the clouds which appear white (note the scale is reversed, the highest temperature is the lowest intensity and the lowest temperature is the highest intensity). The water appears very dark as the thermal inertia of water is so big that the warmest objects in the night data are the water bodies. The land surface night temperature is driven by the vegetation cover, the more vegetation the warmer the surface, the more barren the cooler, so vegetated surfaces appear darker in the images. The image over the Nile delta region makes apparent very bright yellow surfaces over the desert as emissivity in bands 20 and 29 drops sharply over those surfaces.



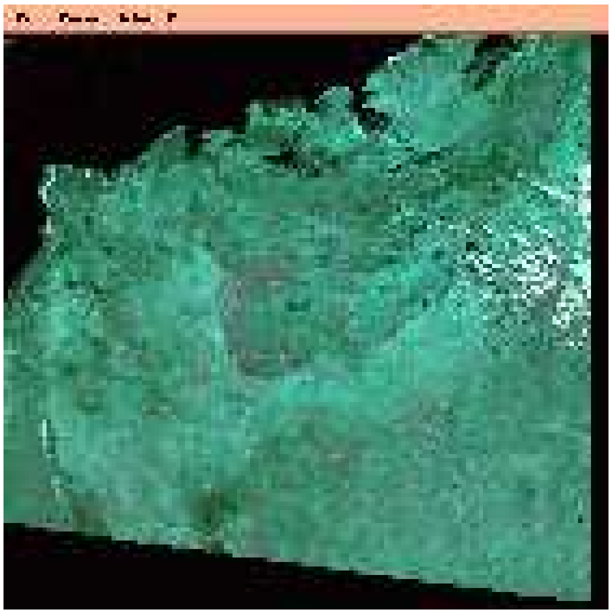


A.4 Thermal anomalies

Madagascar

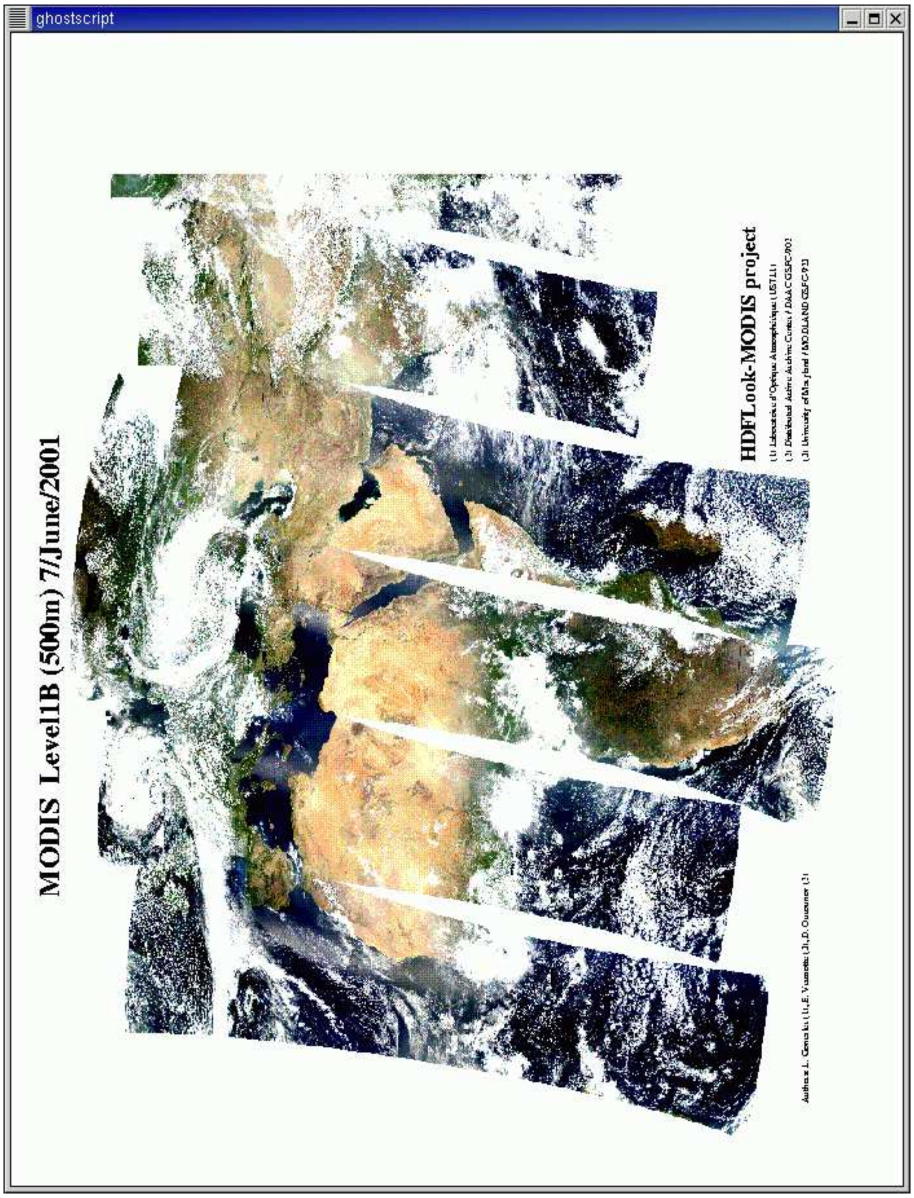
Corrected reflectances:

Thermal anomalies

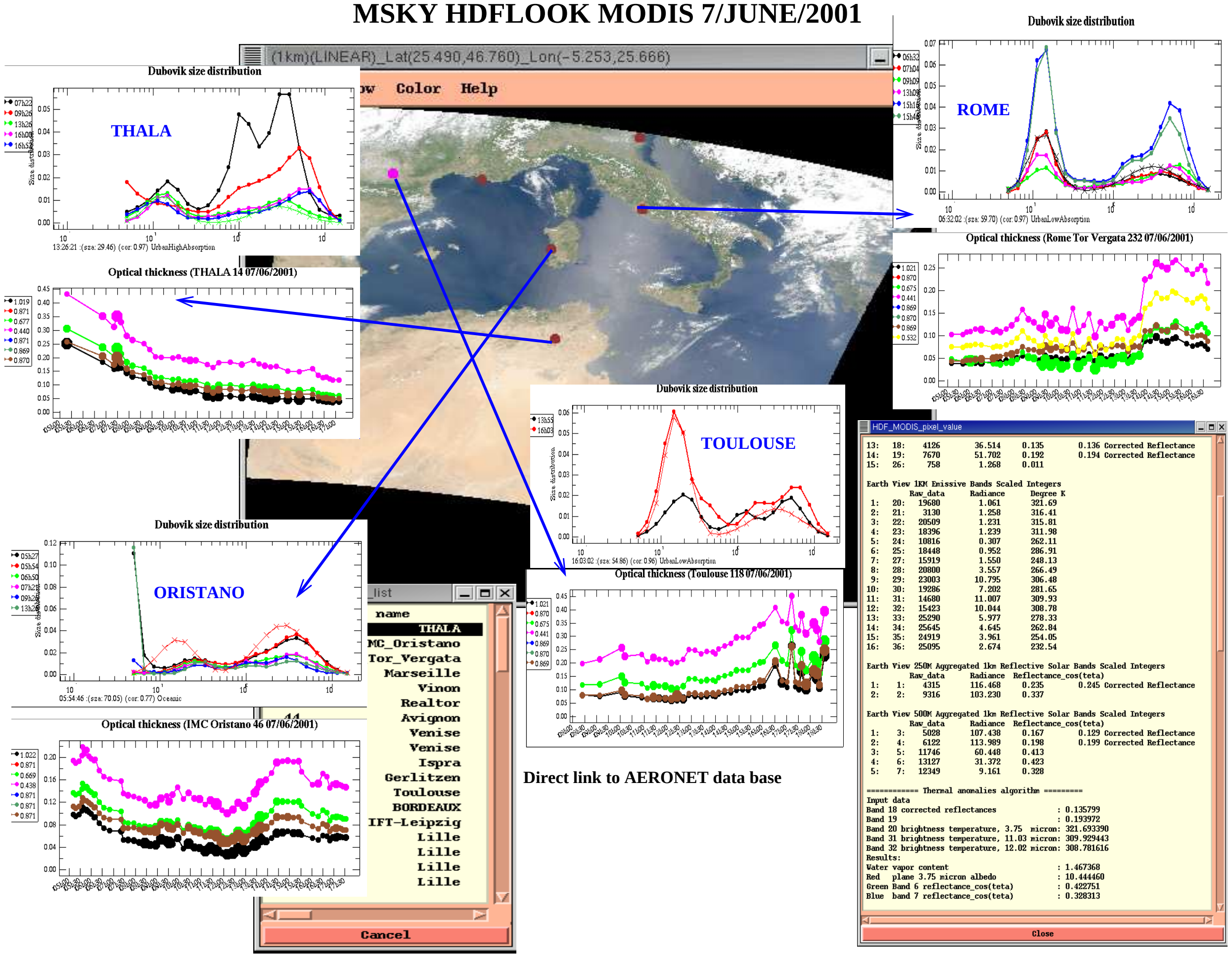


A.5 Level 1B (500m) Mosaic

Level 1B (500m) Mosaic
30000 columns $\times$ 24000 lines
Corrected reflectance



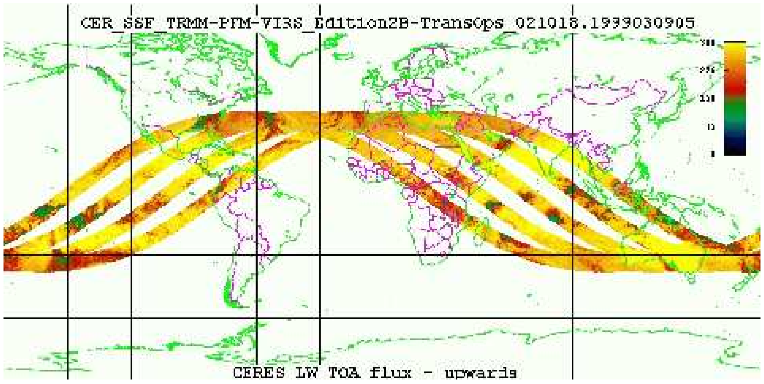
MSKY HDFLOOK MODIS 7/JUNE/2001



B command file examples

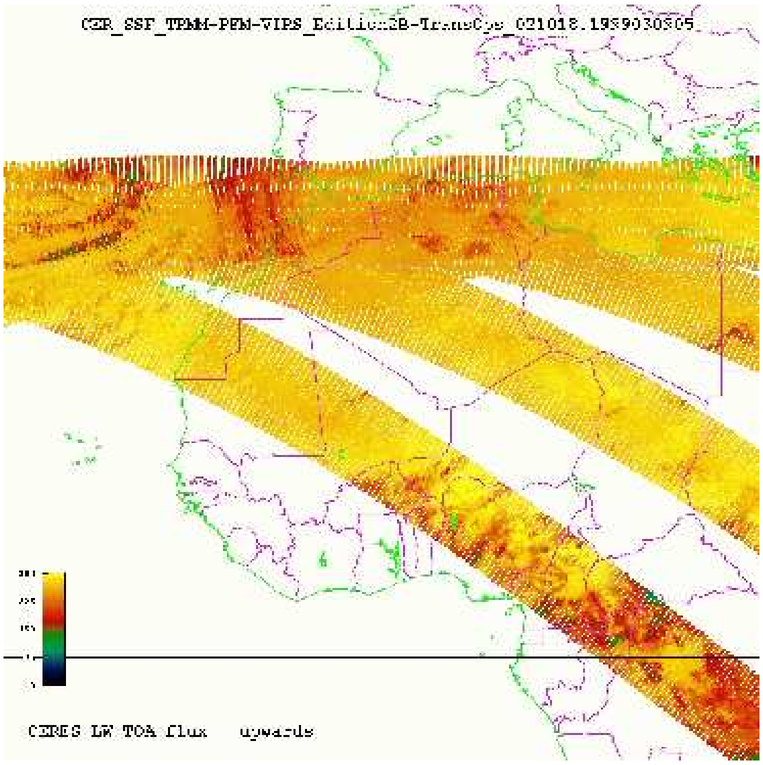
B.1 CERES Mosaic

```
verbose
clear_data

set_output_directory        /users/louis/CERES_COM/OUTPUTS/
set_input_directory         /users/louis/CERES

set_projection_to_geometry   ProjectionTo="LINEAR"    WidthTo=1000 HeightTo=500 \
        LatitudeMinTo=-90.0000 LatitudeMaxTo=90.0000 \
LongitudeMinTo=-180.0000 LongitudeMaxTo=180.0000

#================================ IMAGE SETTING ======================================
set_color_scale_name        RAINBOW3
set_image_background        color=White
add_maps Coastlines=Yes Boundaries=Yes  CoastlineColor=Green BoundaryColor=Magenta
add_scale_to_image X=950 y=50 width=30 Height=150 TickColor=Black ForegroundColor=Black \
BackgroundColor=white TextFormat="%.0f" FontName=Courb.ttf SizeFactor=.8 UpLeftSide=yes \
NoTicks=yes Labels=" 0 0.00   64 75.0   128 150.0   192 226.0   255 300.0"
add_grids       color=Black LatitudeMin=-90  LatitudeMax=90 LatitudeStep=30 \
                LongitudeMin=-180 LongitudeMax=180 LongitudeStep=30
#================================ SELECT SDS     ======================================

select_SDS                 SDSName= "CERES LW TOA flux - upwards"
set_SDS_enhance min=0 max=300

#================================ TITLES         ======================================
add_text x= 100 y = 15 ForegroundColor="Black" BackgroundColor="White" Border=0 FontName=Courb.ttf \
                     SizeFactor=1.5 Rotation=0. text="CER_SSF_TRMM-PFM-VIRS_Edition2B-TransOps_021018.1999030905"
add_text x= 300 y = 480 ForegroundColor="Black" BackgroundColor="white" Border=0 FontName=Courb.ttf \
                     SizeFactor=1.5 Rotation=0. text="CERES LW TOA flux - upwards"

set_input_hdf_file         /users/louis/CERES/CER_SSF_TRM*
create_MODIS_SDS_MOSAIC_image       FileName="CERES_MOSAIC" ClearFile=Yes  CreateJPEG=yes
```



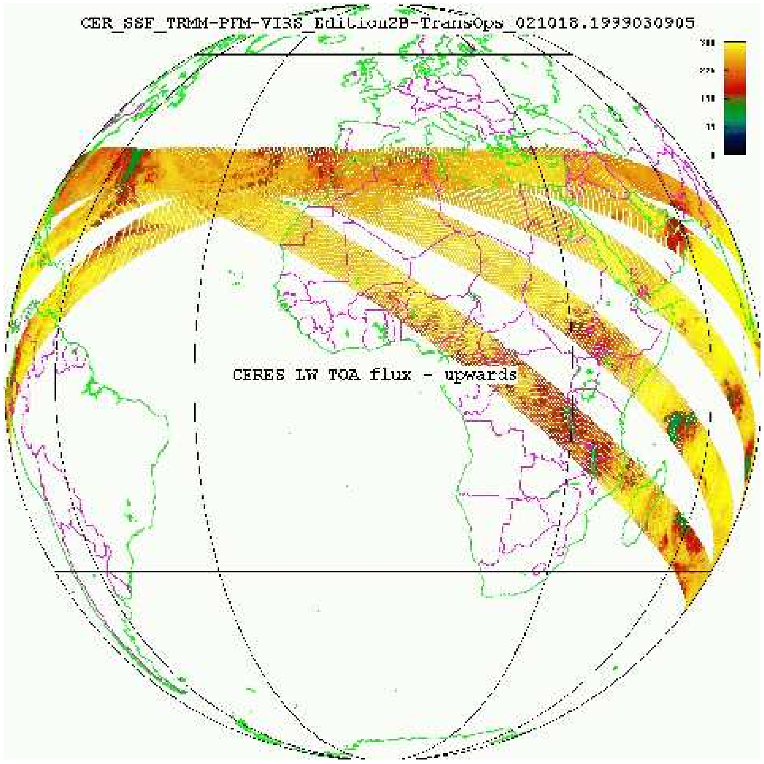
B.2 CERES zoom example

```
verbose
clear_data

set_output_directory        /users/louis/CERES_COM/OUTPUTS/
set_input_directory         /users/louis/CERES

set_projection_to_geometry   ProjectionTo="LINEAR"    WidthTo=1000 HeightTo=1000 \
                                       LatitudeMinTo=-8.0000 LatitudeMaxTo=50.0000 \
                                       LongitudeMinTo=-30.0000 LongitudeMaxTo=28.0000

#=============================== IMAGE SETTING =====================================
set_color_scale_name        RAINBOW3
set_image_background        color=White
add_maps Coastlines=Yes Boundaries=Yes  CoastlineColor=GREEN BoundaryColor=Magenta
add_scale_to_image X=50 y=750 width=30 Height=150 TickColor=Black ForegroundColor=Black \
BackgroundColor=white TextFormat="%.0f" FontName=Courb.ttf SizeFactor=.8 UpLeftSide=yes \
NoTicks=yes Labels=" 0 0.00   64 75.0   128 150.0   192 226.0   255 300.0"
add_grids       color=Black LatitudeMin=-90  LatitudeMax=90 LatitudeStep=30 \
                LongitudeMin=-180 LongitudeMax=180 LongitudeStep=30
#=============================== SELECT SDS     =====================================

select_SDS                 SDSName= "CERES LW TOA flux - upwards"
set_SDS_enhance min=0 max=300

#=============================== TITLES         =====================================
add_text x= 100 y = 15 ForegroundColor="Black" BackgroundColor="White" Border=0 FontName=Courb.ttf \
                    SizeFactor=1.5 Rotation=0. text="CER_SSF_TRMM-PFM-VIRS_Edition2B-TransOps_021018.1999030905"
add_text x= 30 y = 950 ForegroundColor="Black" BackgroundColor="white" Border=0 FontName=Courb.ttf \
                    SizeFactor=1.5 Rotation=0. text="CERES LW TOA flux - upwards"

set_input_hdf_file         /users/louis/CERES/CER_SSF_TRM*
create_MODIS_SDS_MOSAIC_image       FileName="CERES_MOSAIC_Z" ClearFile=Yes  CreateJPEG=yes
```



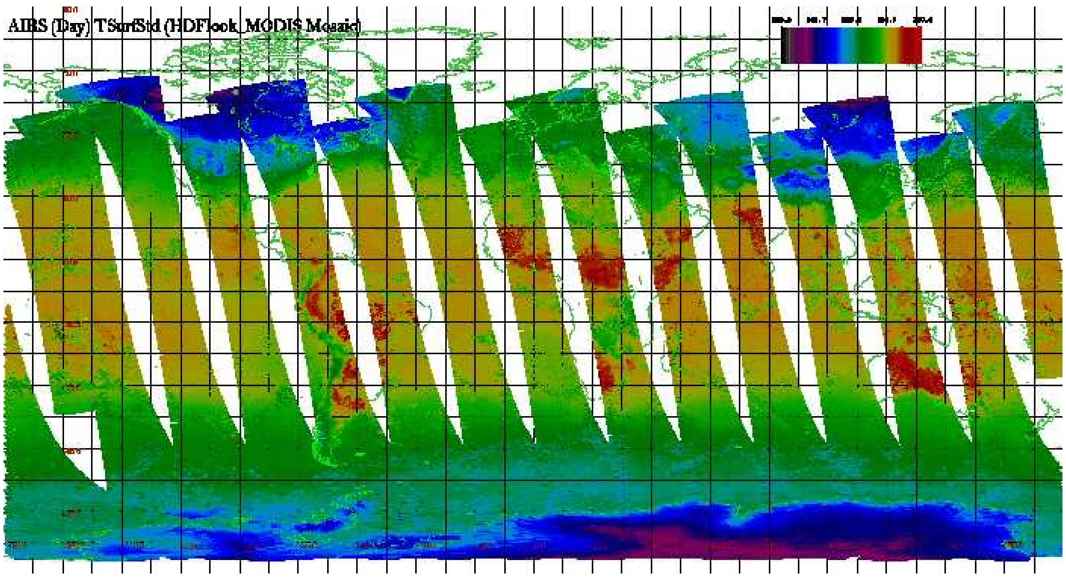
B.3 CERES Orthographic

```
verbose
clear_data

set_output_directory        /users/louis/CERES_COM/OUTPUTS/
set_input_directory         /users/louis/CERES

set_projection_to_geometry   ProjectionTo="ORTHOGRAPHIC"    WidthTo=1000 HeightTo=1000 \
CenterLatitudeTo=0 CenterLongitudeTo=0 \
        LatitudeMinTo=-90.0000 LatitudeMaxTo=90.0000 \
LongitudeMinTo=-180.0000 LongitudeMaxTo=180.0000

#=============================== IMAGE SETTING ======================================
set_color_scale_name        RAINBOW3
set_image_background        color=White
add_maps Coastlines=Yes Boundaries=Yes  CoastlineColor=Green BoundaryColor=Magenta
add_scale_to_image X=950 y=50 width=30 Height=150 TickColor=Black ForegroundColor=Black \
BackgroundColor=white TextFormat="%.0f" FontName=Courb.ttf SizeFactor=.8 UpLeftSide=yes \
NoTicks=yes Labels=" 0 0.00   64 75.0   128 150.0   192 226.0   255 300.0"
add_grids       color=Black LatitudeMin=-90  LatitudeMax=90 LatitudeStep=30 \
                LongitudeMin=-180 LongitudeMax=180 LongitudeStep=30
#=============================== SELECT SDS     ======================================

select_SDS                 SDSName= "CERES LW TOA flux - upwards"
set_SDS_enhance min=0 max=300

#=============================== TITLES         ======================================
add_text x= 100 y = 15 ForegroundColor="Black" BackgroundColor="White" Border=0 FontName=Courb.ttf \
                     SizeFactor=1.5 Rotation=0. text="CER_SSF_TRMM-PFM-VIRS_Edition2B-TransOps_021018.1999030905"
add_text x= 300 y = 480 ForegroundColor="Black" BackgroundColor="white" Border=0 FontName=Courb.ttf \
                     SizeFactor=1.5 Rotation=0. text="CERES LW TOA flux - upwards"

set_input_hdf_file         /users/louis/CERES/CER_SSF_TRM*
create_MODIS_SDS_MOSAIC_image       FileName="CERES_MOSAIC_ORTHO" ClearFile=Yes  CreateJPEG=yes
```



B.4 AIRS Mosaic Day

```
#          Create a reprojected MOSAIC file from a set of AIRS HDF files
#========================================================================

verbose
clear_data
set_output_directory            /data2/home/louis/OUTPUTS
set_input_directory             /net/bratmos/data4/dayTime/

set_projection_to_geometry ProjectionTo="LINEAR"  WidthTo=3000 HeightTo= 1500\
                        LatitudeMinTo=-90.0 LatitudeMaxTo=90.0 \
                        LongitudeMinTo=-180.0 LongitudeMaxTo=180.0


#  ======================   jpeg control file settings === CreateJPEG=yes =================
add_maps        Coastlines=yes Rivers=No Boundaries=No CoastlineColor=Green

add_grids    color=Black LatitudeMin=-90 LatitudeMax=90 LatitudeStep=10 \
LongitudeMin=-180 LongitudeMax=180 LongitudeStep=10

add_text     x= 10 y=30 ForegroundColor="Black"  BackgroundColor="TRANSPARENT" \
Border=0   FontName="Bell.ttf" SizeFactor=3.0 Rotation=0.0 \
"AIRS (Day) TSurfStd (HDFlook_MODIS Mosaic)"


add_latitude_labels    ForegroundColor="Red" BackgroundColor="TRANSPARENT" Border=0 FontName="Bell.ttf" \
                        SizeFactor=1.5 Rotation=0. Format="%.1f" \
                        Longitude=-160 LatitudeMin=-90  LatitudeMax=90 LatitudeStep=20

add_longitude_labels   ForegroundColor="Red" BackgroundColor="TRANSPARENT" Border=0 FontName="Bell.ttf" \
                        SizeFactor=1.5 Rotation=0. Format="%.1f" \
                        Latitude=-80 LongitudeMin=-180 LongitudeMax=180 LongitudeStep=20

add_scale_to_image      x=2200 y=50 width=400 height=100 \
                        TickColor=white  ForegroundColor=Black backgroundColor=White \
                        TextFormat="%.1f" FontName=Courb.ttf SizeFactor=1.2 \
                        UpLeftSide=Yes NoTicks=No \
         Labels="0  computed    63 computed   127 computed 191 computed 255 computed"

set_color_scale_name    RAINBOW0
set_image_background    color=white

set_SDS_enhance min=220 max=320

#  ======================================================================================
select_SDS                      SDSname="TSurfStd"
set_input_hdf_file              /net/bratmos/data4/dayTime/AIRS.2000*
create_MODIS_SDS_Mosaic     FileName="AIRSDayTSurfStd"   ClearFile=Yes BottomPixelFiller=2 CreateJPEG=yes
```



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HDFLook (HDFLook MODIS) is available on:
http://www-loa.univ-lille1.fr/Hdf/

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