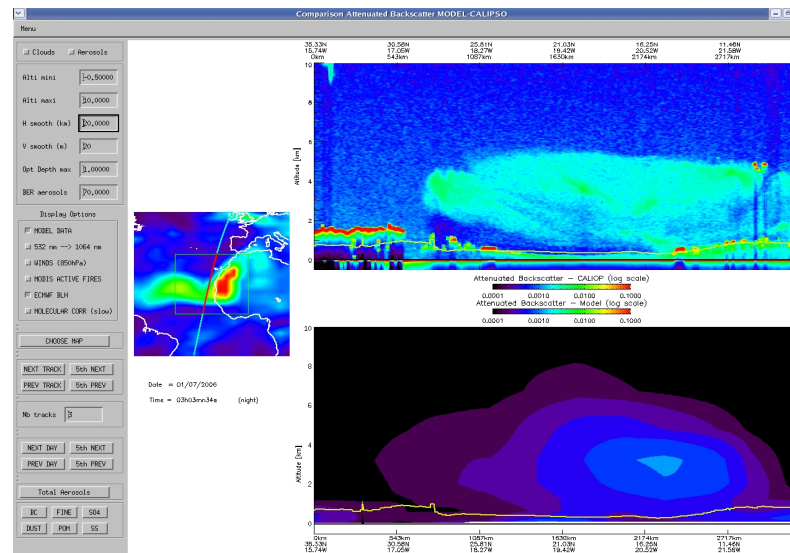


# CALIPSO-MODEL Visualization & Analysis Tool

## VisuCALIOP\_Labonne



Mathieu Labonne, Novembre 2007

Contact : [labonne.mathieu@laposte.net](mailto:labonne.mathieu@laposte.net)



All the functions are written in IDL language.



1. data and pre-processing in iCARE
2. steps to use the tool
3. tool functionalities basic description



## Data displayed

The tool uses 3 different data :

- Pre-processed data files created in ICARE and copied to your machine (explained in **slide 5**).
- some model outputs for comparison (explained in **slide 8**)
- some active fire data to determine fire locations

Active fire data are read in the "path\_fire" directory using the `get_fires` function.

The current version of the code uses MODIS fire products that are not under public access.

To access these MODIS fire products please read :

<ftp://mapsftp.geog.umd.edu/welcome.txt>



# Pre-processing in ICARE

CALIPSO level-1 data are very heavy and a selection of a sub set of parameters is sufficient for this visualization tool. In addition the level-1 data horizontally interpolated from 300m to 3km.

A pre-processing is applied to reduce the size and prepare the files with CALIOP data for the tool on the ICARE resource center in Lille. You need authorization to get access to CALIOP and PARASOL data, contact ICARE: [contact@icare.univ-lille1.fr](mailto:contact@icare.univ-lille1.fr)

The IDL function called `create_CALIPSO_tabs` pre-processes:

- CALIOP level 1 data in /DATA/LIENS/CALIOP
- CALIOP level 2 data in /DATA/LIENS/CALIOP
- Winds from ECMWF in /DATA/LIENS/PARASOL/ANCILLAIRE/METEO/
- ECMWF PBL height (maximum during the 24h before)

It also produces an array of all the latitudes and longitudes of the day. The name of the file is `YYYY_MM_DD_liste_longilatit` where `YYYY` is the year, `MM` the month and `DD` the day. This array enables the visualisation tool to shift quickly to another track in the selected frame. (If this array is missing, the "create\_longi\_latit" function within the visualization tool is called and it takes between one and two minutes to be executed.)

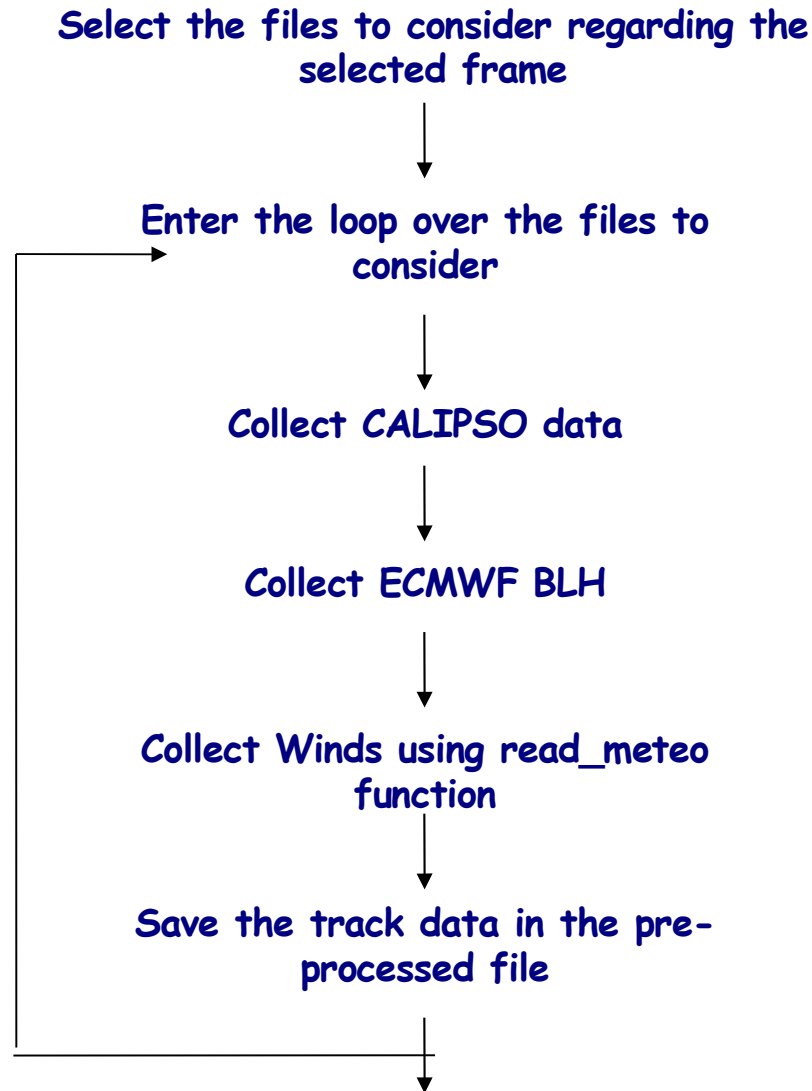


# CALIOP on CALIPSO

- ascending orbit, 29/30 half-orbits/day
- Orbit cycle : 16 days => 233 orbits in a cycle
- always comes from the East (inclination =  $98,2^\circ$ )
  - night orbits: upper right to lower left on the plots
  - day orbits lower right to upper left on the plots
- Day is defined for a sun-earth-satellite angle between  $-95^\circ$  to  $95^\circ$ . So "CALIPSO day" is longer than "CALIPSO night" (about 52 min for day and 46 min for night)
- vertical resolution: 300m in raw data (in hdf files in ICARE), smoothed to 3km for this tool
- horizontal resolution: 20m
- To know more about CALIPSO please refer to <http://smc.cnes.fr/CALIPSO/> or <http://www-calipso.larc.nasa.gov>



# Preprocessing in ICARE the IDL routine `create_CALIPSO_tabs`





# Model data

The model data need to be written in netcdf format.

The filename must finish by '.mXX.dYY.nc' where XX is the month number and YY is the day number ('.m01.d02.nc' for example if the date is the 2<sup>nd</sup> of January).

The file must include the following variables :

- X : longitude of the grid
- Y : latitude of the grid
- pmid3d : pressure at the middle of the boxes in Pa [x,y,z]
- DH3D : vertical box height in km [x,y,z]
- OD5503DD\_BC : BC AOD per layer 550nm [x,y,z]
- OD5503DD\_FINE : Fine Mode AOD per layer 550nm [x,y,z]
- OD5503DD\_POM : POM AOD per layer 550nm [x,y,z]
- OD5503DD\_SS : Sea Salt AOD per layer 550nm [x,y,z]
- OD5503DD\_SO4 : SO4 AOD per layer 550nm [x,y,z]
- OD5503DD\_DUST : Dust AOD per layer 550nm [x,y,z]
- OD5503DD\_AER : Total AOD per layer 550nm [x,y,z]

All AOD are basically given here at 550nm but the user can use other wavelength close to 532nm or 1064nm (CALIPSO channels). Nevertheless, the user must keep the same names for the variables.





## Launch the visualization tool on your local machine

Get the IDL routines:

```
cp /home/aerocom1/CALIOP/visuCALIOP_Labonne.pro <your_directory>
```

The whole tool is in one file including more than 20 functions.

Launch idl

Compile the function for the visualization tool:

```
>.compile visuCALIOP_Labonne.pro
```

Plot the day of your choice:

```
>visuCALIOP_Labonne, year= , month= , day=
```

After, you can navigate interactively



**EXAMPLE:** you want to visualize the 1st of March 2007.

Connect in ICARE: `ssh username@icarbure.icare.univ-lille1.fr`

`cd /home/labonne`

```
>idl  
>.compile create_tabs_CALIPSO.pro  
>create_tabs_CALIPSO, day=1, month=3, year=2007
```

It will create about 29 (=number of orbits/day )files in "path\_outputs" named 2007\_03\_01\_\* (it takes ~10min) + 2007\_03\_01\_liste\_longilatit.

Create a directory called 2007\_03\_01

Copy all the files in this directory, including 2007\_03\_01\_liste\_longilatit  
( « mv 2007\_03\_01\_\* 2007\_03\_01 »)

Copy ("scp -r") this directory from ICARE in the "path\_caliop" directory

Compile:

```
>compile visuCALIOP_Labonne.pro after checking the directory paths
```

Launch:

```
>visuCALIOP_Labonne, day=1, month=3, year=2007
```

On Icare

Local



# Main algorithm basic description

## visuCALIOP\_Labonne

get\_paths

Set directory paths for the different inputs



create\_visu\_window

Create the visualization window with the buttons



find\_tracks

Find the track numbers to consider.



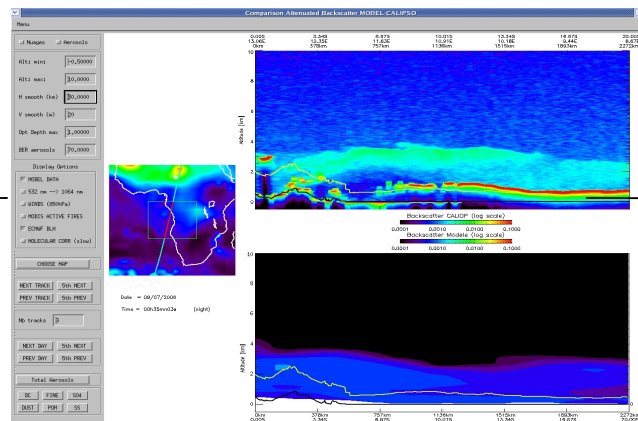
go\_to\_track

Realize the plots regarding the track that is considered. *Slide 12*

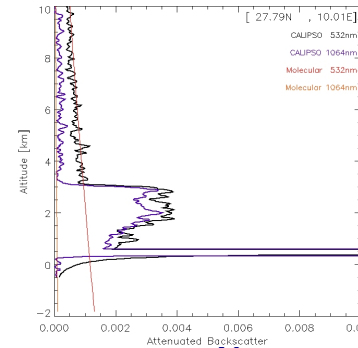


param\_event

actions depending on events on the left side of the window.  
*Slide 13-20*



profiles\_event

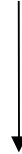


A click on the cross section generates a new window showing the CALIPSO and model cross section profiles at the selected location



## go\_to\_track

Change the file and the data



pick\_up\_model\_outputs



plot\_model\_outputs



plot\_calipso



plot\_map

If it needs to change the current selected track it is said by a keyword. Then it reads the corresponding data

Computes attenuated backscatter profiles along CALIPSO subtrack from the model extinction

Plots the model attenuated backscatter on window lower half.

Plots the measured attenuated backscatter on window upper half

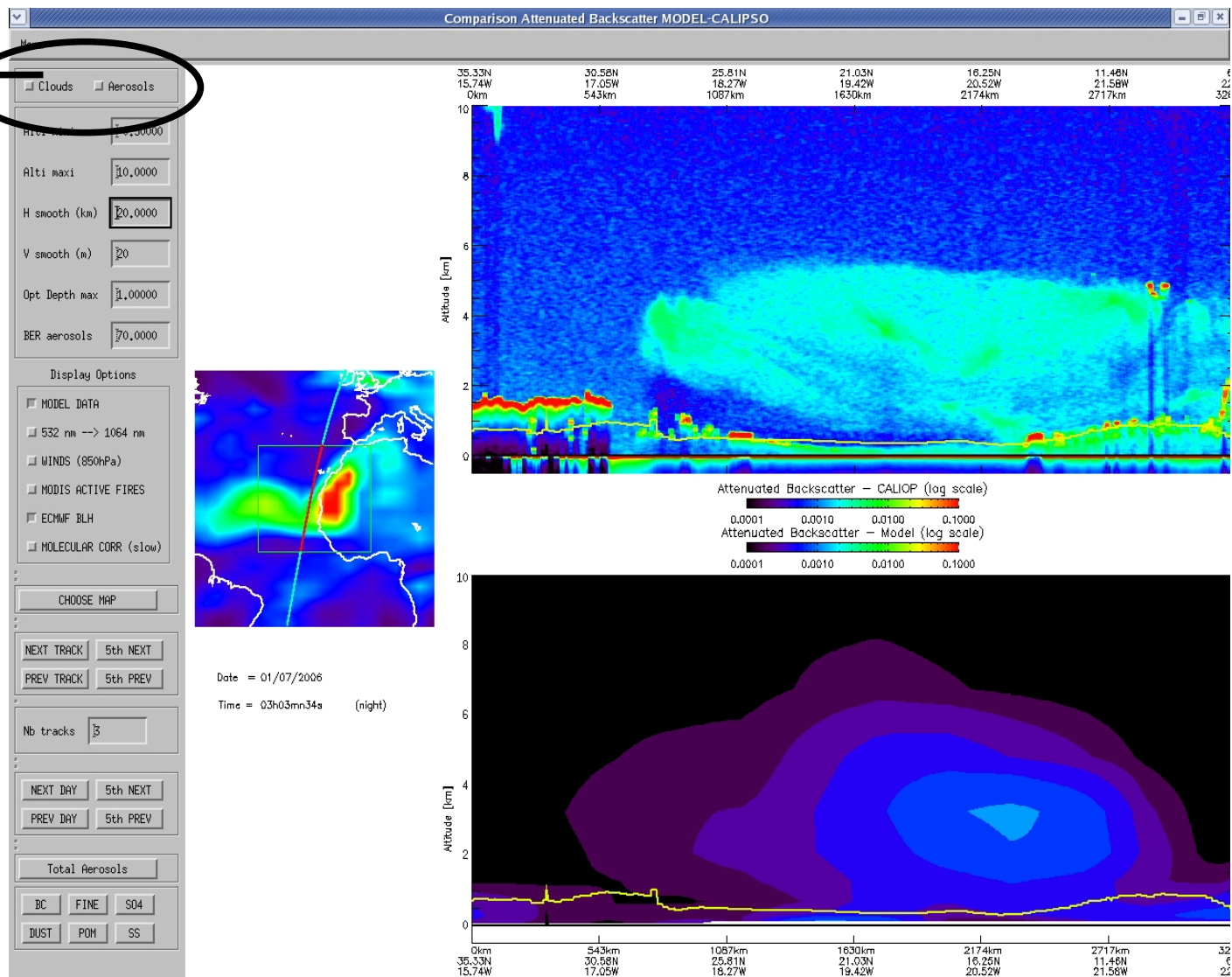
Plots a map showing CALIPSO subtrack. The colored font gives the Model Total AOD if the model profile is plotted.



# param\_event

Level-2 CALIPSO products can be used to show the aerosol and cloud layers detected by the standard CALIPSO algorithm.

plot\_calipso





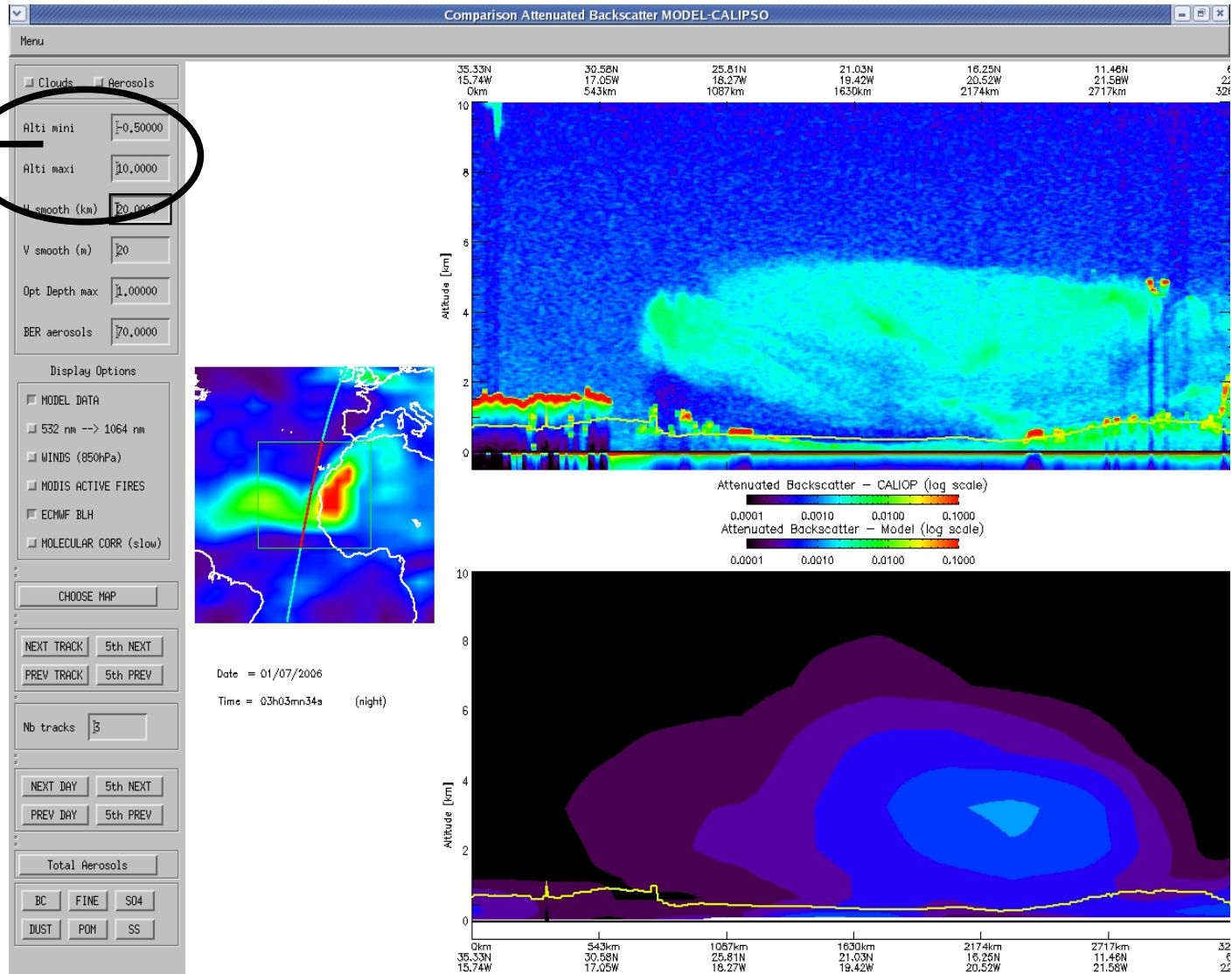
# param\_event

Select altitude range for CALIPSO and model display

plot\_model\_outputs

plot\_calipso

plot\_map



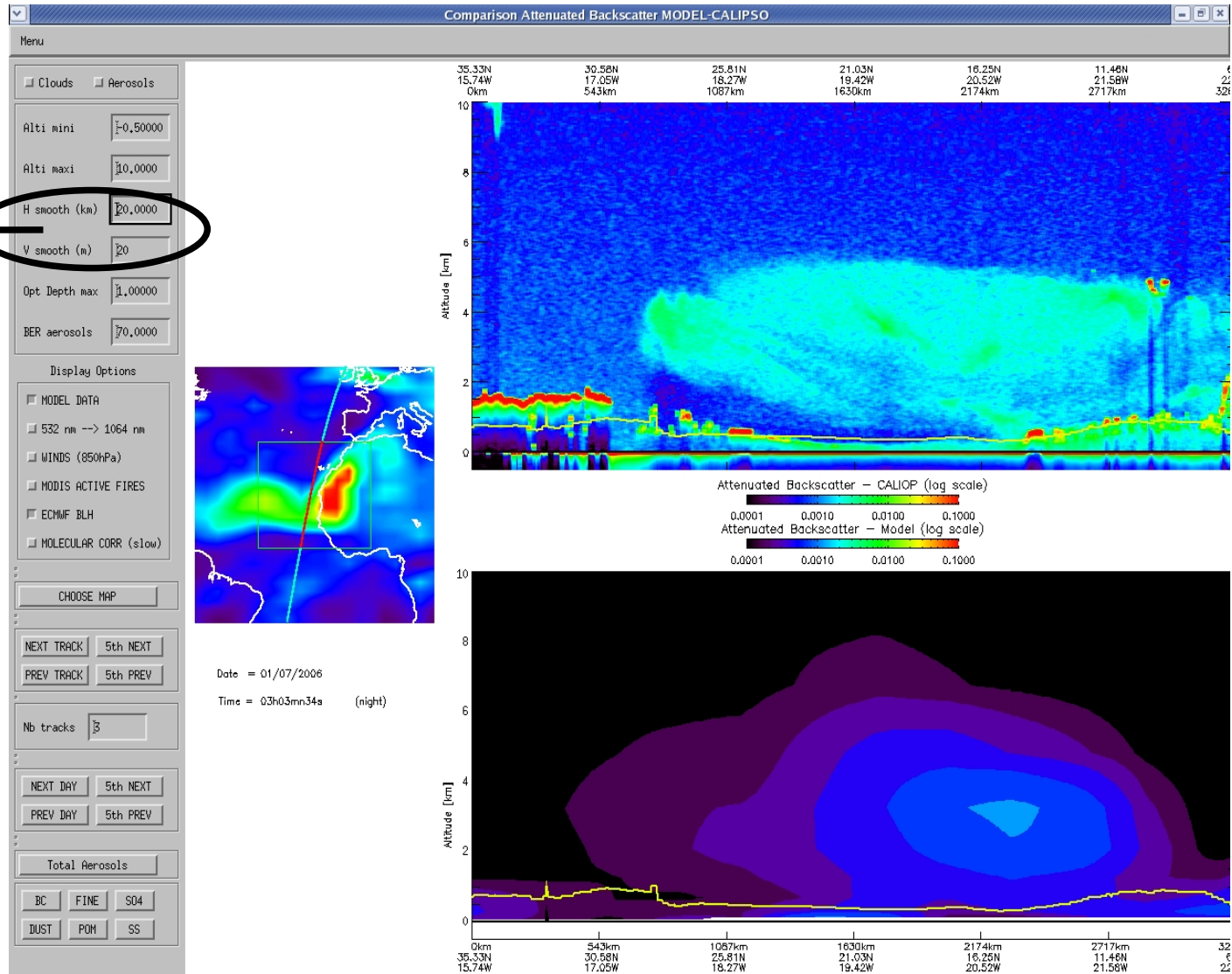


# param\_event

Minimum values:  
Hor: 3km  
Vert: 20m

Change the horizontal  
or vertical  
« smoothing »

plot\_calipso





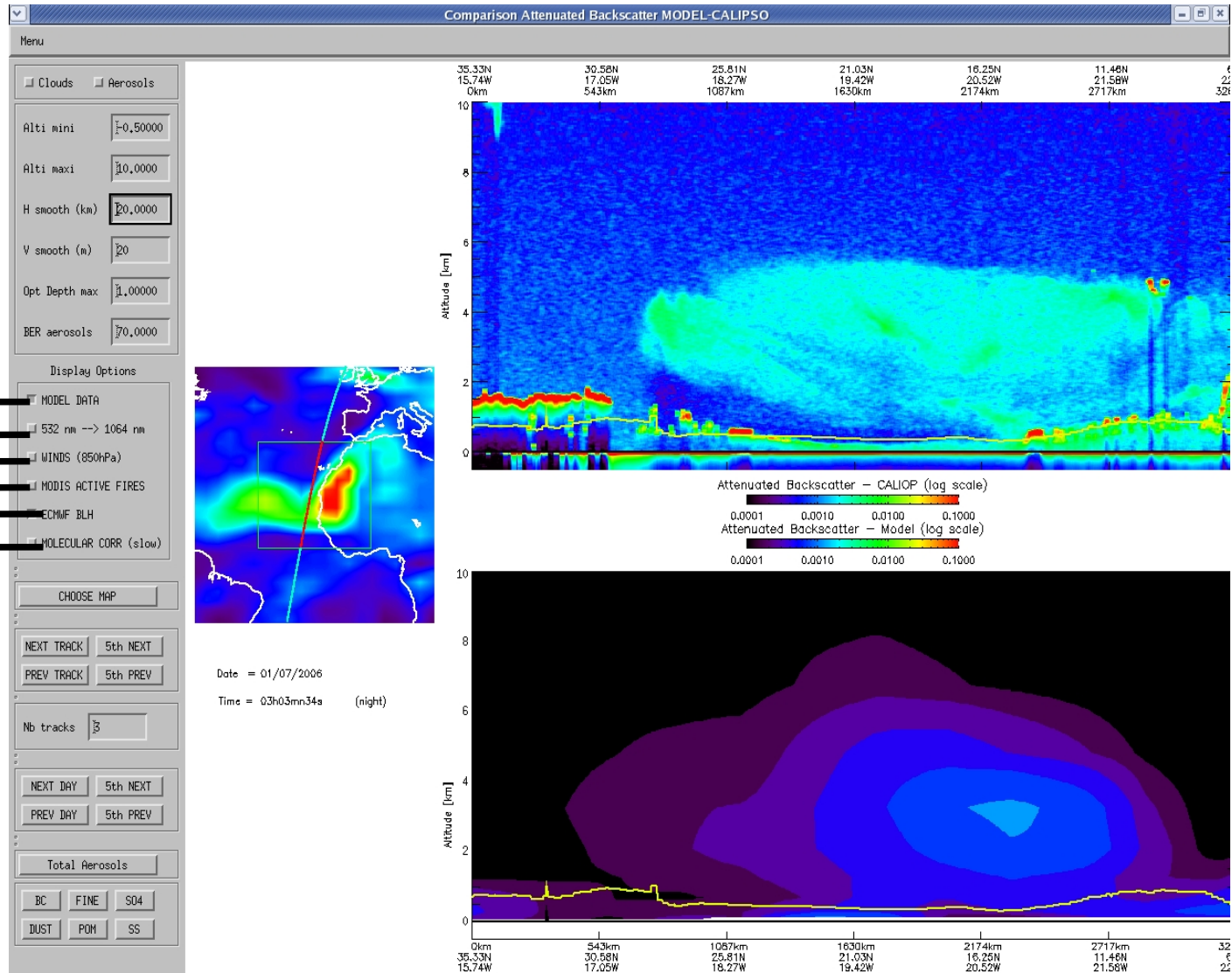
# param\_event

Many options to change CALIPSO and model display using flags in the code

plot\_model\_outputs

plot\_calipso

plot\_map







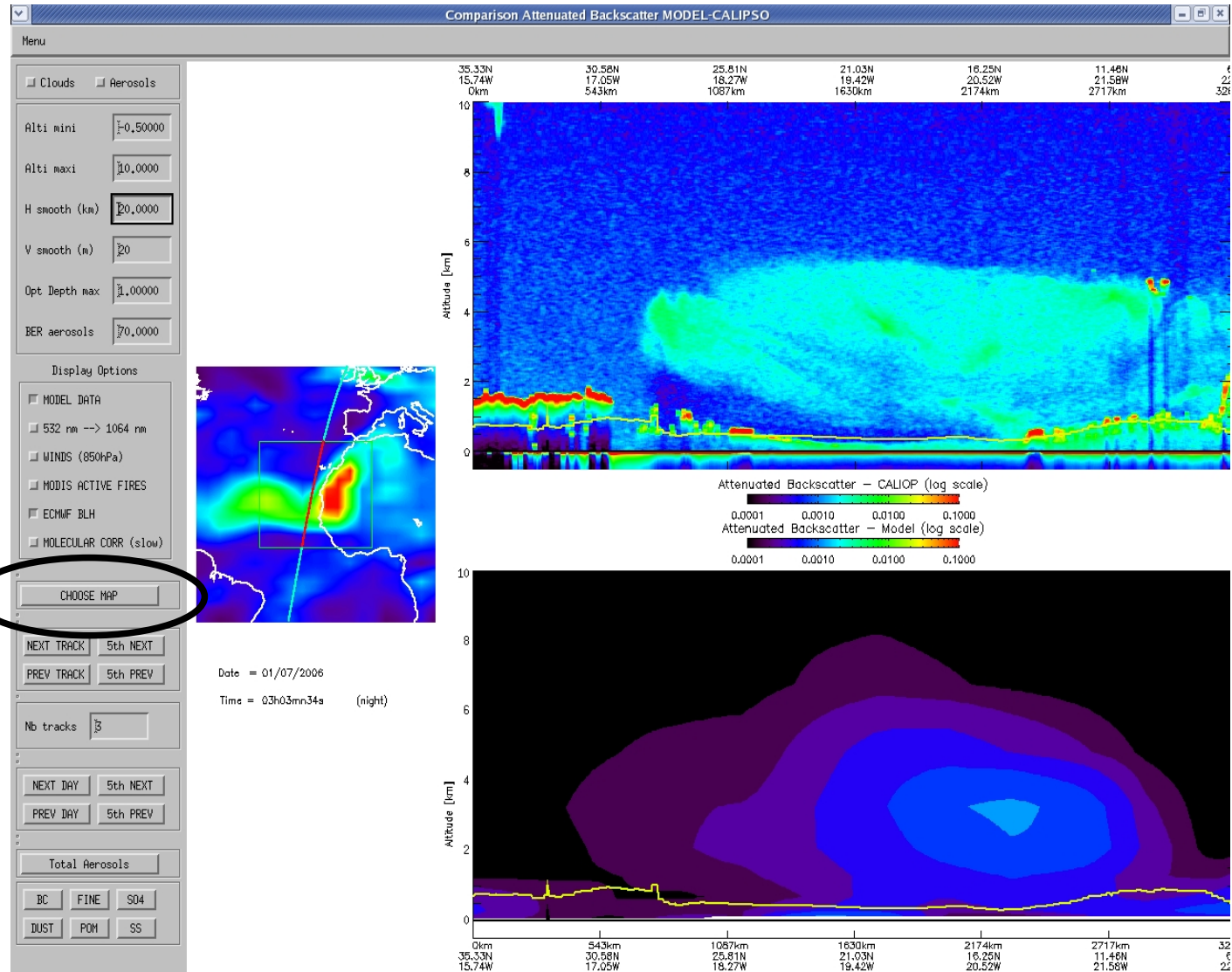
# param\_event

Create a window to choose coordinates

When the user defines the box, enter select\_coord

find\_tracks : to know the new list of CALIPSO tracks inside the box

go\_to\_track : shift to the track that crosses the new box and then plot the profiles and the map

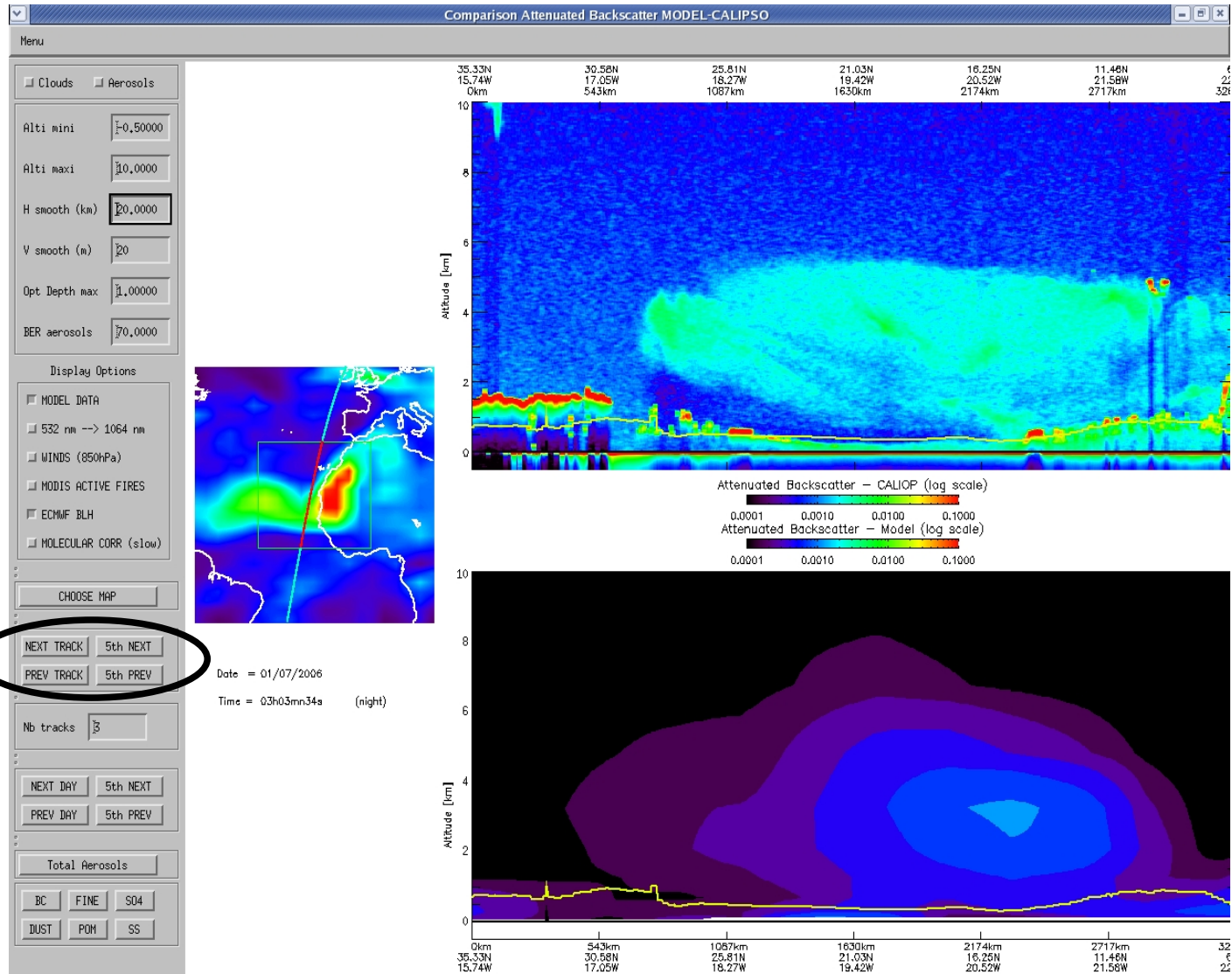




# param\_event

A shift to the following or previous track in the list of the tracks crossing the selected frame.

go\_to\_track



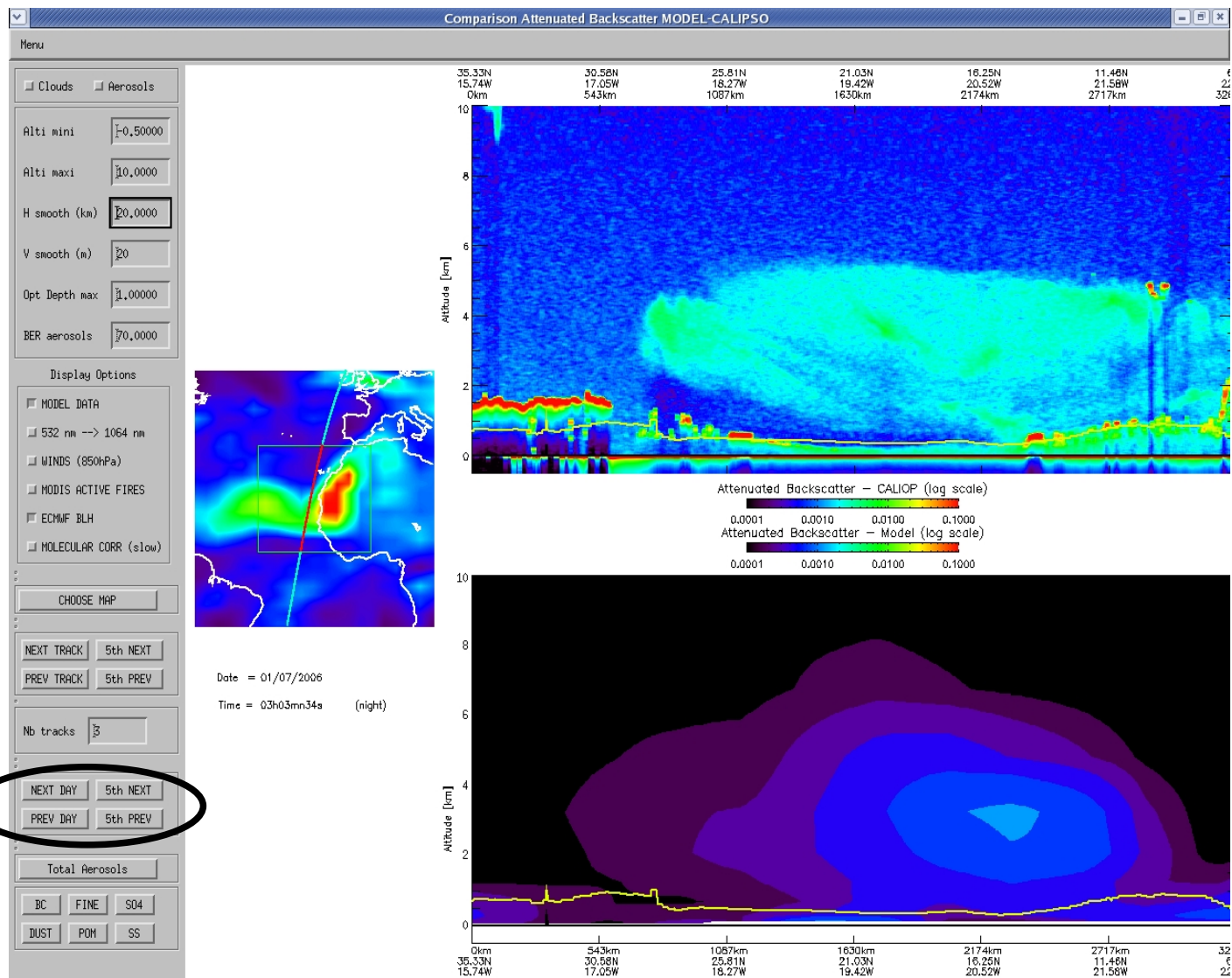


# param\_event

Change the current day to consider

change\_day :  
change the data and the list of tracks to consider (find\_tracks)

go\_to\_track :  
shift to the first track of the new current day and plot the profiles and the map





# param\_event

The model display may use either the total extinction, either the extinction for various aerosol types (dust, sulfate, black carbon...)

plot\_model\_outputs

plot\_calipso

plot\_map

