

Learning from IASI with RTTOV GUI

<http://nwpsaf.eu/site/software/rttov/>

The EUMETSAT
Network of
Satellite Application
Facilities

NWP SAF
Numerical Weather Prediction

**METEO
FRANCE**

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RTTOV-GUI Usage

RTTOV-GUI is a graphical user interface for the radiative transfer model **RTTOV** ⁽¹⁾ developed in the context of the NWP-SAF EUMETSAT project. RTTOV-GUI is part of the RTTOV package since version 11.2.

It allows to run the RTTOV direct and Jacobian models and PC-RTTOV (direct and Jacobian) for one atmospheric profile and for all instruments permitted by RTTOV. The last version of RTTOV-GUI includes an 1D-VAR retrieval functionality.

This algorithm is based on the NWP-SAF 1D-VAR retrieval package scheme. It allows visualizing retrieved T and Q profiles from a user-defined profile and background and observation error covariances ⁽²⁾.

RTTOV-GUI was designed for educational and training purposes.

RTTOV-GUI is written in python (2.7) and uses wxPython, numpy, matplotlib, f2py and h5py.

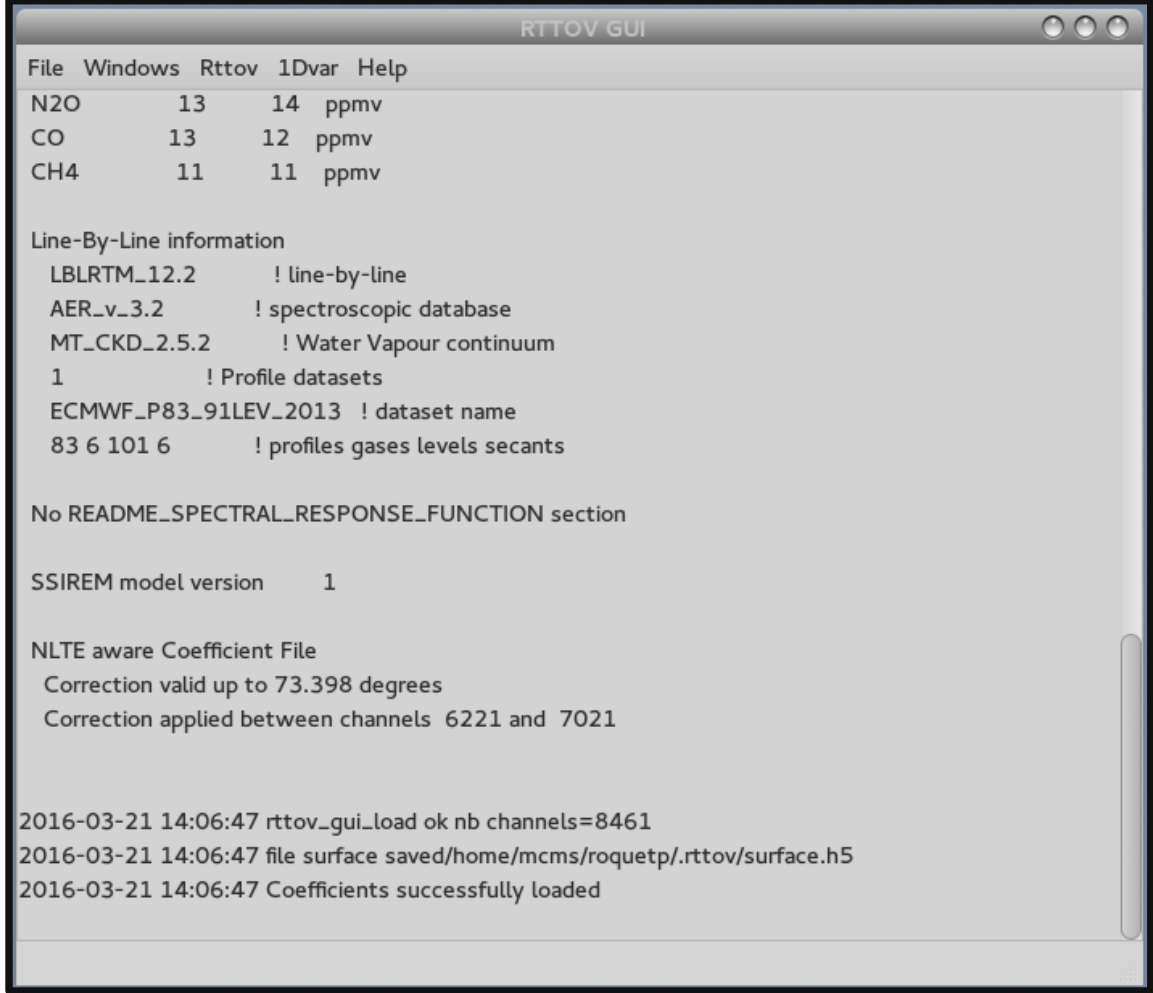
Most windows have the matplotlib toolbar : you can zoom and save the plots.

The interface between RTTOV and RTTOV-GUI is working with hdf5 files kept in a working directory : you can read these files for a further look on your results.

Running the GUI is simple : go to the gui directory, customize the configuration file with the location of the coefficient files and atlas files, source it and run the GUI :

```
$source rttov_gui.env  
$rttovgui &
```

RTTOV GUI main window :
where you can launch the commands :
1- Open a profile
2- Select coefficient files
3- run RTTOV direct or K
and visualize the log.



Run RTTOV direct

Run RTTOV-K

Profile editor window :
You can click on the right panel in order to modify the curve, you can add or remove gases, aerosols or clouds.

Surface editor window :
where you can modify surface parameters, angles and load an atlas. This window displays the emissivity and the BRDF.

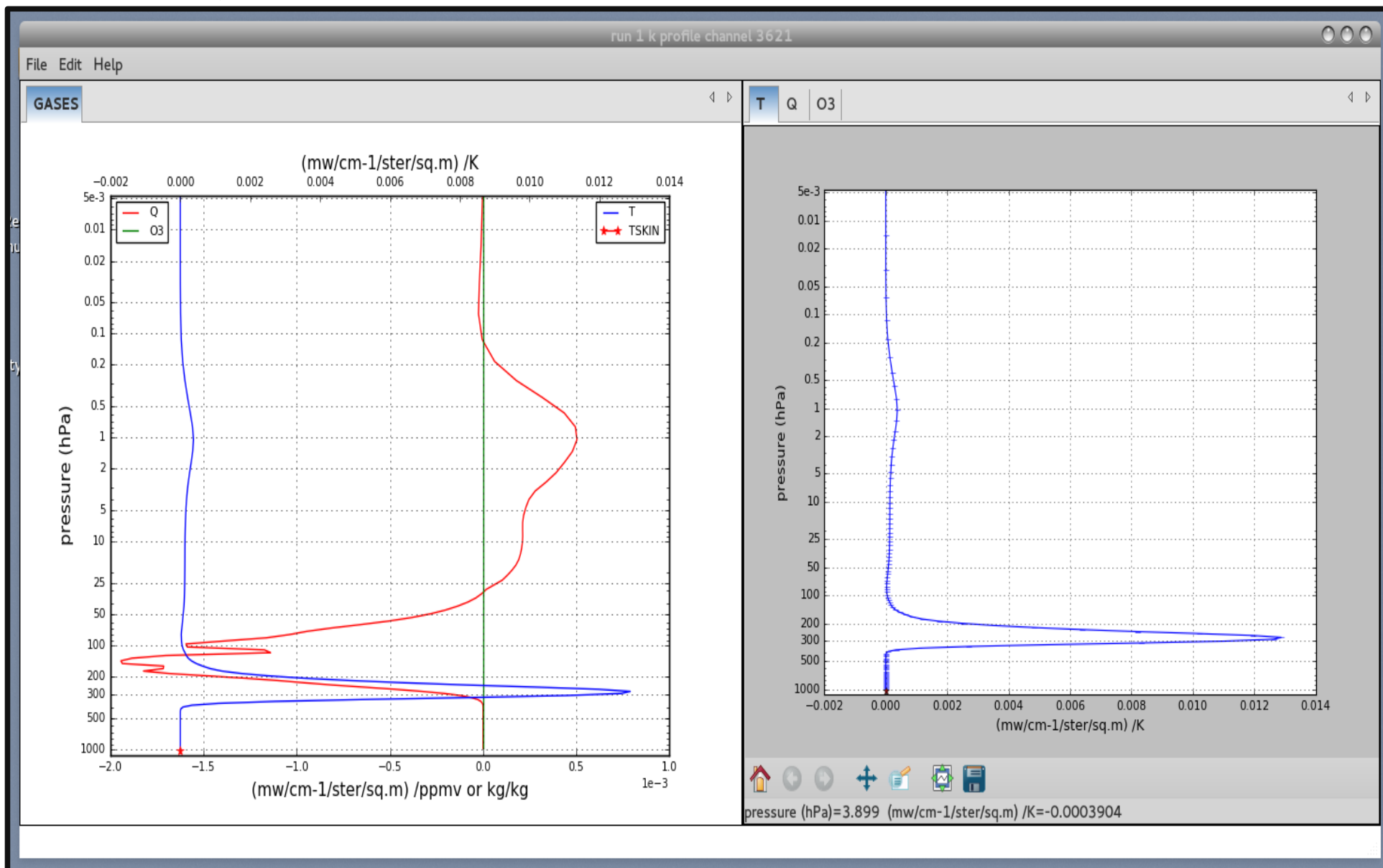
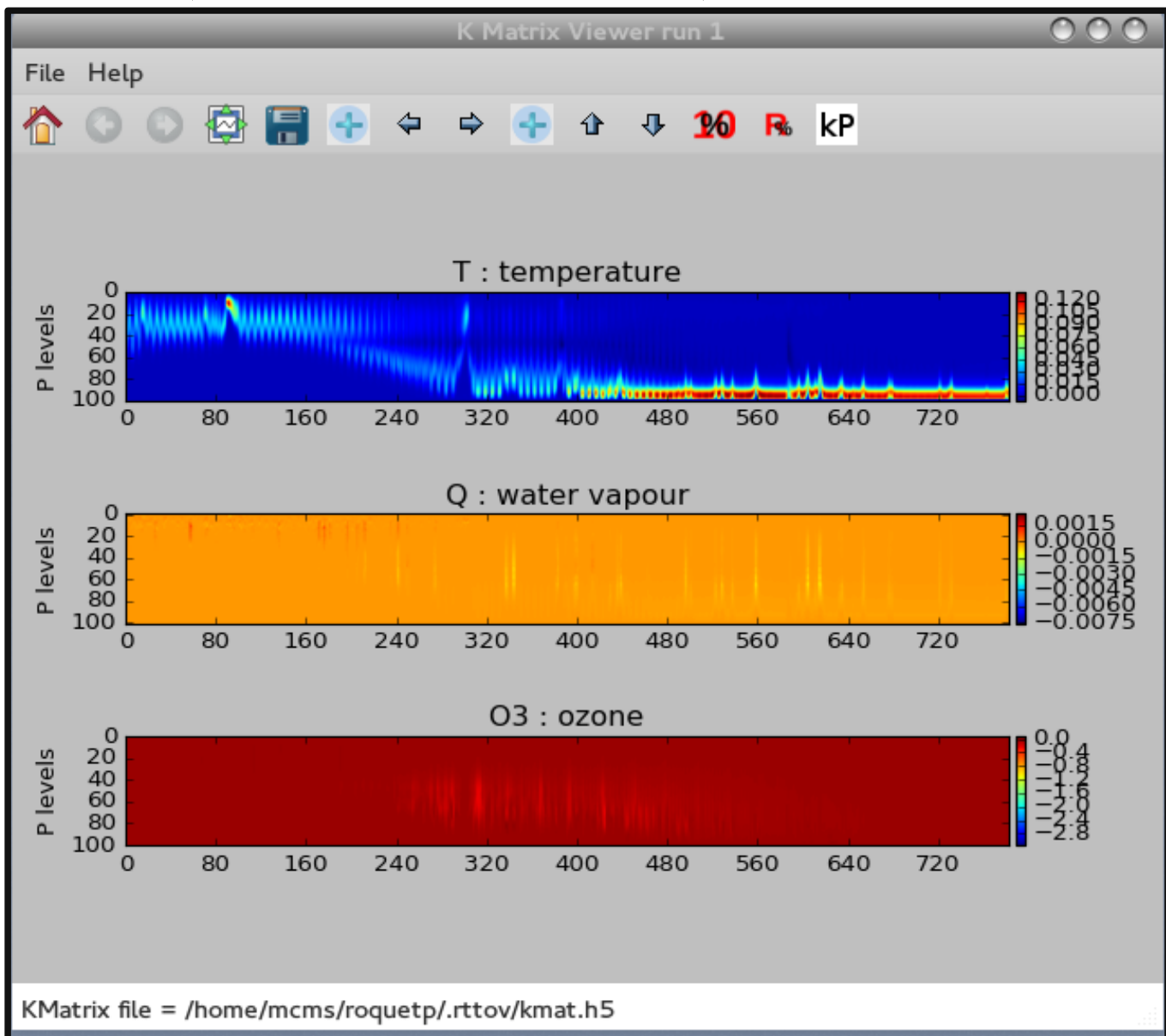
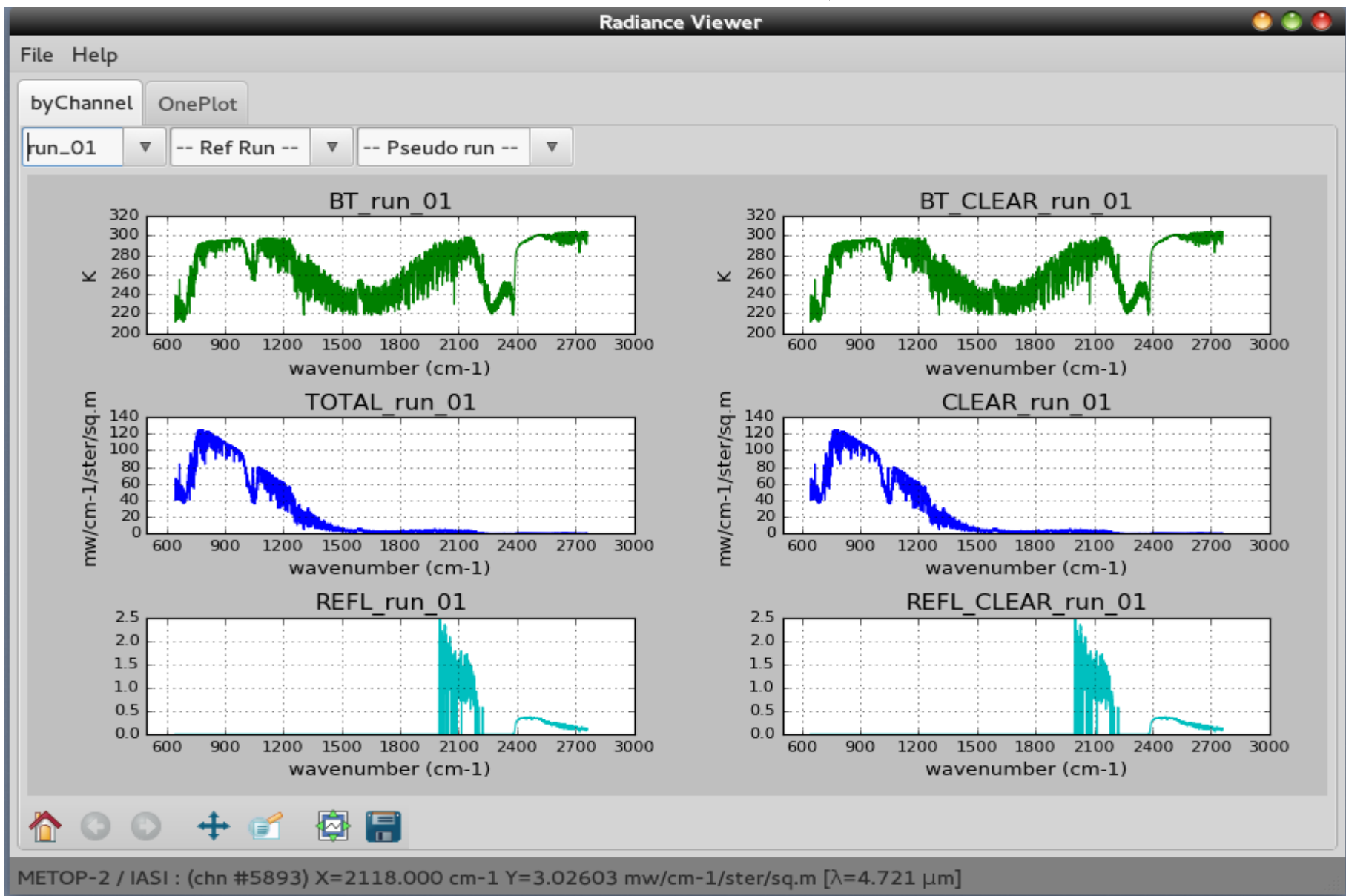
K Matrix window :
when you run the K model, RTTOV-GUI displays the **K matrix**, you can visualize also the K profile by selecting a channel (kP button)

K profile

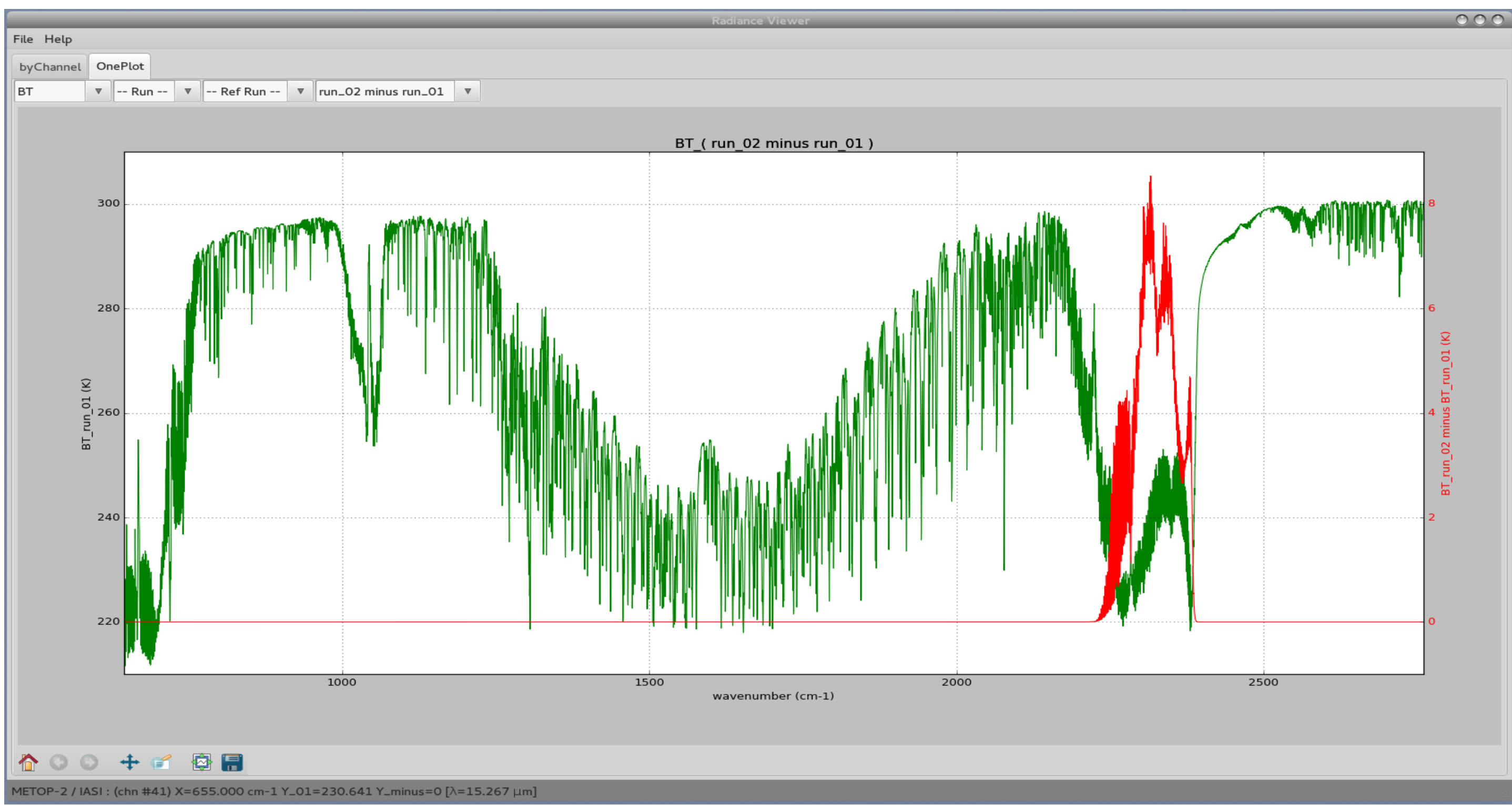
Options window :
where you can change RTTOV options

⁽¹⁾ See also Poster S8-87. RTTOV for hyperspectral IR Sounders : Status and future developments.
⁽²⁾ Background and observation error covariances matrices are inherited from the NWP-SAF 1D-VAR retrieval package.

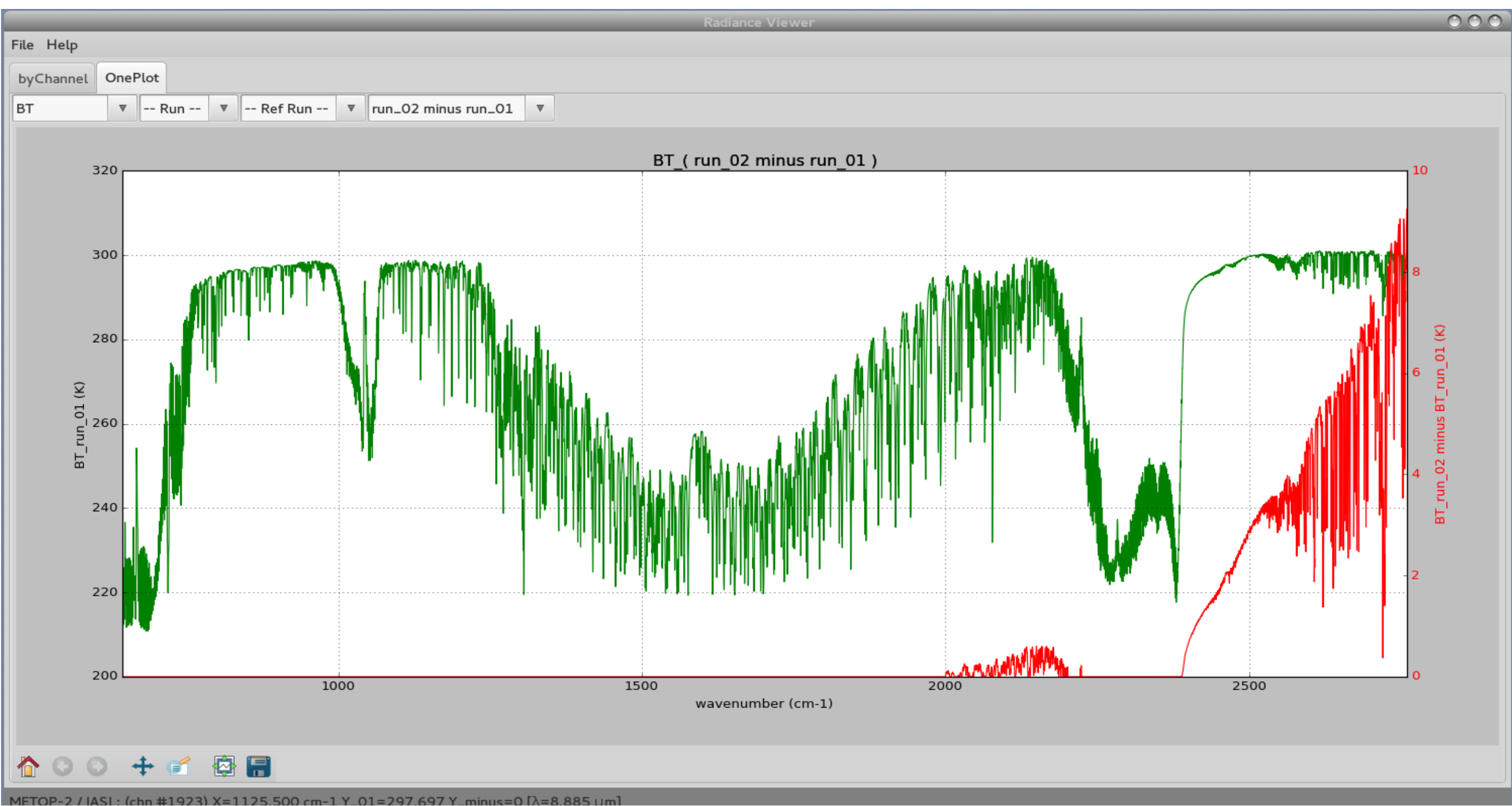
Radiance window : when you run the direct model, RTTOV GUI displays the result of RTTOV in the radiance window, you can visualize radiances, brightness temperatures and reflectances computed by RTTOV and visualize the difference between 2 runs. for an hyperspectral instrument, RTTOV GUI displays the spectrum of radiances, brightness temperatures and reflectances in wave numbers.



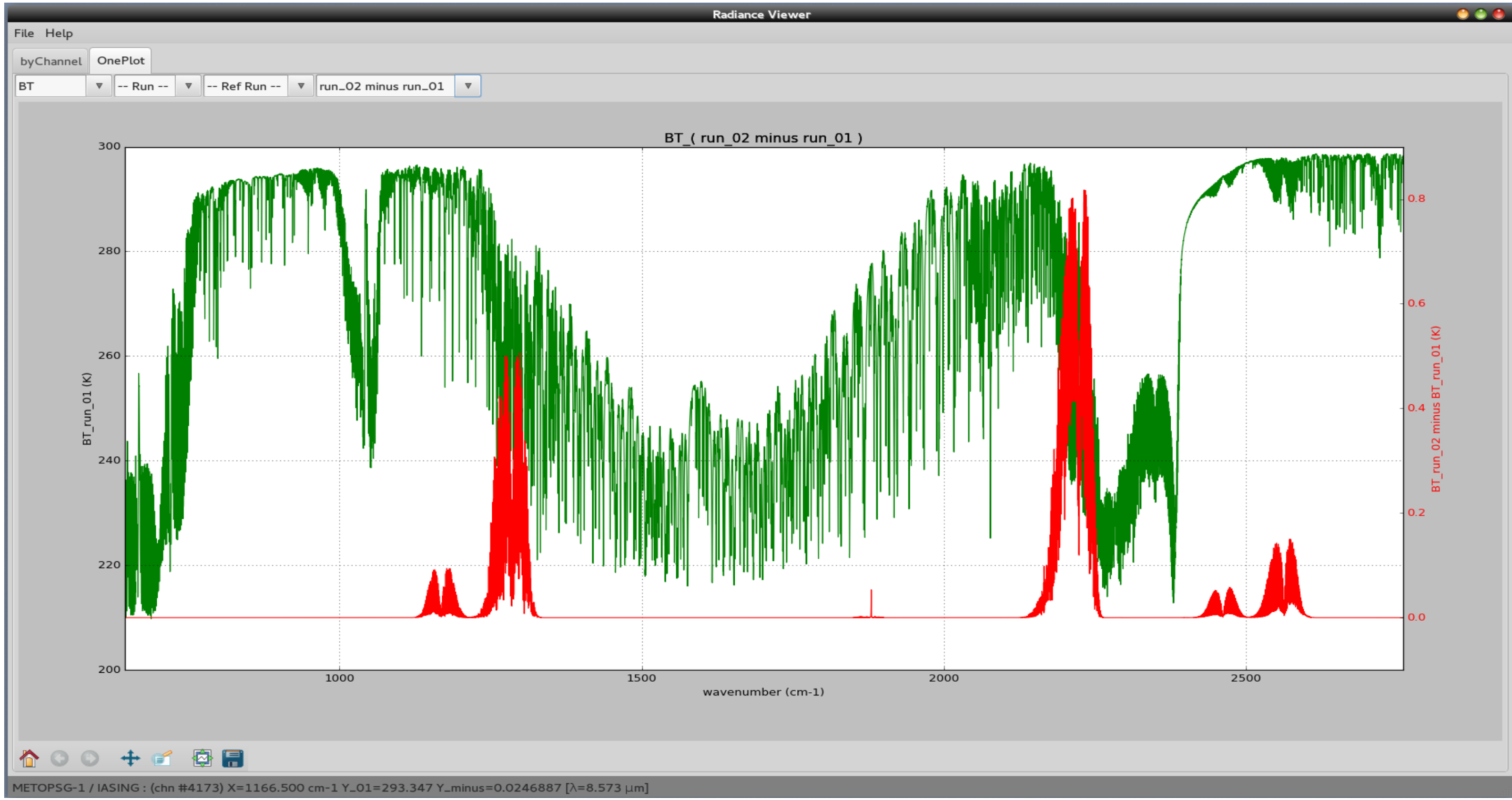
Case studies: a few examples



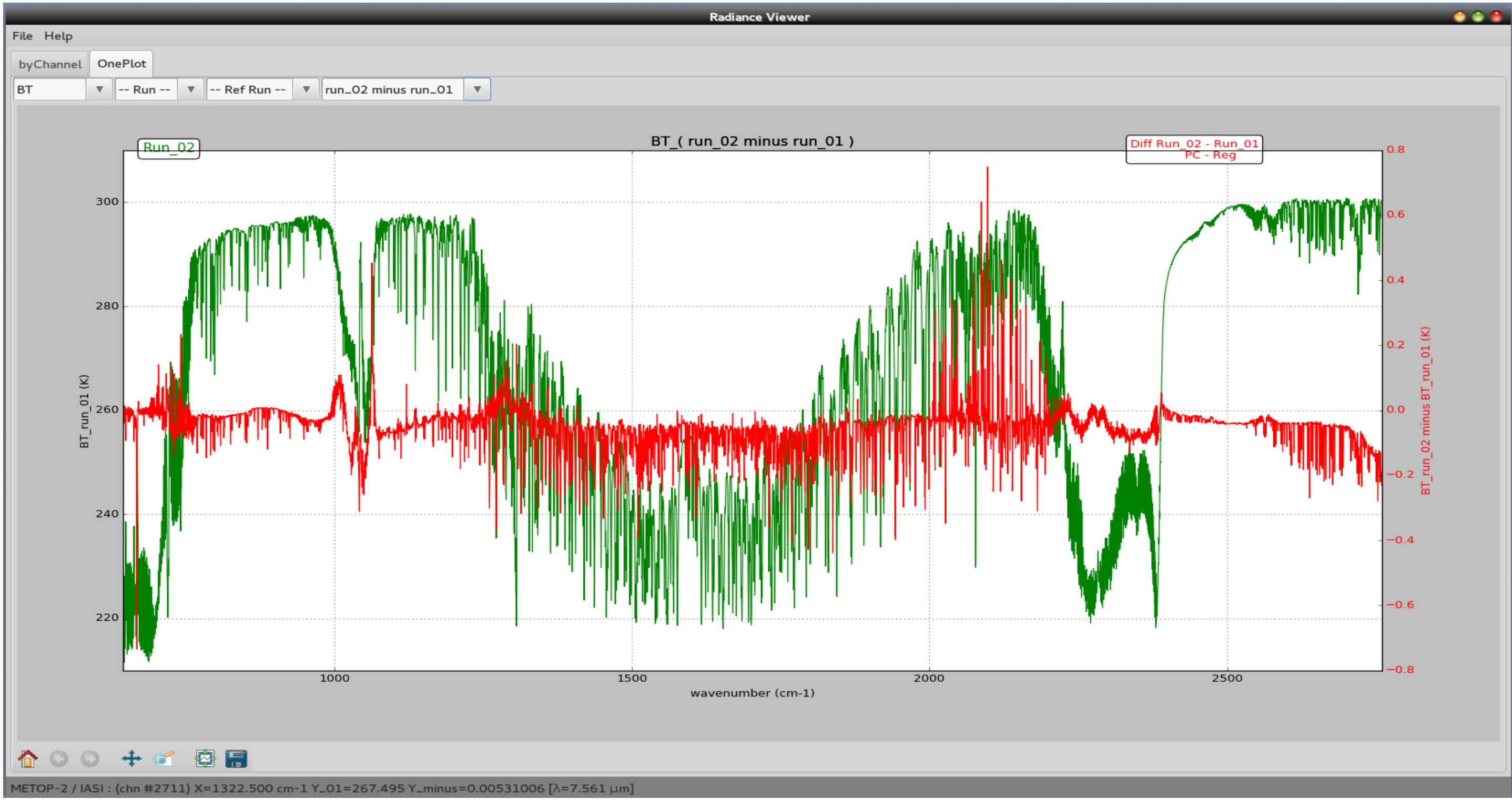
See the differences when applying the non-local thermodynamic equilibrium (NLTE) correction :
At ~2300 cm⁻¹ the difference is about 8 K.



With a RTTOV solar-compatible coefficient file, one can visualize the differences between simulated radiances with RTTOV without the solar radiation and radiances simulated with RTTOV with the solar radiation (solar zenith angle of 20 degrees).



See the difference on a IASI-NG spectrum when using a customized N₂O profile versus using the RTTOV reference profile for N₂O.
The highest differences appear where the N₂O effect is the most sensible : between 1200 and 1350 cm⁻¹ and between 2120 and 2270 cm⁻¹ (absorption bands)



PC-RTTOV is faster than RTTOV (at least 10 times faster).
One can visualize the differences between reconstructed radiances after PC-RTTOV and simulated radiances by RTTOV.