

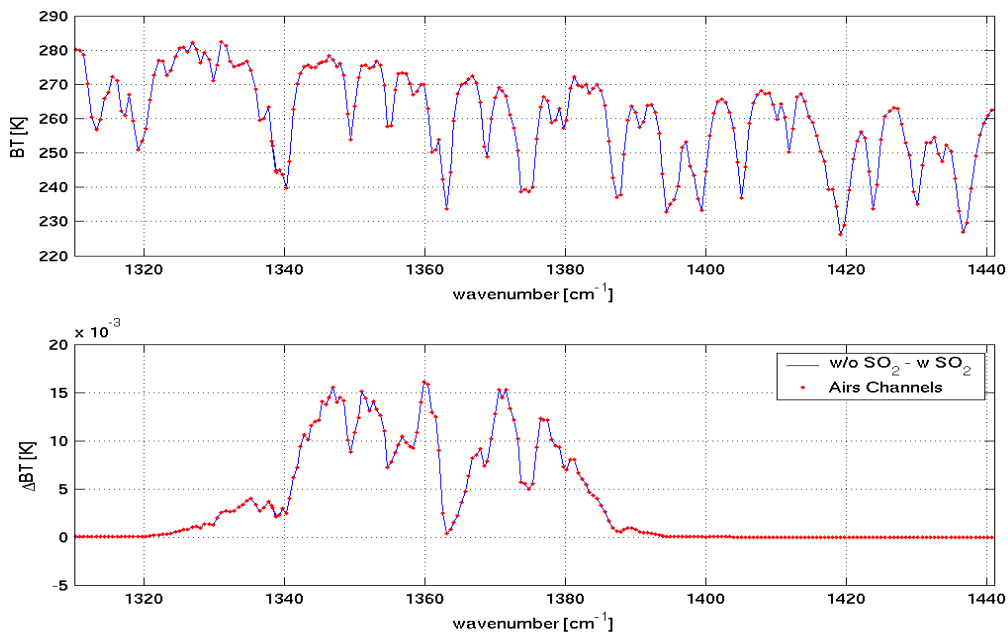
Lab 2b – High spectral resolution infrared data

Exercise 6

Open **Hydra** and load the file: AIRS.2002.10.28.123.L1.AIRS_Rad.v2.6.10.3.A02302200913 (with no extension). Try to repeat some of the operations you did for the MODIS Lab. Describe the differences between the results obtained from the observations collected by MODIS at high spatial resolution and AIRS at high spectral resolution.

This granule has been selected because of the eruption of Mount Etna.

1. Using the same software of exercise 5 and Hydra can you estimate the altitude of the volcano plume?



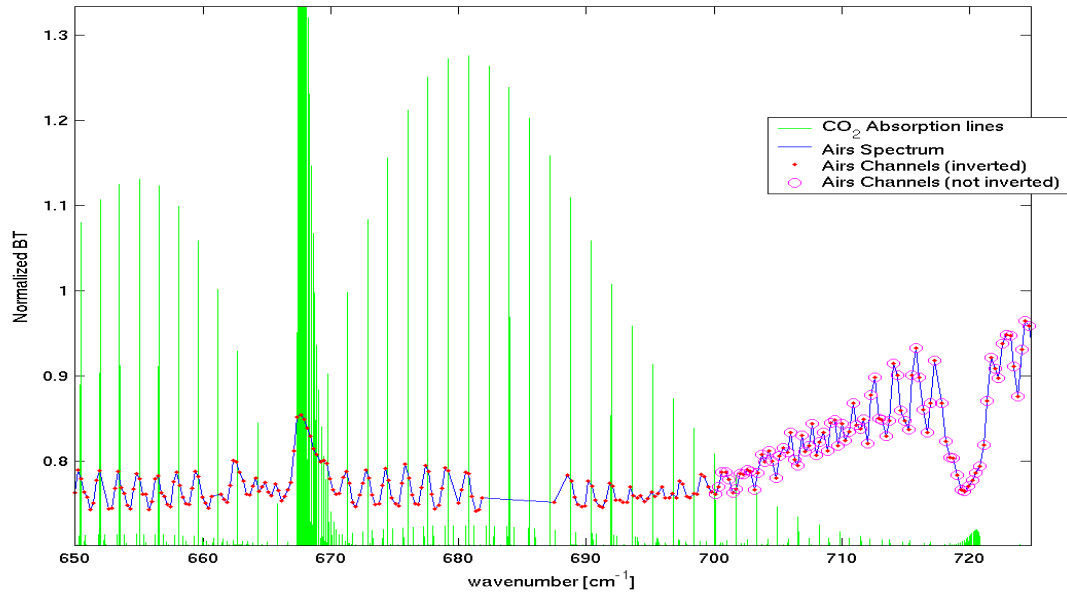
The top panel of this figure shows one simulated AIRS spectrum in the region that goes from 1320 cm^{-1} to 1441 cm^{-1} . The bottom panel shows the differences between the simulated AIRS spectrum with and without SO_2 .

2. Using the *Scatter Plot* function the difference between AAAA.A and BBBB.B wavenumber can be used to detect SO_2 . Determine the optimal values for A and B and map this difference (A-B) to the X axis. If we had to detect the volcanic plume from AVHRR we would have used the difference between 833.3 and 909.0 wavenumber. Map this difference to the Y axis and get a scatter plot. After getting the scatter plot, get color maps for X and Y. How do the two figures compare?

3. Now select a single spectrum over the smoke plume, you should be able to identify a peak around 1227.3 wavenumber. Select the difference between 1123.0 and 1227.3 wavenumber, and map it to the Y axes keeping the difference between 1376.886 and 1414.008 on the X axes. Get a scatter plot and the

color maps (with the *pseudochannels* function). Explain the differences between the colormaps with the help of the scatter plot.

4. Map the difference $(1123.0 - 1227.3) - (1376.886 - 1414.008)$ to the X axis and 907.68 to the Y axis. Get a scatter plot and a colormap for the X axis. Try to describe and explain what you observe in the colormap with the help of the scatter plot.



5. This plot shows an AIRS normalized spectrum (blue) along with the CO₂ lines (green). In the spectral regions where the red dots indicate the AIRS channels the on-line channels are warmer than the off-line channels, can you explain why? In the spectral region where the magenta circles indicate the AIRS channels the on-line channels are colder than the off-line channels, what is the difference between the two spectral regions.

6. Using Hydra plot a colormap of the tropopause temperature for the granule over Italy.

7. Create a scatter plot of $1123 \text{ cm}^{-1} - 1227 \text{ cm}^{-1}$ (on the X axis) and 833 cm^{-1} on the Y axis. Can you explain the shape of the scatter plot? What do the tails represent?