Tropospheric ozone columns over Paris (Crestel-France): diurnal variations and comparison with correlative IASI and surface observations

This new observatory named OASIS is equipped with a mid-resolution Fourier-transform infrared (FTIR) solar absorption spectrometer which measures solar absorption spectra in quasi full automatic mode over the entire year. Ozone is retrieved from the PROFIT 9.6 code [2] in a spectral window from 901 to 1073 cm\(^{-1}\) (where the interfering species are H\(_2\)O, SO\(_2\), and NH\(_3\)).

From the first analysis of in situ ozone content in OASIS retrievals, it is clear that tropospheric ozone (from the surface up to 8 km) can be monitored separately from stratospheric ozone since degrees of freedom reach unity in those two partial atmospheric layers [1].

The acquisition system was set to perform 30 scans at maximum resolution (Maximal Optical Path Difference = 12 cm) in order to have one atmospheric spectrum stored every 10 min in the computer. For each hour, median value was calculated. After normalization by daily maximum value, tropospheric ozone columns were averaged by month to see the diurnal variations.

Daily mean tropospheric ozone (integrated from the ground to 8 km) from OASIS measurements are compared to ozone columns derived from the Infrared Atmospheric Sounding Interferometer (IASI) using the same regularization method. IASI has improved sensitivity to lower atmospheric layers under conditions of higher surface temperatures and larger thermal contrast conditions [5]. This is why the comparisons here focus on 34 and 25 days of measurements acquired respectively during summer/autumn 2009 and summer/autumn 2010 that show a rather good agreement (R = 0.83).

A very good agreement was found also with the chemical-transport model REPROBUS (correlation coefficient of 0.96 and RMD = -1.20%, RMD = -4.65%).

A daily comparison of OASIS measurements with tropospheric ozone columns derived from the spaceborne Infrared Atmospheric Sounding Interferometer (IASI) over the Paris area from February 2009 to May 2012 has shown a good agreement, especially during summer months. Also, a comparison between in situ surface ozone measurements and OASIS data clearly shows OASIS’s capacity to observe diurnal tropospheric ozone variations, as well as ozone pollution episodes in the Paris area.

**Conclusions**

The new solar absorption ground-based observatory (OASIS) equipped with a mid-resolution infrared Fourier-transform spectrometer is able to continuously monitor tropospheric ozone (1) with a rather good agreement with tropospheric ozone (from the ground to 8 km) derived from IASI and (2) with a good representativity of tropospheric ozone variations and pollution episodes over Paris region.

**References**