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Measurements of ozone columns in different atmospheric layers over St. Petersburg (Russia) using ground-based FTIR spectrometer in comparison with IASI satellite data

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Ozone plays a key role in the photochemical equilibrium of the atmosphere. In the stratosphere, it absorbs harmful ultraviolet solar radiation, in the troposphere it is one of the main air pollutant, greenhouse gases and it is involved in the troposphere's oxidative capacity. In this study, we analyze the ozone variability in different atmospheric layers over St. Petersburg (Russia) measured with the ground-based FTIR spectrometer Bruker 125 HR at the Peterhof station (59.82 N, 29.88 E), and compare it to the satellite Infrared Atmospheric Sounding Interferometer (IASI) ozone retrievals.

The FTIR spectrometer has a maximum optical path difference of 180 cm, yielding an apodized spectral resolution of 0.008 cm-1, and has been recording IR spectra since 2009. The high spectral resolution of the registered spectra allows the retrieval of the ozone content in four atmospheric layers. We applied the PROFFIT inversion code to the ozone vertical profiles retrievals in 9.6-μm O_3 absorption band and calculated the daily means of ozone partial columns for about 300 days between 2009 and 2013.

The IASI instrument onboard the satellite MetOp-A measures the thermal infrared radiation emitted by the Earth's surface and the atmosphere with an apodized spectral resolution of 0.5 cm-1. We used the LISA (Laboratoire Interuniversitaire des Systemes Atmospheriques) retrieval algorithm for deriving the ozone profiles between 0 and 60 km for the region of 2 degrees around the Peterhof station in coincidence with FTIR-observation dates, and averaged profiles daily over all the pixels in the considered region.

In this study, we compare and discuss the both types of ozone retrievals: total and partial columns in four atmospheric layers (0-12 km, 12-18 km, 18-25 km, and 25-60 km) for 285 coincident days in 2009-2013.

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