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Comparison of ground-based and satellite MW measurements of vertical ozone profiles

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Ground-based and satellite microwave (MW) instruments play an important role in regional and global monitoring of the content of climatically and ecologically important gases, one of which is ozone. As is known, ozone in the stratosphere absorbs ultraviolet radiation harmful to living organisms, while in the troposphere ozone is a polluting gas due to its toxicity. The presence of rotational absorption lines of ozone in the MW region is the physical basis for using measurements of the spectra of descending and outgoing atmospheric thermal radiation to determine its content. Determination of the total content and vertical profiles of ozone is carried out using ground-based instruments within various international observation networks, for example, the NDACC (Network for the Detection of Atmospheric Composition Change) network. In Russia, ground-based MW measurements of ozone are carried out, for example, at St. Petersburg State University (SPbU) and the Institute of Applied Physics of the Russian Academy of Sciences (Nizhny Novgorod).

The MW spectrum region is also widely used for satellite monitoring of the gas composition of the atmosphere. The MLS (Microwave Limb Sounder) instrument, operating on the AURA satellite (2004), measures the thermal MW radiation of the planet's horizon and allows determining vertical profiles of ozone content at altitudes from 10 to 50–70 km with high vertical resolution (2.5–7 km). Numerous programs for validating ozone measurements by the MLS instrument have shown its high quality and the possibility of using it to validate other measurements as a secondary standard.

This report presents the results of comparisons of ground-based (SPbU MW ozonometer) and satellite (MLS) vertical profiles of ozone content, estimates the values of the mismatch and standard deviation of ozonometer measurements from MLS. Estimates of tropospheric ozone content are also presented.

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