

QOS2016-347, 2016

Quadrennial Ozone Symposium of the International Ozone Commission

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Employing DOAS procedure for the study of stratospheric ozone and nitrogen dioxide in Antarctica

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Measurement of ozone and nitrogen dioxide in the atmosphere of Polar regions poses certain interest due to absence anthropogenic sources of ozone and nitrogen dioxide in troposphere that may hinder the interpretation of the processes in the stratosphere.

The paper analyzes data on the differential slant column densities (DSCD) of ozone and nitrogen dioxide in eastern Antarctic (Progress station) retrieved with a MARS-B instrument employing DOAS technique for the period of a seasonal expedition of 2013-2014. The MARS-B instrument was engineered in NOMREC BSU and successfully passed the procedure of international inter-comparison campaign MAD-CAT 2013 (MPIC, Mainz, Germany). The instrument able to perform measurements with SZA up to 97° thus positively differing from analogous equipment.

While analyzing experimental data, one has revealed the fact that information about vertical distribution of the stratospheric trace gas can be predicted taking into account corresponding trace gas DSCD dependence on the position of the Sun. Comparison of the results with the MACC reanalysis data does not refute this hypothesis.

In the paper, dSCD of ozone, nitrogen dioxide and oxygen dimer at SZA from 85° to 97° for elevation angles 1, 2, 3, 4, 5, 6, 8, 10, 15, and 30° are presented in the form of contour diagrams aiming to retrieve cause-effect relation and calculate time delays. Correlation between ozone and nitrogen dioxide DSCDs in particular days has been detected.