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Validation of total ozone columns measurements from the Russian Arktika M satellite

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Due to its unique highly elliptical trajectory, the Arktika-M series of Russian spacecraft plays virtually the same role for the polar regions of the Northern Hemisphere as geostationary satellites do for the equatorial and mid-latitude regions of the Earth. On board the spacecraft, in addition to other equipment, is installed multispectral instrument MSU-GS, which performs measurements in 10 spectral channels in the visible and infrared spectral regions. One of the spectral channels covers the 9.6 μm ozone band, which makes it possible to determine the total ozone content in the vertical column. Due to high spatial resolution (up to 4 km nadir) and periodicity of measurements (15 minutes), the instrument provides unique information on spatial and temporal variability of the total ozone content in the vertical column of the atmosphere (VCO). On the initiative of one of the authors of the report Yu.M. Timofeev, we compared the TO obtained from the Arktika M series satellites with independent satellite (TROPOMI instrument onboard the S5P spacecraft) and ground-based data (direct-Sun transparency measurements at the stations of the ozonometric network by the Brewer and Dobson instruments) and made qualitative comparisons of the TO distribution with the independent data. It was shown that the mean difference between the MSU-GS and TROPOMI data ranged from 1.3 to 21.6 DU (0.4 to 5%) in absolute value on different measurement days, and the standard deviation of the difference (scatter) from 16.9 to 26.4 DU (5.4 to 7.9%). Comparisons with the data of the ozonometric network showed that the mean differences between satellite and ground data were 5.1 DU (1.4%) and the standard deviation of the differences was 34.9 DU (9.6%). These values differ significantly for different ozone sounding stations.

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