

CH₄, H₂O, N₂O, and temperature from the mid-troposphere to the stratosphere in the northern mid- and high-latitudes

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Profiles of CH₄ have been retrieved from satellite-borne nadir sensors since 1996 by measuring thermal infrared (TIR) emissions from the Earth's atmosphere. GOSAT/TANSO-FTS has been operated since 2009. Profiles of CO₂ and CH₄ are retrieved from the TIR band of the TANSO-FTS. In this study, we assess data quality for CH₄, H₂O, N₂O, and temperature between the mid-troposphere and the stratosphere, contributing the improvement of our knowledge on CH₄ distributions, for instance, in the western Siberia. For comparisons with the TIR data, we used the solar occultation sensor, ACE-FTS, and the routine aircraft observations in the western Siberia. We found that (1) TIR CH₄ mixing ratios are systematically larger than ACE-FTS CH₄ in the 400-200 hPa levels between January and April in 2010/2011, especially in January, several profiles exceeded 2.0 ppmv of CH₄ at the 300 hPa level. (2) TIR H₂O mixing ratios are larger than ACE-FTS H₂O in the 300-250 hPa levels and the above throughout the period studied. (3) TIR CH₄ at the 7 km (430 hPa) and the 5.5 km (500 hPa) altitudes are in good agreement with those from the aircraft observations from the temporal variation view within the range of variations in TIR CH₄.

Acknowledgements: We thank Kaley A. Walker, University of Toronto, Canada for providing us the Version 3.5 ACE-FTS data through <http://ace.uwaterloo.ca>. This research was supported by the Environment Research and Technology Development Fund (ERTDF) of the Ministry of the Environment, Japan (A1202). Aircraft observations in the western Siberia are conducted by NIES with the cooperation of Russian Academy of Science (RAS).

Keywords: methane, troposphere, stratosphere, GOSAT, aircraft