Geophysical Research Abstracts
Vol. 14, EGU2012-3949, 2012
EGU General Assembly 2012

Effects of atmospheric light scattering in validating spectroscopic space-based observations of carbon dioxide by ground-based FTS measurements

S. Oshchepkov (1), A. Bril (1), T. Yokota (1), I. Morino (1), Y. Yoshida (1), T. Matsunaga (1), D. Wunch (2), G. Toon (2), C. O'Dell (3), A. Butz (4), H. Boesch (5), N. Eguchi (6), and the TCCON Team

(1) National Institute for Environmental Studies, Tsukuba, Japan, (2) California Institute of Technology, Pasadena, CA, USA, (3) Colorado State University, Fort Collins, CO, USA, (4) Karlsruhe Institute of Technology, IMK-ASF, Karlsruhe, Germany, (5) Earth Observation Science, Space Research Centre, University of Leicester, UK, (6) Research Institute for Applied Mechanics, Kyushu University, Japan

This work describes a validation study of the Greenhouse gases Observing SATellite (GOSAT) data processing using ground-based measurements from the Total Carbon Column Observing Network (TCCON) as the reference data for column-averaged dry air mole fractions of atmospheric carbon dioxide (XCO_2) during 22 months from June 2009. First we focus on the validation of the path length probability density function (PPDF) method when processing the GOSAT observations. This method permits direct evaluation of the optical path modifications due to atmospheric light scattering whose impact is negligible on the ground-based TCCON measurements but could significantly affect the results of gas retrievals when observing the green house gases from space. We have found an effect from lengthening the optical path over Northern hemisphere stations essentially from June to September each year and from shortening the optical path for sun glint observations in the tropical regions. Removing these observations from the GOSAT dataset provided acceptable agreement in seasonal variability of carbon dioxide over each station as compared with TCCON measurements. A statistical comparison between GOSAT and TCCON co-incident measurements of CO_2 column abundance showed a correlation coefficient 0.8; a standard deviation of 2.15 ppmv, and a small negative bias of 0.4 ppmv over all 12 TCCON sites. Next PPDF-based data processing was compared with those derived by other algorithms including the official GOSAT data products from the National Institute for Environmental Studies (NIES, Japan) and NASA's Atmospheric CO_2 Observations from Space (ACOS). We compare the XCO_2 GOSAT-TCCON correlation diagrams and its seasonal variability for each algorithm with special emphasis on how the GOSAT single scans derived by each algorithm are distributed by the optical path modification.