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Maximization of information content extracted from GOSAT thermal infrared measurements on δHDO in the atmosphere using ground based WS-CRDS and FTIR measurements together with ECHAM5-wiso simulations

Konstantin Gribanov (1), Jean Jouzel (2), Vladislav Bastrikov (1,2,4), Jean-Louis Bonne (2), Francois-Marie Breon (2), Martin Butzin (3), Olivier Cattani (2), Marina Kolyasnikova (1), Valérie Masson-Delmotte (2), Nikita Rokotyan (1), Martin Werner (3), and Vyacheslav Zakharov (1)

(1) Ural Fedral University, Institute of Natural Sciences, Climate and Environmental Physics Lab., Yekaterinburg, Russian Federation (kgribanov@remotesensing.ru), (2) Institut Pierre Simon Laplace, Laboratoire des Sciences du Climat et de l'Environnement, Gif-sur-Yvette, France (jean.jouzel@lsce.ipsl.fr), (3) Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany (martin.werner@awi.de), (4) Institute of Industrial Ecology SB RAS, Yekaterinburg, Russia

Water stable isotopologues provide integrated tracers of the atmospheric water cycle, affected by changes in air mass origin, non-convective and convective processes and continental recycling. In spite of the presence of distinct spectral features of HDO molecule in TANSO-FTS/GOSAT thermal infrared spectra, the retrieval of vertical profiles of δHDO value in the atmosphere remains very difficult task. It is caused, first, by the lack of sufficiently representative set of simultaneously and directly measured vertical profiles of HDO and $H_2^{16}O$, secondly, by high variability of the concentration of main water isotopologue in the atmosphere, and, finally, by low signal to noise ratio for northern latitudes of Western Siberia (target region of the study). In this study, in situ WS-CRDS measurements (Picarro L2130-i), FTIR measurements (Bruker Optics IFS125M) of columnar values, and model simulations (ECHAM5-wiso in nudged mode) were applied for obtaining the extra constraints in the δHDO retrieval from GOSAT data. Adjustable parameters of retrieval algorithm were used for maximization of information content on δHDO value in GOSAT thermal infrared measurements. The retrieval of δHDO for Western Siberia and intercomparison of retrieved, measured, and simulated data are represented for several months of 2012.

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