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Influence of the linear-k method on the accuracy and computational efficiency of GOSAT BESD XCO_2 retrievals

Michael Hilker, Maximilian Reuter, Jens Heymann, Oliver Schneising, Michael Buchwitz, Heinrich Bovensmann, and John Burrows

University of Bremen, Institute of Environmental Physics, Bremen, Germany (mhilker@iup.physik.uni-bremen.de)

Carbon dioxide (CO_2) is the most important anthropogenic greenhouse gas contributing to global climate change but there are still large uncertainities of its sources and sinks. Global measurements of CO_2 concentrations from satellites have the potential to reduce these uncertainities. This however requires to meet challenging accuracy requirements.

The Bremen Optimal Estimation - DOAS (BESD) retrieval algorithm has been developed to retrieve column-averaged dry air mole fractions of CO_2 (XCO_2) from measurements of the SCIAMACHY instrument onboard ENVISAT. After the end of the ENVISAT mission in March 2012, TANSO onboard GOSAT is the only satellite instrument with high sensitivity near the surface. To obtain a consistent global long-term XCO_2 data set from these two instruments, a modified version of the BESD algorithm is also used for the retrieval of XCO_2 from GOSAT. BESD requires computational expensive online radiative transfer calculations with high spectral resolution for an absorbing and scattering atmosphere. Due to higher spectral resolution of TANSO, approximations used to reduce computation time for SCIAMACHY retrievals are no longer valid. In order to improve the computational efficiency, a modified linear-k method is used. Implemented modifications and first results of a validation with line-by-line based BESD retrievals are presented.