Inter-comparison of aerosol information handling to the CO_2 retrieval from GOSAT measurements

Yeonjin Jung (1), Jhoon Kim (1), Woogyung Kim (1), Hartmut Boesch (2), Tae-Young Goo (3), and Chun-Ho Cho (4)

(1) Department of Atmospheric Sciences, Yonsei University, Seoul, Korea, (2) Department of Physics and Astronomy, University of Leicester, Leicester, UK, (3) Global Environment System Research Division, National Institute of Meteorological Research, Jeju, Korea, (4) Forecast Research Division, National Institute of Meteorological Research, Jeju, Korea

The carbon dioxide (CO_2) retrieval algorithm based on optimal estimation method was developed and its performance was analyzed. In sensitivity analysis using simulated radiance spectra at difference surface and atmospheric conditions, the aerosol-related parameters such as total AOD and aerosol optical properties are the most important state vector in CO_2 retrieval, resulting in errors up to 6.5 ppm by aerosol optical information. These errors are caused by the simplified aerosol assumptions, which only represent a subset of three potential aerosol optical properties, and can be also increased in CO_2 retrieval using real-spectra. As aerosols in the atmosphere are highly variable in their amount, vertical distribution and optical properties, those can be under-constrained (Frankenberg et al., 2012). In this study, the aerosol information in CO_2 retrievals are presented by 9 parameters, consisting of the vertical profile height and width, aerosol size distribution and refractive index parameters as aerosol-related state vectors. The CO_2 retrievals with two difference aerosol approaches have been analyzed using the Greenhouse Gases Observing SATellite (GOSAT) spectra over East-Asia and have been evaluated throughout the comparison with collocated ground-based observations at several Total Carbon Column Observing Network (TCCON) sites. These results would improve the accuracy of CO_2 retrieval algorithm taking into account aerosol information and provide useful information to reduce uncertainty and increase data availability.