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Performance test of carbon dioxide retrieval algorithm over East Asia

Woogyung Kim (1), Yeonjin Jung (1), Jhoon Kim (1), Hanlim Lee (2), Hartmut Boesch (3), Mi-Lim Ou (4), and Tae-young Goo (5)

(1) Dept. of Atmospheric Sciences, Yonsei University, Seoul, Korea, (2) Dept. of Geoinformatic Engineering, Pukyong National University, Korea, (3) University of Leicester, Leicester, UK, (4) Korea Meteorological Administration, Seoul, Korea, (5) National Institute of Meteorological Research, KMA, Seoul, Korea

In this study, current state of CO_2 retrieval algorithm development using aerosol information retrieved from TANSO-CAI is introduced and preliminary results are shown. Previous studies about GOSAT CO_2 retrieval algorithm shows incorrect aerosol information induce considerable error in retrieved CO_2 concentration. Most of algorithm use chemical transport model result as a priori aerosol information, however, model has a limitation to provide accurate aerosol information. By using TANSO-CAI aerosol retrieval results, this algorithm is expected to improve the accuracy and data availability especially for East Asia region where the aerosol concentration is higher than other region. Algorithm is based on optimal estimation method and utilized VLIDORT as radiative transfer model to consider polarization effect. Various factors, CO_2, H_2O, temperature, aerosol, surface albedo, surface pressure and wavenumber shift are considered as state vector. To research the performance of algorithm, retrieval test with synthetic data are carried out. Synthetic GOSAT spectra of various atmospheres which can represent East Asia are simulated with high accuracy. To prepare highly realistic spectra randomized spectral noise and wave length shift of each band are added. Based on those synthetic GOSAT data, reference test are performed to evaluate the performance of this algorithm, errors induced by incorrect atmosphere information and characteristics of retrieval on East Asia. According to results, most of those artificial errors are removed during each iteration step and remaining retrieval CO_2 errors of final step is approximately 1ppm. The error induced by wave number shift and aerosol optical property, for instance aerosol type and AOD is relatively higher than error induced by other factors. After the reference test, this proto type algorithm is applied to real GOSAT measured spectra over TCCON site for validation. Validation result show clear bias, however the amount and direction is different from each sites. Those biases are assumed to be the effect of other factors for example, fluorescence, methane, cloud and aerosol. Those biases should be improved in further study.