Sensitivity experiment of aerosol models in aerosol retrieval algorithm and comparison with ground-based observation using GOSAT/CAI and GOSAT-2/CAI-2 data

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Aerosol particles in the atmosphere has an impact not only for the Earth’s radiation budget and changing the Earth’s climate, but also on human health. These aerosol particles are often generated by human activity and are transported to other regions. Satellite remote sensing is an effective way to monitor the atmospheric aerosols in wide area including a source region like an urban area.

Greenhouse gases Observing Satellite-2 (GOSAT-2) that is a successor of GOSAT was launched on October 29th, 2019. GOSAT- 2 has Cloud and Aerosol Imager called CAI-2. CAI-2 performs two-directional observation in forward and backward directions and makes an observation at ten bands composed of seven wavelengths at 340, 380, 443, 550, 674, 869 and 1630 nm. The spatial resolution (IFOV) is 920 m at a wavelength of 1630 nm and 460 m at the other wavelengths. CAI-2 is characterized by having two ultraviolet (UV) bands at 340 and 380 nm. UV band has sensitivity for light absorption of dust particles and light absorption particles such as BC and OC.

We have developed aerosol retrieval algorithm called MWPM (Multiple wavelengths and pixels method) (Hashimoto and Nakajima, 2017). The method simultaneously retrieves fine and coarse mode AOT and single scattering albedo by using several wavelengths and spatial difference of surface reflectance. The method is useful for aerosol retrieval over spatially inhomogeneous surface region like an urban area. The algorithm is applied to CAI-2 aerosol retrieval, and aerosol optical properties such as AOT of fine and coarse particles, Ångström exponent (AE), and BC volume fraction are derived.
In this algorithm, we assume aerosol models for fine and coarse mode aerosols. However, aerosol particle size and these light absorption properties are different in different regions. It is important to know a bias occurred by assumed aerosol models when we validate the aerosol products by ground-based observations and modify the algorithm, so we have investigated the impact on the products by assumed aerosol models, such as aerosol size distribution, complex refractive indices, aerosol height etc.. We show the result of the sensitivity test and discuss aerosol models in the algorithm using a comparison result between aerosol properties from GOSAT CAI/GOSAT-2 CAI-2 and that from ground- based observation such as AERONET and SKYNET.

Keywords: Aerosol, Remote sensing , Atmospheric radiative transfer

