GOSAT/CAIおよびGOSAT-2/CAI-2データを用いたMWPM法による全球エアロゾル特性の導出
Global aerosol properties from GOSAT/CAI and GOSAT-2/CAI-2 by MWPM

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Aerosols continue to contribute the largest uncertainty to estimates and interpretations of the Earth's changing energy budget (IPCC, 2015) because of the strong temporal and spatial variability and a wide range of microphysical and optical properties of the aerosol particles. Aerosol properties from satellites are useful to evaluate global worming or climate change. Anthropogenic aerosols over land are less accurately quantified.

We have developed a satellite remote sensing algorithm to retrieve the aerosol optical properties using multi-wavelength and multi-pixel information of satellite imagers (MWPM). The method simultaneously derives aerosol optical properties, such as aerosol optical thickness (AOT), single scattering albedo (SSA) and aerosol size information, by using spatial difference of wavelegths (multi-wavelength) and surface reflectances (multi-pixel). The method is useful for aerosol retrieval over spatially heterogeneous surface like an urban region.

In this algorithm, the inversion method is a combination of an optimal method and smoothing constraint for the state vector. Furthermore, this method has been combined with the direct radiation transfer calculation (RTM). However, it takes too much computation time. To accelerate the calculation time, we replaced the RTM with an accelerated RTM solver learned by neural network-based method, EXAM (Takenaka et al., 2011), using Rster code. And then, the calculation time was shortend to about one thouthandth.

We applyed MWPM combined with EXAM to GOSAT/TANSO-CAI (Cloud and Aerosol Imager). CAI is a supplement sensor of TANSO-FTS, dedicated to measure cloud and aerosol properties. CAI has four bands, 380, 674, 870 and 1600 nm, and observes in 500 meters resolution for band1, band2 and band3, and 1.5 km for band4. Retrieved parameters are aerosol optical properties, such as aerosol optical thickness (AOT) of fine and coarse mode particles at a wavelenth of 500nm, a volume soot fraction in fine mode particles, and ground surface albedo of each observed wavelength by combining a minimum reflectance method and Fukuda et al. (2013). We will show the results of global aerosol properties from CAI and discuss the accuracy of the algorithm for various surface types.

Our future work is to extend the algorithm for analysis of GOSAT-2/TANSO-CAI-2 that will be launched in FY2018, and also GCOM/C-SGLI and Himawari-8/AHI data.

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