New Approach for Retrieving Aerosol AOD and SSA Properties from Himawari-8 Geostationary Satellite Data in Asia

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Air pollution is a severe and worldwide issue, especially in East Asia. For regional monitoring, satellite observation can compensate the limitation of point measurement of the ground station to provide the source emissions and affected areas. Currently, Asian geostationary satellite (Himawari-8, H8) data with 10-min frequency are the best choice for servicing the intensive monitor. However, the operational retrieval of the aerosol property is still mediocre even unavailable, such as aerosol optical depth (AOD) and single scattering albedo (SSA) based on H8 data (in particular the property of SSA). For this objective, we try to propose a new approach based on the physical kernel from multiple simultaneous radiative transfer equations (RTE) by 6S (Second Simulation of the Satellite Signal in the Solar Spectrum) model. First of all, we derive the total transmittance and atmospheric reflectance (Ra) based on the surface reflectivity from the minimum reflectance technology (MRT) under the hypothesis of stable atmospheric conditions for a certain window size (e.g. 5×5 pixels). To evaluate aerosol SSA, the strong scattering and absorption aerosol modes in the 6S model are employed to analyze the relationship between total transmittance by satellite and direct transmittance from the target pixel for matching up the level of Ra. Consequently, the properties of AOD and SSA could be obtained simultaneously with H8 data. The results show very high potential for the proposed approach in retrieving AOD and SSA properties with H8 data by comparison with ground-based measurements (AERONET), and even better than MODIS aerosol products.