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Development of a dust height retrieval algorithm using the O4 measurements based on OMI

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In this present study, we present an improved retrieval algorithm for Dust Peak Height (DPH) from O_4 absorption at 477 nm based on space-borne measurements. Here, we tried to improve the algorithm by applying O_4 Air Mass Factor (AMF) to consider the both variations of O_4 Slant Column Density (SCD) and O_4 Vertical Column Density (VCD). Temperature-dependent O_4 cross section is used when constructing Look Up Table (LUT) of O_4 AMF to reduce discrepancy between measured O_4 AMF and simulated O_4 AMF. The main algorithm consists of two sub-algorithms (spectrum fitting algorithm and O_4 VCD calculation algorithm) and a LUT of O_4 AMF. Some filtering parameters on LUT, which can affect on O_4 AMF, are determined by sensitivity test between O_4 AMF against the parameters: O_4 VCD, geometries, surface reflectance, Aeorosol Optical Depth (AOD), and aerosol height. Especially, several O_4 VCDs are used in the LUT as O_4 VCD depends on temperature, pressure, and terrain height. The LUT of O_4 AMF is constructed based on the radiative transfer simulation. Inapropriate O_4 VCD assumption can lead to DPH uncertainties more than 89% in dust source region like Gobi Desert (surface altitude $>$ 1 km) in Northeast Asia. The algorithm shows a good performance between true DPH and retrieved DPH (Root mean bias = -0.04 km) in blind test using the Ozone Monitoring Instrument (OMI) synthetic spectrum. We also attempted to retrieve DPH height using the hyperspectral L1B data measured by OMI in Northeast Asia. The DPH retrieved from OMI L1B data (DPH_{OMI}) is compared with DPH measured by National Institute for Environmental Studies (NIES) lidar measurements (DPH_{NIES}). Mean Bias and percent difference between retrieved DPH_{OMI} and DPH_{NIES} are calculated as 0.15 km and 22%, respectively.