Determination of Soot Aggregates Mixing Weight for Dust Optical Property with Satellite and Ground Observations

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Abstract: Previous surveys indicate that most Asian dust particles are mixed with soot aggregates after transportation, which dramatically alter the physiochemical characteristics of dust particles. Consequently, the uncertainty of dust retrievals (AOD and SSA) could be expanded if the mixing/polluted effect is neglected. In order to take the mixing/polluted effect into account, this study aims to determine the mixing weights for retrieving the optical properties of dust/soot mixture. Assuming that the SSAs (or index of refraction) of pure dust events and local pollution (soot aggregates loadings) are constants, the fraction of soot aggregates can be derived from the observed SSA with pre-computed look-up tables based on the principle of the Deep Blue algorithm. By using the long term observations of the AERONET at local sites as the representative SSA of pure dusts, the atmospheric reflectance of MODIS spectral bands can be constructed as the function of soot mixing weight. The results of case studies in determining the soot mixing weights with MODIS data around Cairo region indicate that the proposed approach is highly practical after compared with ground measurements.

Keyword: Dust/soot mixture, mixing Weights, AOD, SSA, AERONET, MODIS