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Aerosol type classification using depolarization ratios retrieved by AERONET sun–sky radiometer data

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The particle depolarization ratios at 1020 nm, were derived using data taken with the AERONET sun-sky radiometer at Beijing, Seoul, Gosan, and Osaka. The depolarization ratio retrieved sun-sky radiometer can be used as a parameter to obtain aerosol sphericity/nonsphericity. The single-scattering albedo increases with increasing measurement wavelength for low linear particle depolarization ratios, which indicates a high share of fine-mode anthropogenic pollution. In contrast, single-scattering albedo increases with increasing wavelength for high linear particle depolarization ratios, which indicated a high share of coarse-mode mineral dust particles. In order to determine the range of the aerosol type, the range of the depolarization value was determined as Pollution (particle depolarization ratio < 0.07), Pollution-dominant ($0.07 \leq$ particle depolarization ratio < 0.15), Dust–dominant ($0.15 \leq$ particle depolarization ratio < 0.25), and dust (particle depolarization ratio > 0.25). In the case of pollution-dominant particles, it was distinguished in SA, MA and HA using SSA value at 1020 nm. Finally, the sun sky-radiometer observed aerosol type classification is significantly improved in dust type aerosol cases. Our study clearly demonstrates monitoring aerosol optical properties over East Asia.