Aerosol type classification of ground-based remote sensing data by k-means clustering

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Aerosols, microscopic particles suspended in the air, are known to affect climate through their direct effects of scattering and absorbing solar radiation and indirect effects of altering the radiation budget via the role of cloud condensation nuclei. Since the effects on climate are different depending on the type of aerosols, it is important to classify the observation data into aerosol types. SKYNET is an international ground-based remote sensing observation network focusing mainly on aerosol observations by the skyradiometer. Data from more than 100 observation sites are available. This study attempts to develop a k-means clustering algorithm in order to classify normalized aerosol parameters retrieved from skyradiometer observations at SKYNET sites (e.g., complex refractive index, single scattering albedo, and asymmetry parameters) into different aerosol types for characterizing each observation site. To check our developed clustering algorithm and parameters used, we first applied our method to more than 120,000 AERONET data obtained for the past 10 years and compared the results of classification with those from previous studies. Especially for the biomass burning and urban clusters indicated by our method, the sites were classified into almost the same clusters as expected from previous studies, and their mean parameters were also found to be similar. This suggests that our method is reasonable particularly for biomass burning and urban clusters. In addition, our classification results for SKYNET sites will be presented in this presentation.

Keywords: Aerosol classification, SKYNET, Clustering algorithm