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# Study of aerosol climatology using data collected by SKYNET network

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Aerosols are known to play important roles on atmospheric heat budget and climate change through their direct and indirect effects. The roles on aerosols on climate change are still not clearly understood due to associated uncertainties in their physical, chemical, and optical characteristics. The characteristics of aerosols are known to vary spatially and temporally. Therefore, spatial information of aerosol characteristics is very important to clearly understand aerosol direct and indirect effects on climate change. SKYNET network (http://atmos.cr.chiba-u.ac.jp/ ), which has several monitoring stations at different parts of the Earth, including Asia and Europe, is continuously measuring data related to aerosols, clouds, radiation, and meteorology. One of the key instruments of the SKYNET network is the sky radiometer (manufactured by PREDE Co. Ltd., Japan). This instrument has the capacity to give columnar information of aerosol, cloud, and water vapor. In this study, we use data of sky radiometer to study aerosol climatology of different atmospheric scenarios.

Figure 1 shows the monthly variations of aerosol (a) optical thickness (AOT) at 500nm, (b)single scattering albedo (SSA) at 500nm, (c) radiative forcing at the surface, and (c) radiative forcing at the top of the atmosphere (TOA) for some urban sites of SKYNET network. As shown in Figure 1(a), AOTs at 500nm are different depending on the observation site. Regardless of the observation site, it is likely that AOTs at 500nm are higher in the summer season. This may be due to the effect of atmospheric water vapor. Figure 1(b) also shows dissimilar SSA values at 500nm for different observation sites. The monthly mean SSA values were observed to fall within 0.85 to 1.0. Those data resemble different aerosol sources depending on the observation site. Figure 1(c) shows aerosol radiative forcing at the surface. Similarly, Figure 1(d) shows the aerosol forcing at the TOA. As shown in Figures 1(c) and 1(d), monthly aerosol forcings at the surface and TOA were different at different sites. They were due to the different values of AOT and SSA, which can be seen in Figures 1(a) and 1(b). Though the observation times are not same for all of those sites, it can be suggested that the aerosol radiative characteristics of urban atmospheres cannot be represented by a single set of optical parameters.

Keywords: Aerosol optical thickness, single scattering albedo, aerosol radiative forcing, aerosol heating rate