Classification of Dust/Non-dust Particle from the Asian Dust Plumes and Retrieval of Microphysical Properties using Multiwavelength Raman Lidar System

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East Asia is one of the main source regions of aerosol pollution. It has been estimated that emission from industry and automobiles, dust emission from the large desert areas, and forest fire smoke in Siberia contribute to one-fourth to one-third of the total global emissions of the organic matter, soot, and dust (Ginoux *et al*., 2004). Dust storms that originate in the Taklamakan desert of China and the Gobi desert of Inner Mongolia occur frequently and are one major source of the dust emission in East Asia (Huang *et al*., 2005). Korea is located in the downwind area of the Asian continent and is significatly influenced by long-range transported dust in each spring season. Durinng transportthe dust particles could mix and react with other chemical components (e.g., SO_4^{2-}, NO_3^- and sea salt), which modify the optical and microphysical properties of the Asian dust.

In this study the particle depolarization ratio were retrieved from the observation with a multiwavelength Raman lidar at Gwangju, Korea (35.11˚N, 126.54˚E). The measurements were carried out on 24 February and 9 March 2004. Using the particle depolarization ratio, the non-dust particles were distinguished from the Asian dust plume, and the proportion of the non-dust particle to total dust plume was retrieved as shown in figure 1.

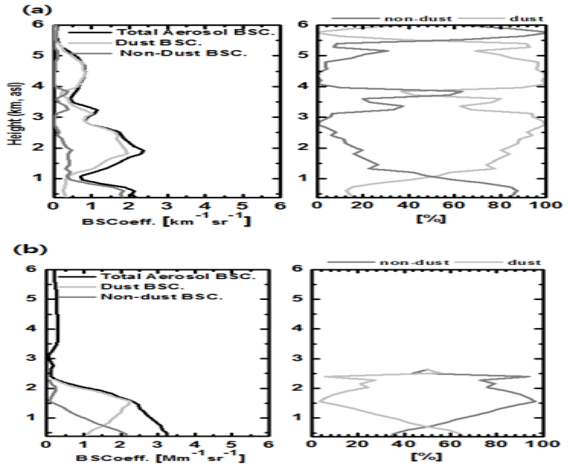

Figure 1. The vertical profiles of backscattering coefficient. The backscattering coefficient of total aerosol (black solid line), dust (light gray solid line) and non-dust particle (gray solid line) at 532 nm and the proportion of dust (gray color) and non-dust (light gray color) particle to the total aerosol (a) 24th Feb (b) 9th Mar

The calculated proportion of the non-dust particle was used for the retrieval of backscatter coefficients at 355, 532, and 1064nm and extinction coefficients at 355 and 532 nm of non-dust particles in the dust plume. Microphysical parameters of non-dust particles including single-scattering albedo at 532 nm were retrieved using retrieved optical values. The retrieved single-scattering albedo of non-dust particles was 0.92-0.95 below 1 km height and 0.82-0.91 above 1 km height on 24 February and 0.81±0.03 on 9 March 2004 as shown figure 2.

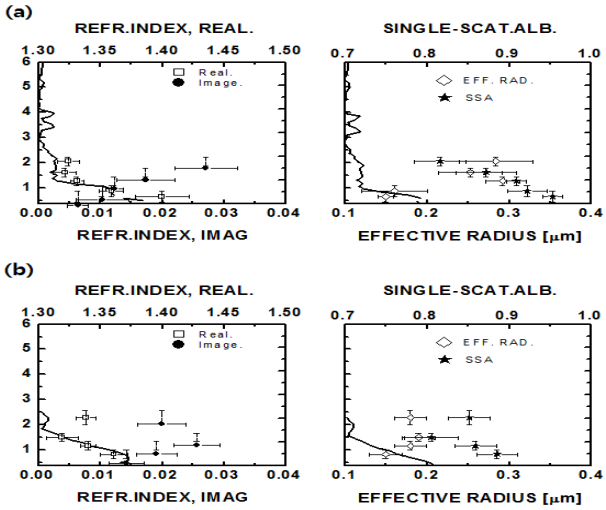

Figure 2. Microphysical parameters. Refractive index real part, Refractive index imaginary part, Particle effective radius and single scattering ableo

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