Long-term study on the physical characteristics of polar aerosols at the King Sejong station, Antarctic Peninsula

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Antarctica is a significant region for studying climate change of the Earth due to experiencing dramatic changes (Chen et al. 2009; Pritchard et al. 2009). Aerosol particles are one of various factors for climate change in the Antarctica. The Antarctica where there is less anthropogenic emission source is also good place for studying sources and processes of natural aerosols. However, still there is a lack of long-term information on physical characteristics of aerosols due to environmental conditions. In this study, we present seasonal and monthly physical characteristics of aerosol particles at the Korean Antarctic station King Sejong (62°13'S, 58°47'W), Antarctic Peninsula.

The simultaneous observations of physical characteristics of aerosol particles were conducted from March 2009 to February 2015. A condensation particle counters (TSI 3772 and 3776), a CCN counter (DMT CCN-100), and an Aethalometer (Magee Scientific, AE-22) were used to determine physical characteristics (e.g., concentrations of condensation nuclei (CN), cloud condensation nuclei (CCN), and black carbon (BC)) of aerosols. Aerosol number size distributions were also measured in the size range 10-300 nm with a scanning mobility particle sizer (SMPS).

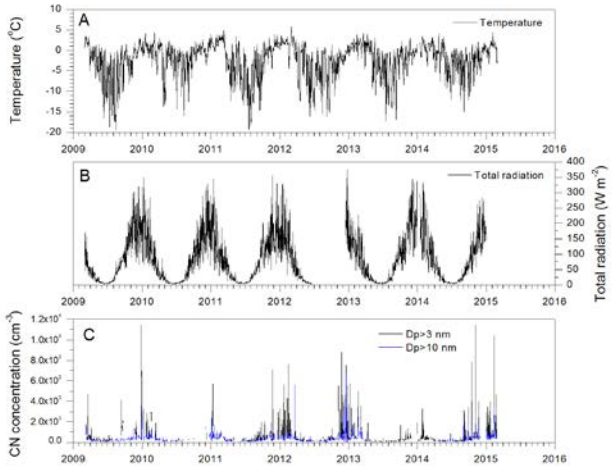

Figure 1. Daily variation of mean values of (a) temperature, (b) total radiation, and (c) CN concentrations of particles larger than 3 nm (black line) and 10 nm (blue line).

Figure 1 presents daily mean values of temperature, total radiation, and CN concentrations of particles larger than 3 and 10 nm. Clear characteristics of CN concentrations, temperature, and total radiation are observed. As shown in Figure 1(c), maximum CN concentrations were observed during austral summer, while minimum values were observed from May to August between late autumn and winter period. This result is in good agreement with observation results from other Antarctic stations (Virkkula et al. 2009).

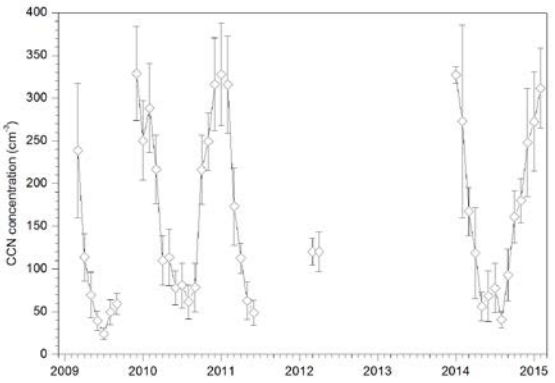

Figure 2. Monthly variation of CCN concentration at a SS value of 1.0% from March 2009 to February 2015 with a standard deviation.

Figure 2 shows monthly mean values of CCN concentration at a supersaturation (SS) value of 1.0%. The CCN concentrations were also highest during austral summer period, while the lowest CCN concentrations were observed during winter.

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