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ATMOSPHERIC PARTICLE FORMATION EVENTS OBSERVED AT THE KING SEJONG STATION, ANTARCTICA

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Global radiation budget is affected by natural and anthropogenic aerosols, directly through solar radiation scattering, and indirectly through cloud albedo change. Secondary aerosol formation is ubiquitous, Antarctic and Arctic areas, urban areas, coastal environments, marine boundary layers, and boreal forests. These secondary produced particles play an important role in global climate and atmospheric chemistry processes because they can grow to radiatively-active sizes through physico-chemical processes.

Condensation Particle Counters (CPC) with different cut-off diameter (TSI CPC model 3025: D > 3nm and 3010: D > 10 nm) were deployed at the King Sejong station (KSJ, 62.22 ^{o}S, 58.78 ^{o}W) to measure nano-meter size aerosol formation with a time resolution of 1 second, for 33 days from 6 Dec. 2005 to 7 Jan. 2006. In parallel, an Optical Particle Counter (OPC, Grimm model 1.108) was used to measure particle number size distribution from 0.3 μm to 20 μm with time a time resolution of 5 minutes. Meteorological data, such as solar irradiance, air temperature, wind speeds and direction, atmospheric pressure, were obtained from the KSJ meteorological observation tower.

Results show that total aerosol concentration under a clean air mass condition is around 300 – 400 cm^{-3}. During a particle formation event, number concentration of particles with diameter between 3 nm and 10 nm reach up to 50,000 cm^{-3} while the background number concentration (D > 10nm) remained as 300 – 400 cm^{-3}. These events continued for more than 4-5 hours depending on the availability of the direct solar radiation, with smooth increases in the number of particles larger than 10 nm.

These freshly nucleated particles can grow to accumulation mode sizes and affect radiation budget in the Antarctic regions and eventually the global climate. The importance of direct solar radiation in the Antarctic particle formation events during the austral summer season seems to impose the involvement of photo-chemistry of biologically driven precursor gases.