Measurements of Aerosol Optical Properties from Gosan, South Korea

A. Jefferson[1,2], S.-W. Kim[2,3], J. Harris[2], E. Dutton[2], and J. Ogren[2]

[1]Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder 80309; 303-497-6493, Fax: 303-497-5590, E-mail: Anne.Jefferson@noaa.gov
[2]NOAA Climate Monitoring and Diagnostics Laboratory, Boulder, CO 80305
[3]Seoul National University, Seoul, Republic of Korea

The aerosol properties at Gosan were strongly influenced by meteorological conditions in 2001. Frontal systems of high or low pressure affected the rate of transport from the source region, the amount of precipitation, and vertical advection and mixing of the air mass. Figure 1 shows the arrival of a frontal system from China that brought large amounts of dust aerosol to the site. Before the frontal passage on April 11, the dust was in an elevated layer around 4 km, and after the frontal passage, the dust was observed at the surface. The spring months had a mixture of air masses from several source regions. Marine air masses accompanied with precipitation dominated the summer months. Fall started with air predominantly from the Korean Peninsula, and the late fall and winter months had air masses almost exclusively from mainland China during 2001.

Because the air mass arriving at Gosan passed over several source regions (i.e., arid, urban, agricultural, and marine) the aerosol was usually a mixture of several chemical components. Rarely was a pure dust, seasalt, or pollution aerosol observed. Aerosol loading was highest from air masses from China (avg. 100 Mm^{-1}) and lowest from marine air from the Pacific Ocean south of the island (avg. 48 Mm^{-1}). The single-scattering albedo ranged from a daily average low of 0.6 to a high of 0.99. Despite this range, most of the aerosol single-scattering albedo values fell close to the average of 0.88. Albedo values were lowest from the Korean Peninsula, with an annual average value of 0.87. On the other hand, the aerosol hygroscopic growth values displayed a relatively wide range of values; most values were in the frequency distribution above 1% of the total number ranging from 1.4 to 2.9, with an average value of 2.1 for sub-10-µm particles. Aerosols from the marine sector had the highest hygroscopic growth factors, values, averaging 2.46, while those from the Korean Peninsula had the lowest average value of 1.90.

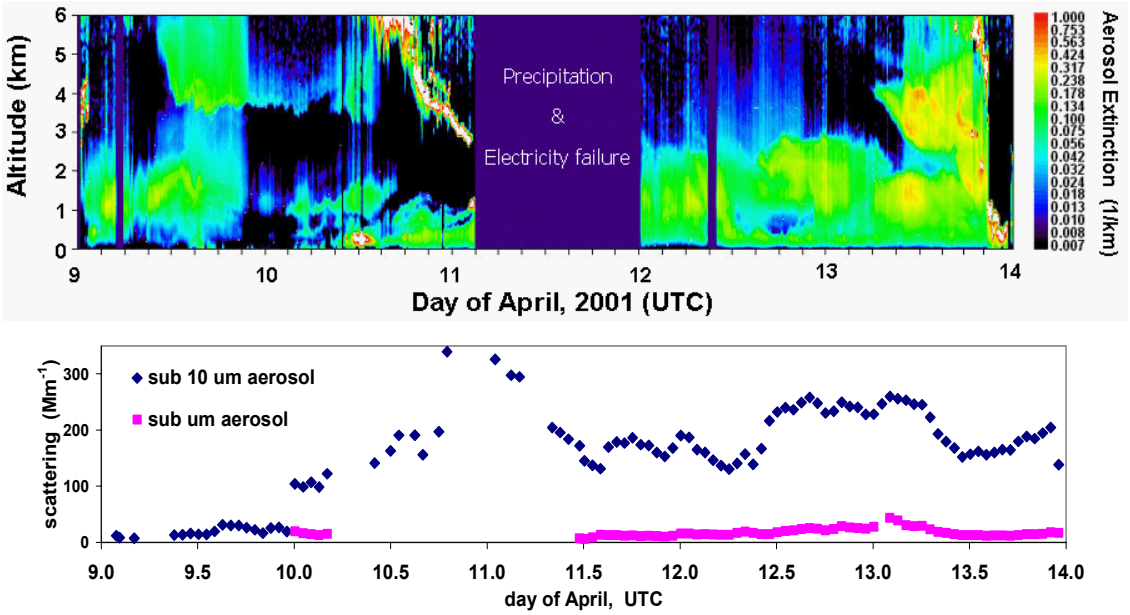

Figure 1. Micropulse lidar measurements of column aerosol extinction (top) and surface measurements of aerosol scattering (bottom) before (April 9, 2001) and after (April 11, 2001) the passage of a cold front transporting dust from China.