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Dust Particles in the Free Atmosphere in the Asian Continent: Four Seasons Balloon-borne Measurements.

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The free troposphere over east Asia has been recognized as the region where long-range transport of KOSA (yellow sand event or yellow sand particle; Asian Dust) particles, especially in spring season, are extremely active. Asian dust particles (KOSA particles) become great concern from view point of global warm by radiative effect and KOSA particle contribution to geochemical cycle of atmospheric constituents in the east Asia and west Pacific regions.

We measure number-size distribution, its vertical changes, concentration, of atmospheric particles on the basis of balloon-borne measurements made through all season from summer of 2001 to summer of 2005 at Dunhuang (40°00'N, 94°30'E) which is in east side of Taklamakan desert, Beijing, China and Anmyeon island, Korea west side of Korea. Balloon-borne measurements in Dunhuang City located at eastern edge in Taklamakan desert were made in the campus of Meteorological Bureau, while measurement in Anmyeon was made in the isolated beach near the Korea Global Atmosphere Watch Observatory. We used Balloon-borne Optical Particle Counter (OPC) developed by atmospheric research group of Nagoya University and SIGMATEC Co. Ltd (Tsuchiya et al., 1996) to get the information of vertical Profile of Particle size and concentration. This balloon-borne OPC system was originally developed to observe polar stratospheric clouds and largely modified to realize effective portability in 1993. The OPC used these studies was designed to discriminate between particles with radii of 0.3, 0.5, 0.8, 1.2, and 3.6 μm (5 channels)

The measurements were carried out several times from summer of 2001. Figure shows the distribution of particle size and number concentration in August 17, October 17 of 2001, January 11, April 30, August 27 of 2002 in Dunhuang and March 18 of 2005 in Anmyeon, which are averaged by running mean of 700m interval. The observable height regions of balloon-borne measurements contained not only the troposphere but also the stratosphere, balloon burst heights of 30km, and tropospheric profiles only are used in this study.

In August 17 2001, very thin clouds were identified during the period of balloon-borne measurement and from aerosol concentration and humidity profiles, we can show these clouds with thickness of 400m were identified at 7.6-8km altitude from the extremely enhancement of particles

with their diameter $\geq 3.6\mu\text{m}$ (most of particles were grown up to particles with $D \geq 3.6\mu\text{m}$). The aerosol layer with peak height of 6.7km was identified below the clouds. In the aerosol layer, concentration of super micron particles was noticeable. In case of April 30, 2002, the aerosol distributions were complex because of not clear weather condition, some dry region and high humidity region are found below 5km.

In March 18 2005, the weak aerosol layer in which particles with their diameter $\geq 0.3\mu\text{m}$ are more than 4 particles/cm³ was found about 7km, while those in Dunhuang are more than 10 particles/cm³. But the particles more than $\geq 1.2\mu\text{m}$ were not shown in high free troposphere(above 5km) in Anmyoen, Korea. The other weak aerosol layer was found below 5km. Whatever the case, there was notice of weak yellow sand event in the day actually

Balloon-borne measurements showed possible contributions of soil particles in the free troposphere, and regional transport of air masses containing coarse size particles was important. The vertical profiles of aerosol particles from observational data in the free troposphere over Dunhuang strongly suggested that mineral particles present which seems be originated from desert Area by local influence and transported far away in all seasons.

In this study, the first measurement in Korean Peninsula which is important region for understanding features of transport of Asian dust. It is difficult to mention about the general features of Asian dust for only one measurement. But the future measurements expect to understand Asian dust not only at source region but also at sink region

