

Vertical Variability of the Particulate Matter Observed over Beijing during A "Dust" Process

メタデータ	言語: eng 出版者: 公開日: 2017-10-05 キーワード (Ja): キーワード (En): 作成者: メールアドレス: 所属:
URL	http://hdl.handle.net/2297/6536

Vertical Variability of the Particulate Matter Observed over Beijing during A “Dust” Process

B. Chen^{a,b}, G.-Y. Shi^a, M. Hayashi^c, K. Yamashita^c, T. Yamamoto^d, M. Yamada^e

(a)*LASG/IAP/CAS, Beijing, 100029, CHINA*

(b)*Graduate School of CAS, Beijing, 100029, CHINA*

(c)*Department of Earth System Science, Faculty of Science, Fukuoka University,
Fukuoka 814-0180, JAPAN*

(d)*Metocean Environment INC. Tokyo154-8585, JAPAN*

(e)*Graduate School of Environmental Studies, Nagoya University, Nagoya, JAPAN*

Using a tethered balloon observing system, vertical distributions of aerosol number concentration in segregated sizes in the near surface atmosphere (from ground to about 1,200m altitude above ground level) were obtained at the Atmospheric Observing Experimental Base (39°48'N, 116°28'E) in the outskirts of Beijing around a “dust” weather on Mar.15 and 16, 2005 with an Optical Particle Counter (OPC). Meteorological data as the ambient temperature, relative humidity and air pressure, etc. were simultaneously got with the loaded radio-sondes. Aerosol samples were collected directly from different altitudes with a remote-controlled low-volume impactor (LVI) and individual particles were analyzed with electron microscopes and an energy dispersive spectrometer (SEM-EDX).

On Mar.15, the relative humidity kept increasing with the height going up and the particles distributed well throughout the layer up to approximately 1,200m altitude (Figure 1). On Mar.16, the number concentrations of particle in every size range went obviously enlarged, especially in coarse mode (with diameter>2 μ m, figure 2). There showed a distinct inversion at about an altitude of 500m, under which the humidity kept rising up and it decreased sharply above it. The particle distributions in fine mode (with 0.3 μ m<diameter<0.5 μ m) corresponded well with the layer, where the concentration kept high and nearly uniform below the layer and went down above it. Some coarse particle peaks emerged at several levels during the two days, e.g. the particle number concentration in coarse range (Diameter>2 μ m, especially >5 μ m) at the level of 1,200m high was even larger than that on ground on Mar.15 and two highly concentrated peaks of particles in coarse range were also found at the levels about 700m and 1,100m.

Although no dust weather was recorded by the local meteorological station on Mar.15 and Ma.16, for the reasons that the visibility was not very low (around 10 km) and the surface wind speed was not high (around 2 m/s) then, yet mineral particles were apparently dominated throughout the whole boundary (ground to the altitude of 1,200m), especially on Mar.16: More than 80% of the particles collected at every levels-ground, 500m and 1,200m-are mineral ones, both in the first stage (Particle diameter>1 μ m) of the sampler and the second stage (Particle diameter<1 μ m). A heavy dust storm happened in the borders of Mongolia and China around Mar.15, and back-trajectory analysis showed that the air mass at the observation site over Beijing just came from the center area of the dust storm within 24 hours. The surface wind was weak in the two days, but the wind kept strong (>7 m/s) above the altitude 600m all through the two days. So we may say that the particulate matter compositions were highly influenced by the remote dust, i.e. the mineral particles were probably dust

transported from remote area during the two days. The vertical profiling of the particulate matter seemed in multiple layer structure in the dust transportation.

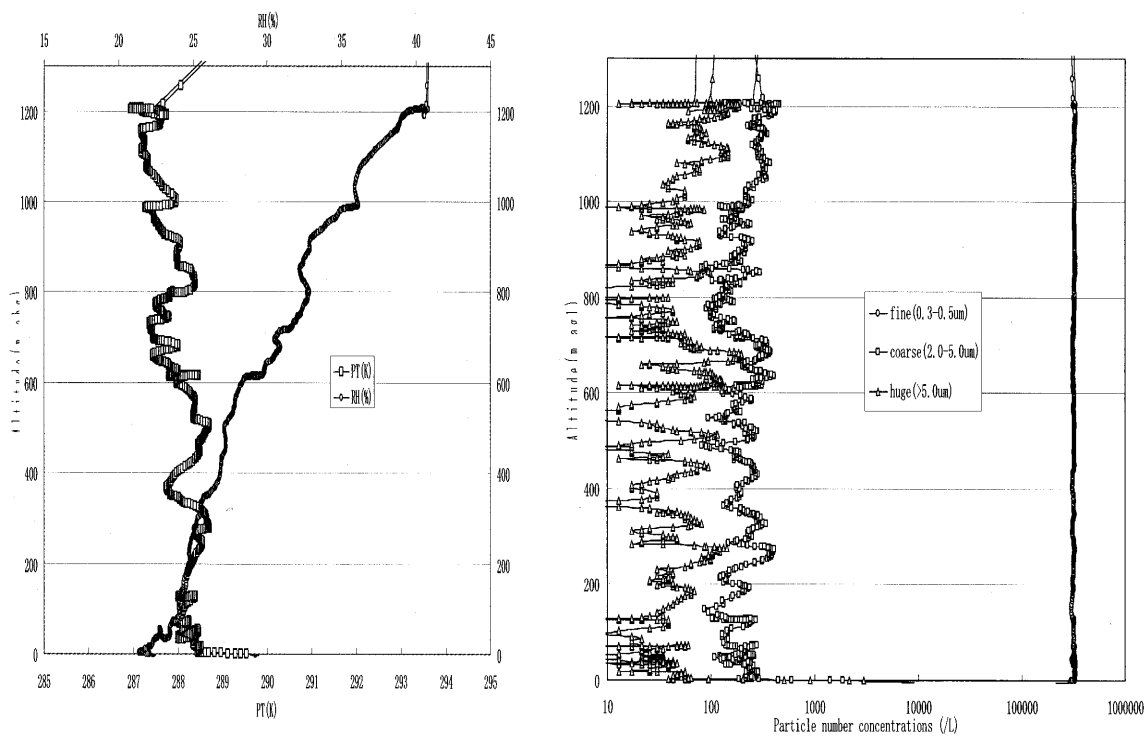


Figure 1 Vertical Distributions of Potential Temperature (K), Relative Humidity (%) (left) and particle number concentrations in three diameter classes (right) on Mar.15

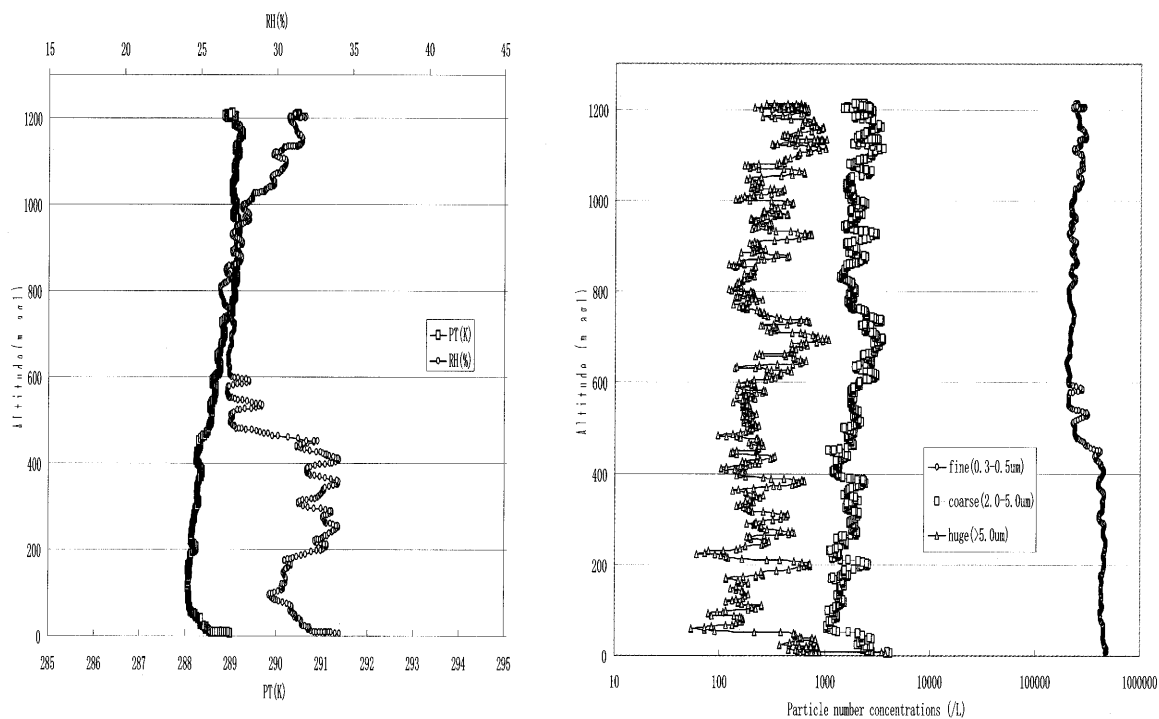


Figure 2 Vertical Distributions of Potential Temperature (K), Relative Humidity (%) (left) and particle number concentrations in three diameter classes (right) on Mar.16