

# The characteristics of high PM episodes occurred in spring 2014, Korea

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This study was conducted for understanding the characteristics of high PM episode occurred during spring 2014 in Seoul, Korea. As shown in Figure 1, there were apparently two high peaks in all components; one on February 21, 2014 (Case 1), and the other on March 18, 2014 (Case 2).

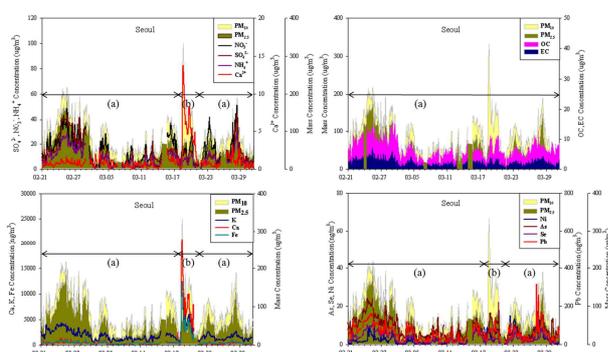


Figure 1. The time series of individual chemical components of whole period bounded (a)  $PM_{2.5}$  and (b)  $PM_{10}$ .

In Case 1,  $PM_{10}$  concentration in SMA started to increase to over  $100 \mu\text{g}/\text{m}^3$  from 21 LST February 21, 2014 and lasted as long as 186 hrs.  $PM_{10}$  and  $PM_{2.5}$  concentrations were 1.6 times and 1.9 times higher than those measured during the whole period, respectively. Especially, sulfate concentration increase was apparent, 2.2 times higher than that measured during the whole period. Trace elements such as arsenic, selenium, and lead also increased to 1.7~2.0 times higher than average concentration. On the other hand, the concentration of crustal elements such as calcium and iron decreased to 0.6~0.9 times lower level. According to the air parcel movement, it was thought that Case 1 episode was affected not only by the long range transport of atmospheric pollutant but also by the domestic stagnation.

In Case 2, even though the  $PM_{10}$  concentration was 1.2 times higher than that of Case 1,  $PM_{2.5}$  concentration was much lower in this period (0.59 times). In addition, calcium ion concentration sharply increased to  $7.0 \mu\text{g}/\text{m}^3$  and elemental calcium concentration also increased to  $9.0 \mu\text{g}/\text{m}^3$  which were higher than those of whole period, considering the inlet difference. Case 2 episode showed the characteristics of typical Asian Dust event in chemical composition. It was thought that the Asian dust occurred in the Inner Mongolian and Gobi desert area passed through the Northeast area of China including Beijing and reached to the Korean Peninsula showing

particulate concentration gradient, the maximum concentration of  $PM_{10}$  in Seoul was  $333 \mu\text{g}/\text{m}^3$  in this period.

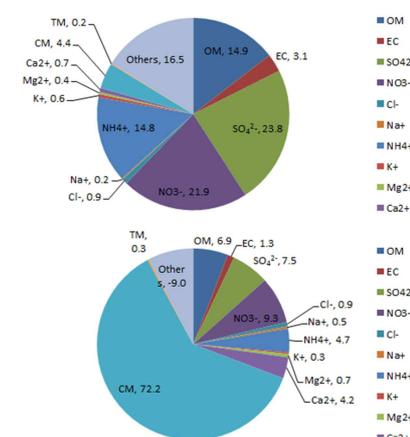


Figure 2. Chemical composition of each high PM episodic periods.

For Case 1, number concentrations of particles smaller than  $1 \mu\text{m}$  were dominant. Especially, there were many hot spots under  $100 \text{ nm}$  size ranges, which is Aitken nuclei mode, implying that the gas to particle formation or secondary particle formation was occurred in this period. For Case 2, number concentration of particles measured in SMPS and APS was smaller than that of Case 1 and the number concentration greater than  $3 \mu\text{m}$  increased in the former part of this period, which is the main size range of Asian dust particles (Kim et al. 2007).

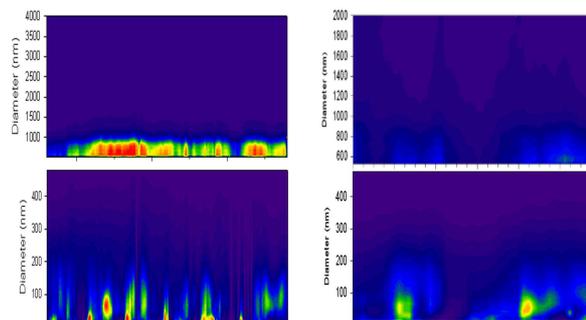


Figure 3. The size distribution of particles measured by APS and SMPS.

Kim, J., Jung, C.H., Choi, B.C., Oh, S.N., Brechtel, F.J., Yoon, S.C. and Kim, S.W. (2007) *Atmos. Environ.* **41**, 4841-4855.