# Synoptic-scale weather patterns associated with high PM10 events in Seoul, South Korea

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The synoptic-scale weather patterns associated with springtime high PM10 events in Seoul, South Korea, are examined for the period of 2001-2014. The high PM10 events are defined when the daily-mean PM10 concentration in March-April-May (MAM) is greater than 100μg/m$^3$, but separated from the yellow dust events reported by the Korean Meteorological Administration. The results are also compared with the low PM10 events. The composite analyses show that high PM10 events accompany anomalously low sea level pressure (SLP) over the Eastern China and significant low-level southwesterlies over the Yellow sea and southeasterlies over the Korean peninsula. In contrast, yellow dust events, of which PM10 concentration is extremely high, mostly accompany eastward propagating synoptic-scale cyclones in the Northern China and Manchuria. These cyclones are baroclinically well organized and develop in time, causing strong low-level northwesterlies for several days which likely transport desert dusts to the Korean peninsula. The low PM10 events are also associated with moving cyclones. However, such cyclones develop across the Yellow sea and cause precipitation over the Korean peninsula.

The self-organizing map (SOM) analyses further revealed that high PM10 events have two characteristic synoptic-scale weather patterns. The most frequent pattern consists of strong low-level southwesterlies before the onset as in the composite analysis. In this case, high PM10 events in Seoul are likely at least in part affected by PM10 transport from the Eastern China where the industries are growing fast. This possibility is supported by the back trajectory analysis. On the other hand, less than one third of high PM10 events show stagnation pattern with very weak low-level wind. This may imply an accumulation of PM10 in a local scale. This result indicates that high PM10 events in Seoul are caused not only by long-range PM10 transport but also by local accumulation of PM10, confirming previous studies.

Key words: PM10, Yellow dust, SOM analysis, back trajectory analysis