



\textbf{Detailed Characteristics of Weekend Effects in Chinese Cities }

Yong-Sang Choi, and Bo-Ram Kim

Department of Environmental Science and Engineering, Ewha Womans University, Seoul 120-750 Korea

Yong-Sang Choi (1) and Bo-Ram Kim (2)

(1) Ewha Womans University, Republic Of Korea (ysc@ewha.ac.kr), (2) Ewha Womans University, Republic Of Korea (boram.teresa@gmail.com)

In China, the weekend effects in climate variables and air pollutants have been found, and many researchers studied characteristics of the weekend effect in various respects: seasonality (Gong et al., 2006), regional variation (Choi et al., 2008), and long-term change in its phase (Ho et al., 2009), etc. However, it is still equivocal that the occurrence of the weekend effect is attributed to whether boundary anthropogenic aerosol processes or semi-weekly synoptic weather system. This study investigates the weekend effect in PM₁₀ (aerosol particulate matter with a diameter < 10 μm) mass concentrations, and its relationship with synoptic-scale weather variability in Beijing and Tianjin. It was previously reported that Tianjin has stronger weekend effect than Beijing (Choi et al., 2008), though their geolocations are very close so that the cities are affected by the same atmospheric waves. Both cities have large industrial complexes that emit large amount of air pollutants. For the analysis, we have newly compiled the air pollution index data from 2000 to 2009, obtained from the State Environmental Protection Administration of China. We converted the row values into the mass concentration anomalies from the 7-day mean. Any weeks with missing data were removed. Using the anomalies can naturally remove seasonal cycle and long-term trend of PM₁₀ mass concentration. Our analysis is done for each year and season due to transient phases of Chinese weekend effects. Fast Fourier Transform is also used to extract 7-day frequency and amplitude of the anomalies and its random orders. As a result, Beijing and Tianjin have a similar pattern of weekend effects in summer, while it is not true in other seasons. Especially, the characterized weekly pattern is most obvious in summer, 2002. We cannot show a peak of spectrum nearby 0.14 (1/7day) operating FFT with artificial random orders, implying that the weekend effect in the Chinese cities cannot occur by chance. This study also shows the coupled weekly variations between PM₁₀ concentrations and the meteorological conditions: cloud, precipitation, surface wind, pressure, etc. The significant coupling was observed in the boundary layer, but not in free atmosphere. The results indicate that the generation of weekend effect is grounded on boundary aerosol processes, but hardly on synoptic-scale weather variability. Therefore, human activities more likely influence the weekend effects in some Chinese cities. This study will present the abovementioned research results, together with detailed characteristics of Chinese weekend effects that we have pursued since last few years.

References

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