

Investigating the feature and regional sources of urban PM_{2.5} concentration over Central China in 2014

*miaomiao Lu¹, Xiao Tang¹, Zifa Wang¹

1. LAPC IAP CAS.

In Central China, where Wuhan is a typical megacity, rapid economic growth has created numerous cities-clusters in recent years, which undoubtedly aggravates the regional and urban haze pollution in China attracting worldwide attention. In sight of recent works on observed particulate matter pollution, the feature and potential source regions of PM_{2.5} concentration over Wuhan in the whole year remain highly uncertain. Based on analysis of observed data, the hazy days (average daily PM_{2.5} $75 \mu\text{g m}^{-3}$) in Wuhan accounted for 48% in 2014, and the annual concentration of PM_{2.5} ($84.1 \mu\text{g m}^{-3}$) kept the same level with that of Beijing in 2013. Especially, PM_{2.5} value in January was twice of that in Beijing over the corresponding period. Air pollution was severest in winter over Wuhan with hazy days of 18-30days in different month, followed by spring and autumn. Though the air quality was the best in summer, the days of PM_{2.5} concentration averagely exceeding $75 \mu\text{g m}^{-3}$ ranged from 3 to 17days. We analyzed the impact of regional chemical transport of air pollutants throughout the year using a Nested Air Quality Prediction Model System (NAQPMS) with a source tagged tracer method. The monthly local contribution of Wuhan in winter is the smallest (less than 50%), which indicates regional transport is the dominant source of high PM_{2.5} level. The local emissions play a determinant role in PM_{2.5} formation in summer, while regional contribution could be 30%-40% approximately. The main reason is that prevailing strong winds in favor of regional transport from high-emission areas in winter, and strong local specificities and effective diffusion processes in vertical that decreasing PM_{2.5} concentration in the local. Our results highlight the importance of the air pollutant transports in the formation of fine particulate matter over Wuhan. On a long term and durable perspective, regulating the regional trans-boundary environmental impact assessment in China appears to be an imperative for effectively mitigating urban PM_{2.5} loading.

Keywords: PM_{2.5}, Central China, regional transport, haze pollution, Wuhan