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Investigating transport mechanism of a month-lasting haze episode in Wuhan, Central China

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Just as Beijing, Wuhan as a typical megacity with a population of over 10 million over Central China, experienced severe and persistent haze pollution frequently. In this study, we found unique characteristics of month-long PM2.5 pollution in Wuhan comparing to Beijing in January 2014 as follows. (1) The monthly average concentration of PM2.5 in Wuhan of 172.8 μgm-3 with 19 heavily polluted days with daily PM2.5 value exceeding 150 μgm-3 was about twice that in Beijing of 94.6 μgm-3. Moreover, PM2.5 concentrations increased and decreased more smoothly than that in Beijing during early and late stage of pollution processes respectively. (2) High PM2.5 loading occurred over Wuhan under the control of strong winds with daily average wind speed of 2.3 m/s $\sim$ 3.3 m/s or various wind directions, significantly different from that in Beijing. We elucidated formation causes and transport mechanism of month-lasting haze pollution using atmospheric chemistry model with an on-line source-tagged method and combining with weather patterns analysis. (1) Long-range transport of polluted air masses under condition of regionally strong winds from northern regions to Wuhan was the primary causes during explosive growth processes of fine particles, contributing 40% $\sim$ 80%. Especially, North China Plain was the key source region, directly elevating pollution levels over Wuhan. (2) Clean air from the Siberian area and the sea weakened gradually reaching Wuhan and could not eliminate effectively air pollutants during dissipation processes of haze pollution. Meanwhile, local accumulation of pollutants in Wuhan city-cluster and long-range transport from eastern and southern regions were responsible for high background concentrations of PM2.5 remained in the atmosphere. This study reveals correlation of haze pollutions between Wuhan area and East and Central China, which facilitates to optimize mitigation strategies and assess effects of emission control measures more reasonably in Wuhan affected by complex regional transport.