

Investigation of relationship between air pollution formation mechanism and synoptic pattern based on three-years observations in megacity Beijing, China

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Air pollution is a severe problem in China especially in winter season for the decade years. To investigate the formation mechanisms of air pollution in winter, the relationship between air pollution and synoptic pattern was explored by employed three years (2013-2015) high resolution PM_{2.5} concentrations, synoptic charts, satellite images, radiosonde data, wind pattern observation, and HYSPLIT Trajectory Model in megacity Beijing, China. The results indicated that haze days (daily PM_{2.5} concentration > 150 $\mu\text{g}/\text{m}^3$) in winter season Beijing is 36, 28 and 35 for 2013, 2014 and 2015, respectively. Consistent air pollution episodes always accompanied with the following synoptic patterns: 1) at 500 hPa, cold air forces were located in the north part and north china Plain was controlled by western wind; 2) at 850 hPa, warm advection frequently occurred above North China plain and Bohai bay, which favored stable synoptic pattern and transportations of air pollutants to Beijing; 3) On surface, Beijing was controlled by back of anticyclone, low pressure or uniform pressure situation, which accounted for 47.3%, 18.2% and 34.5% of the serious haze episodes, respectively. The above results also illustrated that air pollution episodes accompanied with anticyclone arose most frequently with maximum daily PM_{2.5} concentration 258.8 $\mu\text{g}/\text{m}^3$. The results will offer beneficial environmental implications for the air pollution forecasting.

Keywords: air pollution, synoptic pattern, anticyclone, formation mechanisms