

Characteristics of Severe Air Pollution in Jiangsu Province and its Relationship with Meteorological Conditions under Cold Air

*Lu Cao^{1,2}, Duanyang Liu^{1,2}, Peng Zhou³, Wenlian Yan², Chen Hao²

1. Key Laboratory of Transportation Meteorology, 2. Jiangsu Meteorological Observatory, 3. Nanjing Meteorological Bureau

By analyzing the severe air pollution cases in Jiangsu Province during 2013-2018, we investigated the characteristics of meteorological conditions during those polluted episodes in this study. The results showed that in Jiangsu Province, the level of air pollution happened under cold air was mostly in Level 5. There were only 14% of all events in Level 6, which mostly took place when the cold air was from central pathway, and rarely cases were from easterly pathway. Generally, the air pollution episodes under central and western pathway were regional and continuous, with primary pollutant of $PM_{2.5}$, followed by O_3 ; while those under eastern pathway were local and short, frequently with primary pollutant of O_3 . During severe pollution episodes, at high altitude, the cold air was mainly at north side of Jiangsu Province; at mid and low altitude, there was northwest airflow in front of ridge or weak shear; on the surface, Jiangsu was in the front of cold air. The stratification was stable with the mixing layer height less than 1.2 km, and there were vertical temperature inverse happened of more than 50% events. At the day and the day before the severe pollution episode, the wind speed was generally less than 4 m/s, and there was no or weak precipitation ($<1.0\text{mm/day}$). Compared to the easterly pathways, more air pollutants were transported from central or westerly pathway. The heavy pollution might be intensified under stable weather conditions with negative transportation upstream, very strong inverse and weak wind. In the circulation beneficial to the severe pollution, the maximum elevate of the 24-h mean concentration in Nanjing was less than $150\text{ }\mu\text{g/m}^3$ from central-pathway cold air and less than $100\text{ }\mu\text{g/m}^3$ from westerly and easterly pathway cold air. Overall, the severe air pollution in Jiangsu province was attributed to the combined contributions from local emission, regional transportation and unfavorable weather conditions.

Keywords: Pathway of cold air, characteristics of heavy air pollution, meteorological conditions

