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Cold Fronts Transport Features of North China Pollutant over the Yangtze River Delta, China

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An air pollution process in Jiangsu Province, China on December 22–23, 2016 is discussed by analyzing various data set, including the meteorological observation data, the reanalysis data from National Centers for Environmental Prediction (NCEP), the Air Quality Index (AQI), the $PM_{2.5}$ and PM_{10} concentrations data, and the airflow backward trajectory model of National Oceanic and Atmospheric Administration (NOAA). The results show that the air pollution episode was under the background of a medium cold front from the west of the Hetao area, and caused by regional transport of pollutants from North China. The primary pollutant was $PM_{2.5}$ and PM_{10}. The $PM_{2.5}$ and PM_{10} concentrations increase significantly 4–6 h after the cold front passing and reached the peak in 13–24 h. The obvious lag phenomena of the rising period and the peak-moment of $PM_{2.5}$ and PM_{10} concentrations were found at the Suzhou, Huai'an, Taizhou and Xuzhou stations, and the maximum of 3h-allobaric, the maximum and average values of the wind speed near the ground were larger one by one at the four stations respectively in the northwestern Jiangsu, north-central Jiangsu, along with the Yangtze river Jiangsu, and southeastern Jiangsu. The period of middle –heave level pollution in Suzhou was 7–9 h later than in Huai'an and Taizhou, and was 24 h later than in Xuzhou, because of the lower $PM_{2.5}$ and PM_{10} concentrations at early December 21, the delay of pollutants from upstream, and the larger wind speed from the boundary layer to the surface in southeastern Jiangsu. WRF-Chem model can well reveal the pollutant transport process. The high-value zone has a close relationship with the position of cold front. At 1200 LST on December 22, the cold front reached Xuzhou accompanied by high $PM_{2.5}$ concentration. At 1400 LST on December 22, the cold front advanced to Huai'an. The high $PM_{2.5}$ concentration zone moved south alongside the cold front and covered Xuzhou and Huai'an. Suzhou, far away from the upstream, was less vulnerable to pollutant transport. The high-value did not fell until the northwest wind shifted to the north wind. The backward trajectory analysis of air pollution also indicated that regional transport of pollutants from North China led to the middle –heave level pollution weather.