

A persistent fog event involving heavy pollutants in Yancheng area of Jiangsu province

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In the early December 2013, dense fog involving heavy pollutants lasted for 9 days in Yancheng area. The characteristics, formation and lasting mechanisms of this persistent fog were analyzed based on observational data at Sheyang site, reanalysis data and final analysis data from NCEP/NCAR, combining with the weather background, meteorological and physical variable fields. Results include that: (1) The fog process was characterized by long duration, low visibility and high pollutants concentration. (2) Atmospheric circulation contributed to the development and maintenance of heavily polluted fog. The existing southerly anomaly in the lower troposphere brought more moisture to the Jiangsu area, which provided moisture condition for fog formation. Meanwhile, the weakening of South Asian winter monsoon led to the weakening of surface wind, which favored fog formation and pollutants' accumulation, but not for transporting fog and pollutants outward via advection, resulting in the maintenance of polluted fog process. The higher pressure in the middle troposphere controlled the development of convection, and helped the polluted fog aggregated in the lower layer of the atmosphere. The decreasing vertical gradient of horizontal wind in the middle and lower troposphere not only suppressed the development of synoptic-scale disturbances by weakening the atmospheric baroclinic instability, but also made the atmospheric stratification more stable by weakening vertical mixing. (3) Deep inversion was the key thermal factor causing the heavily polluted fog. (4) The fog exhibited obvious outbreaks with good visibility weather turned to severe fog several times; and the weak cold air invasion and radiative cooling were the triggering factors to the sudden enhancement of the fog.