Observational Study on Jump Features of Macro and Microphysical Structures of a Fog Event in Nanjing, China

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A comprehensive fog experiment was carried out in the north suburb of Nanjing, China with many instruments, e.g., tethered balloon system, fog droplet spectrometer, visibility meter. Using the data of boundary layer profiles, fog droplet spectra, visibility and conventional meteorological elements as well as NCEP reanalysis, a fog case on December 14th, 2006 was chosen to study the jump features (sharp strengthening and weakening) of fog top and ground fog’s density, and their causes are also discussed in detail. Result shows that the explosive development of fog top is due to upward turbulent transport of moisture and its accumulation under up-layer inversion as well as substantial temperature decrease; sharp strengthening of ground fog is mainly caused by lower saturation vapor pressure in the near-surface layer under the influence of cold advection, enhancement of inversion owing to up-layer systematic sinking motion, and moisture accumulation under inversion; during the fog top decline, turbulence happens near the fog top and up-layer sinking motion causes the occurrence of temperature increase, fog double layer structure and low-level jet; the sharp weakening of ground fog is the result of solar radiation and downward transport of momentum; sinking motion has dual roles in the fog event; fog double layer structure occurs during the sharp decline of fog top and accelerates fog top decline, which is extremely different from the former results that double layer causes fog top development.