



Analysis on the Characteristics of Vertical structure of Sand and Dust in a Dust Storm process

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By using CAILPSO (Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations) data and MM5 numerical simulation output data, the characteristics of dusty layers vertical structure and its accompanying dynamic and thermal structure in a severe dust storm occurred from 19 to 22, March, 2010 in North China were studied. The result shown: In the mature period of dust storm, the dusty layer distributed almost in the whole troposphere from 2 to 9 km. The vertical mixture caused by the cold frontal uplifting and the sinking after the front induced a uniform distribution of dust particles. After that, in the long distance transportation period of dust, the dusty layer separated to two layers clearly, located at the lower troposphere (below 700hPa) and the middle upper troposphere (from 600 to 300hPa) respectively. In the mature, sustain and vanishing periods of the dust storm process, the weak vertical change of wind speed, potential temperature and equivalent potential temperature closely coordinated with the dusty layers. It indicates that the neutral mixed layer maintained in the dusty layer. Meanwhile, in the mature, sustain periods of the dust storm process, the evident tropopause fold and obvious declining of large potential vorticity appeared. It also was confirmed by the vertical distribution of the upper level jet stream, potential vorticity and specific humidity. According with it, when the tropopause sustained at a higher altitude, the dusty layers were expanded to a higher altitude also. Otherwise, the dusty layers were lower. It should noted that in the mature and sustain periods of the dust storm process, a banding area located at 40°N from 7km to 9km appeared in the stratosphere. It indicates that in this dust storm process, parts of the dust particles were transported from troposphere to stratosphere. And it also formed a continued dust transportation belt in the stratosphere. It can be regarded as a straightforward and observational evidence to prove the troposphere-stratosphere transportation of dust aerosol and the transmission of dust aerosol in stratosphere.

Key wards: dust storm, dust particles, vertical structure, CAILPSO data