Geophysical Research Abstracts
Vol. 19, EGU2017-4080, 2017
EGU General Assembly 2017

Case study of the cause and the dynamic structure for a small-scale snowstorm event associated with a cyclone

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Abstract: This study investigates the cause and dynamitic structure on a small-scale snowstorm event occurred in Shandong peninsula, east China with Doppler radar, profile, automatic station, routine sounding and surface observation data. The results are as follows. (1) Precipitation occurred in two stages: the first weak precipitation was typical snowstorm caused by Huanghe cyclone with the characteristic of weak snowfall and north-east radar echo, and the second strong precipitation one behind the cyclone was ocean-effect snowstorm with character of strong snowfall and south-west radar echo.(2) Favorable synoptic situation led to the occurrence of the first stage snow, such as obvious trough, cyclonic circulation, southwestern low-level jet and surface cyclone. Its vapor came from the South China Sea. The snowfall was distributed to ahead of southwestern low-level jet on the right and eastern side of surface cyclone. (3) By contrast, the second precipitation occurred after trough passed Shandong peninsula and cyclone passed through Bohai straight to Huanghai sea. Cold air intruded into Shandong peninsula from Bohai straight and Huanghai sea. North-east wind was prevailing and its speed was stronger than north-west wind, which brought rich water vapor and heat. Snowfall distributed within north-east wind. And, (4) the structure of wind field in the lower troposphere was different during ocean-effect snowstorm. At the beginning, there was mid-γ scale low circulation beside north coastal area in Shandong peninsula, and radar radial velocity shows a meso-βvortex in low level. Meanwhile, there was a shear between the south-east wind and north-west wind near the east coastal area. During strong snowfall, a shear between the north-east and north-west wind was found in boundary layer. Both the low circulation and shear are the favorable dynamic factors.
As a result, the case implies that remarkable difference between Bohai straight/ Huanghai Sea and Bohai Sea ocean-effect snowstorm, the former is behind Huanghe cyclone, and the latter is common and typical, in terms of wind field structure, motion of radar echo and precipitation distribution.
Key words: Huanghe cyclone, Snowstorm, Ocean-effect, Analysis of observation data