1. Data

Five kinds of data are used in this paper, including radiosonde station observations, 24-h cumulative rainfall data from the 254 national meteorological stations, NCEP/NCAR 4°×4° analysis data, the four years of the Tibetan plateau vortex and shear line, and typhoon and tropical lows data from the Shanghai Institute of Typhoon of CMA.

2. Spinning activities of SDPVs in Hetao region

3. Results and analysis

3.1 Environmental field features of spinning SDPVs in Hetao region

3.2 Possible causes for SDPV’s spinning in Hetao region

4. Conclusions

The main conclusions are as follows:

1. The impact weather system for the spinning SDPVs in the west of Hetao region is the transverse shear flow field while that for the spinning SDPVs in the east of Hetao region is the longitudinal shear flow field on the deep low trough over the region.

2. The spinning activity of SDPVs in Hetao region is mainly attributed to the environmental shear flow field which affects the SDPVs, while that for the spinning SDPVs in Hetao region is accompanied by activities of tropical lows. Those tropical lows influence the spinning event of SDPVs in the west of Hetao region and eventually influence the spinning of the vortex in the east of Hetao region.

3. The environmental field of the spinning SDPVs in Hetao region provides them with the condition to enhance positive vorticity within the vortex zone.