

Observation and genesis analysis of a continuous downburst weather

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Intruduction

A continuous downburst (CD) occurred in Wangjing and Dongzhi County, western Anhui on May 2 2016. The gale occurred at around 15 pm (BJT). Wangjiang and Dongzhi both had the phenomenon of the gale and rain at the same time the hail was observed in Wangjiang only.



Fig.1 Rain (value) , hail (conjoined triangle) and gale (flag) from 13:00 to 16:00

Wangjing downburst area was about 4km*3km, Dongzhi about 1km*1km.

Analysis on storms

Two microbursts were identified to the rapid decline of storms, the distribution of ground wind direction and influence range.

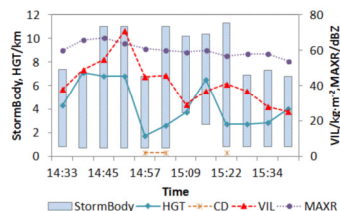


Fig.2 Storm parameters from 14:33 to 15:40

The two gales were closely related to the rapid decline in maximum reflectivity height and VIL. In addition, the lightning distribution was consistent with the movement direction of the storm.

Two microbursts were seen to the rapid decline of storms, and the distribution of ground wind direction and influence range. The time of CD occurred during 14:54~15:01, 15:18~15:20.

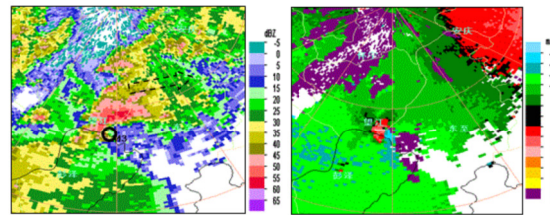


Fig.3 Reflectivity factor and radial velocity on 0.5° elevation at 15:03 and 15:22

Among many storm cells, the storm related to the ground gale had a continuous and deep meso-cyclone during one hour, therefore this storm characterizes as a supercell storm.

Genesis of downbursts

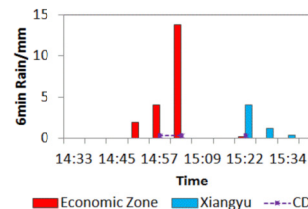


Fig.4 6 minutely rain at Economic-zone of Wang-jiang and Xiangyu of Dongzhi

When 6min precipitation was 4mm or more, the downburst occurred. The rain more than 4mm had a dragging role as an initial cause. And the storm top and reflectivity factor nuclear decreased more than 4km, and mass center height decreased more than 3km within a volume-scanning time interval.

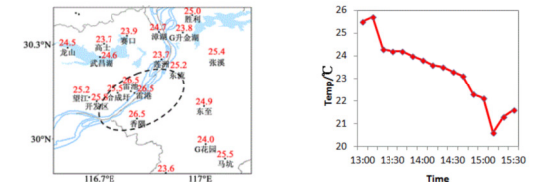


Fig.5 Daily maximum temperature(left) and 10-min mean temperature(right)

That the temp dropped more than 4°C meant negative buoyancy was obviously enhanced.

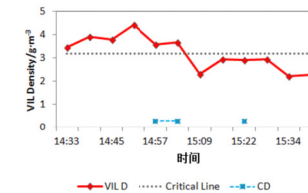


Fig.6 VIL density from 14:33 to 15:40

The cause of the hail in Wangjiang was that the VIL density was more than 3.2 g·m⁻³. The hail didn't occur in Xiangyu, Dongzhi because the VIL density was less than 3.2 g·m⁻³ when the storm moved to Xiangyu.

Conclusion

The dragging force about the rain particles at the initial stage was the main cause. In the middle-late stages, the thermal instability, momentum downward and compensatory air-flow at the medium, as well as the increase of the negative buoyancy between the water and the environment played an important role in the development of CD. And the momentum downward caused by prevailing wind direction in the middle of the troposphere determined the ground wind directions of two downbursts.

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