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Characteristics of the structure change based on radar parameters and lightning activity on a big hailstorm case

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Abstract
The observational data from Doppler radar, Safir3000 three-dimensional lightning position system, microwave radiameter,and from high-density meteorology automatic stations were used to analyze a big hail case which connected with a sea breeze-front on the west coast of the Bohai bay. The characteristic of merger and trailer process, quantitative structures change based on radar parameters and lightning activity were studied. At present China,the Doppler radar is the most effective tool of obtaining the data of thunderstorm structure currently and the relationship between the change and hailing and lightening activities basing on radar echoes during the research on hazard weathers are used. Aiming at achieving the quantificational indicators, some new parameters of radar are applied to reflect effectively the special change of thunderstorms, inner dynamic and water-bored materials and so on.For the vertical distribution of these quantities, the higher the parameters are and the stronger the updraft are. Echo at the temperature level determines the nature of water particles, that is, it mainly is water drops or ice crystals. The height of the echo center reflected the height of the water particles in cloud sets.

The result was based on the following respects:
Firstly, the humid and cold sea breeze convergence line in local instable region on ground was the mechanism for storms' triggering and developing with the time of early warning for hailstorm of 2 h. Secondly, there were two merger types of γ-mesoscale convective cells ,that is,the independence type, and the feeder type. As cells merging, the cloud bridge between two cells emerged at the height of 4-6km or 9-10km . Thirdly, at the time of merging, the development of storm was limited and hailfall and the peak of lightning emerged after merger.Fourthly, the relationship the evolution of quantificational storm 3D-structure (time-height cross sections of the radar parameters of upFV40[U+3001]downFV40[U+3001]ETS11 etc.) with lightning activity was investigated, with the result that the radar parameters were able to describe properly the feature of merger process and the change of hailstorm structure change, and pulled ahead of the total lightning flash peak for 12min.

The introduction of radar parameters were stated below:
V40:the echo volume within the scope of 40dBZ reflects the size of the core of strong echo and its height, and it partly reflects the spatial size and intensity of the convective clouds set within the scope of research.
upFV40(downFV40):the volume variability of the V40 above(under) -15[U+2103] layer.
ETS11:the sum of grids of the top which are above 11km of echo,not only reflects the development the thunderstorm' height, but also the size, and it is the parameter describing development of the thunderstorm system.