Multi-scale structure of meso-gamma scale vortex observed by X-band Doppler radars

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The structure and behavior of meso-gamma scale vortex (MGV) and misovortices embedded within it were analyzed using data observed by two X-band Doppler radars on 24 November 2017. The MGV of 6-8 km diameter developed offshore under a winter monsoon situation, traveled eastward to the coast and approached the radars. The MGV was first identified by a distinct Doppler velocity couplet with comma-shaped reflectivity pattern. As the misovortices (less than 2km in diameters) developed within the MGV, the MGV gradually decayed and both Doppler velocity and reflectivity pattern became more complicated with small-scale velocity couplets and accompanying kinks. Most of the long-lasting misovortices appeared in the northeastern part of the MGV and then moved cyclonically around the MGV center, reaching their maximum strength as they came into the northwestern part of the MGV. Dual-Doppler derived wind field showed that the misovortices developed along the strong horizontal shear line within the MGV and some of them merged with nearby vortices as they develop. It is suggested that these misovortices developed by the horizontal shearing instability and their movements were affected by the cyclonic rotation of the MGV.

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