

Tornadogenesis as revealed by high-resolution ensemble forecasts for the Tsukuba city supercell tornado on 6 May 2012

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To clarify the environmental conditions for tornadogeneses, we performed ensemble-based analyses using 33-member high-resolution ensemble forecasts of the Tsukuba city supercell tornado on 6 May 2012. The horizontal resolution of the model was 50 m. The initial and boundary conditions were taken from ensemble forecasts with 350-m horizontal resolution started from local ensemble transform Kalman filter analyses with 1875-m horizontal resolution, which assimilated four C-band radars and dense surface data. The results of backward trajectory analyses of parcels that were placed in forecasted near-surface tornado-like vortices showed that the circulation of the vortices can be generated due to both surface friction and baroclinity, but the way the circulation is generated did not appear to be essential for determining whether tornadoes are generated or not. On the other hand, the mesoscale environment such as the strength of low-level mesocyclones at about 1-km height and near-surface humidity had strong correlations with the maximum vertical vorticity of the tornado-like vortices, indicating that these factors seem to be essential for a tornadogenesis.

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