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MMM SEMINAR *NCAR*

Vorticity Evolution Leading to Tornadogenesis and Tornadogenesis Failure in Simulated Supercells

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A three-dimension idealized cloud model was used to study the storm-scale differences between simulated supercells that produce tornado-like vortices and those that do not. Each simulation was initialized with a different RUC-2 sounding that was associated with tornadic and nontornadic supercells in nature. The focus is an analysis of vorticity along backwards-integrated trajectories leading up to tornadogenesis (19 simulations) and tornadogenesis failure (14 simulations), respectively. In so doing, the differences between the nontornadic and tornadic cases can be explored in relation to their associated environmental sounding.

Backwards-integrated trajectories seeded in the near-surface circulation indicate that the largest differences in vertical vorticity production between the tornadic and nontornadic simulations occur in parcels that descend to the surface from aloft (i.e. descending). Thus, the results from this study support the hypothesis that descending air in the rear of the storm is crucial to tornadogenesis. In the tornadic simulations, the descending parcels experience more *negative* vertical vorticity production during descent and larger tilting of horizontal vorticity into positive vertical vorticity after reaching the surface, due to stronger horizontal gradients of vertical velocity. The larger vertical velocities experienced by the trajectories just prior to tornadogenesis in the tornadic simulations are associated with environmental soundings of larger CAPE, smaller CIN and larger 0-1 km storm relative environmental helicity. Furthermore, in contrast with what might be expected from previous works, trajectories entering the incipient tornadic circulations are more negatively buoyant than those entering the nontornadic circulations.

This seminar will be recorded and available via webcast at:
http://www.fin.ucar.edu/it/mms/fl-live.htm

Thursday, 12 December 2013, 3:30 PM
Refreshments 3:15 PM
NCAR-Foothills Laboratory
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