MMM SEMINAR SERIES

A new pathway for tornadogenesis exposed by numerical simulations of supercells in turbulent environments.

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A simulation of a supercell storm produced for a prior study on tornado predictability is reanalyzed for the purpose of examining the finescale details of tornadogenesis. It is found that the formation of a tornado-like vortex in the simulation differs from how such vortices have been understood to form in previous numerical simulations. The main difference between the present simulation and past ones is the inclusion of a turbulent boundary layer in the storm's environment in the present case, whereas prior simulations have used a laminar boundary layer. The turbulent environment contains significant near-surface vertical vorticity ($\zeta > 0.04$ s–1 at $z = 7.5$ m), organized in the form of longitudinal streaks aligned with the southerly ground-relative winds. The ζ streaks are associated with corrugations in the vertical plane in the predominantly horizontal, westward-pointing environmental vortex lines; the vortex-line corrugations are produced by the vertical drafts associated with coherent turbulent structures aligned with the aforementioned southerly ground-relative winds (longitudinal coherent structures in the surface layer such as these are well-known to the boundary layer and turbulence communities). The ζ streaks serve as focal points for tornadogenesis, and may actually facilitate tornadogenesis, given how near-surface ζ in the environment can rapidly amplify when subjected to the strong, persistent convergence beneath a supercell updraft.

Thursday,9 November 2023, 2:00pm

Refreshments 1:45pm

Please also join colleagues for refreshments and informal discussion after the seminar until 3:30pm

NCAR-Foothills Laboratory, 3450 Mitchell Lane

FL2-1022, Large Auditorium

Seminar will also be live webcast

https://operations.ucar.edu/live-mmm

Participants may ask questions during the seminar via Slido.