

On the use of a mobile Doppler lidar to probe the boundary layer near and in tornadic and non-tornadic supercells

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Abstract

A commercially available 2 μm , coherent, pulsed, Doppler-lidar system (TWOLF - Truck-mounted Wind Observing Lidar Facility) was used during year 2 of VORTEX-2 (Verification of the Origins of Rotation in Tornadoes Experiment). The lidar was mounted on a truck housing the MWR-05XP (Meteorological Weather Radar, 2005, X-band, phased array) mobile radar. The primary objectives of the experiment using the lidar were: (1) to probe the clear air, between the radar truck and the precipitation associated with supercells and thereby map the wind field in clear air, complementing coverage by the radar; (2) to probe tornado vortices as near to the ground as possible and up to $\sim 50 - 100$ m above and thereby map the wind field and its vertical variations with fine spatial resolution in and just above the friction layer; and (3) to separate aerosol motion from hydrometeor motion in tornadoes, when hydrometeors are centrifuged radially outward, but aerosols are not, owing to their much lower mass; and (4) to map out small-scale features in the clear-air boundary layer near tornadic and non-tornadic supercells.

Preliminary results from the field campaign conducted from 1 May - 15 June 2010 will be given, along with a discussion of problems encountered and how they might be overcome in future campaigns.