

Rapid-scan, polarimetric, mobile Doppler radar observations at X-band of an EF-5 tornado in Oklahoma on 24 May 2011

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During a major tornado outbreak in central Oklahoma on 24 May 2011, RaXPo1, a mobile, rapid-scan, polarimetric, X-band Doppler radar collected data in three tornadoes. This presentation will focus on an overview of the dataset collected in the second one, whose genesis to maturity was captured at one deployment location for a period of ~ 45 min. Volumetric 360 deg scans were made up to 18 deg elevation angle during the genesis and late-maturity phases, at 18-second updates. For about six minutes, while the edge of the tornado came within 3 km of the radar, PPI 360 deg scans were made at just 1 deg elevation angle every two seconds. It is believed that this is the most rapidly updated polarimetric, Doppler radar dataset ever collected in a tornado.

The highest wind speeds found were 125 m/s at low levels, making this the second most intense tornado ever documented by Doppler radar. Polarimetric signatures of ρ_{hv} and Z_{dr} clearly show the debris cloud and its continuity at high temporal resolution. Other features that can be seen include multiple vortices, a thin, curved, low-reflectivity band curling around the tornado, which may be associated with a horizontal vortex at the leading edge of the tornado seen on a video taken at the radar truck, and a jet of rapidly moving hydrometeors spiraling into the tornado from the main body of the parent storm. The vertical structure of the tornado in terms of reflectivity, Doppler velocity, and polarimetric variables will also be highlighted. Plans for analysis techniques in progress or to be tested, some of which may be uniquely suited to rapid-scan datasets, will be briefly noted.