**Motivation**

- The short spatial and temporal scales of supercell thunderstorms make coordinated dual-Doppler deployments of mobile radars difficult.
- As a result, retrieval of the atmospheric state through EnKF-based assimilation of single-Doppler radar data has emerged as a valuable analysis tool (Marquis et al. 2012; Tanamachi et al. 2013; Skinner et al. 2015).
- This study compares kinematic features in ensemble mean analyses with polarimetric signatures in mobile radar data.

**Methodology**

- 54-member ensemble of NCOMMAS (Coniglio et al. 2006) simulations with 500 m horizontal grid spacing across El Reno supercell.
- NSSL two-moment microphysics (Mansell et al. 2010).
- Radial velocity and radar reflectivity from the National Weather Radar Testbed Phased Array Radar (PAR; Zmic et al. 2007) are assimilated from 22:20 UTC.
- LETKF (Hunt et al. 2007; Thompson et al. 2015) assimilation of RaXPol radial velocity data from 22:48 to 23:15 UTC with 1-min analysis cycles.
- Adaptive inflation and additive noise used for spread maintenance.

**RFD Surge and Tornado Genesis**

- An intensifying downdraft NW of the low-level mesocyclone precedes a surge in horizontal momentum within the RFD.
- Increased convergence along the RFD surge gust front coincides with rapid intensification of the low-level mesocyclone and tornadogenesis.
- The RFD surge gust front roughly marks the leading edge of the forward-flank high-$Z_{DR}$ arc wrapping around the mesocyclone.
- The strongest wind speeds within the RFD surge are co-located with a relative minimum in spectrum width, suggesting a small turbulent component to the wind.
- $Z_{DR}$ values in the RFD decrease prior to tornadogenesis, which indicates an increasing concentration of small raindrops (Kumjian 2011; French et al. 2015).
- $Z_{DR}$ decreases ahead of the RFD surge, suggesting the potential for horizontal advection of small raindrops across the RFD surge gust front.

**Near-Surface Flow Field During the Tornado**

- Rapid intensification of the tornado coincides with development of an organized near-surface wind field consisting of a broad, arcing downdraft bounding strong winds wrapping from the storm inflow to the rear of the tornado.
- The downdraft is co-located with X-band polarimetric signatures indicative of hail; including attenuation in $Z_{DR}$ and $Z_{H}$, CC values below 0.9, and very large $K_{DP}$ values that are normally associated with a large amount of melting hail (Kumjian 2013).
- The forward flank south of the downdraft is characterized by relatively low $K_{DP}$, moderate $Z_{DR}$, and CC near 1, consistent with a low concentration of large raindrops falling into the storm inflow.

**Summary**

- Radial velocity data from two rapid-scan radars have been assimilated using a LETKF to produce 1-minute analyses of the El Reno supercell.
- Features in the ensemble mean analyses are co-located with signatures in un-assimilated radar data.
- Tornadogenesis occurs following intensification of a downdraft and internal RFD momentum surge NW of the low-level mesocyclone.
- The RFD surge is associated with strong wind speeds, high $Z_{DR}$, and low spectrum width, with decreasing $Z_{DR}$ values ahead of the surge.
- A broad downdraft containing hail develops following tornadogenesis.