Verification of RUC analyses using VORTEX2 soundings for non-tornadic and tornadic supercell environments

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Research Question
Can our best-available observational dataset reproduce the key, subtle differences between the environments of non-tornadic and tornadic supercells sampled during VORTEX2?

Motivation
The wind profile below 500 m was the main discriminating factor between non-tornadic and tornadic supercells in VORTEX2. However, observations near the surface are scarce, and boundary layer parameterizations can lead to errors.

Future Work
• Incorporate SPC mesoanalysis into near-surface RUC analyses.
• Use observed storms motions for SRH calculations.
• Spatially average RUC pseudo-soundings using a Barnes analysis technique.

Importance of low-level humidity and winds for tornadogenesis
• Low humidity in the boundary layer leads to colder outflow, which is detrimental to stretching needed for tornadoes.
• Strong near-surface shear promotes intense low-level mesocyclones.

LCL and SRH differences in composite soundings
• Mixed-layer LCL height was well handled by the RUC analyses.
• Near-surface storm-relative helicity was underestimated by the RUC, especially in the tornadic supercellular environments.

Composite soundings
• The RUC temperature profile exhibits minimal errors.
• RUC dry biases exist in the low- to mid-troposphere, while moist biases are found in the upper troposphere.
• Winds below 500 m are too fast in the RUC, however the hodograph shape is well-represented in both cases.

VORTEX2 soundings & RUC pseudo-soundings
• Parker (2014) compiled soundings from the 12 best sampled VORTEX2 supercells (5 non-tornadic, 7 tornadic).
• In this study, only the 41 far-inflow soundings were analyzed.
• RUC pseudo-soundings were created by interpolating the gridded fields in space and time to the radiosonde path.

Any questions? Email me at becoffer@ncsu.edu