

Single and Dual-Doppler Radar Observations of a Left-Moving Supercell Thunderstorm on 26 May 2009

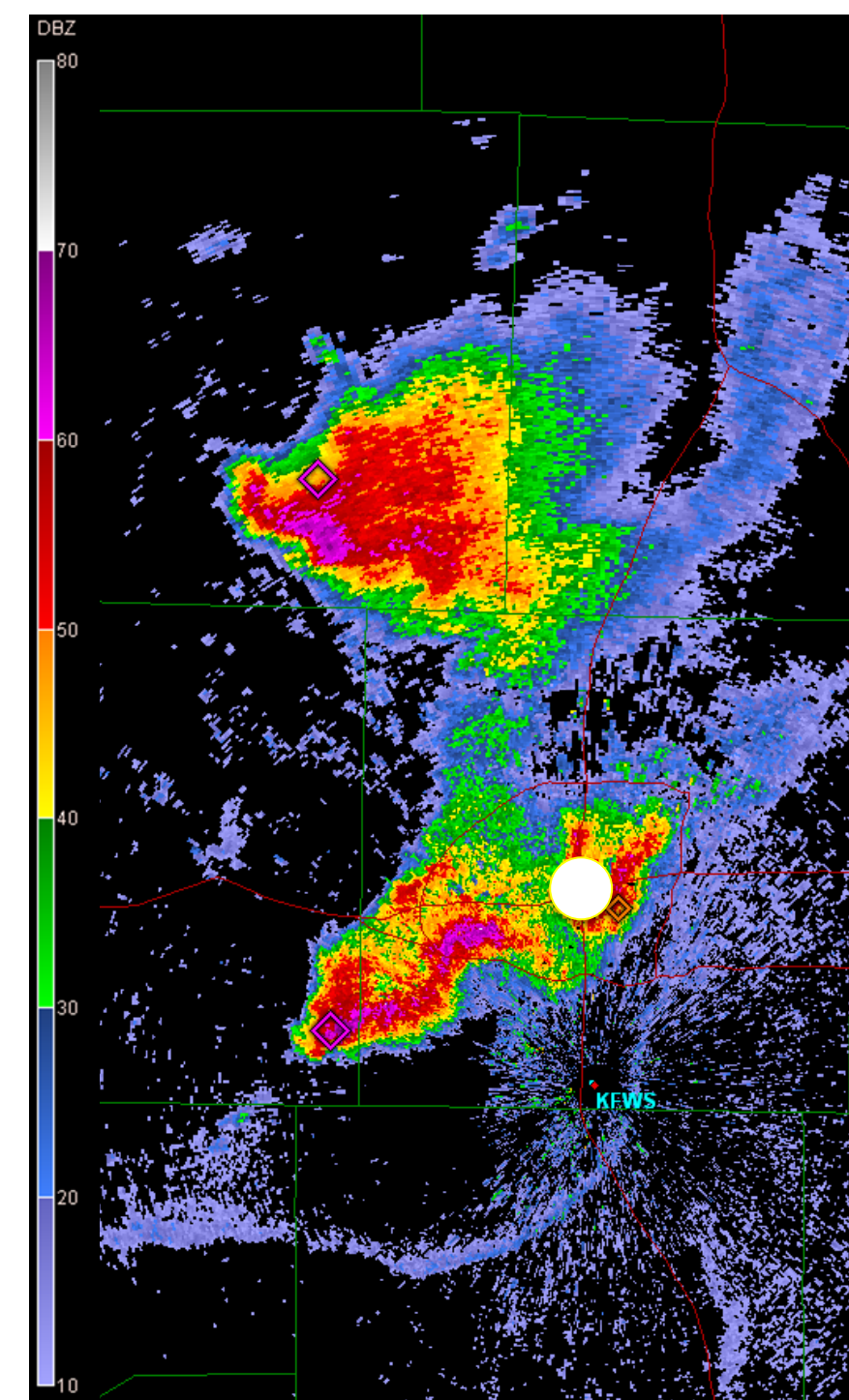
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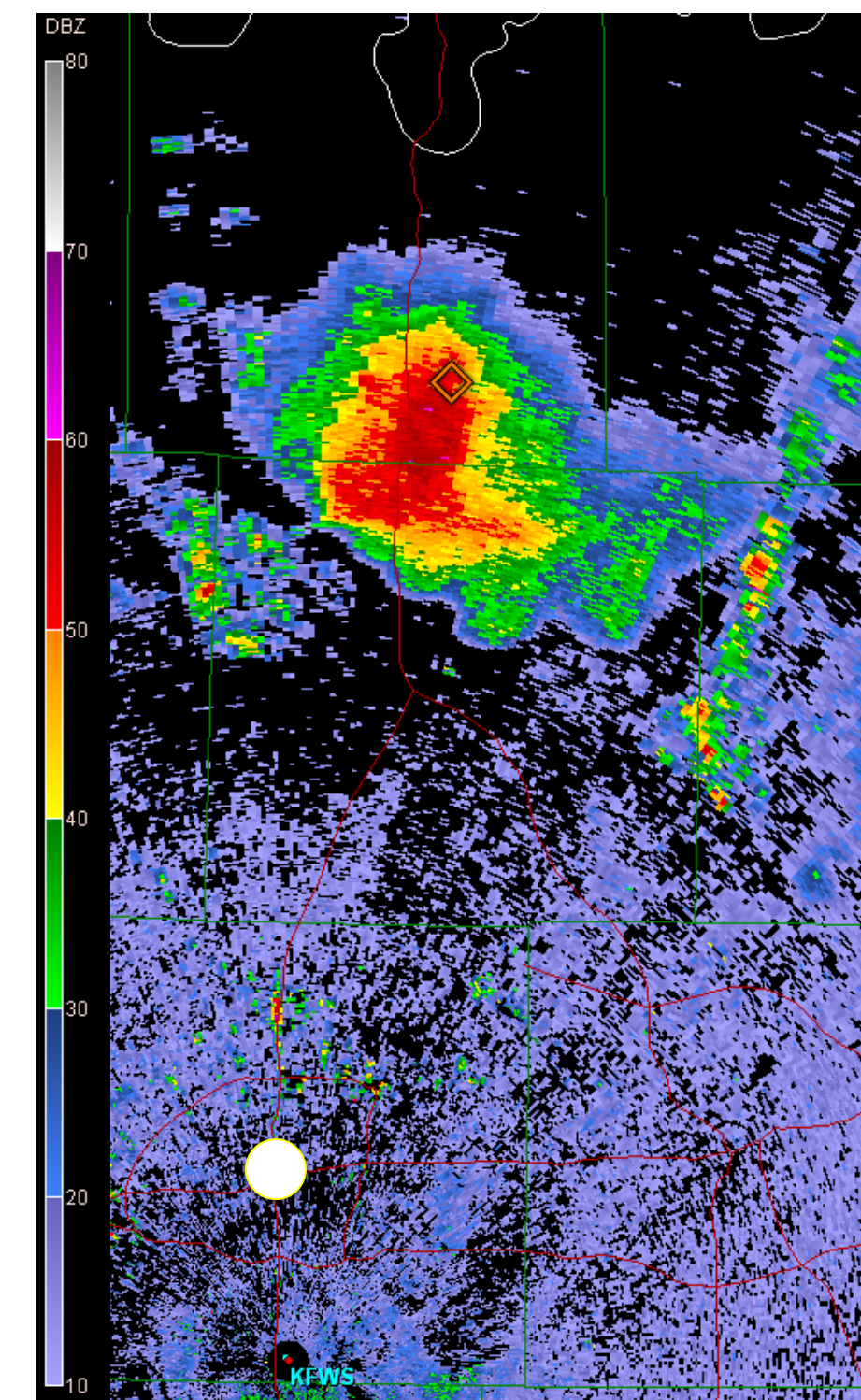
Introduction

This study examines mobile Doppler radar data collected on a left-moving supercell north of Fort Worth, TX, on 26 May 2009. Two Doppler on Wheels (DOW) radars intercepted this storm during VORTEX2. This case is of interest due to the relative scarcity of high-resolution Doppler radar observations of left-moving supercells. It is also of note because at the end of its lifetime, the supercell transitioned from a left-moving to a right-moving supercell.

The storm split around 2330 UTC. By 0023 UTC, the left split displayed a prominent hook echo on its left-rear flank. Fort Worth, TX, is marked with a white dot (right).



By 0226 UTC, the storm had transitioned into a right-moving supercell (left), possibly due to the onset of the nocturnal low-level jet and the resultant increase in low-level storm-relative helicity.



Radar Deployments

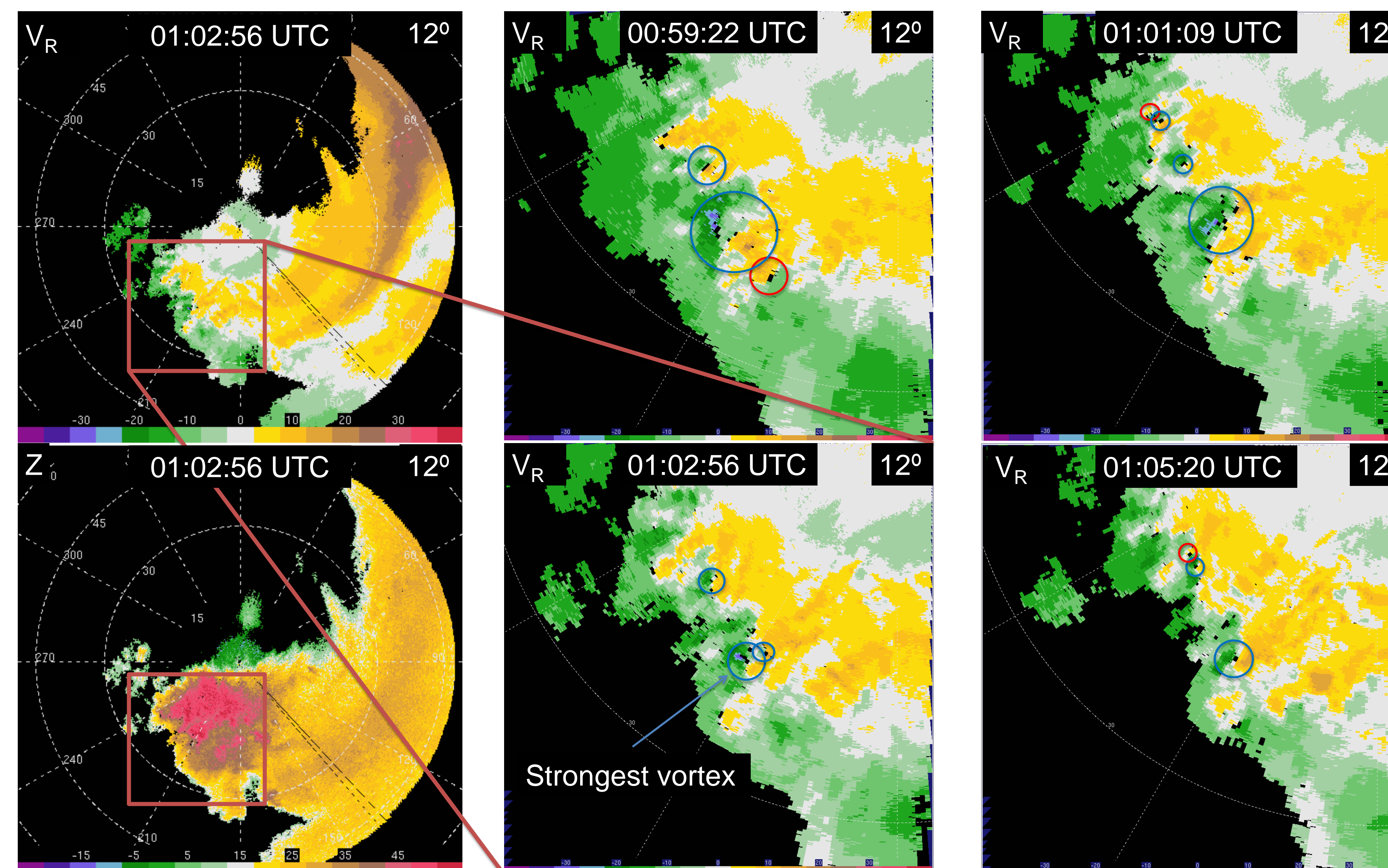


DOW6: 0120 – 0221 UTC
DOW7: 0055 – 0221 UTC

Data and Methodology

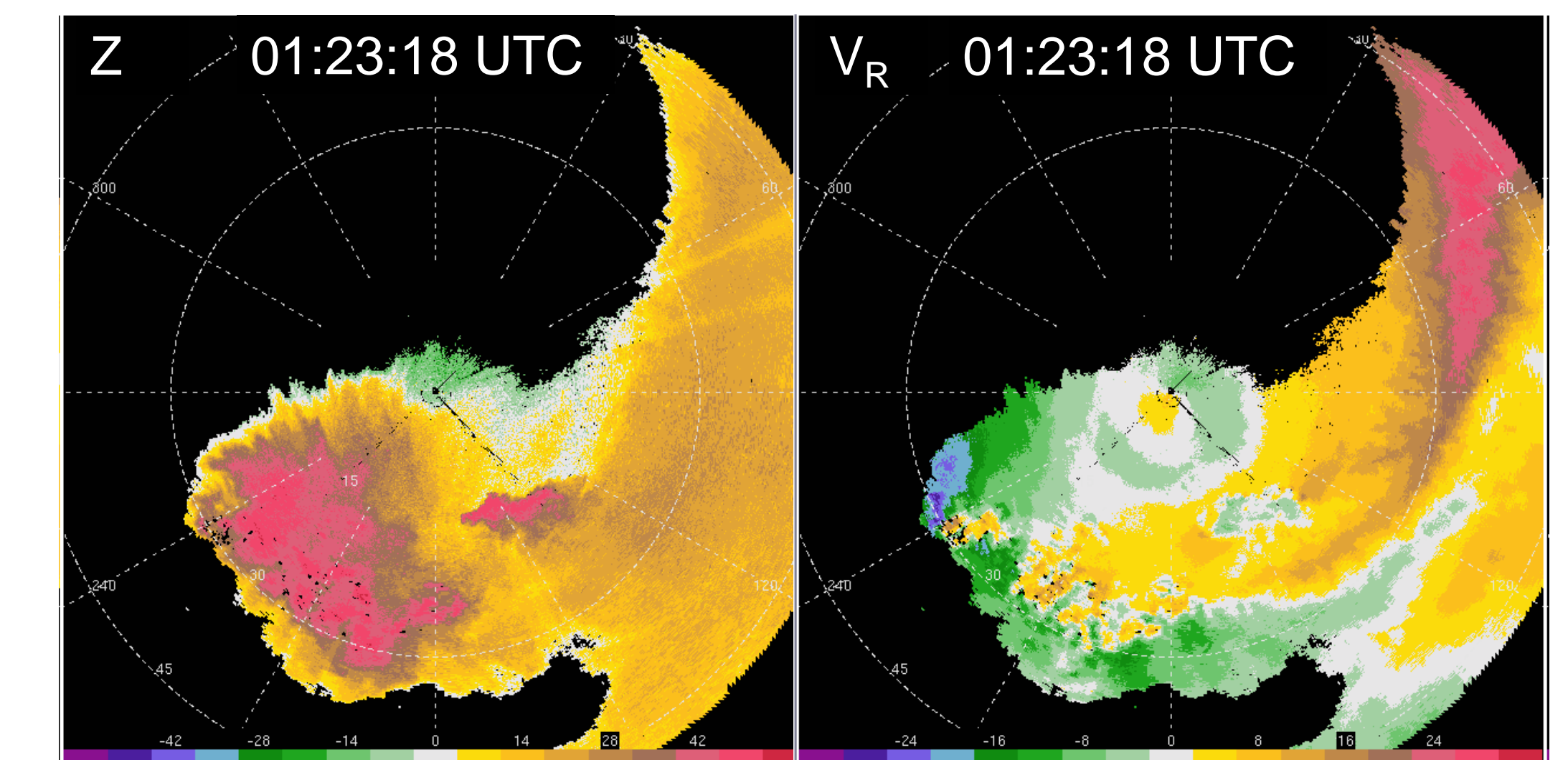
The DOW radars are both X-band (3-cm wavelength) radars with a beamwidth of 0.93° . The data were edited with SOLOII software to remove data with poor signal-to-noise ratios, to delete second-trip echoes, and to dealias folded velocities. The edited data were then mapped to a Cartesian grid using REORDER software and a one-pass Barnes analysis. Currently, objective analyses have only been performed on the data that show the wind shift (below right). The Cartesian grid spacing is 150 m, a smoothing parameter of 0.25 km^2 was applied, and data more than 1.12 km from a grid point did not contribute to the analysis at that point.

Vortices



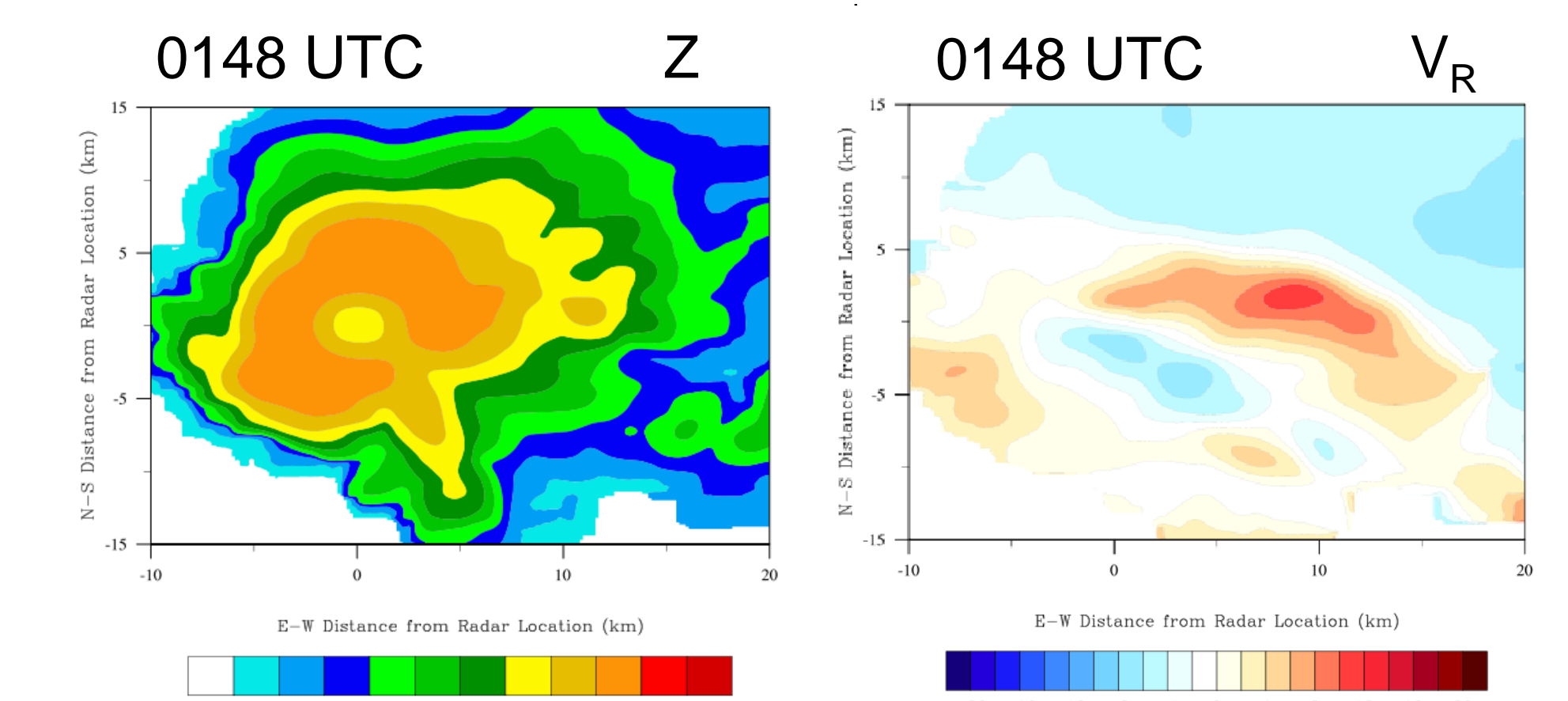
- Numerous small, short-lived vortices were present along the southwestern flank of the supercell, as seen in the DOW7 data (above).
- The vortices were strongest and most numerous around 4 km above the surface, roughly corresponding with the 12° elevation scan.
- The vortices extended from about 2 km to at least 5.5 km above the surface, corresponding to the 6° and 16° scans, respectively.
- The vortices ranged from 1 to 8 km in diameter, and the average vortex was about 2 km in diameter.
- The vortices were both cyclonic (red circles) and anticyclonic (blue circles).
- There was often more than one vortex contemporaneously, and occasionally there were as many as four.
- The vortices were relatively short lived, persisting for as long as 8 minutes, though most only lasted about 4 minutes.
- The maximum ΔV was 42 m s^{-1} and the average ΔV was 25 m s^{-1} .

Eastern Storm



- A second cell initiated to the east of the original cell at 0110 UTC.
- This cell lasted about 40 minutes until it was absorbed into the original left-moving cell.

Wind Shift



- As the storm evolved, a wind shift propagated through the precipitation core from southwest to northeast at an average speed of 7 m s^{-1} .
- This wind shift was not associated with any fine lines in the reflectivity field.

Future Work

Further analysis, including dual-Doppler wind syntheses, is required to diagnose the origins of the vortices found aloft on the southwestern flank of the supercell. These syntheses, in conjunction with synoptic-scale analyses, will also assist in determining why the supercell developed right-moving characteristics near the end of its life.