

Vortex Arches in Supercells: WSR-88D Observations

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ABSTRACT

Observations from the WSR-88D at New Underwood, South Dakota (KUDX), are used to examine vortex “arches” that have been found previously in many dual-Doppler analyses of supercells. These arches—formed by baroclinic processes—are defined as lines of equal vorticity connecting the cyclonic and anticyclonic vortex couplets that often straddle the hook echo of a supercell. A background and conceptual model of vortex arches is given first; then KUDX observations of three cyclonic supercells (one that was tornadic) over western South Dakota and northeastern Wyoming are used to illustrate various aspects of these arches. Evidence suggests that vortex arches (i) are at least occasionally evident in the WSR-88D data, (ii) may exhibit a dominant anticyclonic vortex, even though the supercell is cyclonic, and (iii) can potentially assist the warning forecaster when making tornado warning decisions. In the last example, vortex arching was observed about eight minutes prior to tornadogenesis. Given the recent upgrade of the WSR-88D network to “super resolution” in 2008, vortex arches should be relatively easier to identify now compared to years prior to 2008.