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NORTHERN ILLINOIS UNIVERSITY

(Capstone Title)

A Capstone Submitted to the
University Honors Program

In Partial Fulfillment of the
Requirements of the Baccalaureate Degree

With Honors

Department Of

(Your Department)

By

(Your Name)

DeKalb, Illinois

(Graduation Date)
University Honors Program
Capstone Faculty Approval Page

Capstone Title (print or type)

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Student Name (print or type) ______________________________________________

Faculty Supervisor (print or type) __________________________________________

Faculty Approval Signature _______________________________________________

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Tornadogenesis in supercell thunderstorms has been a heavily studied topic by the atmospheric science community for several decades. However, the reasons why some supercells produce tornadoes, while others in similar environments and with similar characteristics do not, remains poorly understood. For this study, tornadogenesis failure is defined as a supercell appearing capable of tornado production, both visually and by meeting a vertically contiguous differential velocity ($\Delta V$) threshold, without producing a sustained tornado. Data from a supercell that appeared capable of tornadogenesis, but which failed to produce a sustained tornado, was collected by the Atmospheric Imaging Radar (the AIR, a high temporal resolution radar) near Denver, CO on 21 May 2014. These data were examined to explore the mechanisms of tornadogenesis failure within supercell thunderstorms. Analysis was performed on the rear-flank downdraft (RFD) region and mesocyclone, as previous work highlights the importance of these supercell features in tornadogenesis. The results indicate a lack of vertical continuity in rotation between the lowest level of data analyzed (100 m AGL), and heights aloft (> 500 m AGL). A relative maximum in low-level $\Delta V$ occurred at approximately 100 m AGL (0.5° in elevation on the radar) around the time of suspected tornadogenesis failure. This area of low-level rotation was unable to maintain a sustained connection with more intense $\Delta V$ patterns observed in the mesocyclone (> 2 km AGL). Additionally, the RFD produced by the Denver Supercell had a peak in intensity between approximately 3 and 3.5 km AGL just prior to the time of tornadogenesis failure, while simultaneously experiencing a relative minimum in intensity in the layer between the surface and 1 km.