1. Title Slide

Title: **A Downburst Study of the 29-30 June 2012 North American Derecho**

Authors and Affiliations

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Topics: Severe Weather and Lightning

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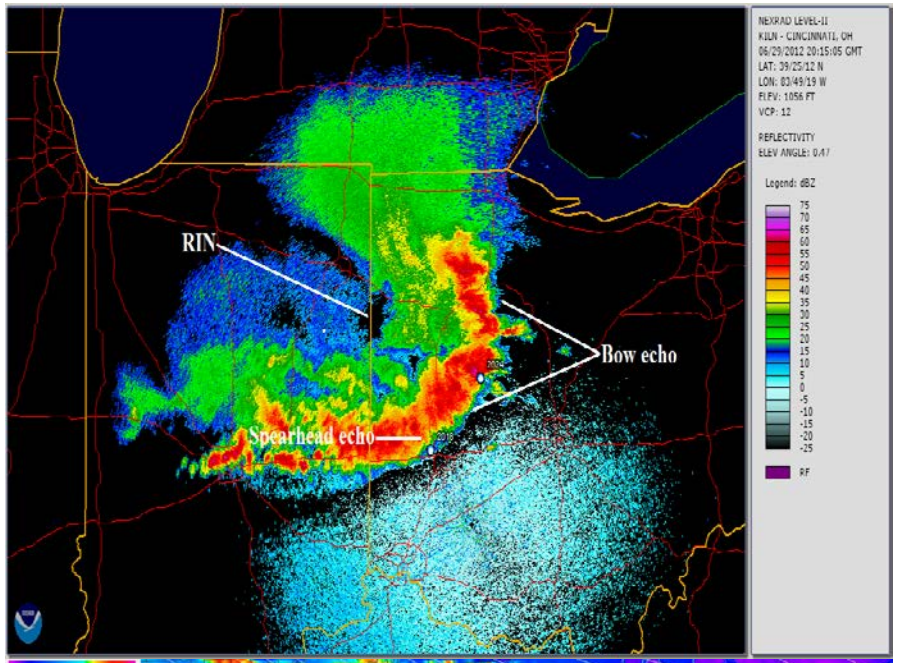
2. Introduction

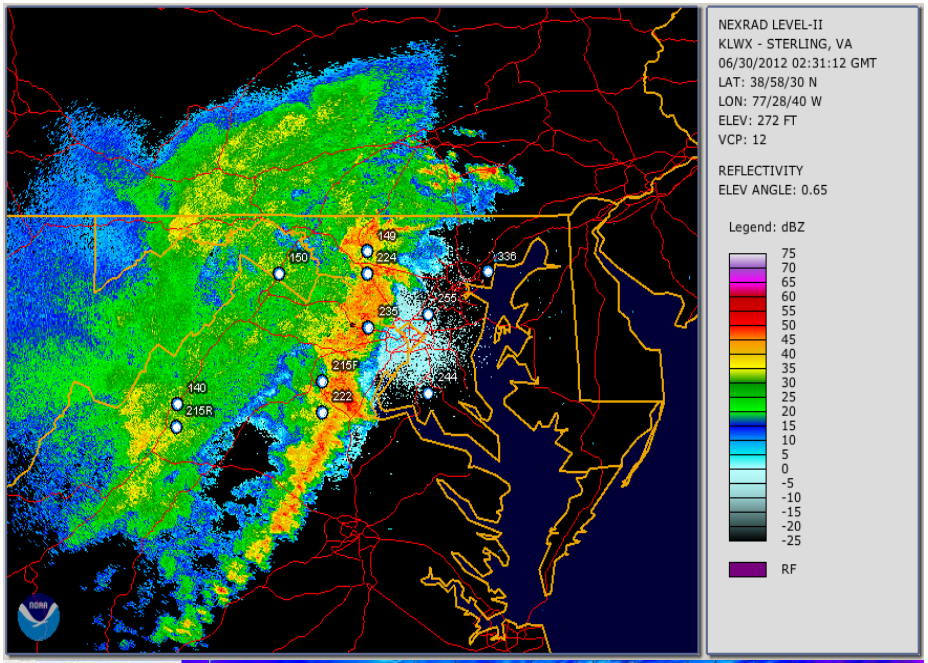
- During the afternoon of 29 June 2012, a complex of strong thunderstorms developed over Illinois and Indiana and then tracked southeastward over the Ohio Valley and central Appalachian Mountains by evening, and eventually produced widespread significant severe winds (> 65 knots) over northern Virginia and the Washington, DC metropolitan area. This convective system satisfied all criteria to be classified as a “derecho”.
- The purpose of this study is twofold:
  - To identify and document severe downburst events from the time of derecho initiation over northern Indiana to the time that the derecho-producing convective system (DCS) moved off the Atlantic coast.
  - Apply GOES-13 Rapid Scan Operations (RSO) water vapor (WV) and thermal infrared (IR) channel brightness temperature differencing (BTD) imagery, level-II NEXRAD imagery, and Rapid Refresh (RAP) model-derived microburst prediction algorithm output, including the Microburst Windspeed Potential Index (MWPI), to demonstrate the development and evolution of severe DCS-generated winds.

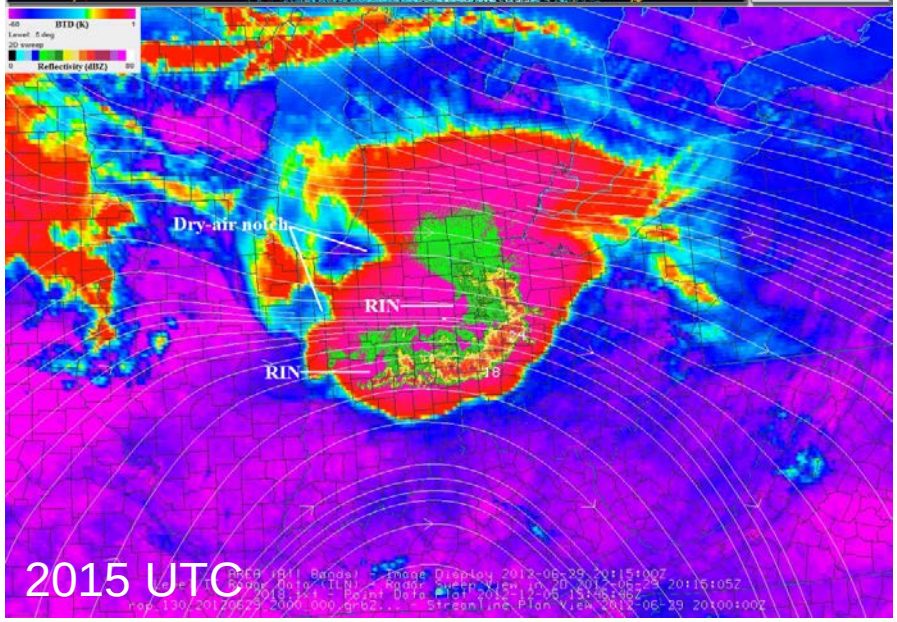
3. Methodology/Expected Outcomes

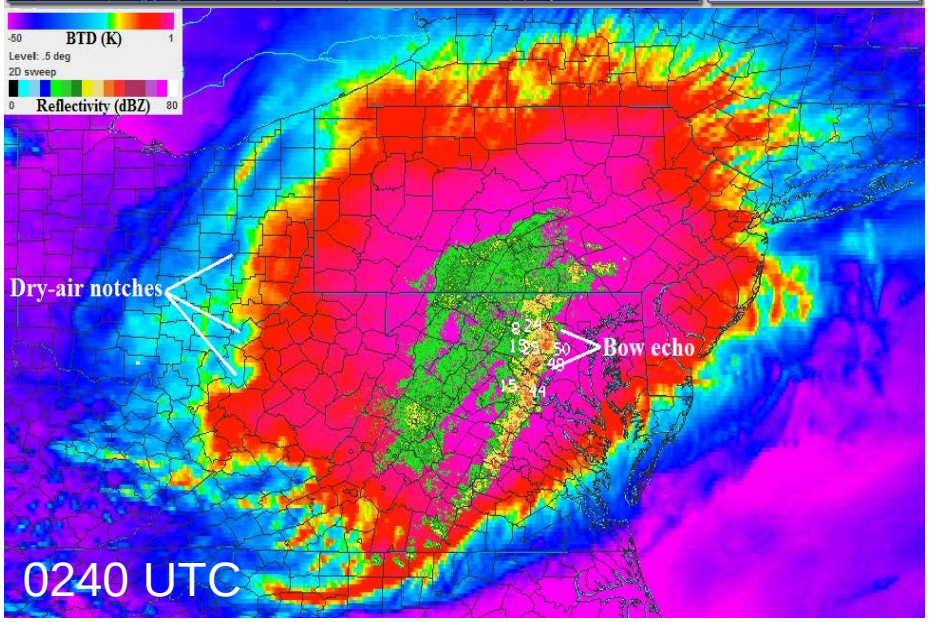
- The comparison of GOES WV-IR BTD and NEXRAD imagery to Storm Prediction Center (SPC) high wind reports emphasized the role of larger downbursts and downburst clusters in the generation of enhanced severe winds, especially over the Washington, DC metropolitan areas. This comparison also established the DCS as a progressive derecho. Overlying of NEXRAD and theta-e cross sections over RAP model-derived microburst product imagery described the tropospheric thermodynamic structure that was favorable for severe downburst generation.
- The combination of satellite, radar, and numerical model resources, visualized by McIDAS-V software, will describe the evolution of this DCS and will serve as an example of how to use this data in forecasting meso- to micro-scale severe wind events (i.e. downbursts, microbursts) embedded in larger-scale derechos.

4. Results: GOES-NEXRAD-Storm Report Comparison

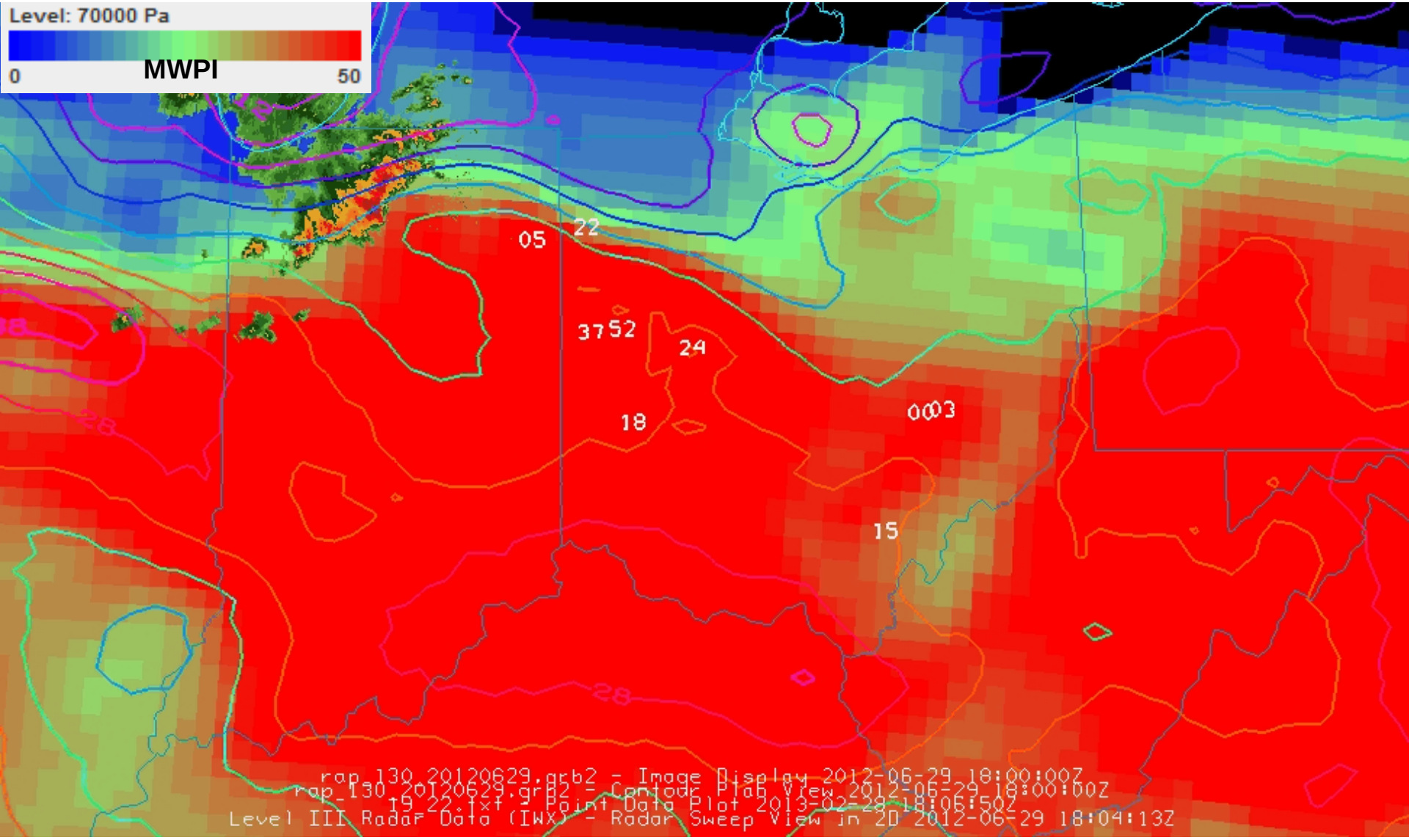








5. RAP Model MWPI-$\Delta\theta_e$-NEXRAD Composite

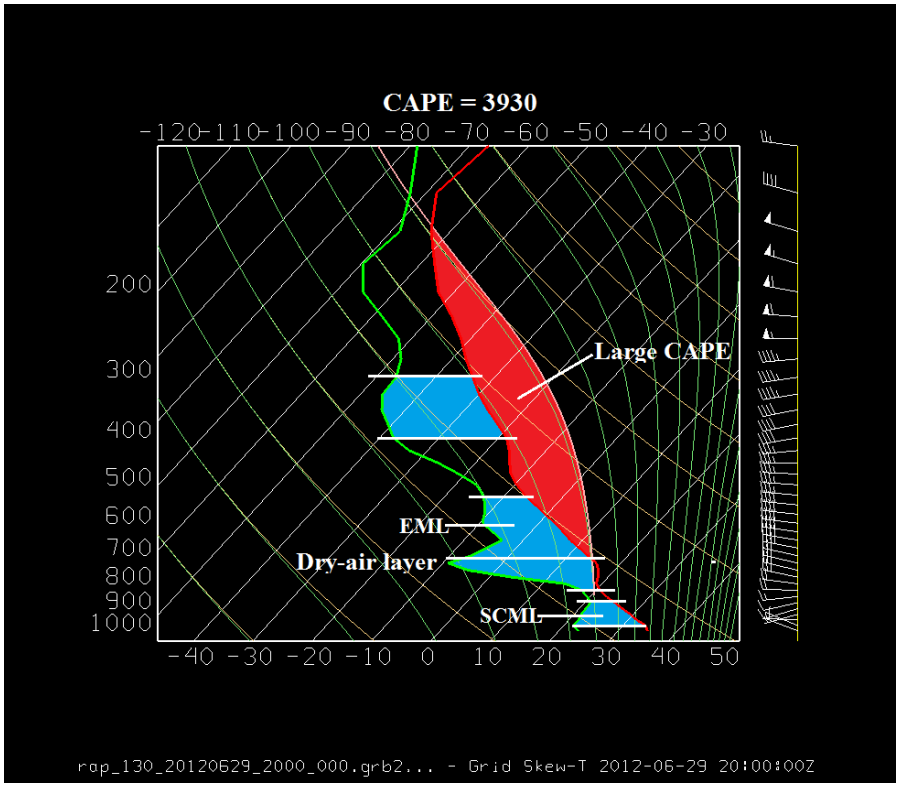


$$MWPI \equiv \{(CAPE/100)\}+\{\Gamma+ (T\text{-}Td)_{700}\text{-}(T\text{-}Td)_{550}\}$$

6. RAP Model Sounding Profiles

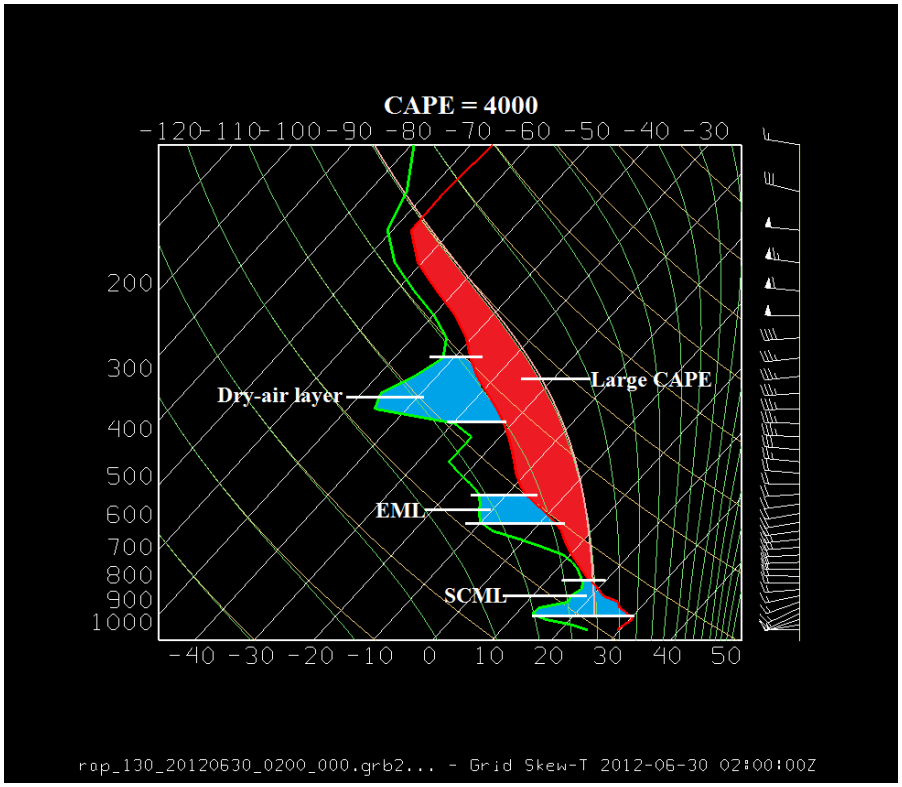
Dayton, Ohio

2000 UTC 29 June



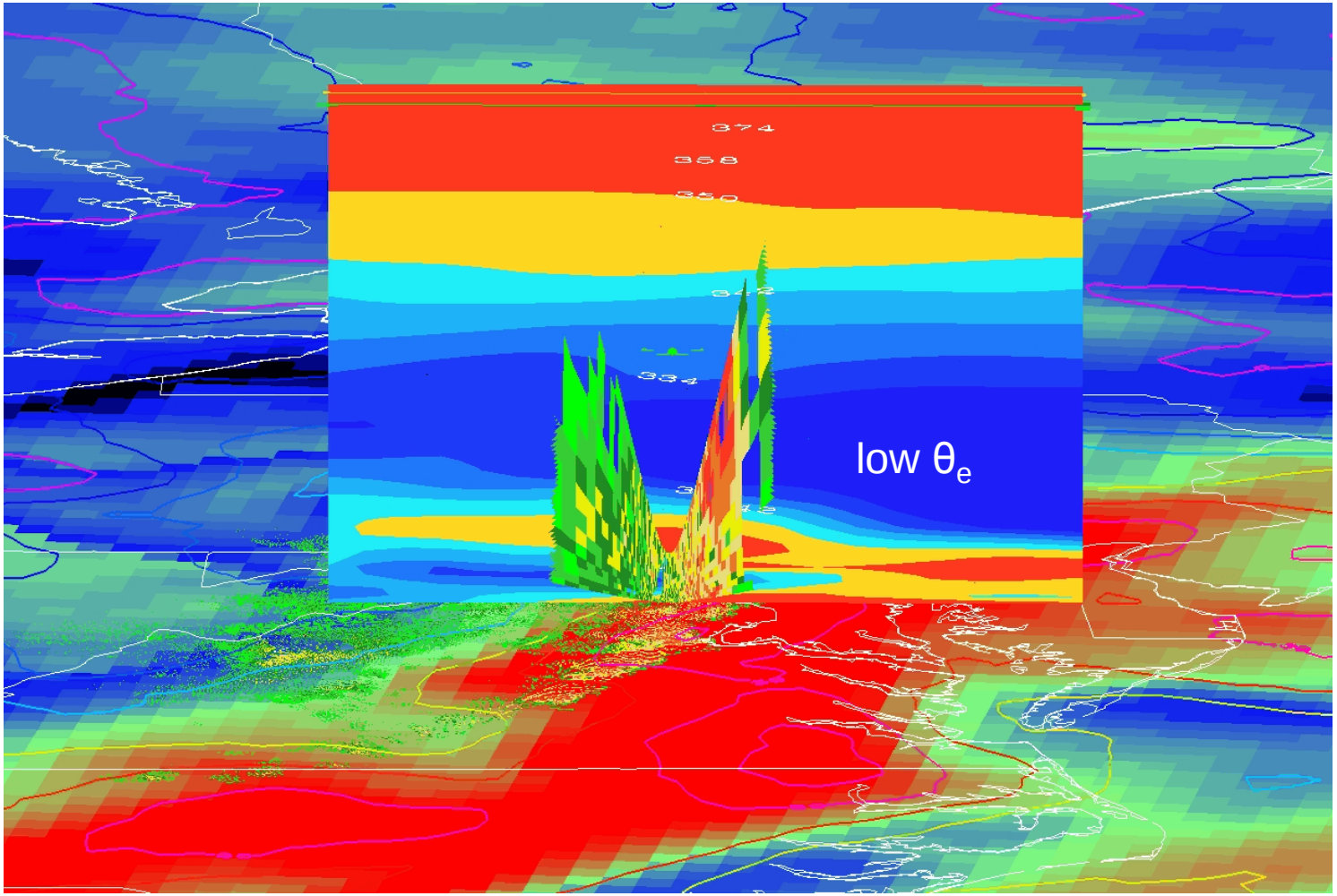
Reston, Virginia

0200 UTC 30 June



RAP model sounding profiles echo the favorable environment for severe downbursts with very large convective available potential energy (CAPE) and a prominent EML between the 500 and 700-mb levels.

7. VA-DC-MD Downburst Clusters



During the period of DCS re-intensification, and its track through the Washington, DC metropolitan area after 0200 UTC 30 June, the leading convective storm line was elevated through a prominent mid-tropospheric dry (low θ_e) layer.

8. Possible Path to Operations

- Forecast technique for enhanced severe winds resulting from downburst activity associated with derecho-producing convective storms (DCSs) will be disseminated as McIDAS-V bundles (scripts).
- Training and operational applications of the DCS forecasting technique will be presented in a Virtual Institute for Satellite Integration Training (VISIT) lesson, to be available at the NOAA/NWS Learning Center.

9. Future Plans

- In order to correlate dry-air notch signatures identified in GOES WV-IR BTD imagery with rear-inflow jets (RIJs) associated with severe-wind producing MCSs, BTD imagery will be compared to NEXRAD radial velocity imagery.
- This correlation will also be studied in additional DCS cases both prior to and following the June 2012 derecho.

10. Publication List

- References

  - Atkins, N.T., and R.M. Wakimoto, 1991: Wet microburst activity over the southeastern United States: Implications for forecasting. *Wea. Forecasting*, **6**, 470-482.
  - Corfidi, S.F., J.S. Evans, and R.H. Johns, cited 2013: About Derechos. Available online at http://www.spc.noaa.gov/misc/AbtDerechos/derechofacts.htm
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