# High Resolution Analysis Products to Support Severe Weather and Cloud-to-Ground Lightning Threat Assessments over Florida

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# Presentation Outline

- Description of operational high-resolution analyses at NWS Melbourne, FL (NWS MLB)

- Implementation of additional diagnostics
  - Severe weather products
    - Supercell Composite Parameter (SCP)
    - Significant Tornado Parameter (STP)
  - Cloud-to-ground lightning initiation signatures
    - Sounding + reflectivity information
    - Four reflectivity / temperature levels

- Sample results

# Operational Analyses at NWS MLB

- Configuration of ARPS Data Analysis System (ADAS)
  - Analysis software from University of OK, similar to LAPS
  - Integrates all available data over FL peninsula
    - 40-km RUC: background field for analysis
    - Level II WSR-88D, satellite IR/VIS, sfc obs, mesonet, etc.
    - Objectively analyzed onto grids using a Linux workstation
  - Run at high temporal (15 min) and spatial resolution (4 km)
  - Visualization, Time Animation, & Diagnostics in AWIPS & web
  - www.srh.weather.gov/mlb/ldis/4km/ADAS_temperature.htm
- Result: More comprehensive understanding of evolving fine-scale weather features

# Additional Products Implemented

- Supercell Composite Parameter (SCP)
  - Depict potential areas for supercell thunderstorms
  - Values > 1 → threat for supercell thunderstorms

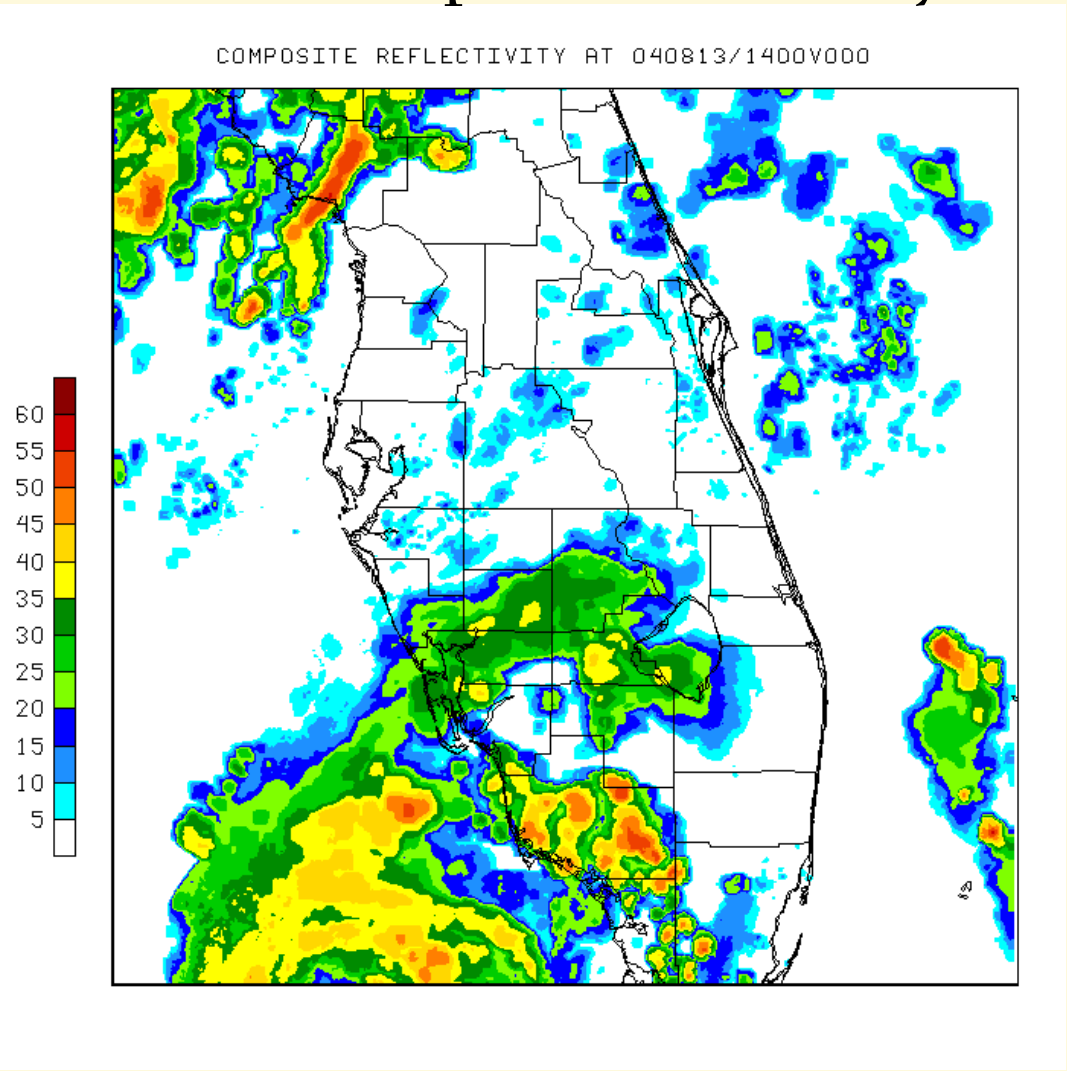
$$SCP = \left(\frac{MUCAPE}{1000\ J\ kg^{-1}}\right) \times \left(\frac{BRN\ Shear}{40\ m^2 s^{-2}}\right) \times \left(\frac{0\text{-}3\ km\ SRH}{100\ m^2 s^{-2}}\right)$$

- Significant Tornado Parameter (STP)
  - Identify areas favorable for supercells producing F2+ tornadoes
  - Values > 1 → threat for significant tornadic supercells

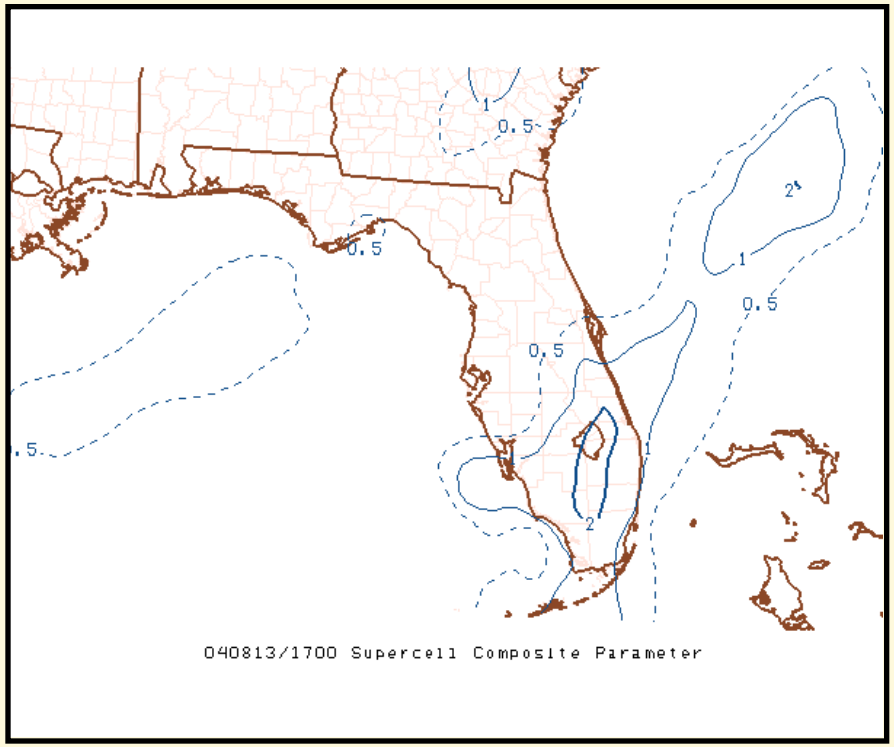
$$STP = \left(\frac{SBCAPE}{1500\ J\ kg^{-1}}\right) \times \left(\frac{0\text{-}6\ km\ Shear}{20\ m\ s^{-1}}\right) \times \left(\frac{0\text{-}1\ km\ SRH}{150\ m^2 s^{-2}}\right) \times \left(\frac{[2000 - SBLCL]}{1000\ m}\right)$$

  - Reference: Thompson *et al.* (2003), Weather and Forecasting

# Hurricane Charley Example:
## 1-km Composite Reflectivity

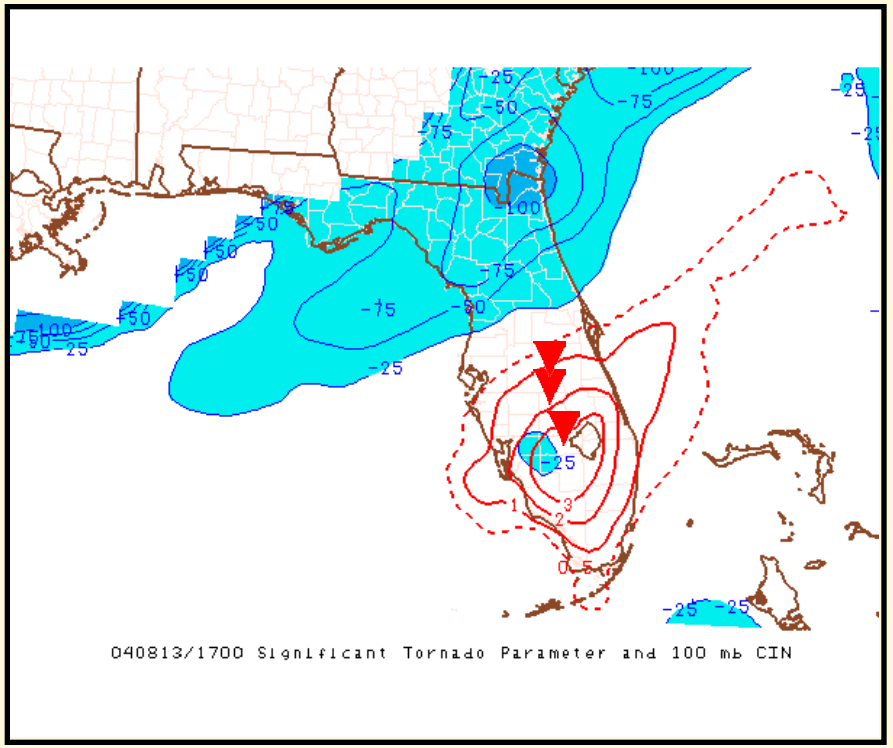


# Hurricane Charley Example:
## Storm Prediction Center RUC Products*




SCP at 1700 UTC 13 AUG 2004

STP at 1700 UTC 13 AUG 2004



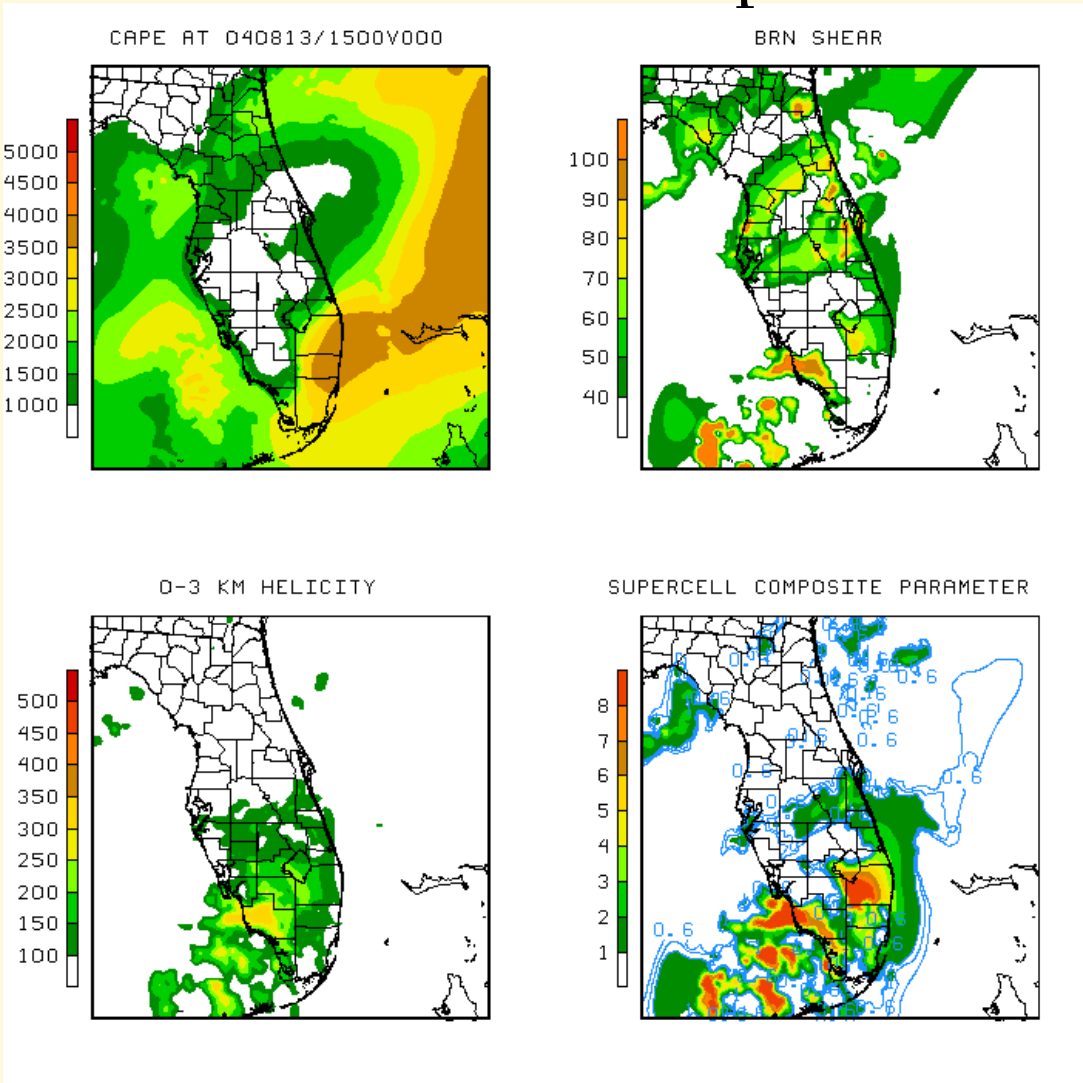

*Courtesy of Roger Edwards, Storm Prediction Center

# Hurricane Charley Example:
## 4-km ADAS SCP 4-panel

**Chart Legend:**

**CAPE BRN_Shr**

**0-3SRH SCP**

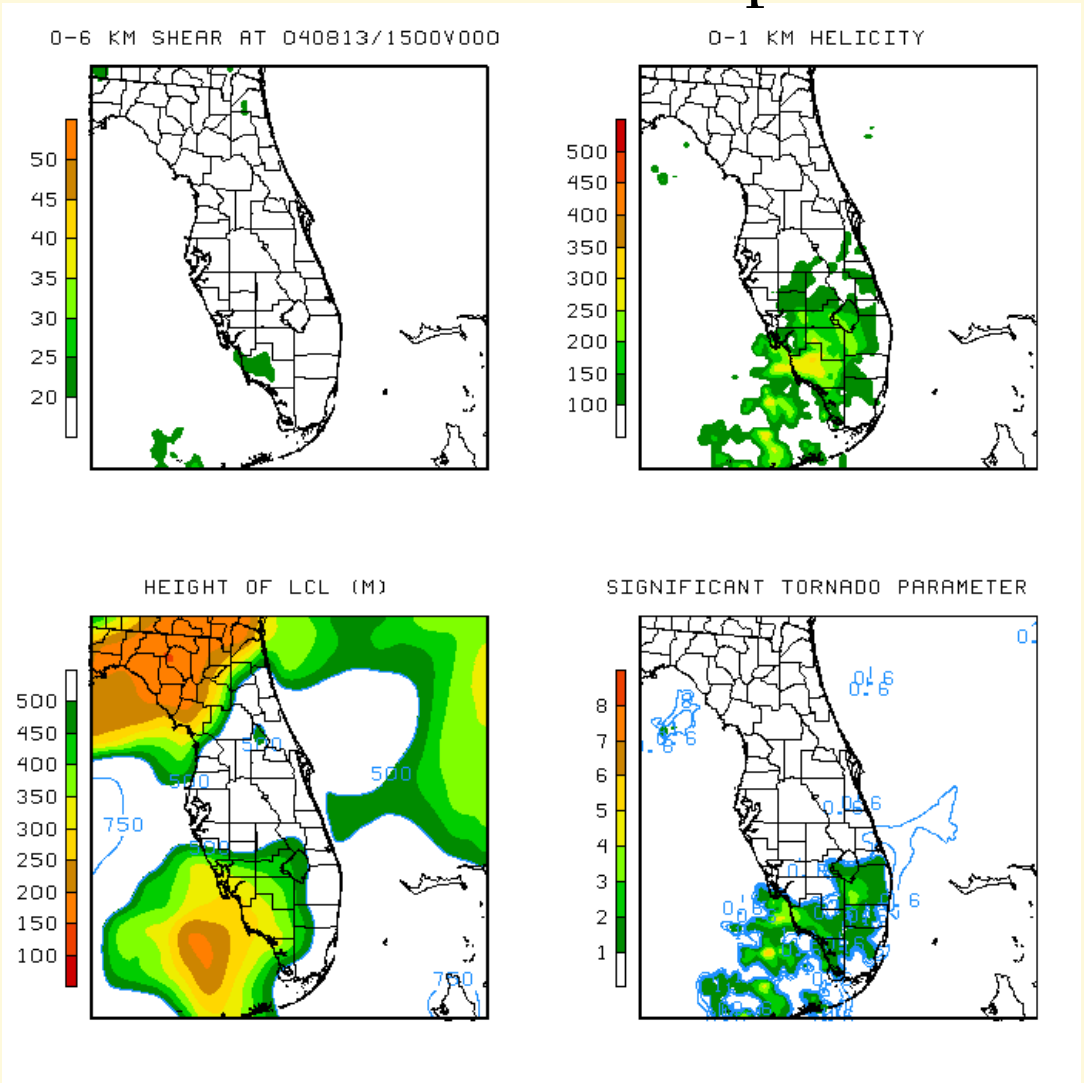


# Hurricane Charley Example:
## 4-km ADAS STP 4-panel

**Chart Legend:**

**0-6Shr 0-1SRH**

**LCL STP**



# Additional Products Implemented

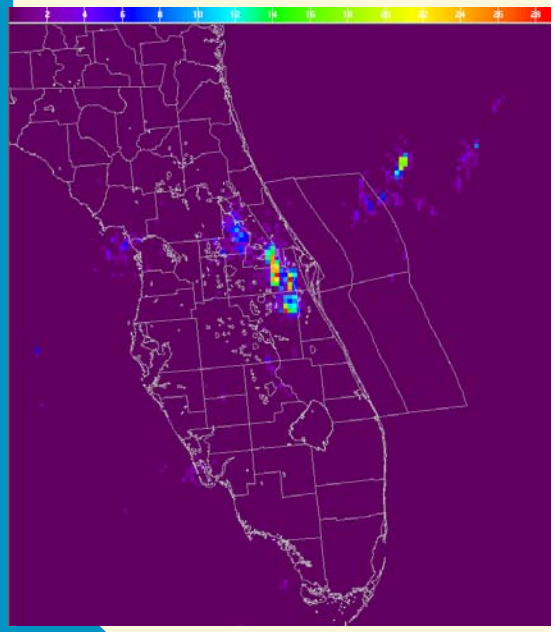
- Cloud-to-Ground Lightning Initiation Signatures
  - Based on Gremillion and Orville (1999) study over Kennedy Space Center, FL
  - Implemented 3 most skillful lightning initiation signatures
    - > 40 dBZ at -10°C [CSI of 79%, 7.5 min median lead time]
    - > 30 dBZ at -15°C [CSI of 71%, 12.5 min median lead time]
    - > 20 dBZ at -20°C [CSI of 63%, 10.5 min median lead time]
  - Created 4-panel web displays
    - Composite reflectivity
    - Most skillful reflectivity threshold values

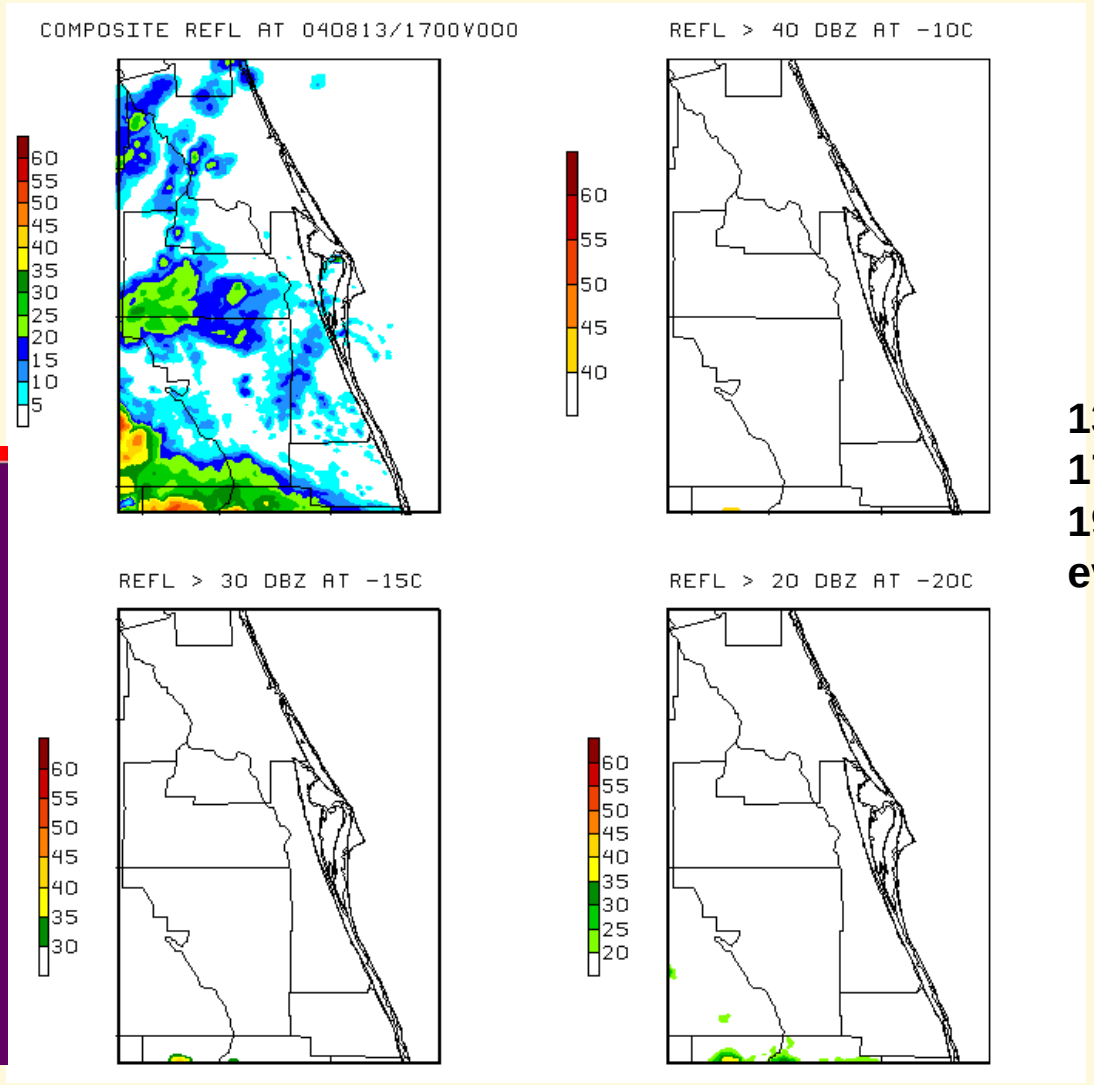
# Hurricane Charley Example:
## 1-km ADAS 4-panel reflectivity

**Reflectivity Plots Shown:**

**Comp >40@-10° >30@-15° >20@-20°**

**Corresponding NLDN CG lightning below**






**13 AUG 2004 1700 UTC to 1900 UTC, every 5 min**

# Summary

- Operational ADAS at NWS Melbourne, FL
- New diagnostics recently made available
  - Supercell Composite Parameter
  - Significant Tornado Parameter
  - Gremillion CG Lightning Initiation Signatures
- Examples
  - 4-km operational Florida peninsula graphics
  - Prospective 1-km east-central Florida domain
- Questions?
- AMU Web page: http://science.ksc.nasa.gov/amu