

High-Resolution Model Simulations of Tornadic Storms over Florida during Tropical Storm Gabrielle (2001)

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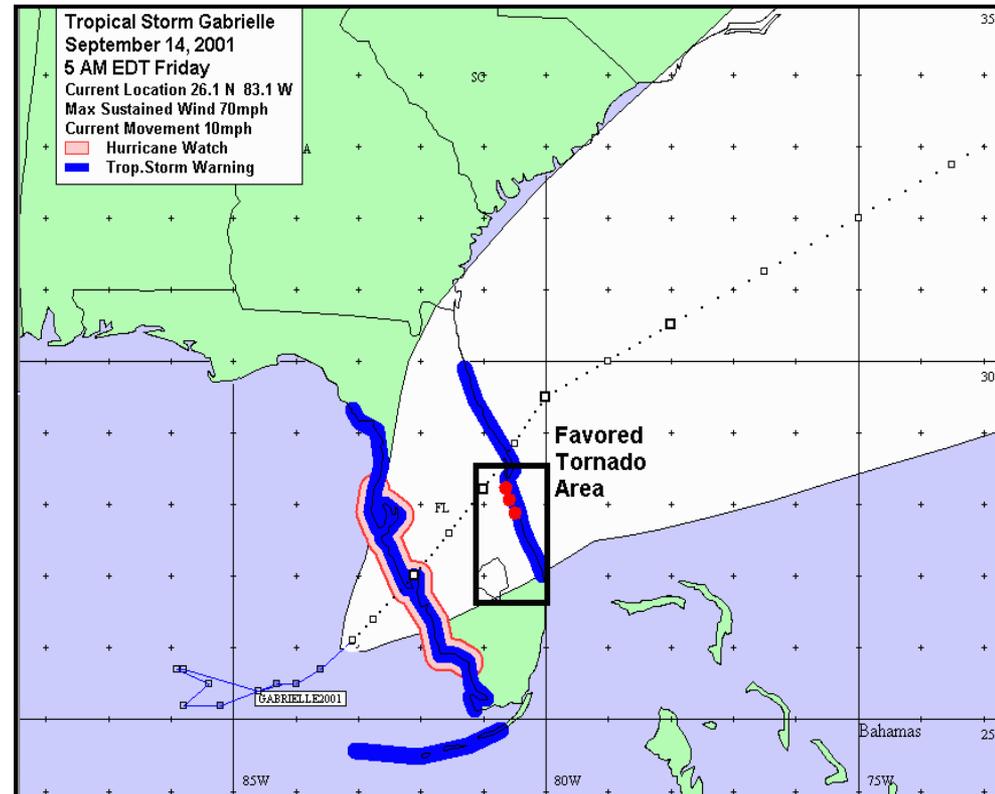
**Peter Blottman, Scott Spratt,
David Sharp, Matthew Volkmer**
NWS Melbourne, FL

**National Weather Association
28th Annual Meeting; Jacksonville, FL
22 October 2003**



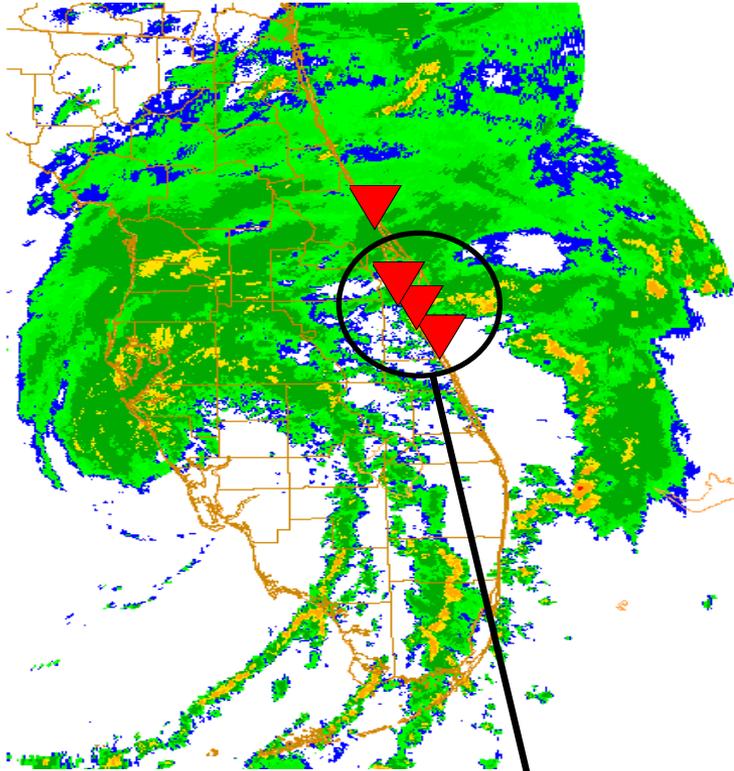
Talk Outline

- **14 SEP 2001 Event Summary**
- **Advanced Regional Prediction System (ARPS) Configuration**
- **Simulation Results**
 - **Impact of Level II WSR-88D & Local Data in Initial Conditions**
- **Summary**



14 Sep 2001 Event Summary:

(Tornado times, locations, and damage in east FL)



TC Gabrielle - Outer Rainband Tornadoes

**Four Tornadoes
in MLB CWA**

Three...F0
One.....F1 *



**Three Tornadoes in
Brevard County**

Same “mini-supercell”

Sebastian Inlet Tornado (725 AM); Melbourne/Eau Gallie Tornado (745 AM)

* Cocoa Tornado (845 AM); New Smyrna Beach Tornado (520 PM)

- **Brevard county tornadoes (bottom 3 on left graphic):**
 - Tracked SE to NW
 - Damage reports between 1125 UTC and 1245 UTC

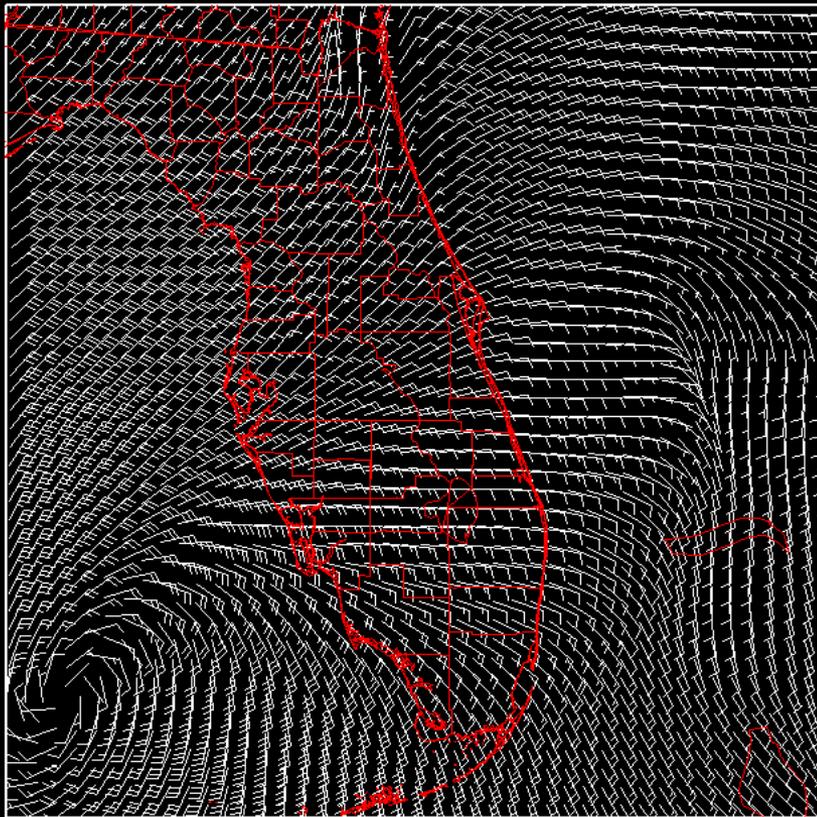
ARPS Model Configuration

- **Designed to mimic NWS Melbourne configuration**
 - Coverage over entire Florida peninsula
 - $Dx = 4 \text{ km}$, $dz_{\text{avg}} = 400 \text{ m}$, 45 vertical levels
 - Nine hour forecast
- **Boundary Conditions: RUC 40-km 3-12 h forecasts**
- **Initialized with & without ARPS Data Analysis System**
 - **No ADAS: RUC interpolated to 4-km grid**
 - **ADAS with all available real-time data:**
 - Level II WSR-88D data from KMLB (Melbourne, FL)
 - Satellite IR brightness temperatures & VIS data
 - Surface observations
 - Local wind profilers and towers

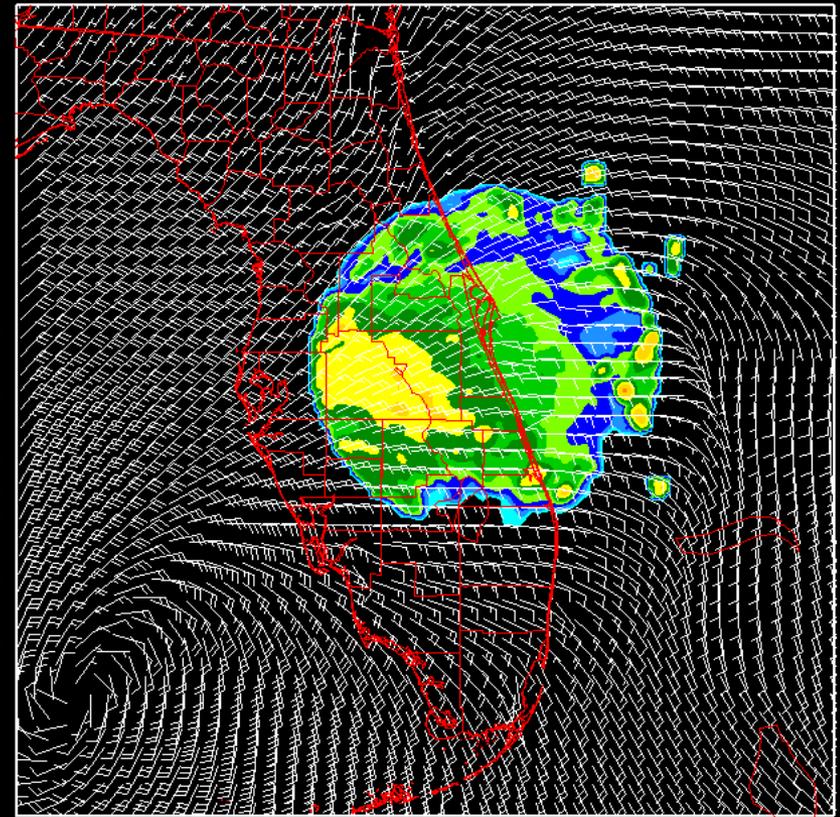
ARPS Simulation Results: 0900 UTC initialization (Forecast Composite Reflectivity & Sfc Winds at 0 h)

No ADAS

ADAS w/ KMLB Level II



ARPS Composite Reflectivity and Sfc. Wind at 010914/0900F000

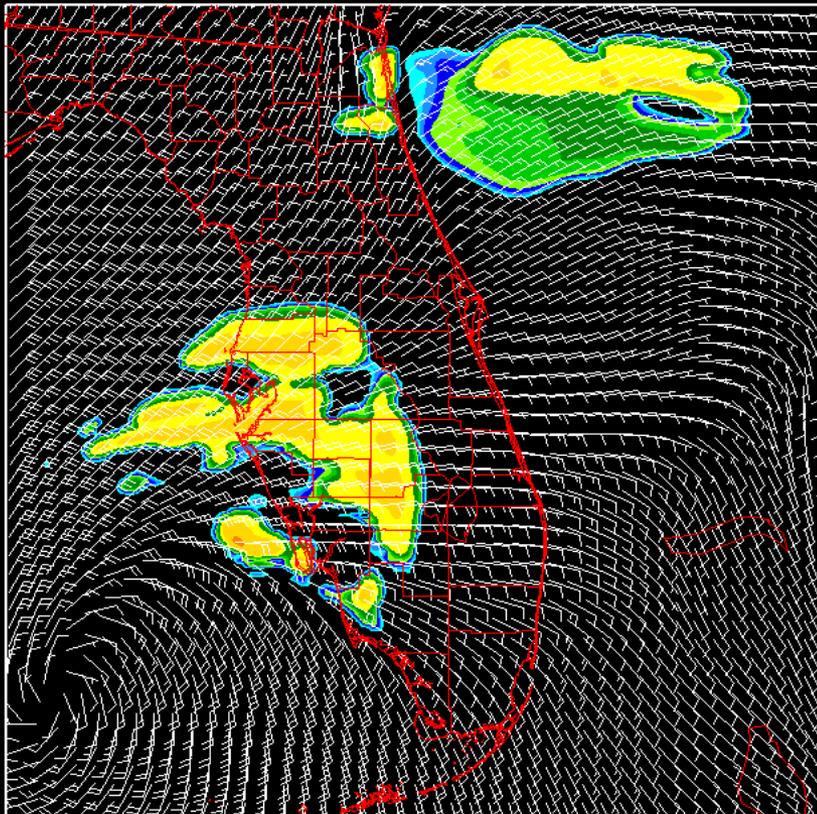


ARPS Composite Reflectivity and Sfc. Wind at 010914/0900F000

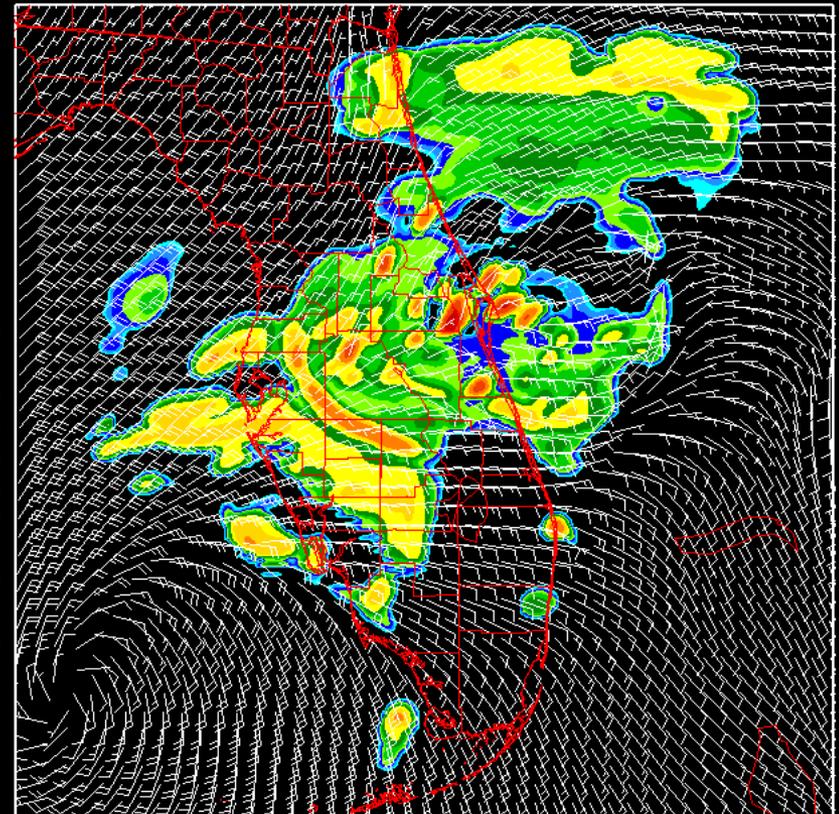
ARPS Simulation Results: 0900 UTC initialization (Forecast Composite Reflectivity & Sfc Winds at 1 h)

No ADAS

ADAS w/ KMLB Level II



ARPS Composite Reflectivity and Sfc. Wind at 010914/0900F001

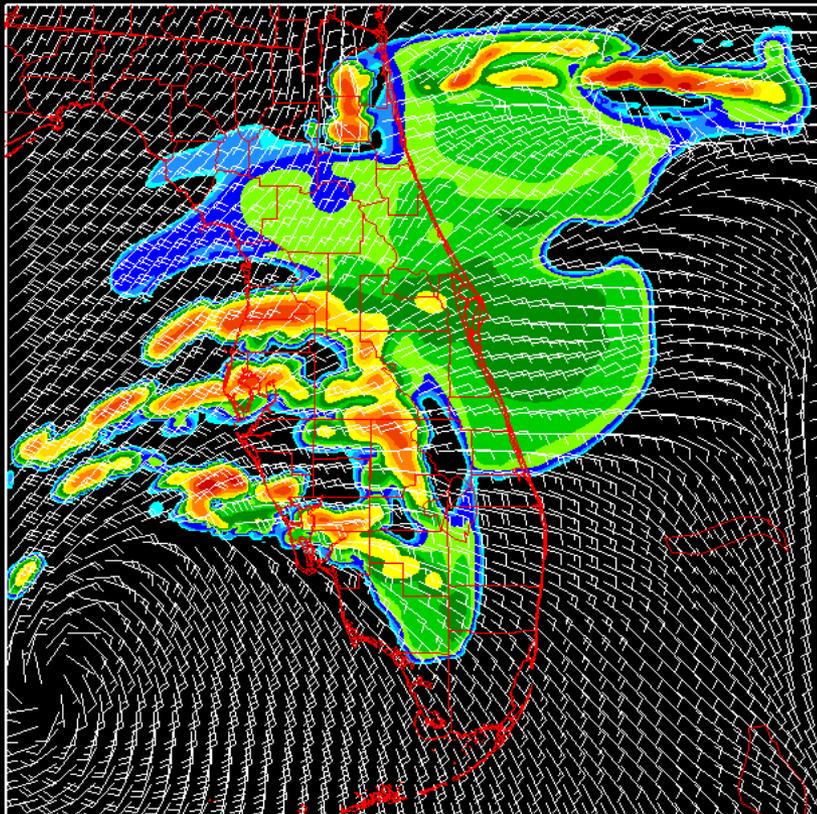


ARPS Composite Reflectivity and Sfc. Wind at 010914/0900F001

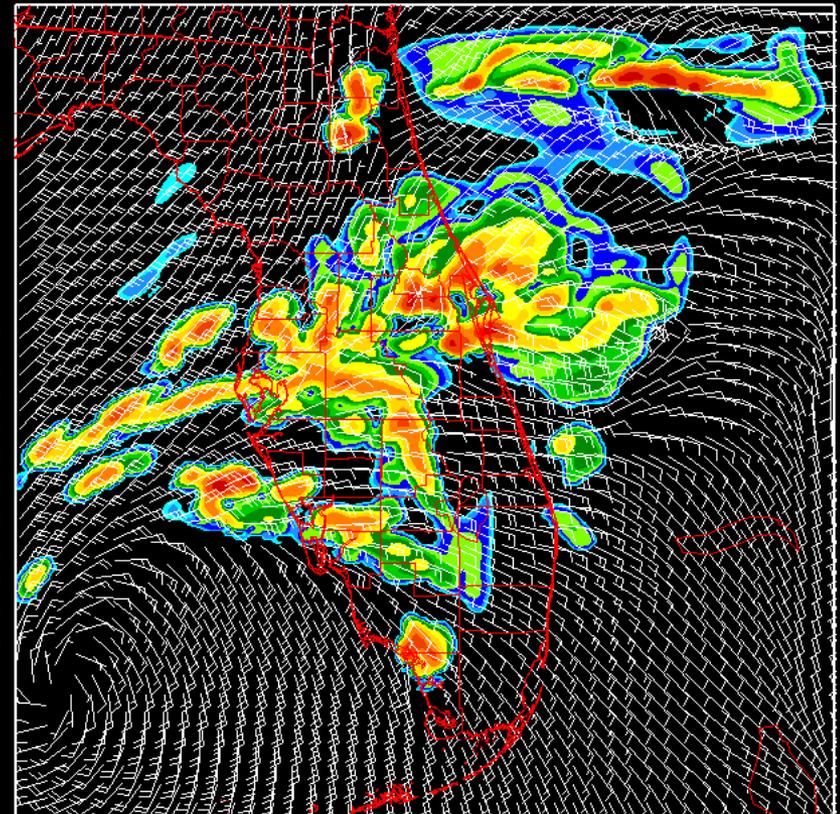
ARPS Simulation Results: 0900 UTC initialization (Forecast Composite Reflectivity & Sfc Winds at 2 h)

No ADAS

ADAS w/ KMLB Level II



ARPS Composite Reflectivity and Sfc. Wind at 010914/0900F002

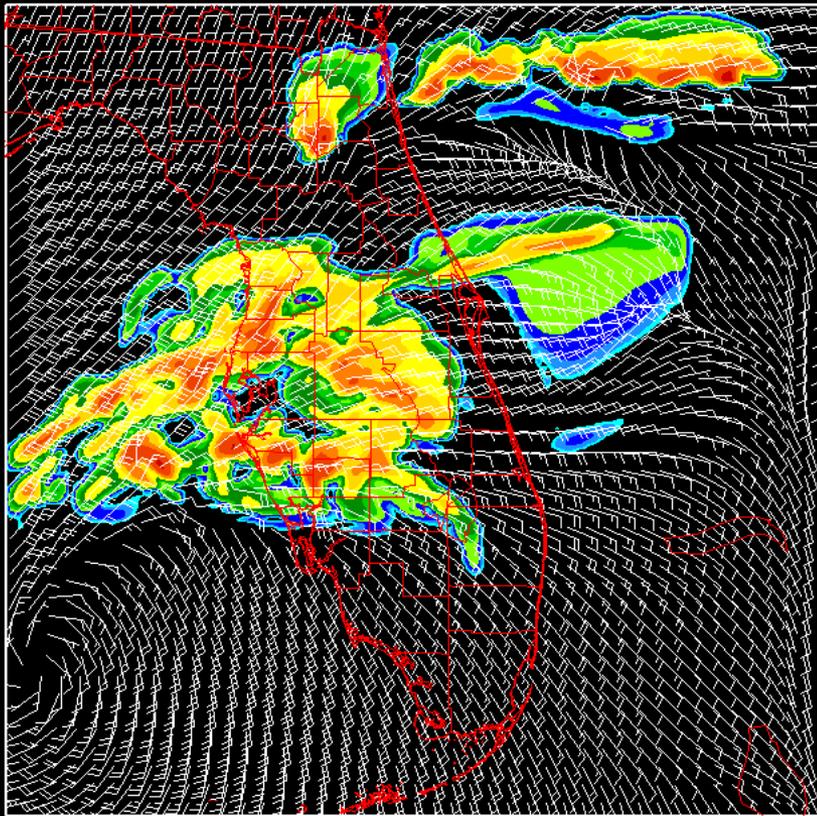


ARPS Composite Reflectivity and Sfc. Wind at 010914/0900F002

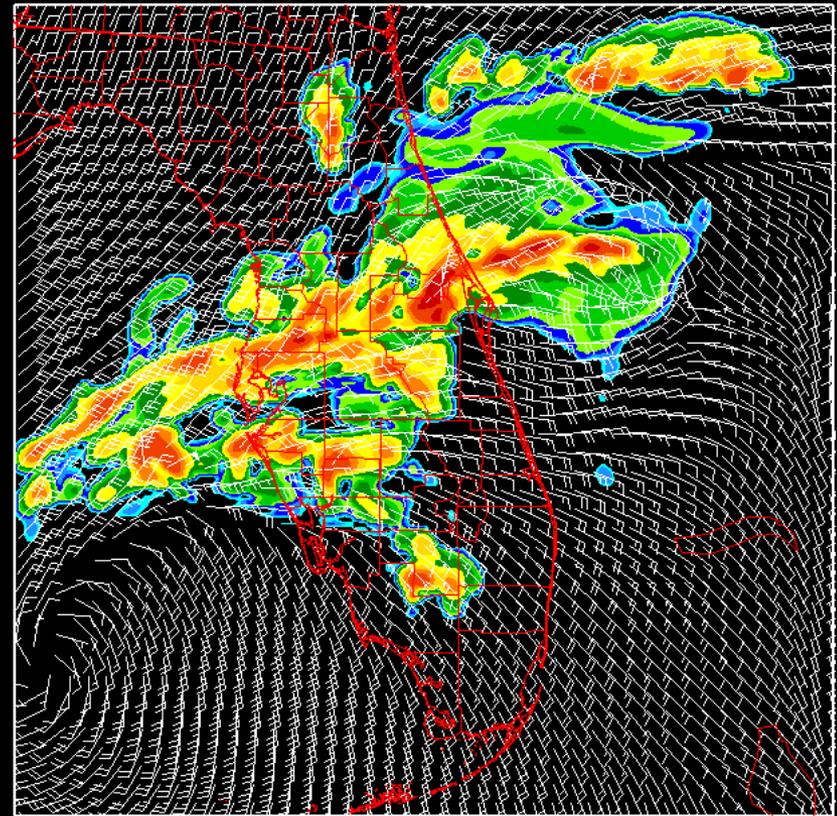
ARPS Simulation Results: 0900 UTC initialization (Forecast Composite Reflectivity & Sfc Winds at 3 h)

No ADAS

ADAS w/ KMLB Level II



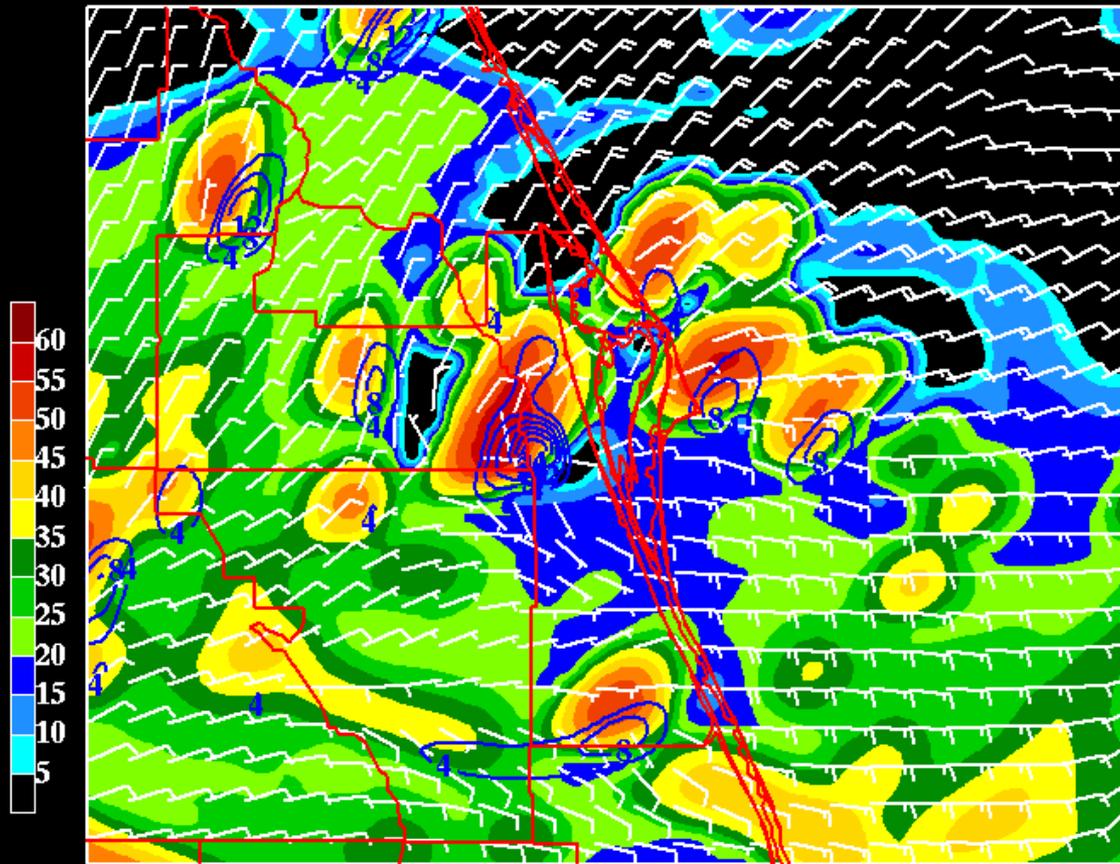
ARPS Composite Reflectivity and Sfc. Wind at 010914/0900F003



ARPS Composite Reflectivity and Sfc. Wind at 010914/0900F003

ARPS Simulation Results: 0900 UTC initialization

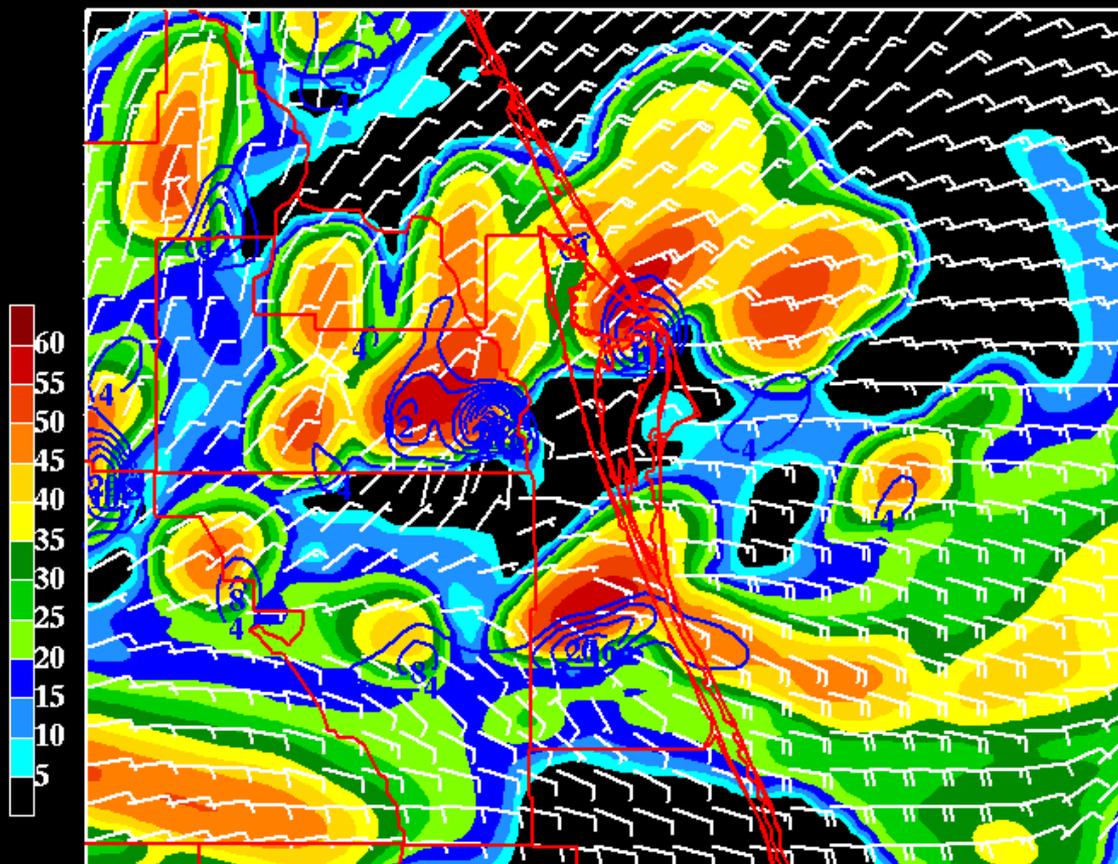
(Forecast Composite Reflectivity & 900-mb vorticity at 1 h)



Refl, Sfc Wind, and 900-mb Vorticity (*10**4) at 010914/0900F001

ARPS Simulation Results: 0900 UTC initialization

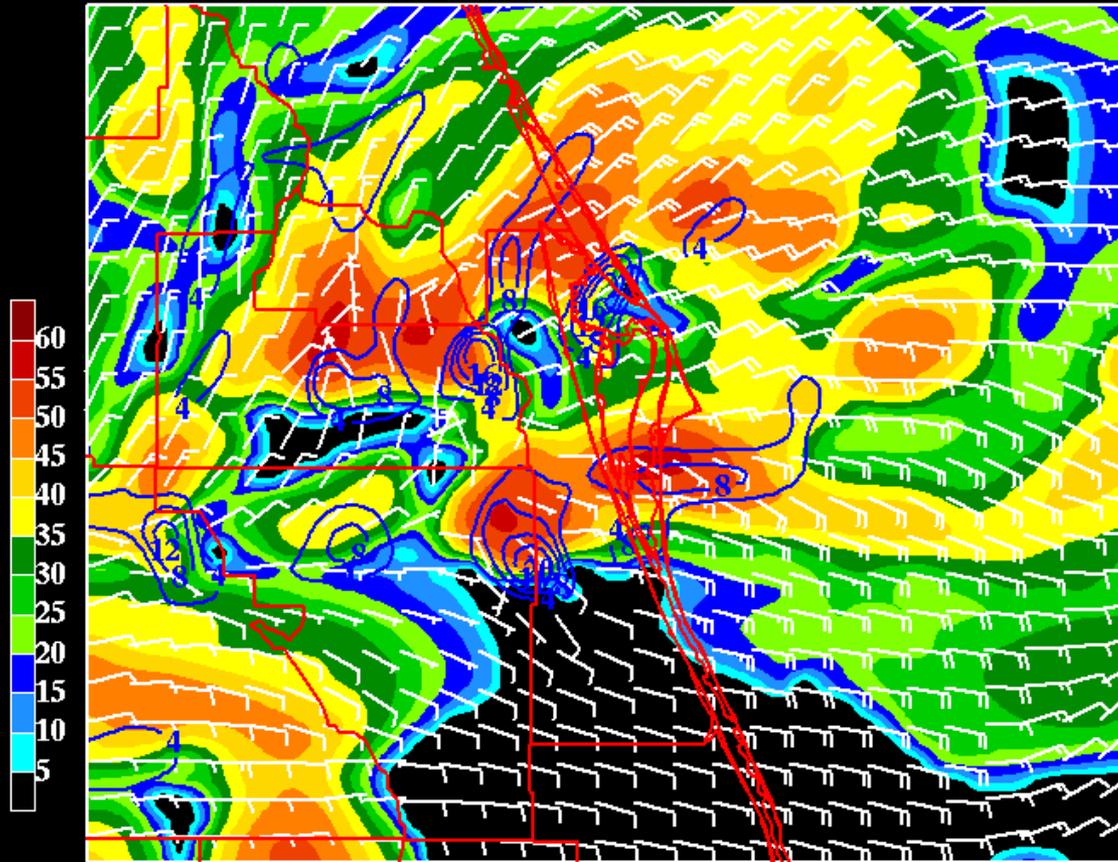
(Forecast Composite Reflectivity & 900-mb vorticity at 1.5 h)



Refl, Sfc Wind, and 900-mb Vorticity (*10**4) at 010914/0900F00130

ARPS Simulation Results: 0900 UTC initialization

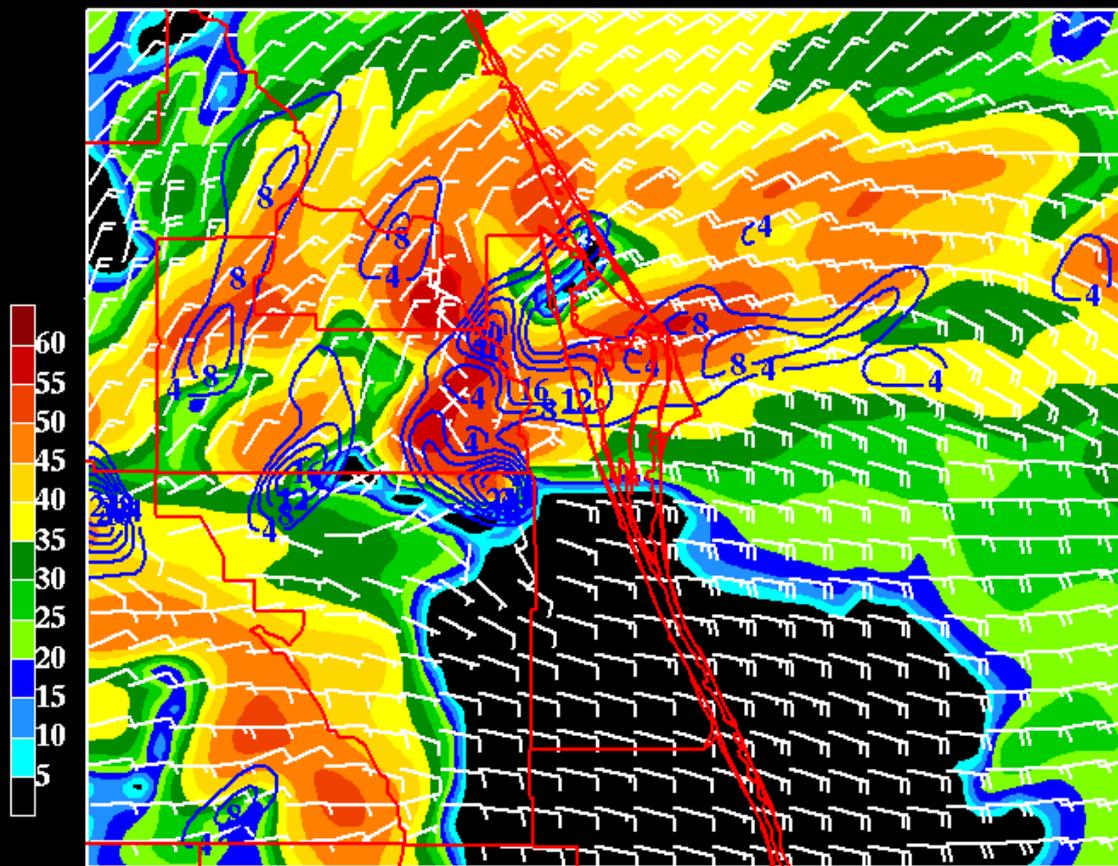
(Forecast Composite Reflectivity & 900-mb vorticity at 2 h)



Refl, Sfc Wind, and 900-mb Vorticity (*10**4) at 010914/0900F002

ARPS Simulation Results: 0900 UTC initialization

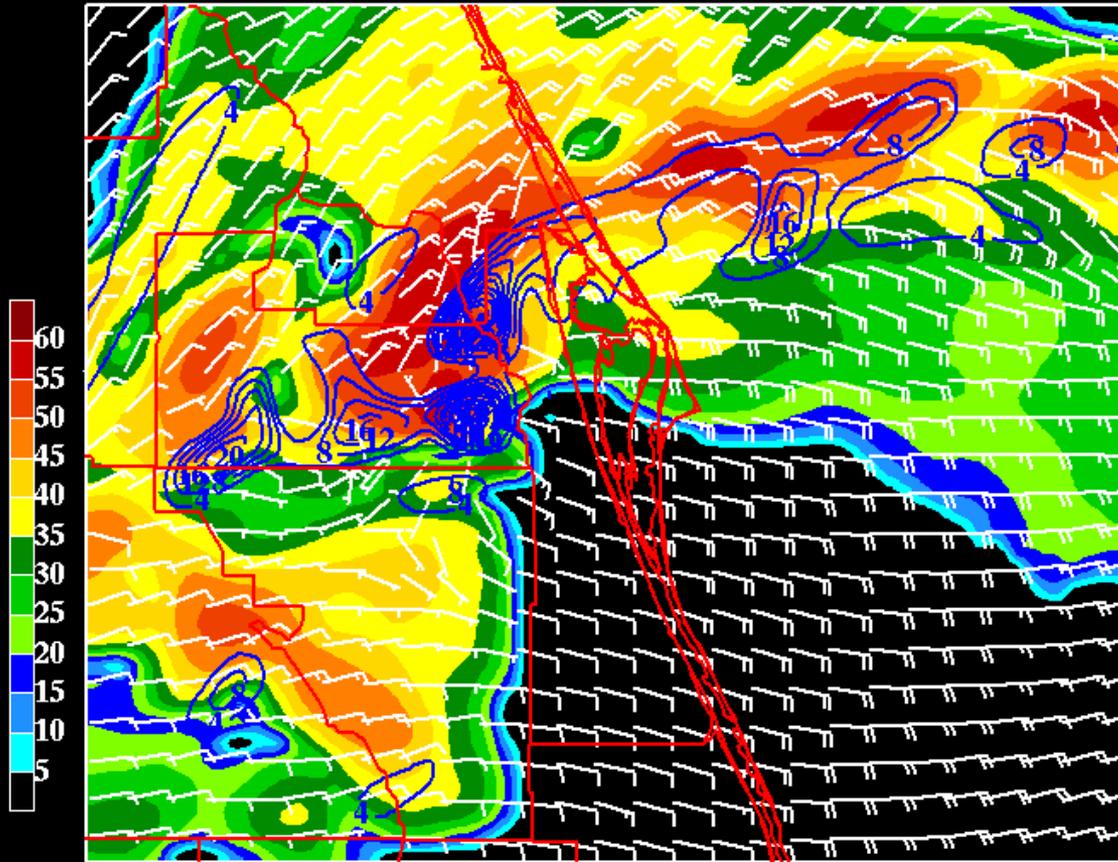
(Forecast Composite Reflectivity & 900-mb vorticity at 2.5 h)



Refl, Sfc Wind, and 900-mb Vorticity (*10**4) at 010914/0900F00230

ARPS Simulation Results: 0900 UTC initialization

(Forecast Composite Reflectivity & 900-mb vorticity at 3 h)



Refl, Sfc Wind, and 900-mb Vorticity (*10**4) at 010914/0900F003

Summary

- **14 Sep 2001: Damaging tornadoes in outer rain bands of T.S. Gabrielle**
- **4-km ARPS simulations with / without hi-res data**
 - **Without data:**
 - **Delayed spin-up of precipitation in model**
 - **No supercell formation over east-central Florida**
 - **With data:**
 - **Much shorter spin-up time for precipitation**
 - **Distinct supercells within ~30 km of reality**
 - **Illustrates importance of assimilating hi-res observational data (esp. Level II WSR-88D data) in local NWP models**
- **AMU quarterly reports: <http://science.ksc.nasa.gov/amu/home.html>**