



# Using Flow Regime Lightning and Sounding Climatologies to Initialize Gridded Lightning Threat Forecasts for East Central Florida



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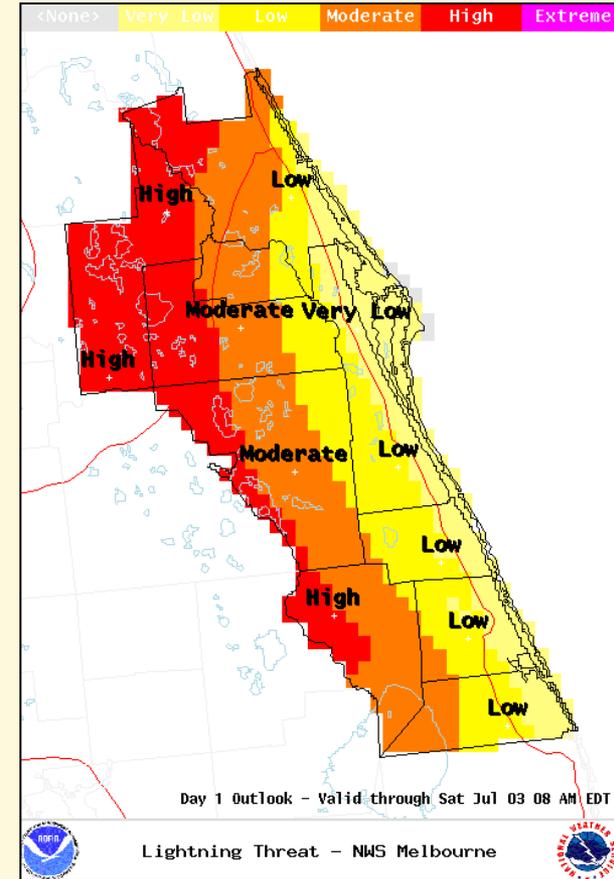
# Presentation Outline



- Describe the daily lightning threat index map
- How and why the map is created
- Motivation for developing lightning climatologies
- Two types of climatologies
- Case Study
- Summary

# Lightning Threat Index

- Cloud-to-Ground (CG) Lightning Threat Index Map at NWS Melbourne
  - Issued daily by 1200 UTC
  - 5 color-coded threat levels at 5 x 5 km
    - Probability of thunderstorms
    - Expected amount of CG activity
- Created on AWIPS/GFE
- Adjusted by assessing observations, spatial patterns of thunderstorm formation parameters





# Lightning Threat Indices

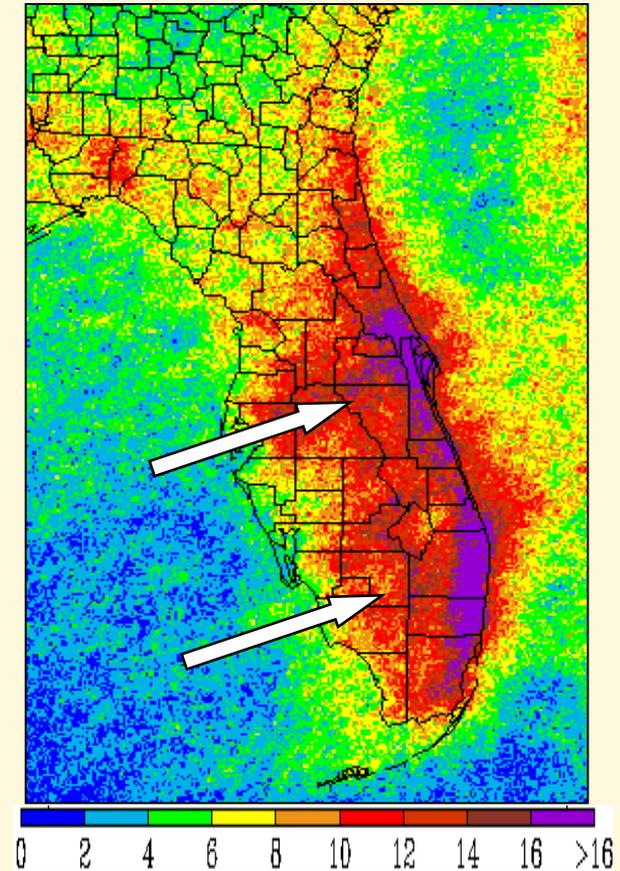
- Threat levels depend on
  - Probability of thunderstorms
  - Expected amount of CG
- Range of CG probabilities and amounts within each level

Threat Level	Threat Level Descriptions
<b>Extreme</b>	50% probability, excessive CG 60 - 70% probability, frequent CG 80 - 90% probability, occasional CG
<b>High</b>	30 - 40% probability, excessive CG 50% probability, frequent CG 60 - 70% probability, occasional CG
<b>Moderate</b>	10 - 20% probability, excessive CG 30 - 40% probability, frequent CG 50% probability, occasional CG
<b>Low</b>	10 - 20% probability, frequent CG 30 - 40% probability, occasional CG
<b>Very Low</b>	10 - 20% probability, occasional CG
<b>None</b>	No Threat

# Motivation

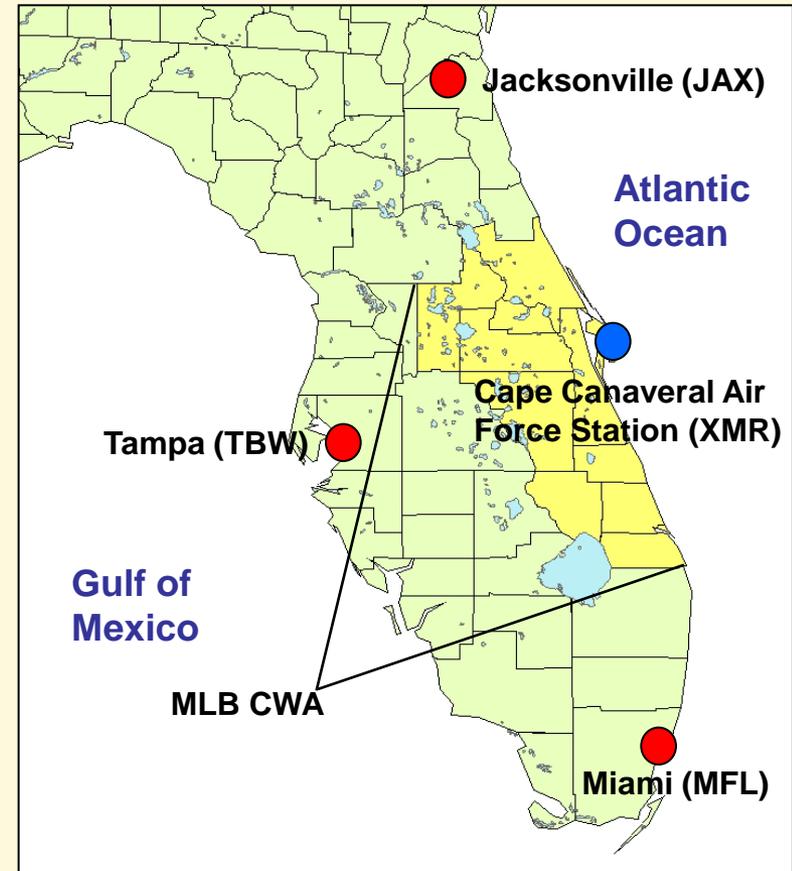
- NWS MLB requested:
  - Spatial climatologies of CG probability and amount to create first guess field
  - Climatological soundings to help adjust first guess field
- Climatologies stratified by synoptic flow regime
  - Previous work shows connection between flow regime and CG occurrence
  - 1200 UTC soundings used to determine flow-regime-of-the-day

24-hour CG Probability for Southwest Flow (Stroupe 2003)



# Flow Regimes

- 1000–700 mb average wind direction 1200 UTC soundings at MFL / TBW / JAX
- Combination of 3 directions determined flow regime
- 7 flow regimes:
  - 1) Ridge south of MFL
  - 2) Ridge btwn MFL/TBW
  - 3) Ridge btwn TBW/JAX
  - 4) Ridge north of JAX
  - 5) Ridge over Florida Panhandle
  - 6) Northwest flow
  - 7) Northeast flow





# Data

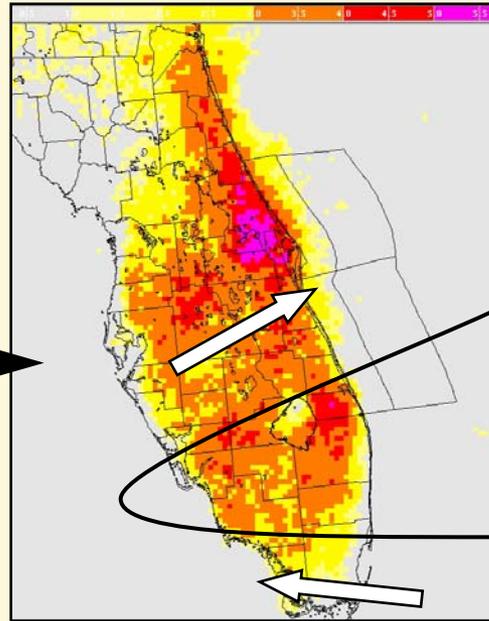
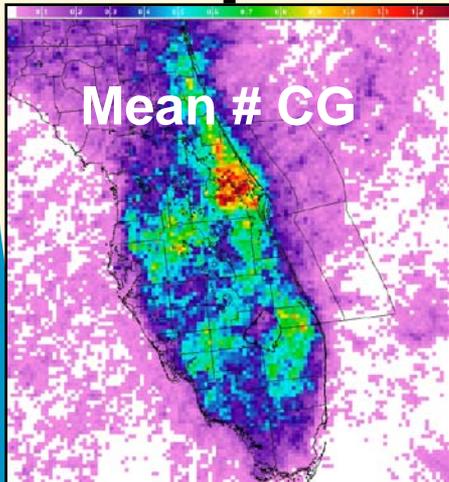
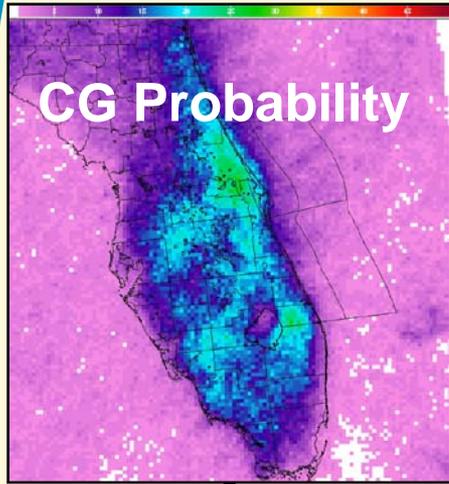
- Warm season (May – September) 1989 – 2004
- Data/code provided by FSU and NWS TAE to create spatial lightning climatologies
  - Hourly lightning data grids created from NLDN data
  - Flow regime dates of occurrence
  - Code to read and process data
- Soundings for vertical profile climatologies
  - 1200 UTC MFL, TBW, JAX
  - 1000 UTC XMR  
(asynoptic time due to operational requirements)
- Flow regime dates used to stratify grids and soundings



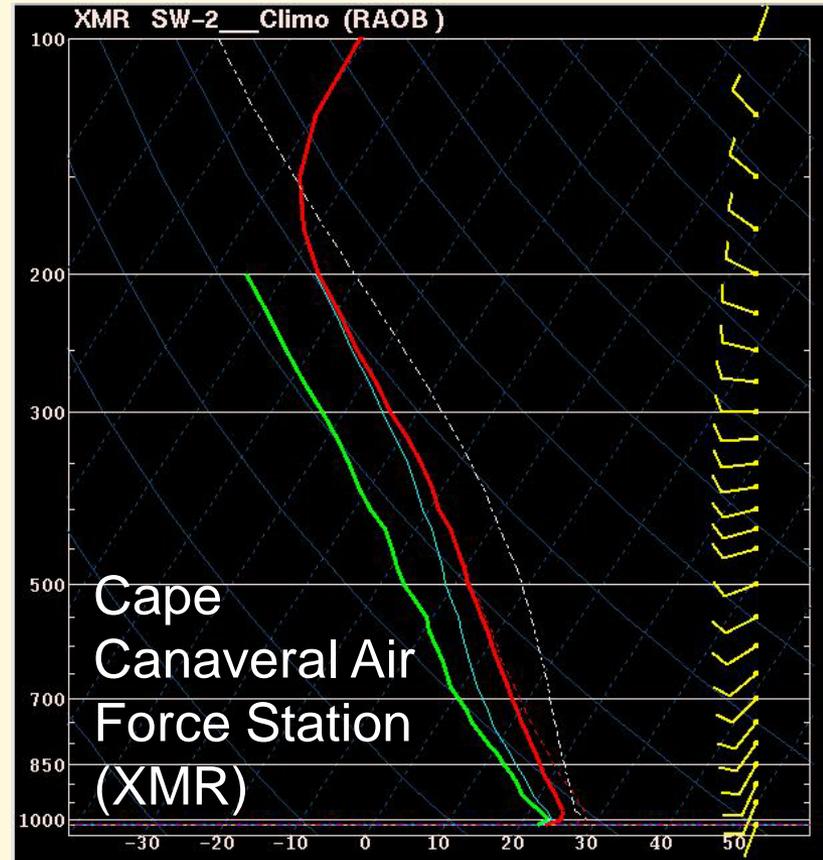
# Climatologies

Spatial: Gridded values create first-guess field

Soundings: Average vertical profiles for 4 sites

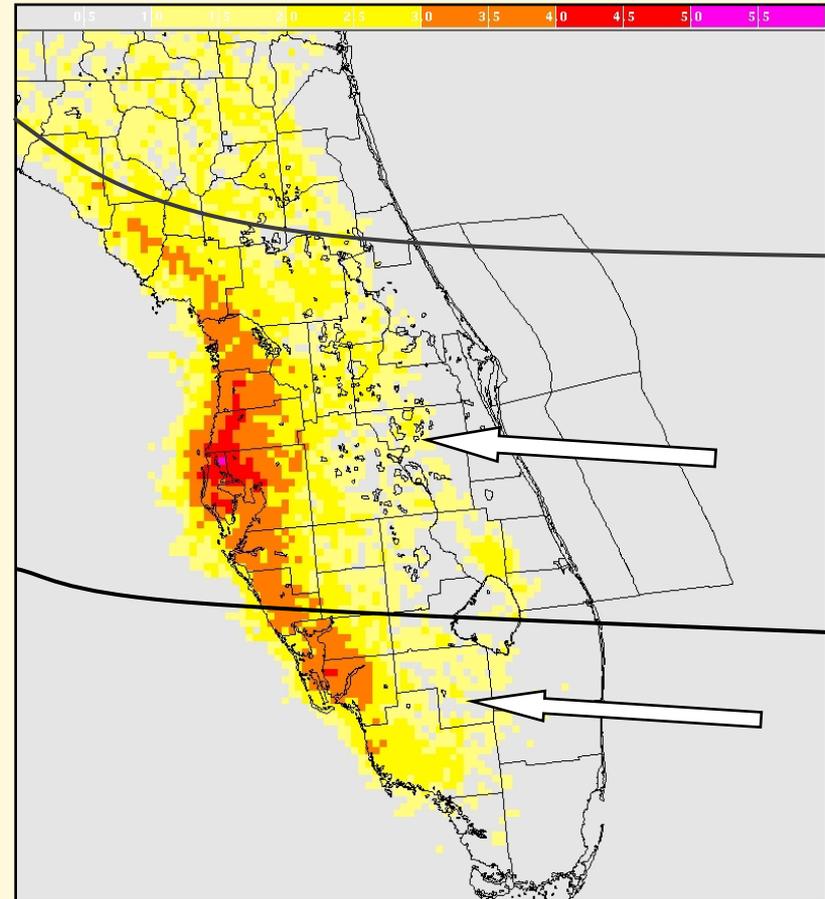


First Guess Lightning Threat Index

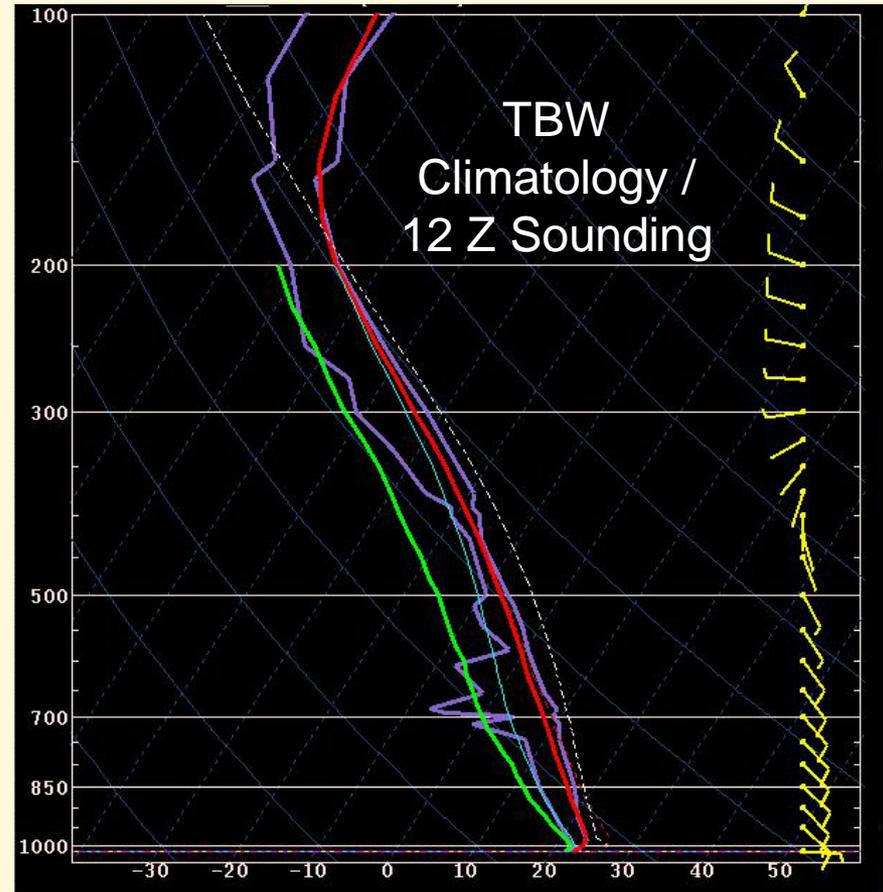
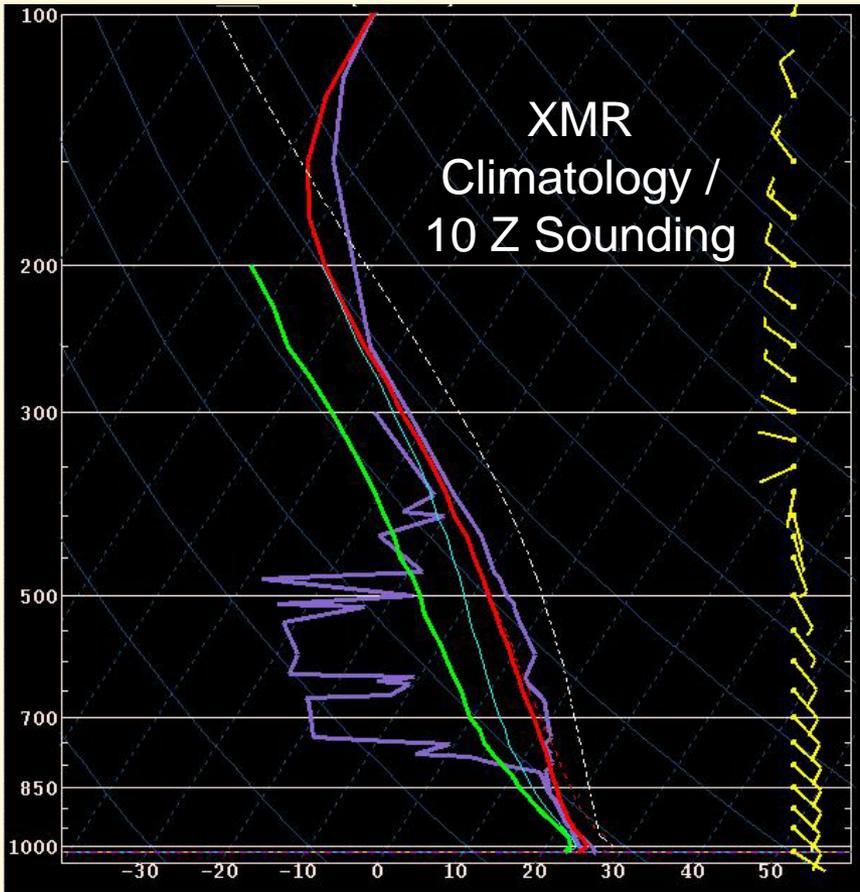


# Sample Case: 13 July 2006

- Ridge north of Florida
- SE flow regime
- Lightning more likely on west coast
- Forecasters start with first-guess threat map
- Climatological soundings adjust first guess map



# 13 July 2006

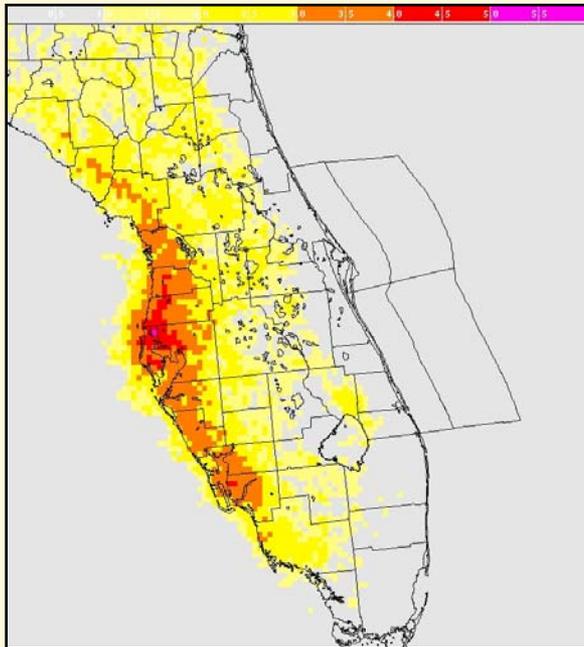


	<u>PW</u>	<u>KI</u>	<u>TT</u>
Obs:	1.65"	6	42
Climo:	1.81"	28	44

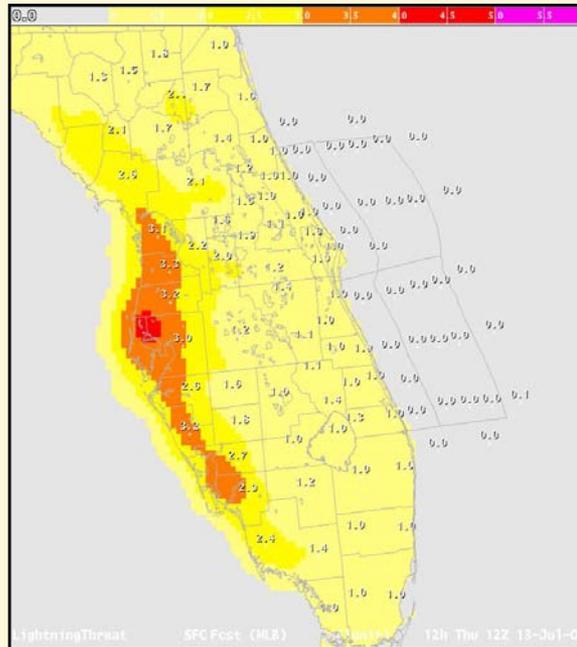
	<u>PW</u>	<u>KI</u>	<u>TT</u>
Obs:	1.98"	32	44
Climo:	1.73"	27	43

# 13 July 2006

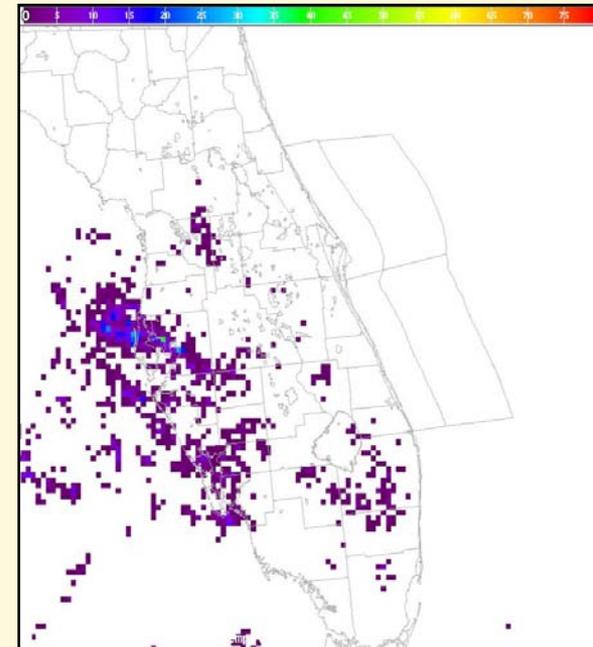
## Lightning Threat Index Forecast Verification



First Guess Field



Forecaster-Adjusted Field



Observed Lightning



# Summary



- Created climatologies based on flow regime:
  - Gridded CG probabilities and number of strikes
  - Morning soundings at 4 Florida locations
    - 1200 UTC MFL – TBW – JAX
    - 1000 UTC XMR
- Gridded climatologies used to create a first-guess lightning threat index map
- Soundings compared to observations to determine deviation from mean

Lightning Threat Map: <http://www.srh.noaa.gov/mlb/ghwo/lightning.shtml>

IMU: [http://www.srh.noaa.gov/mlb/amu\\_ml/IMU2.html](http://www.srh.noaa.gov/mlb/amu_ml/IMU2.html)

AMU: <http://science.ksc.nasa.gov/amu>