

Near Term Convective Precipitation Forecasting using Real-Time Lightning Data, Observations, and Radar

Schneider Electric – A Provider of Business Weather Solutions

Aviation

- Aviation Forecasting for commercial, corporate, and specialized flight operations
- Helicopter Decision Support Systems

Transportation

- Pavement Forecasting and alerting services for state and local government
- Weather for Intelligent Transportation Systems (e.g. 511)

Energy

- Load Forecasting and alerting services for electric/gas utilities and renewables
- Transmission and Distribution Crew Management
- Wind Farm Safety

Commercial

- Custom Forecasting for weather sensitive businesses –construction, sports, and outdoor entertainment

50 Meteorologists based in Minneapolis, Minnesota provide 24/7 support





Goal to Improving the Near Term Precipitation Forecast

- Significantly reduce missed precipitation events happening now or are nearly imminent
 - Quantitatively and qualitatively improve accuracy
 - Reduce over-forecasting
 - Reduce manual precipitation forecast editing that cover for model deficiencies
 - NWS AWIPS Graphical Forecast Editor (GFE) employed for such forecaster modification
- Improve accuracy of precipitation type
 - Snow
 - Rain
 - Freezing rain
 - Thunder
- Improve downstream products that use the general weather forecast such as:
 - Airport Terminal Forecasts
 - Automated Alerting for Transportation, Construction, Sports, Utilities, etc..

Challenges with Near Term Precipitation Forecasting

- Assimilation and analysis of observations too slow

- Assimilation and analysis of observation used in freely available near term models are not leveraged in a timely enough fashion to handle events that pop up during the lag period between timeliness of observation datasets versus when these observations are leveraged in the model data
 - These events can be very impactful and in the warm season can be fairly widespread

- Manual Editing of Precipitation is Labor Intensive

- Forecast editors can find it extremely challenging making sure all events are covered
 - The sheer volume can lead to missed events
 - Trying to ensure there are no missed events, the forecaster can often over-forecast as insurance
 - Amounts can be easily under/over done and potential flooding events not properly forecasted especially for rapidly developing/decaying convective outbreaks
 - Takes the forecasters eye off of forecasting events for hours 6-12+ where the skill is potentially better served

How to Overcome Model Lag with Current Precipitation Events?

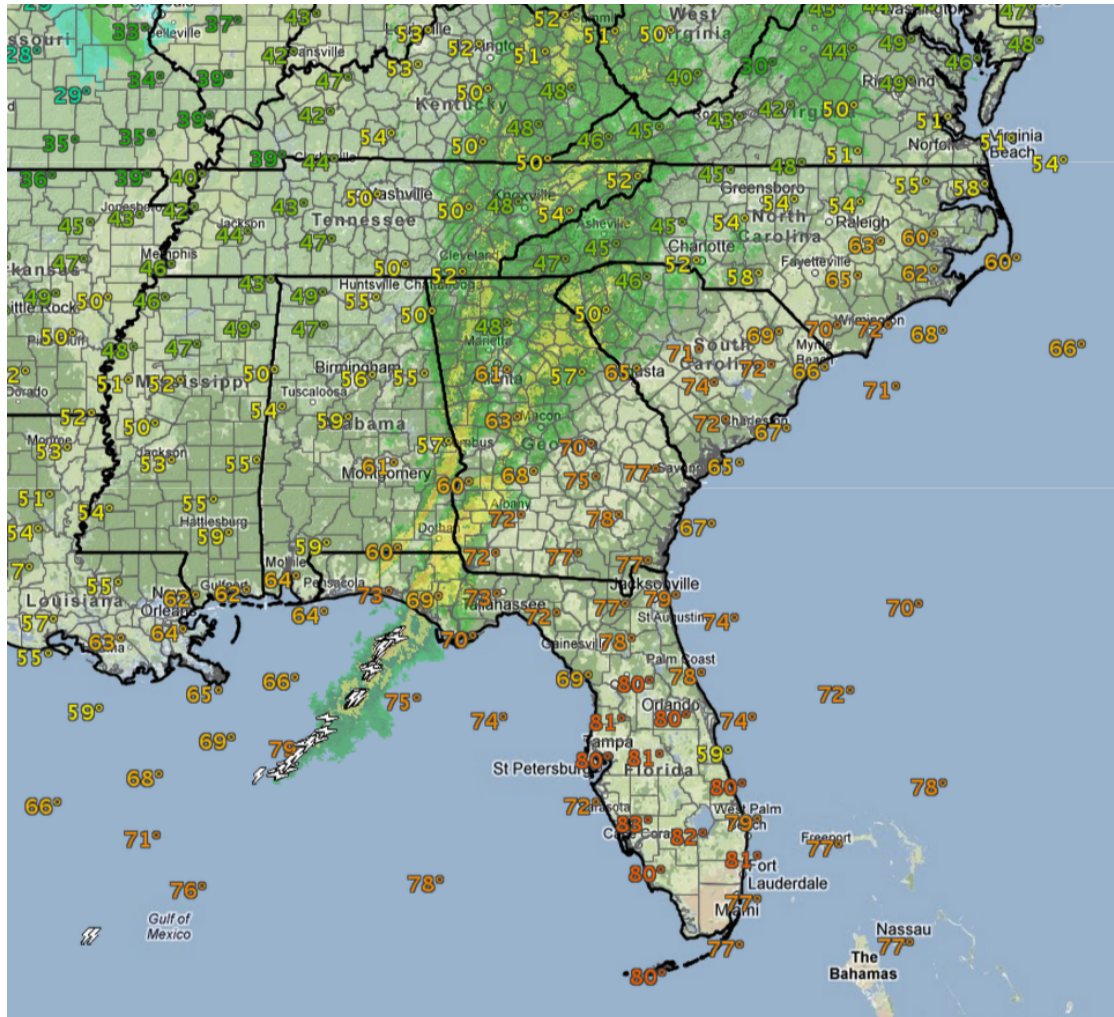
- Use Observation/Remote Sensing Data Inputs such as:
 - Surface Observations
 - Radar Data
 - Lightning Data
- Integrate the Observation/Remote Sensing Data into the Model Blend used in the Precipitation Forecast First Guess Field
 - Use algorithms to approximate the additional precipitation necessary to represent the worst case of all observational inputs but individually the minimum threshold acceptable given the value of the observation or remote sensing data
- Use Model Data in the Most Rapidly Updating input Model to leverage in Algorithms
 - Quantity estimate
 - Storm motion

Case Study

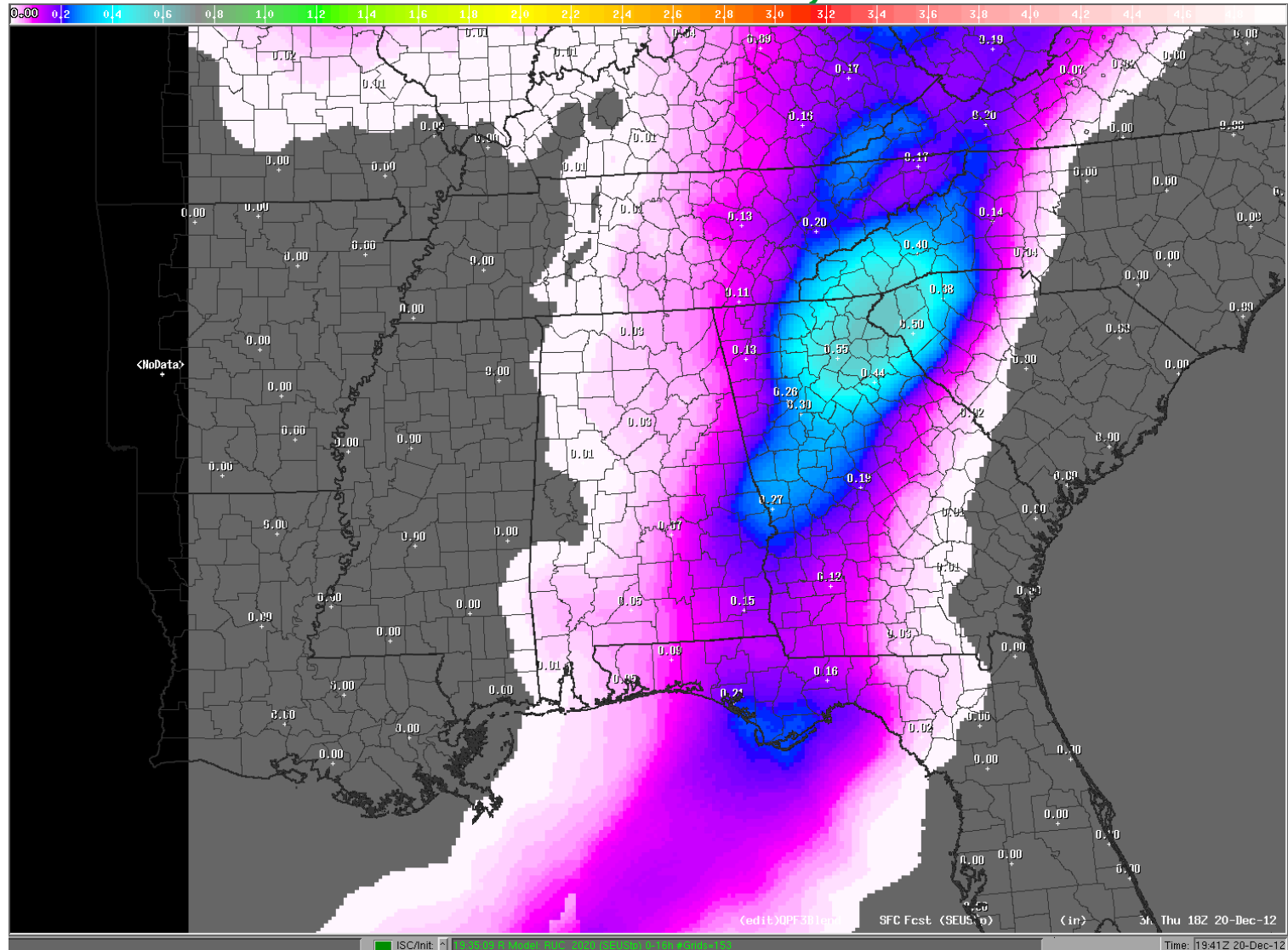
December 20th, 2012 18-21UTC

- Cold frontal event over the panhandle of Florida northward to Ohio
- Typical behavior for a cold frontal event for this time of year in this region
- Challenge on these events are often (not always) low bias for amounts and event speed, that is more often than not, faster than guidance

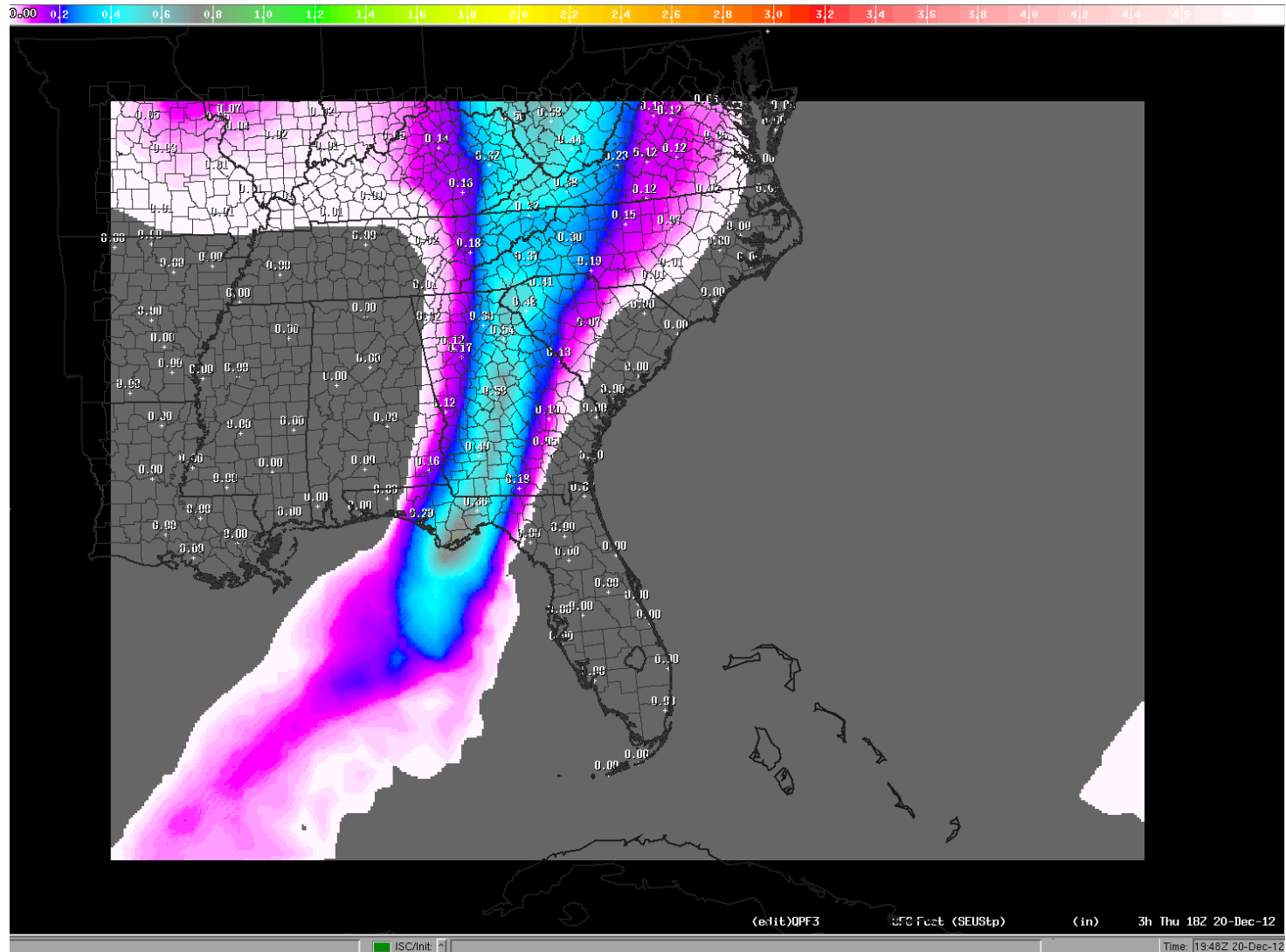
1937UTC December 20th, 2012 Radar, Lightning, and Temperature



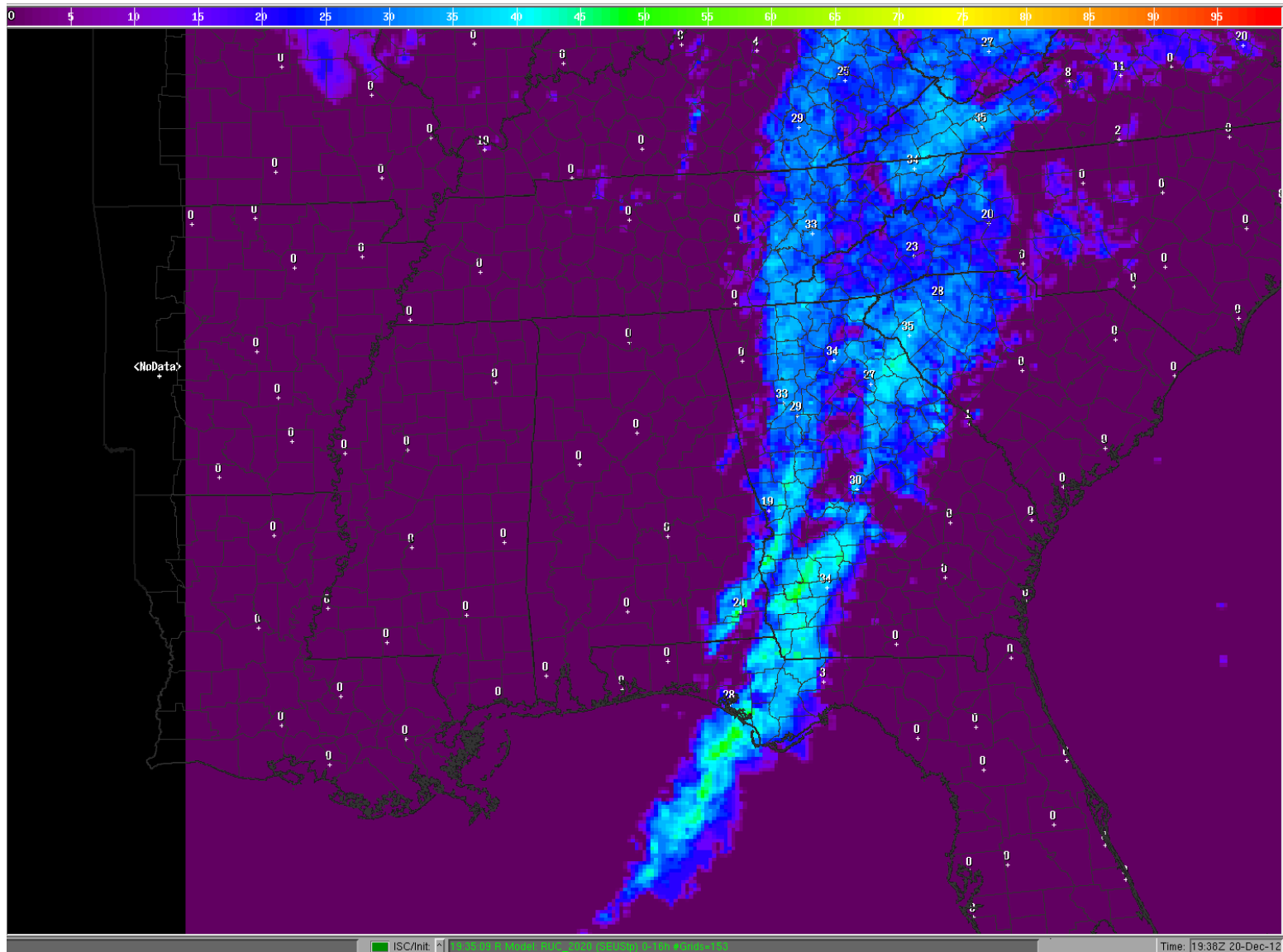
Initial First Guess Blend of NAM and GFS Used by the Forecasters (in.) 18-21 UTC December 20th, 2012



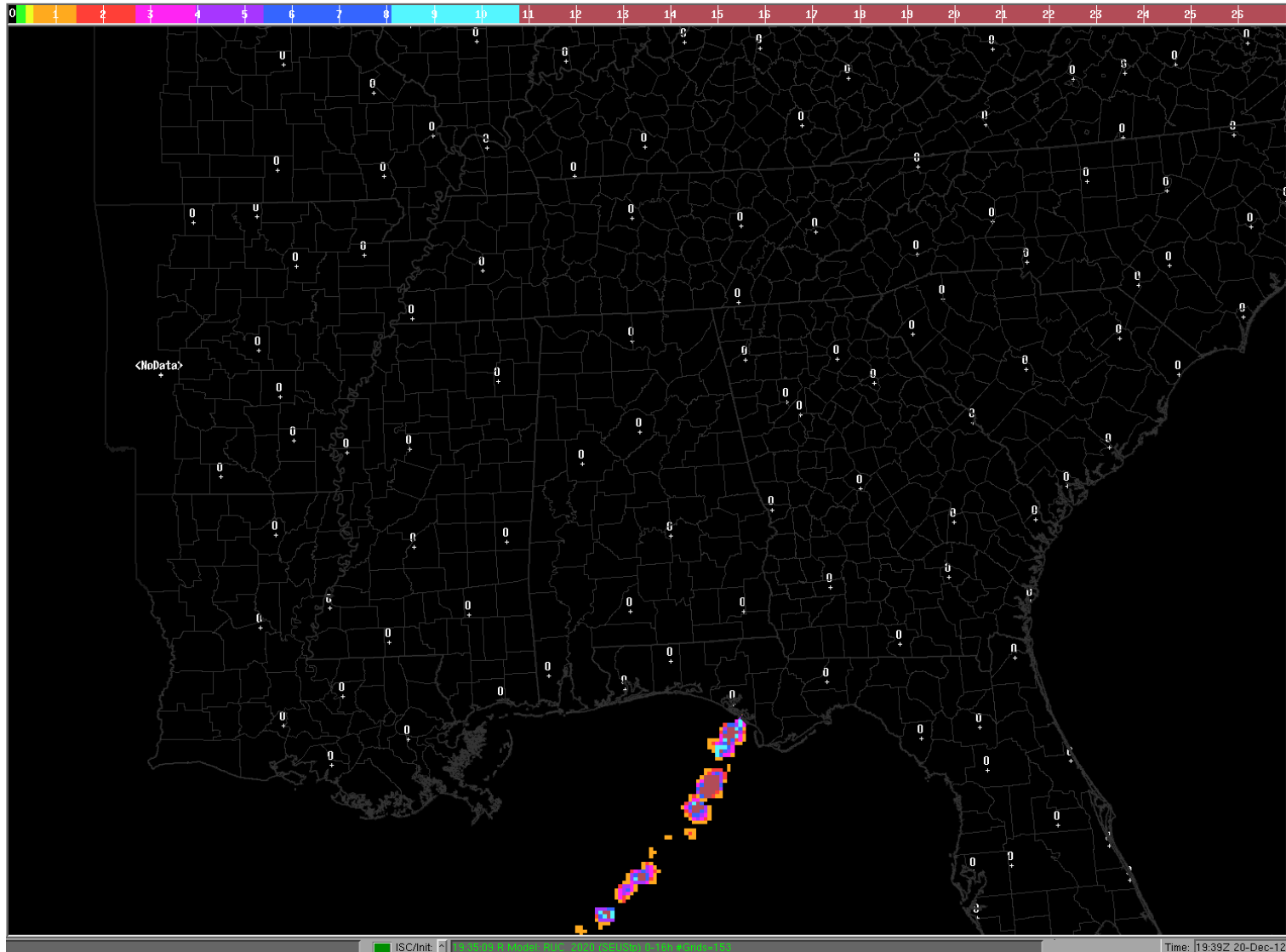
Precipitation Forecast Modified by Forecaster (in.) 18-21UTC December 20th , 2012



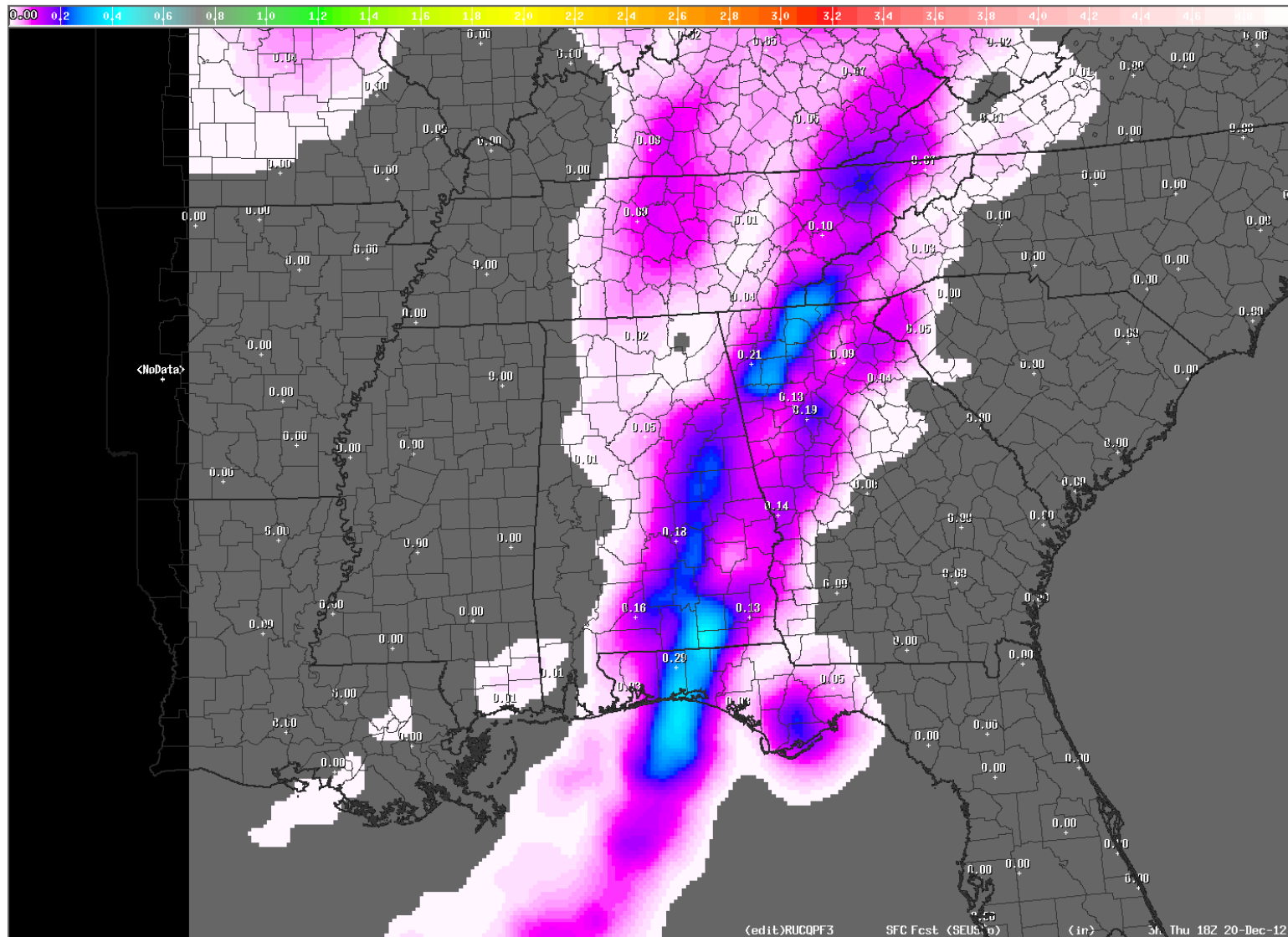
19 UTC December 20th, 2012 Radar Data (dBZ)



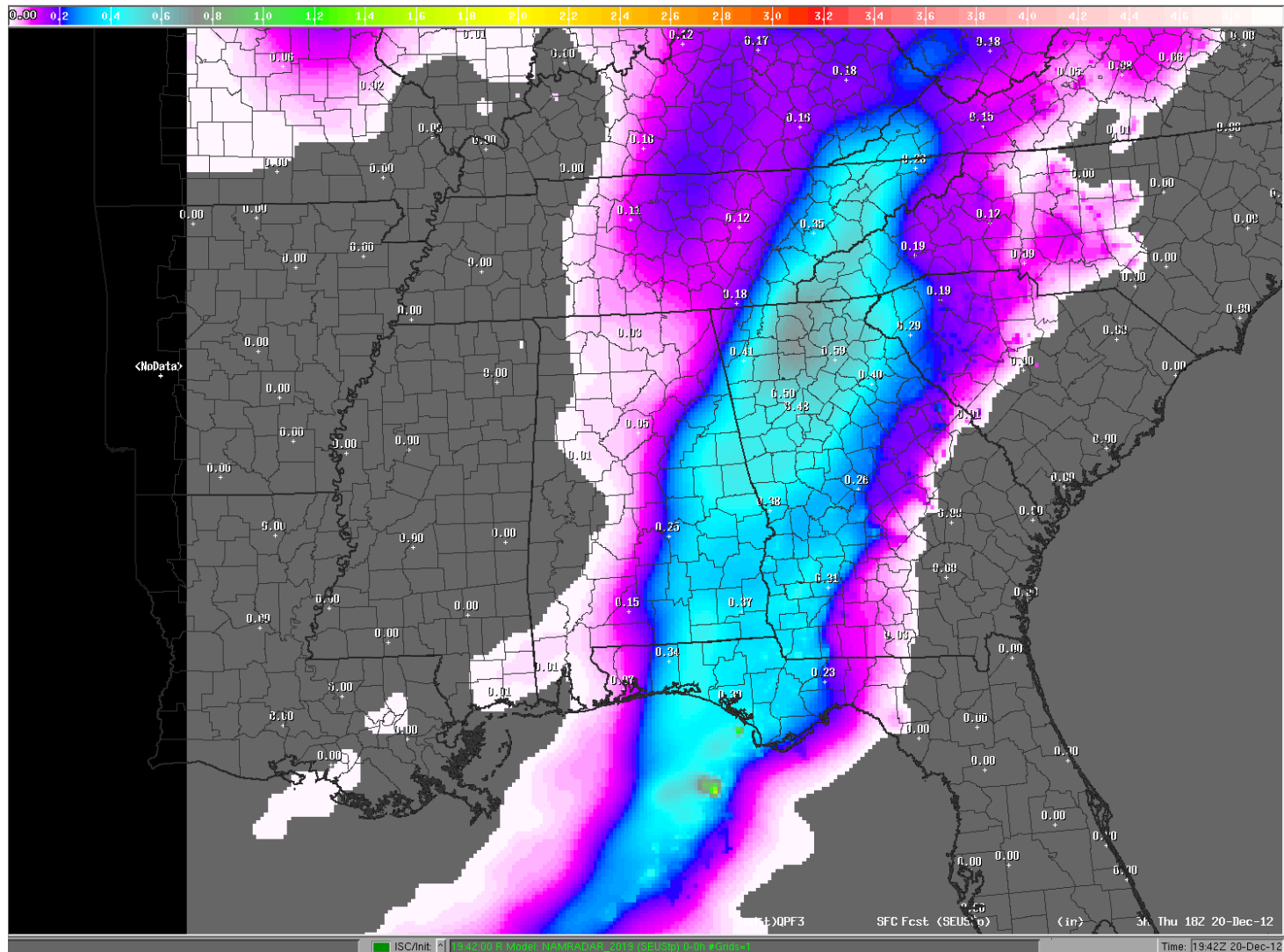
19 UTC December 20th, 2012 Flash Density Data (strokes/10min)



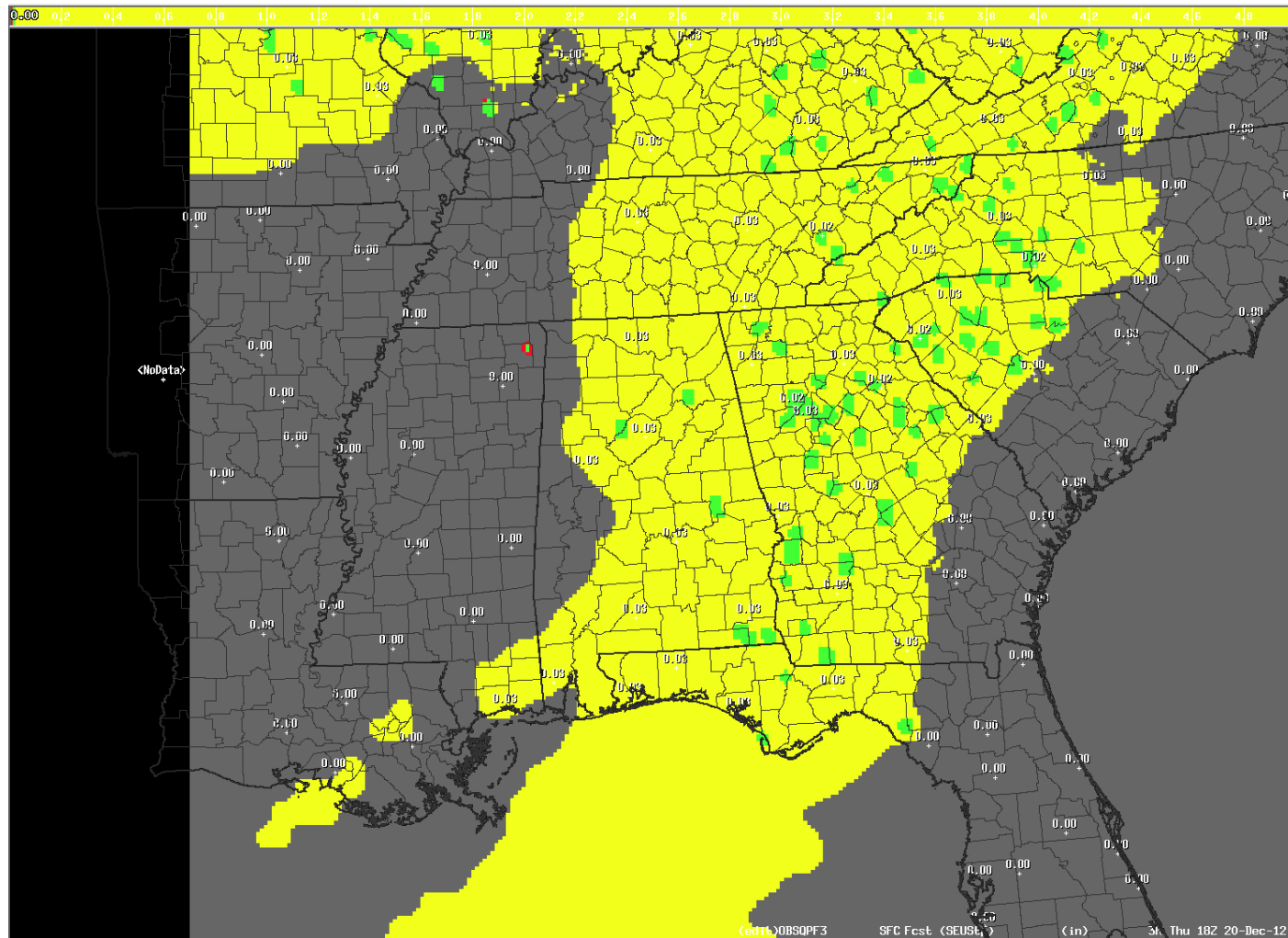
18-21 UTC December 20th, 2012 RAP Model Precipitation Forecast (in.)



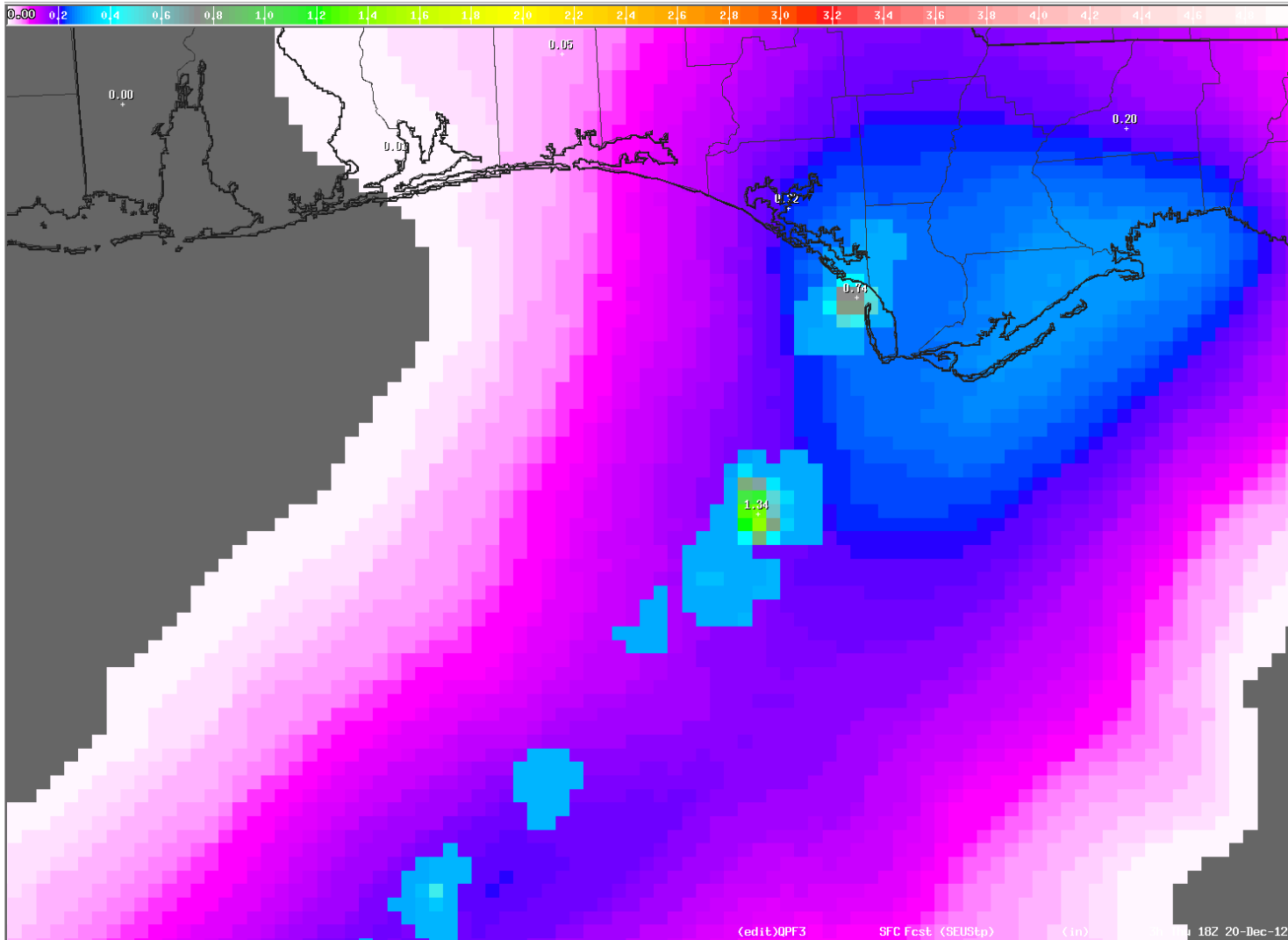
18-21UTC December 20th, 2012 Enhanced Precipitation Forecast (in.)



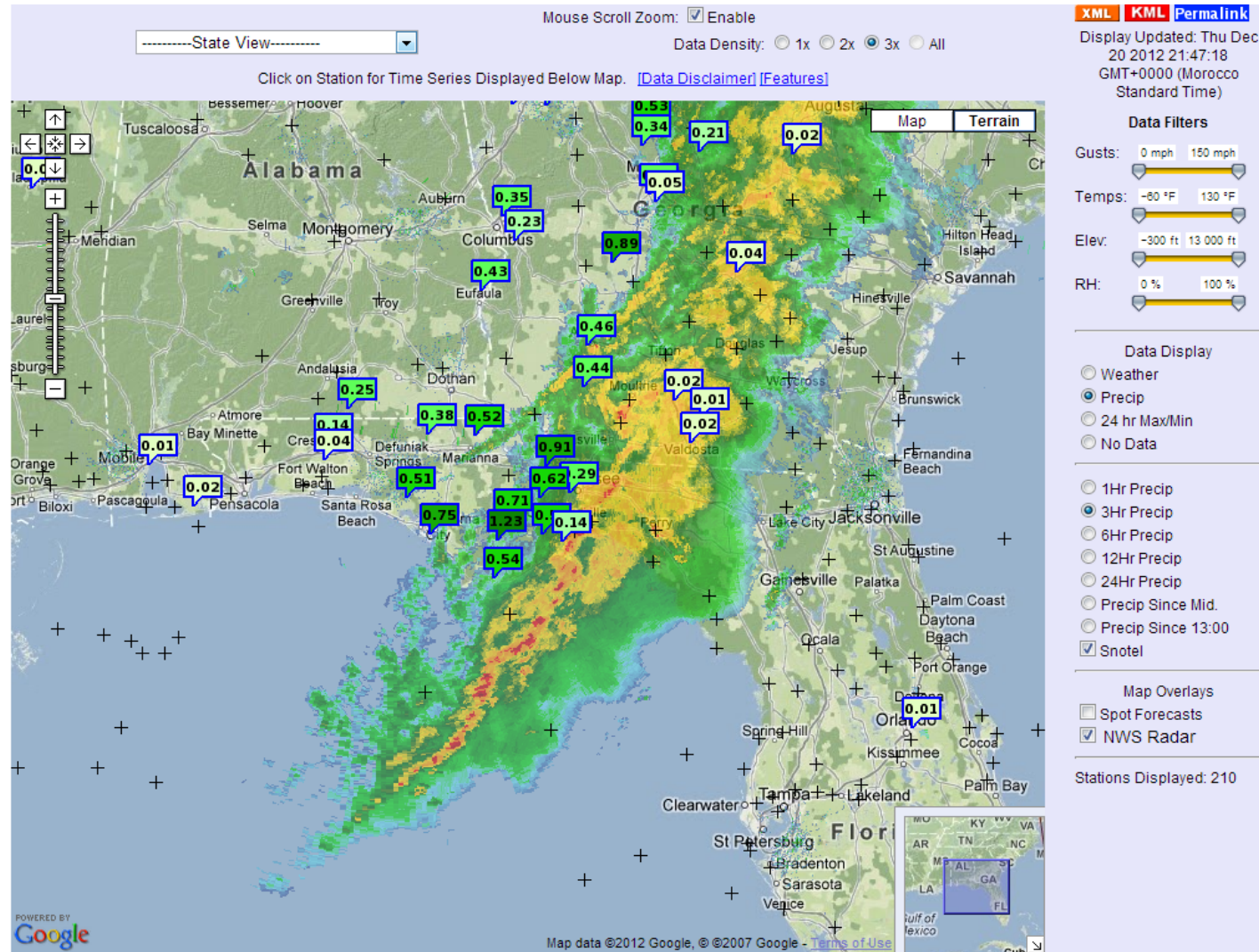
20 UTC December 20th, 2012 Precipitation Observations with Coverage of Forecast Precipitation



18-21 UTC December 20th, 2012 Zoomed In Precipitation Forecast Enhanced by Lightning Data (in.)



21 UTC December 20th, 2012 Radar and 3 Hour Precipitation Observations (<http://www.wrh.noaa.gov/slc/gmap/>)



Summary

- The precipitation forecast enhancement scheme:
 - Reduces missed events to the forecast end users that use our:
 - Online web products
 - Precipitation Alerting
 - Aviation forecasts
 - Any other forecast products using near term precipitation forecasts
 - Reduces the amount of labor required to capture all the near term events
 - Improves quantitative accuracy of near term events
 - Allows the meteorologists to divert their attention to more value add forecasting and consulting tasks

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Questions?