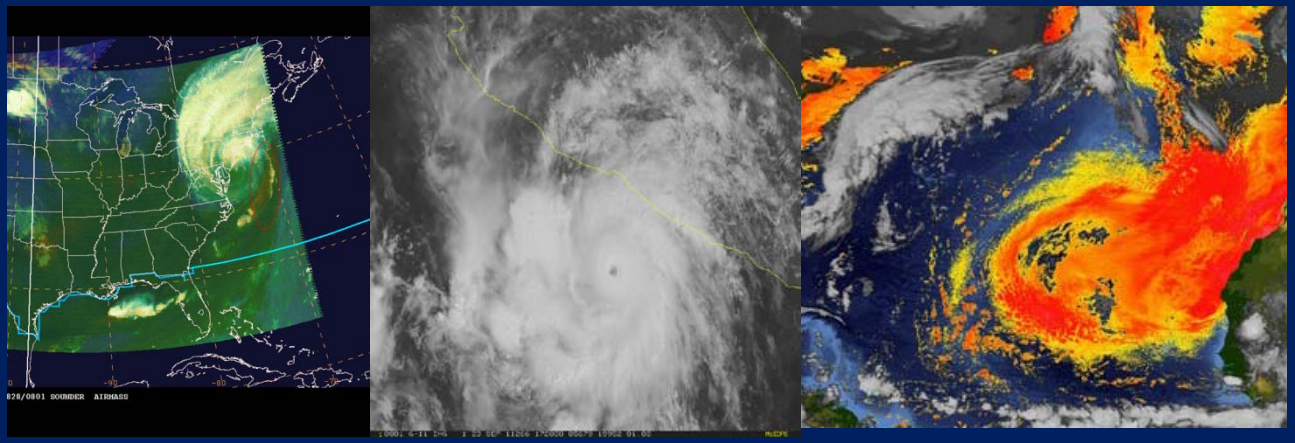
The 2011 GOES-R Proving Ground Activities at the National Hurricane Center



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[5]NASA/MSFC, Huntsville, AL

[6]Univeristy of Alabama Huntsville, Huntsville, AL

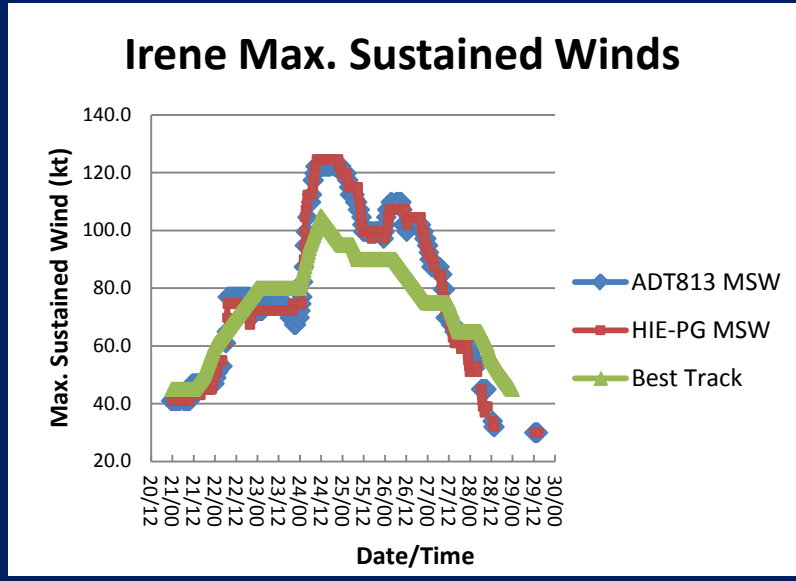
Note: We have a lot of other collaborators on this!

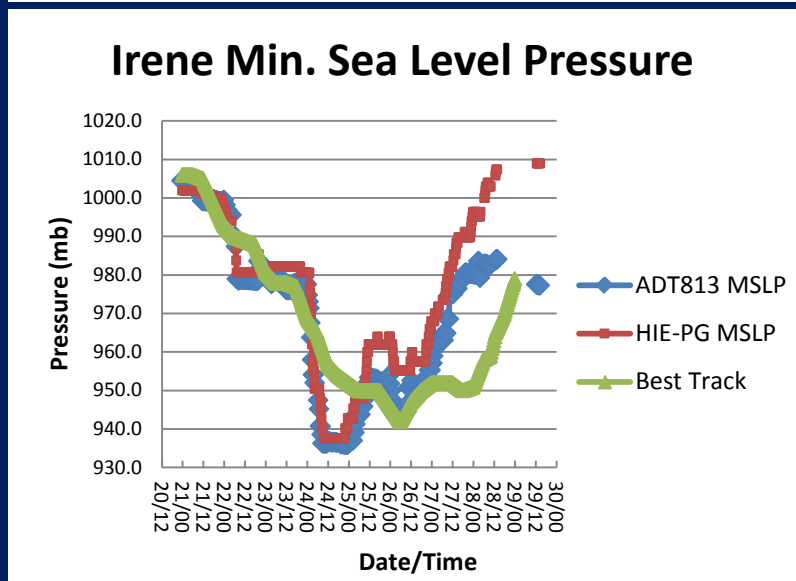
Overview of GOES-R

- Next generation of GOES satellites
- Planned launch in late 2015
  - Advanced Baseline Imager (ABI)
    - 16 channels, improved spatial and temporal resolution
  - Geostationary Lightning Mapper
    - Near continuous monitoring of total lightning
  - Space Weather Instruments
  - Communications Capabilities

2010 GOES-R Products Evaluated (continued in 2011)

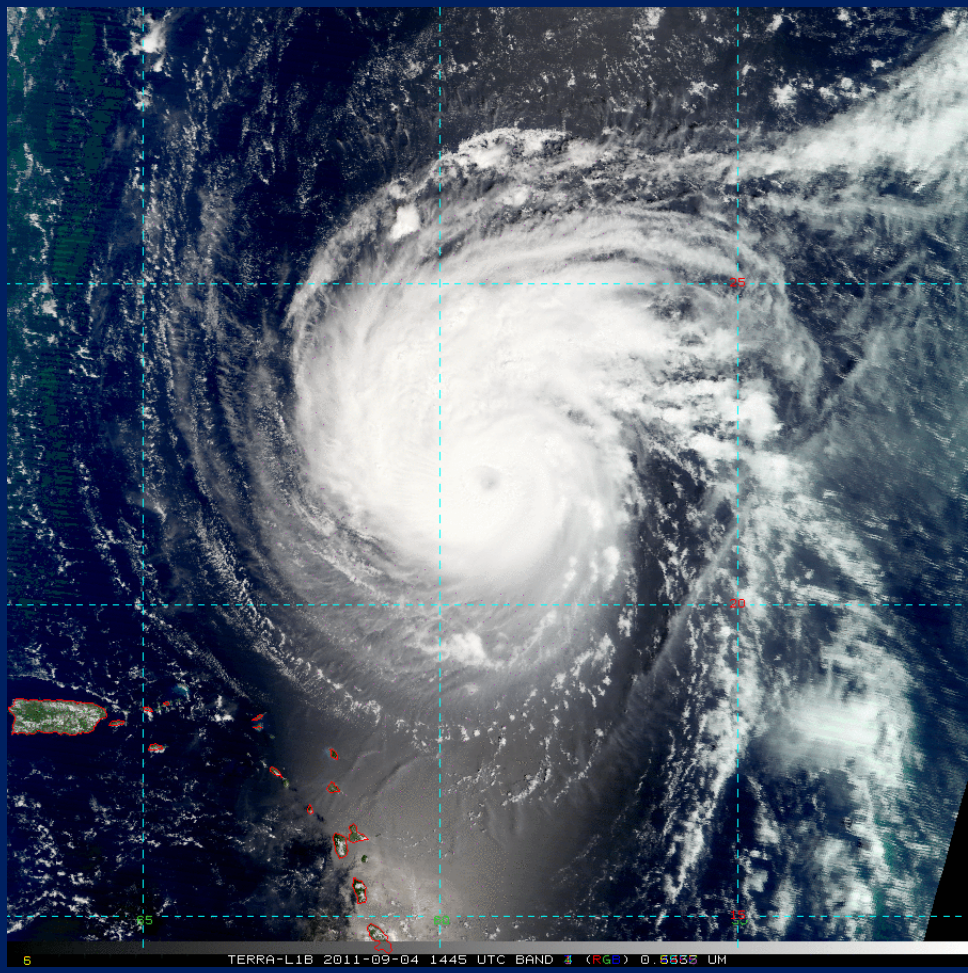
- **Official GOES-R Baseline Product**
  - Hurricane Intensity Estimate (HIE) [Adaptation of CIMSS ADT]
- **GOES-R Decision Aids/Imagery Products**
  - Red-Green-Blue (RGB) Air Mass Product [CIRA/RAMMB]
  - RGB Dust Product [CIRA/RAMMB]
  - Saharan Air Layer (SAL) Product [HRD + CIMSS]
  - Super Rapid Scan Imagery [CIRA + NHC + CIMSS] (Don, Nate, Hilary)
  - Lightning-based Rapid Intensification Index (RII) [RAMMB+CIRA]





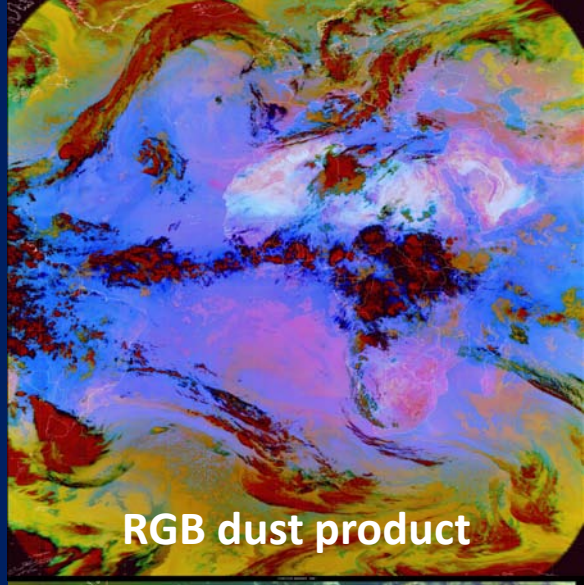
New Proving Ground Products at NHC in 2011

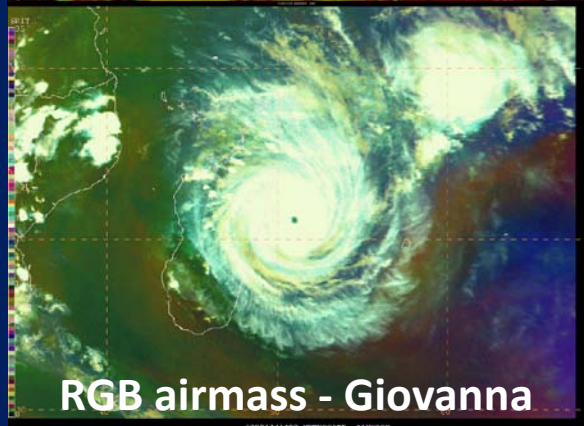
- Tropical Overshooting Top Detection (CIMSS)
- GOES-R Natural Color Imagery (from MODIS)
- Pseudo Natural Color Imagery (from METEOSAT)



Comments and Observations from the 2011 Hurricane Season

- NHC now ingesting N-AWIPS compatible versions of the RGB airmass/dust products provided by SPoRT and CIRA. This made it much easier to utilize and evaluate the imagery.
- RGB products very useful in evaluating the environment around eastern Atlantic disturbances – one non-developing disturbance had dry air to the west and dust to the east!
- RGB products helped evaluate extratropical transition of several cyclones
- RGB dust product proved capable of showing dust all the way to the image limb
- Pseudo natural color imagery proved useful in differentiating between convection and low clouds, as well as showing dust outbreaks


RGB dust product

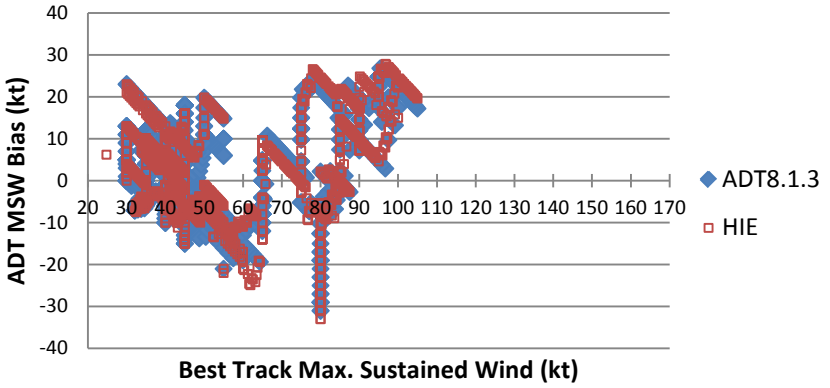

RGB airmass - Giovanna


Pseudo natural color - Giovanna

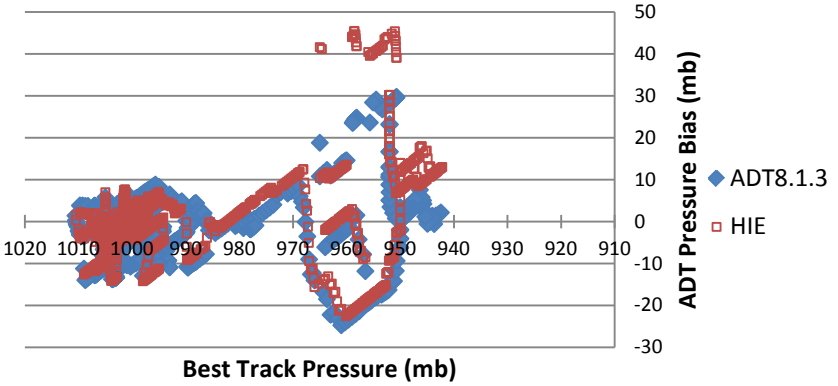
HIE Evaluation

- Evaluation of 2011 HIE data still underway.
- 2011 sample dominated by weaker systems where ADT/HIE are known to be less accurate.
- In most cases the HIE/ADT estimates are close, however the higher temporal sampling (15-min) makes the HIE somewhat more responsive to short-term changes than the operational ADT (30-min).
- The HIE does not employ the CKZ Wind>MSLP conversion, leading to some higher MSLP biases.
- The automated center finding capabilities are being investigated/updated by CIMSS.
- Can the handling of shear patterns be improved?

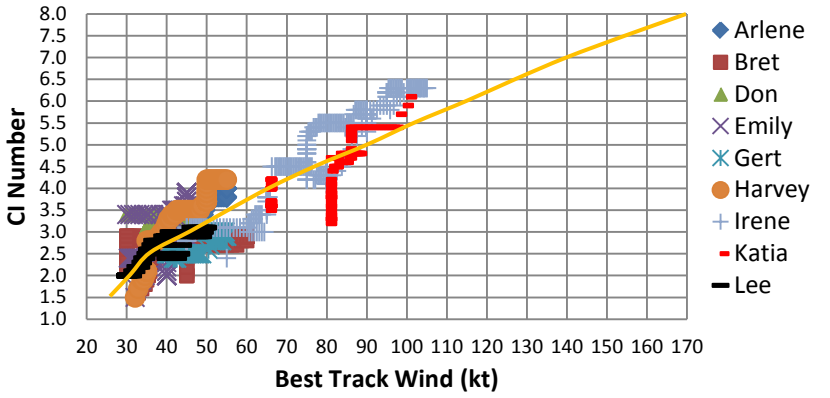
Maximum Sustained Wind Bias



Minimum Sea Level Pressure Bias



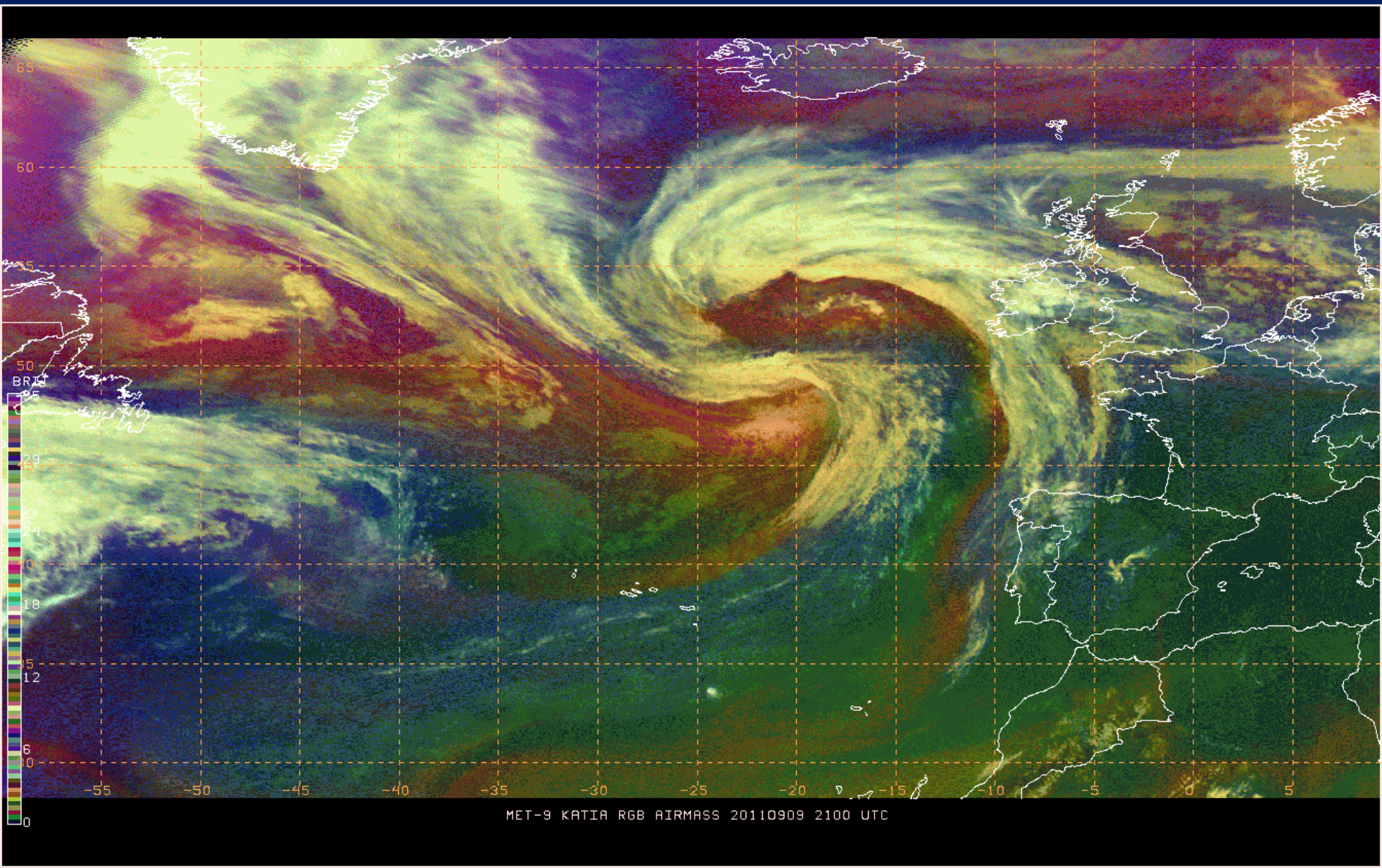
ADT 8.1.3 CI vs. Best Track Wind

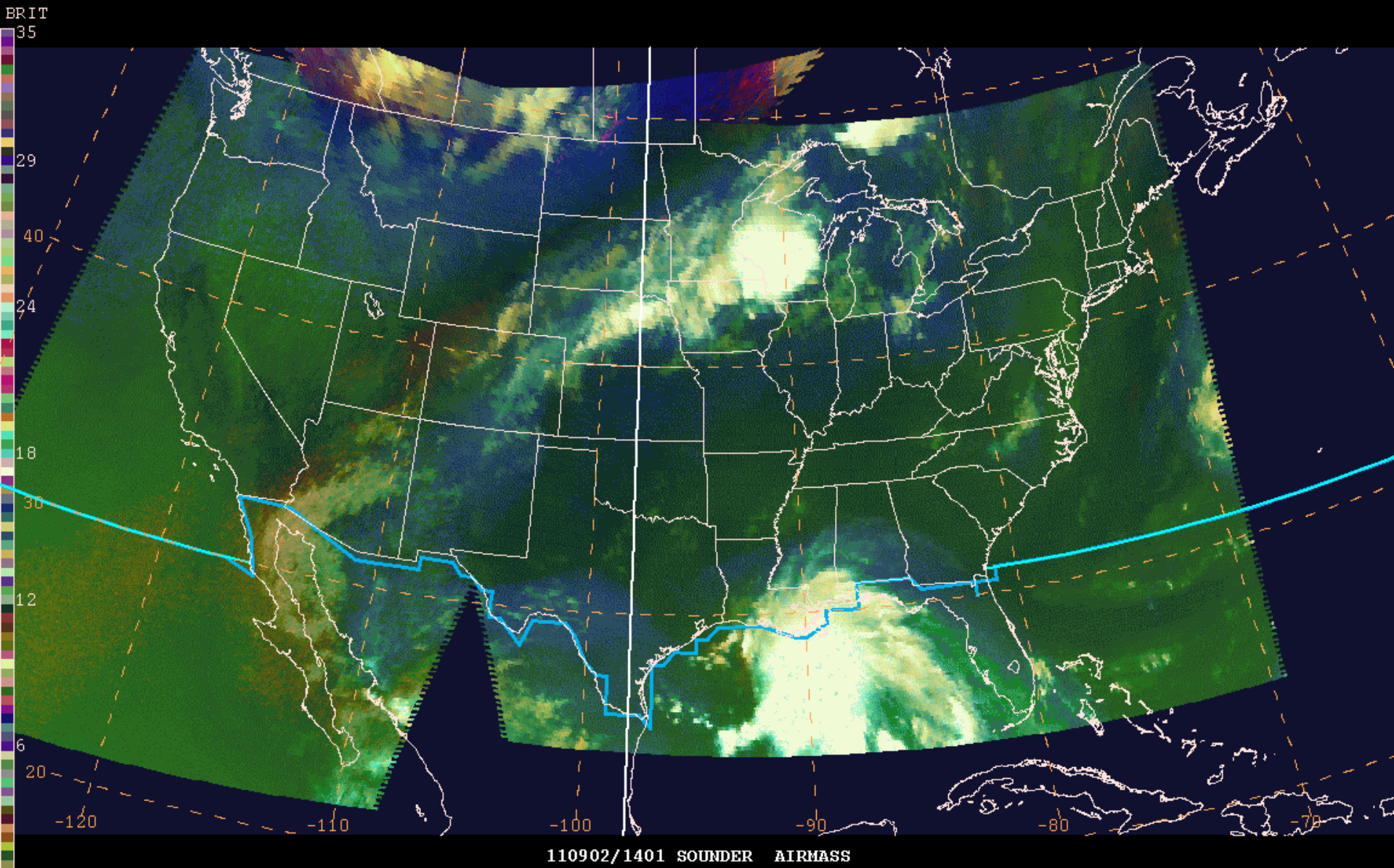


Other Comments and Observations from the 2011 Hurricane Season

- Not a lot of cases to test out rapid intensification algorithms
- Super rapid scan imagery was very useful near sunrise for center location and aircraft go/no go decisions – this could become a increased part of operations in 2012
- Routine production of natural color imagery useful to product developers

Extratropical Transition of Katia in RGB Airmass Product

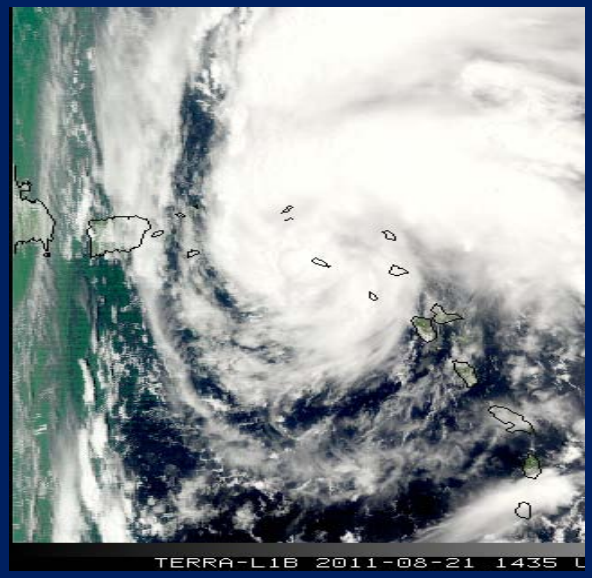




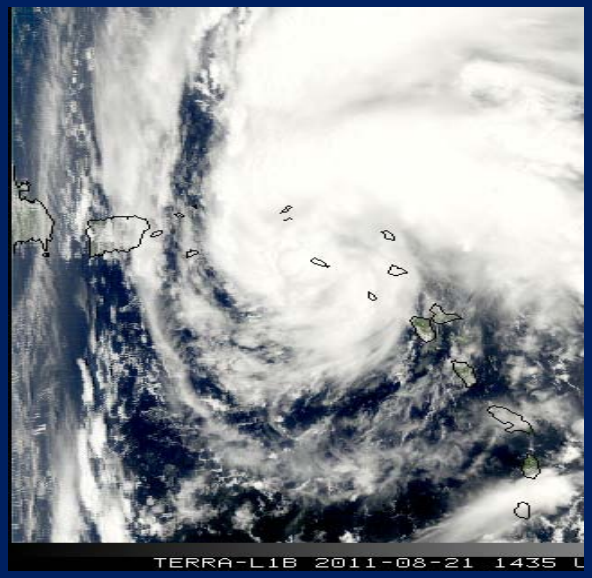
GOES Sounder Version of the RGB Airmass Product (evolution of Tropical Storm Lee)

GOES-R Natural Color Product Improvements

- Routine product generation revealed algorithm deficiencies (too much green at high viewing angles)
- Algorithm developers made correction on Oct 20th



Old Algorithm

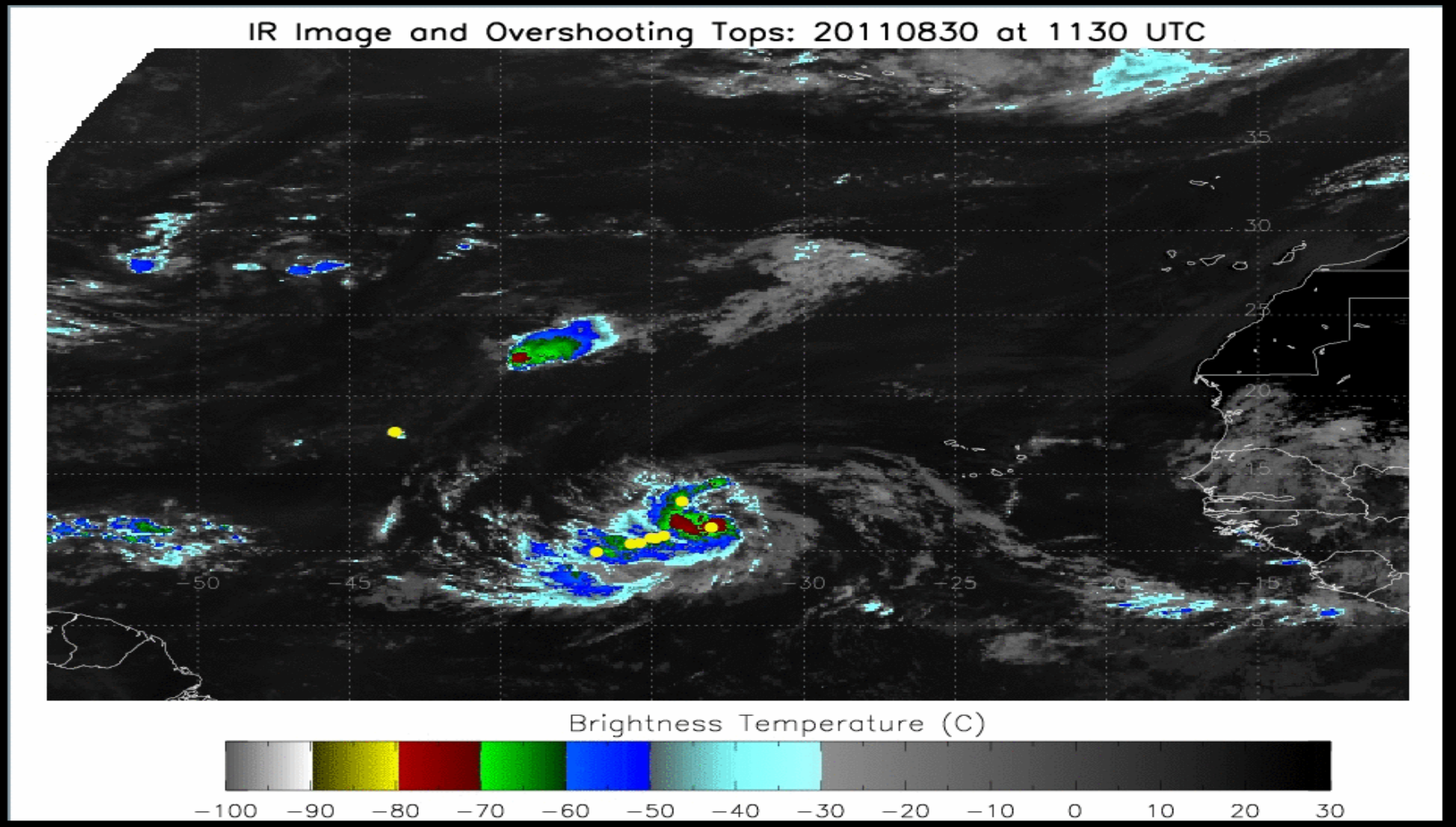


New Algorithm

Tropical Overshooting Top Detection

-- Automated method based on geostationary IR imagery

-- Possible TOT activity relationship with TC genesis and RI

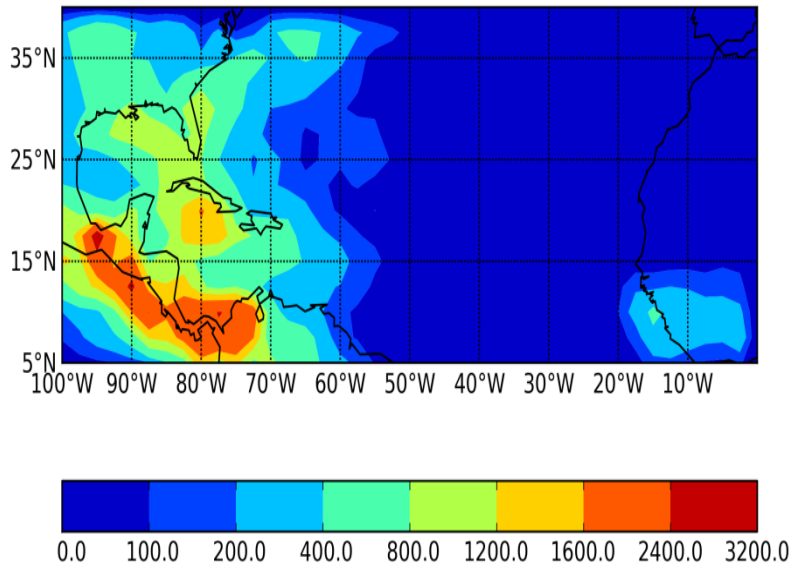


Early stages of Katia – yellow points indicate TOTs

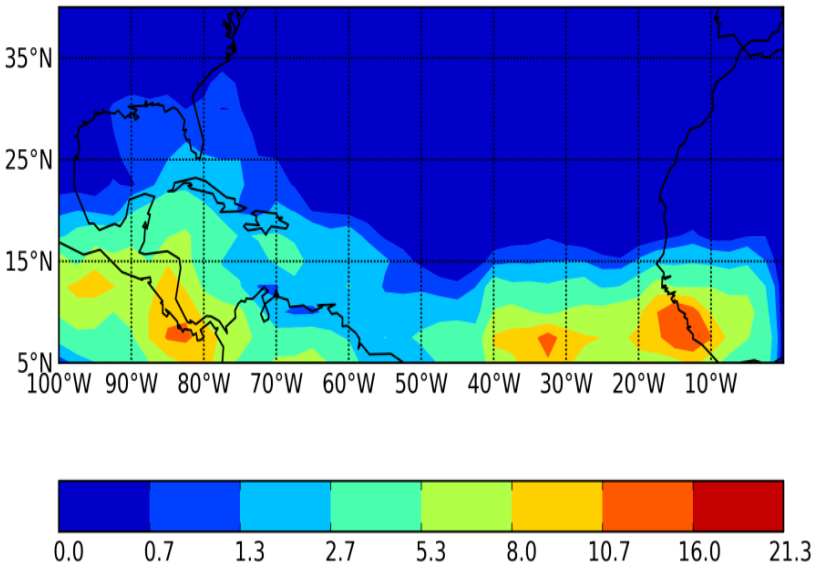
NHC/TAFB believes this product could be useful, but need more experience with it

Tropical Overshooting Tops and Lightning

Jul-Oct 2010 and 2011



Strikes/day-2.5° lat/lon

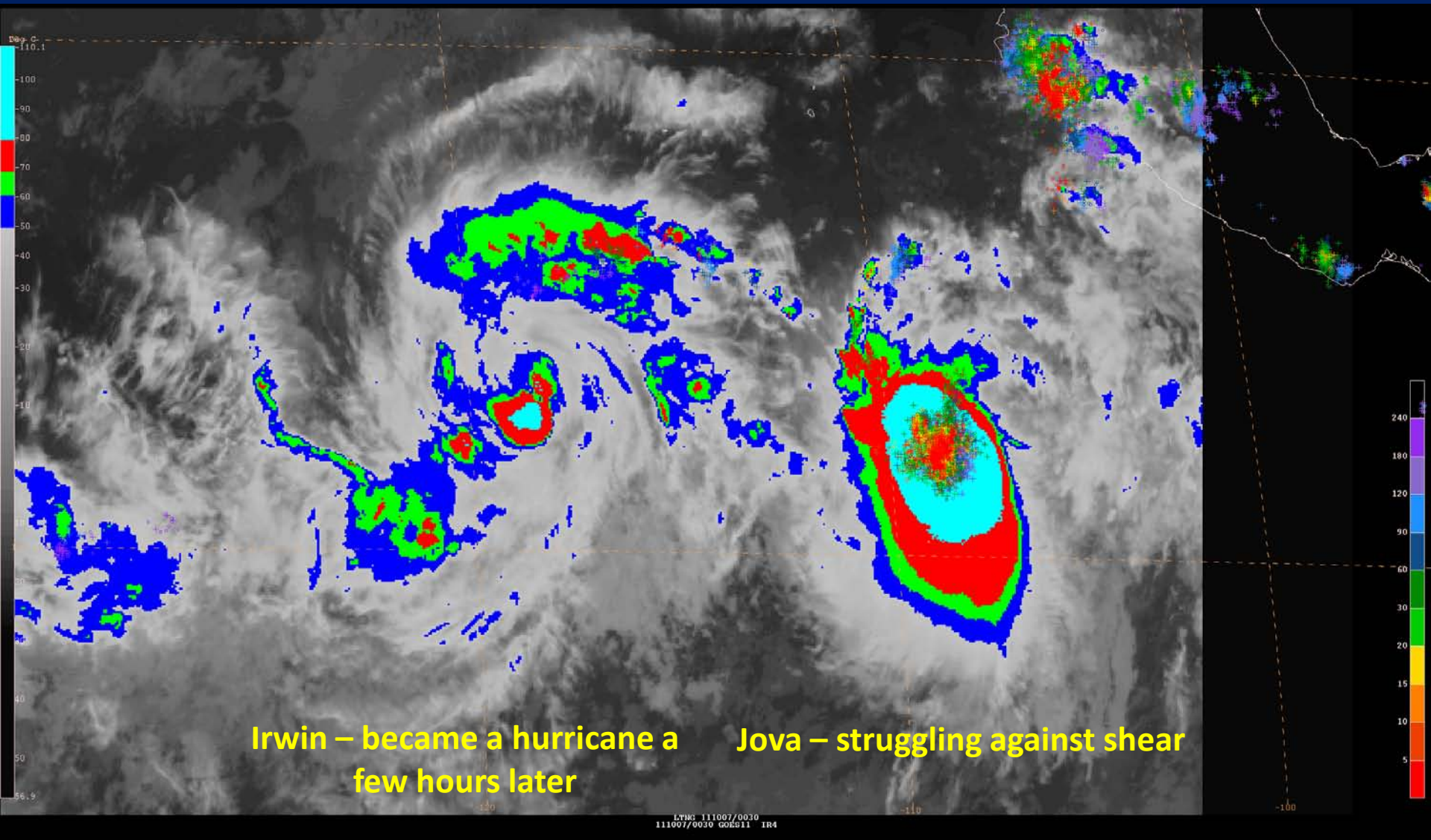


TOTs/day-2.5° lat/lon

-- Lightning from WWLLN and TOTs from GOES/Meteosat are partially correlated, but notable differences exist.

-- Investigations for evaluating quantitative TOT utility/applications are continuing (CIMSS).

A Recent Example of Lightning in Eastern Pacific Tropical Cyclones



Evaluation of Lightning Impact on Rapid Intensity Change

- Experimental version of Rapid Intensification Index run in real time during 2011
  - Inner core lightning lowers probability of RI
    - 2011 cases confirm positive correlation between shear and inner core lightning
  - Rainband lightning increases probability of RI
- Three performance metrics for probabilistic forecasts
  - Brier Score, Bias, Threat Score
- Very few Atlantic rapid intensification cases
  - 9 out of 317 forecasts
- Small RI sample size prevented meaningful statistics

Conclusions

- RGB products in N-AWIPS format greatly increased their utilization
- 2011 GOES-R Proving Ground was again a learning experience. More experience is needed, especially with the lightning and overshooting tops products/algorithms.
- Useful feedback to developers obtained on many of the image products and algorithms.
- Forecaster availability, data display systems, and time constraints continue to limit the number of products that can be tested per season.

Plans for 2012 NHC Proving Ground

- Product set TBD by June 2012
- Provide more of the imagery products in N-AWIPS format
  - Transition to AWIPS-2 for 2013 season?
- Increase involvement of the Tropical Analysis and Forecast Branch (TAFB)
- More coordination with OPC/HPC/SAB Proving Ground
- Investigate quantitative evaluations when possible
- Formalize forecaster feedback procedure
- Possible inclusion of JPSS products in 2013