

Conference Title: 2016 CoRP Symposium

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Title: Developing an Interactive Probabilistic Forecasting Tool for Maritime Weather Hazards

Type of Presentation: _____ Poster

 X Oral

Short Abstract:

Forecast offices responsible for monitoring weather conditions over open water rely on antiquated forecasting tools. Geostationary imagery and numerical weather prediction (NWP) analyses are the primary information sources for forecasters when outside of radar range. There is a lack of products specifically developed and designed for offshore operational forecasting of mesoscale and synoptic scale meteorological events. This project is designed to create an interactive tool for forecasters at the Ocean Prediction Center to identify developing and sustained weather systems that have the potential to produce navigational hazards.

This project is analogous to the ProbSevere model, developed by CIMSS, which calculates the likelihood that a radar-identified precipitation cell will produce severe weather (wind speed > 50 knots or hail > 1 inch) in the next 60 minutes. ProbSevere collocates precipitating cells with the glaciation rate and growth rate from GOES infrared imagery, the maximum expected size of hail from radar, and the effective bulk shear and convective available potential energy from NWP. A Bayesian model compares the observed conditions to previous storms and severe storm reports to calculate the probability of the storm becoming severe, which is visualized in interactive forecasting software. ProbSevere has received terrific reviews from National Weather Service forecasters, however, the model is incapable of monitoring regions outside of radar coverage. New predictors are being tested for use in the maritime environment, where storm lifecycles are dramatically different than typical mesoscale systems over land. For instance, NWP will be critical to establish ambient environmental conditions, recent precipitation estimates from low earth orbit sensors will serve as a proxy for radar, and lightning flash data can identify intense convective regions. This project is in support of the GOES-R Risk Reduction Program.

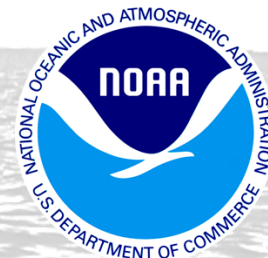
Developing an Interactive Probabilistic Forecasting Tool for Maritime Weather Hazards



Patrick Meyers

NOAA/NESDIS Corp Symposium

July 18, 2016



Scott Rudlosky, Mike Pavolonis, Ralph Ferraro,
John Cintineo, Michael Folmer, Nai-Yu Wang,
Daniel Vitelli, Kayla Brown, and Killian Farrell

The Problem

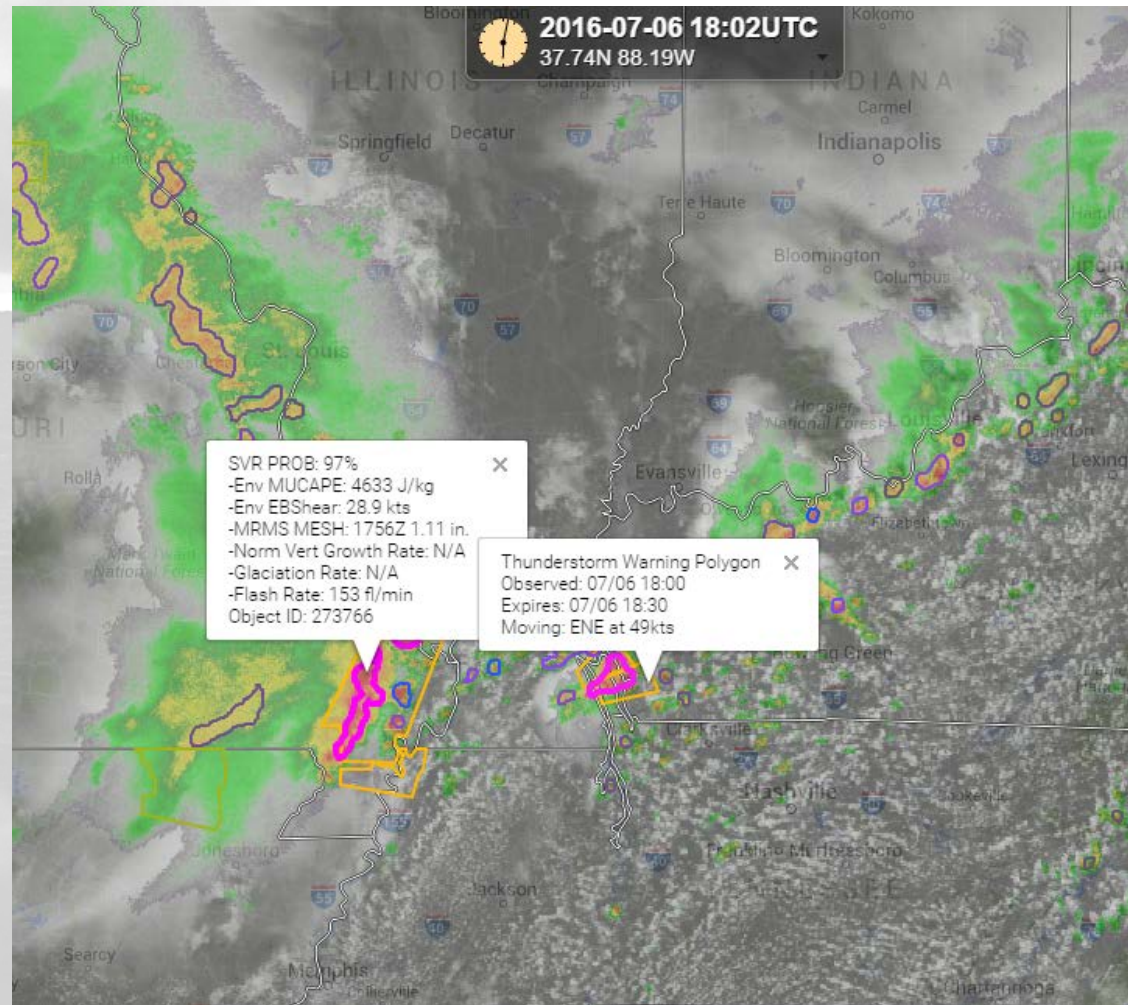
- The ocean is big – Large area of responsibility
- Surface observations are sparse
- Satellite observations are (relatively) plentiful
- Current ocean warnings leave more to be desired

The Goal

- Identification of local, high-impact events
- Condense relevant information for forecasters
- Quantify storm characteristics
- Intelligently process GOES-R data volume

CIMSS's ProbSevere over CONUS

- Multi-sensor Bayesian model to determine probability of severe weather
- “Connecting Obs Across Systems”
- Radar: MESH
- GEO: Growth Rate
- NWP: CAPE/Shear
- Lightning Flashes



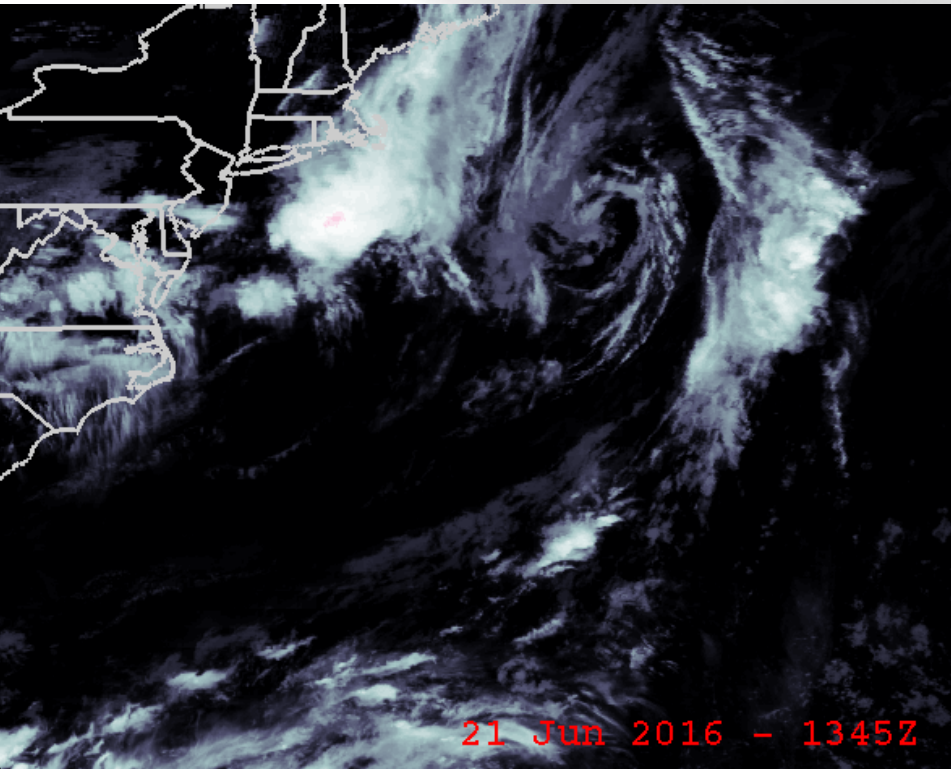
Mike Pavolonis (NOAA), John Cintineo & Justin Sieglaff (CIMSS)

Adapting ProbSevere for Maritime Hazards

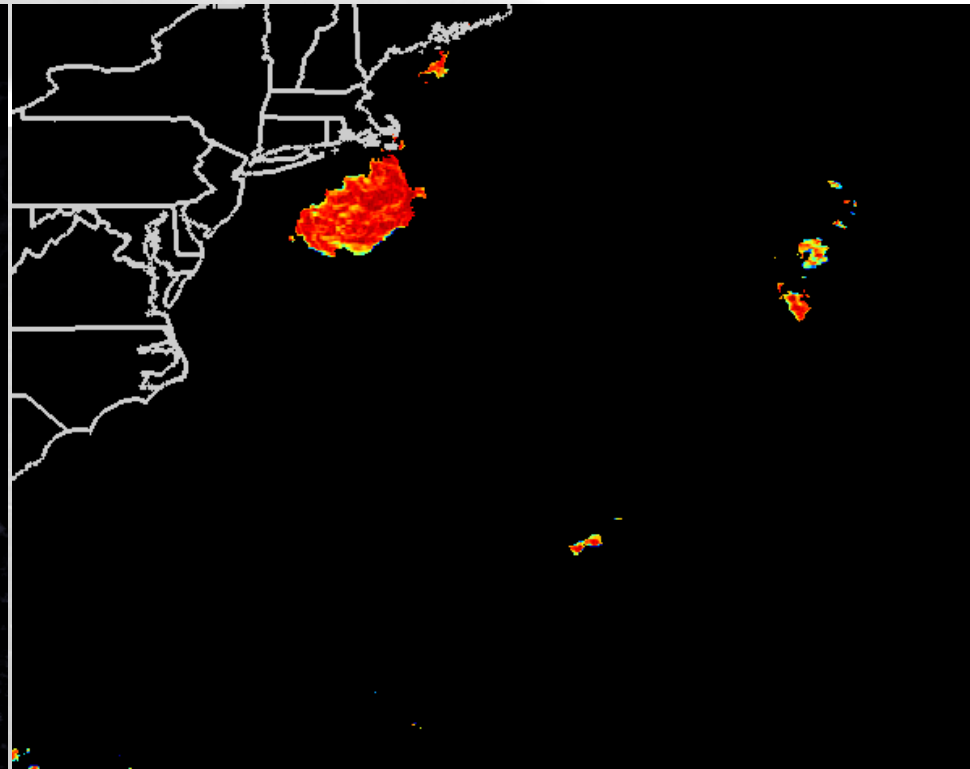
- Wind-Only – Identify gale-force winds
- Determine ground truth
- Re-evaluate predictor selection
 - Different atmospheric regime/air masses
 - Very limited radar
 - Introduce SST & TPW, and satellite fields
- Examine case studies for product evaluation

Extending ProbSevere: Event Tracker

11 μ m Top-of-Troposphere Cloud Emissivity

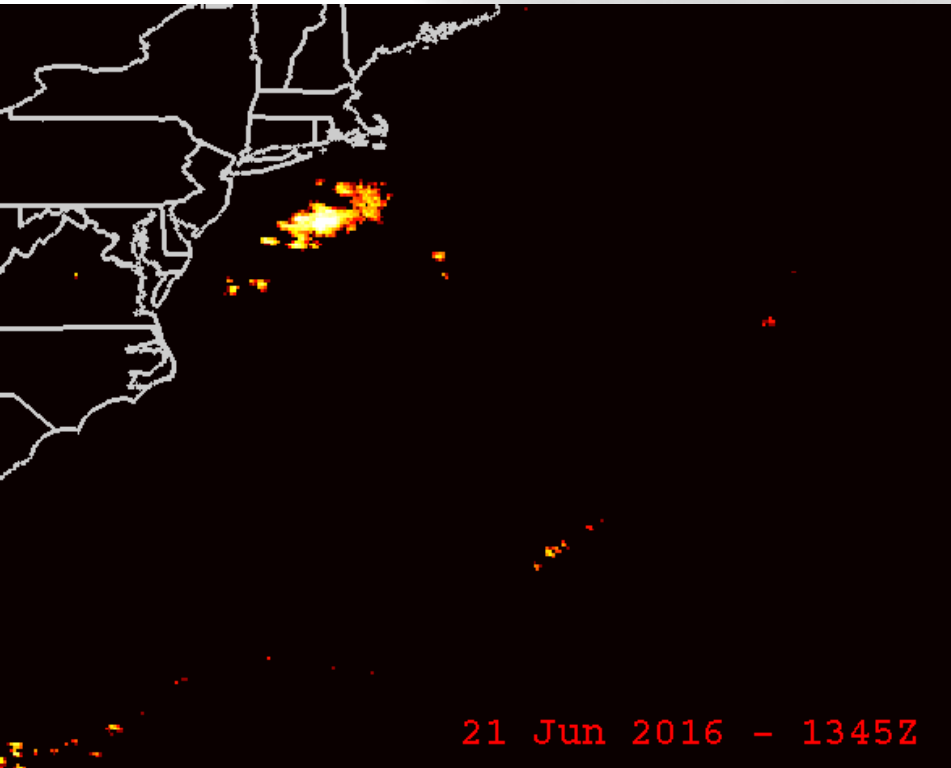


Std. Deviation of 11 μ m in 3x3 box

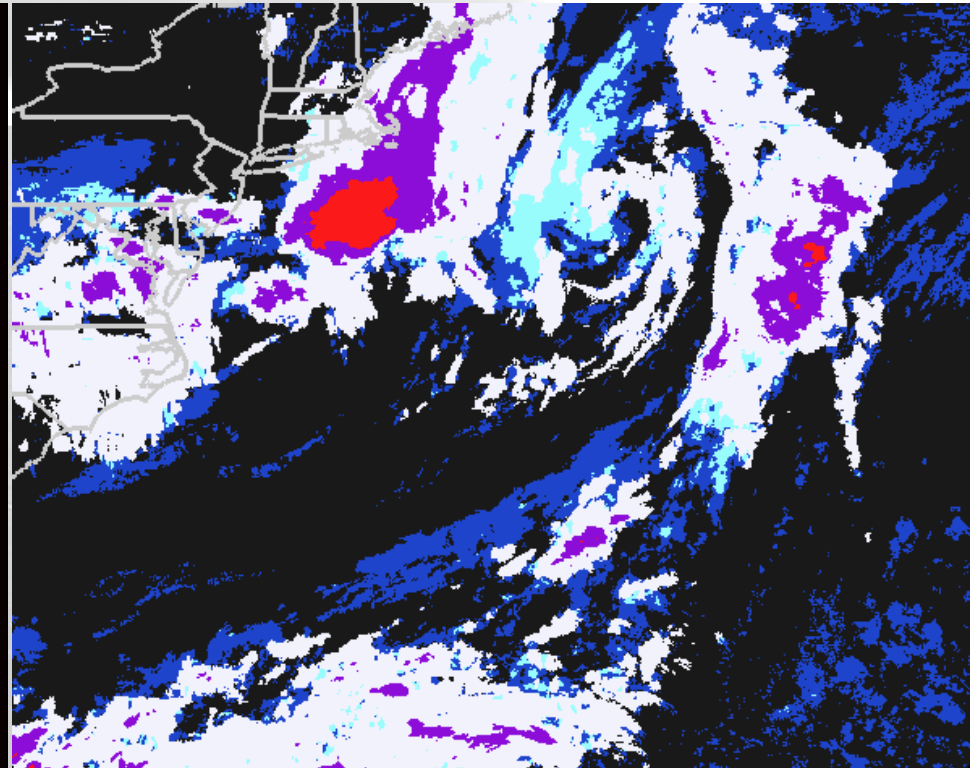


Extending ProbSevere: Event Tracker

Lightning Flash Density

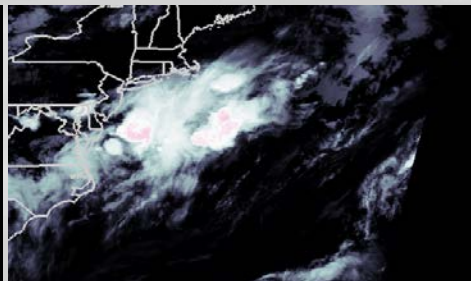
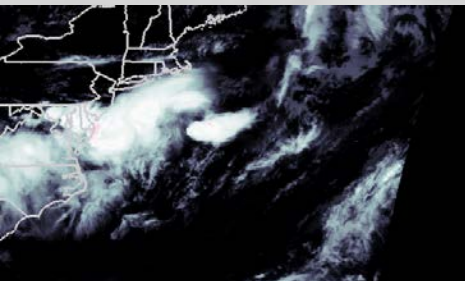
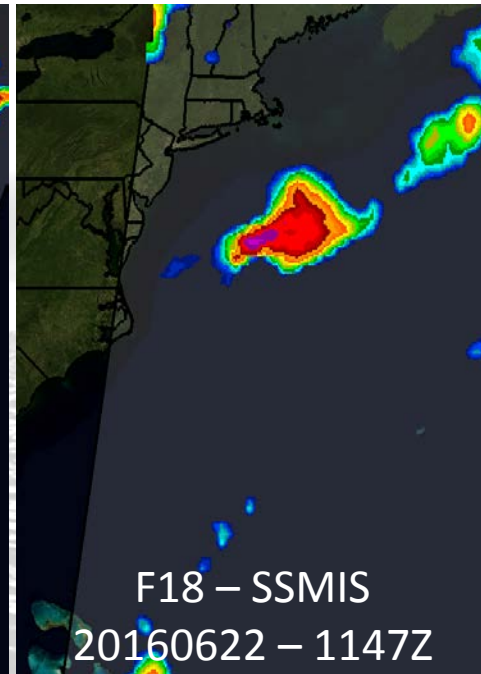
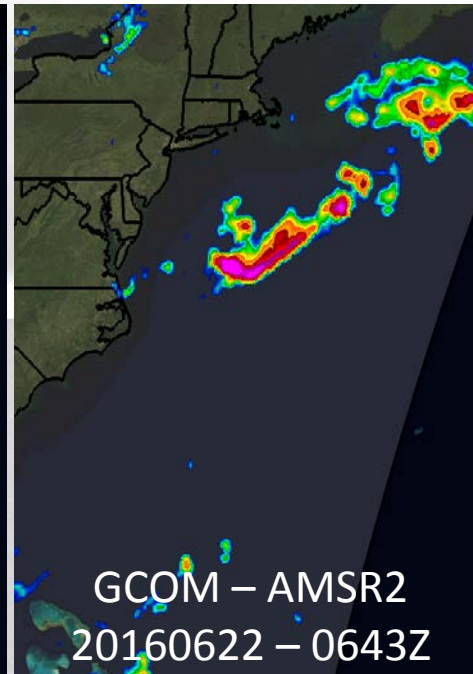
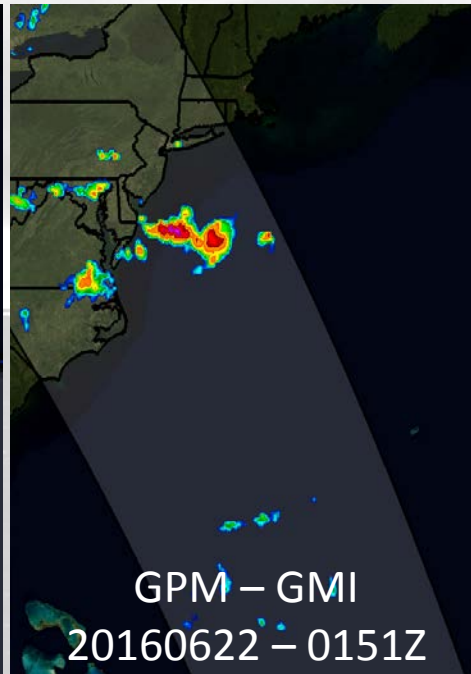
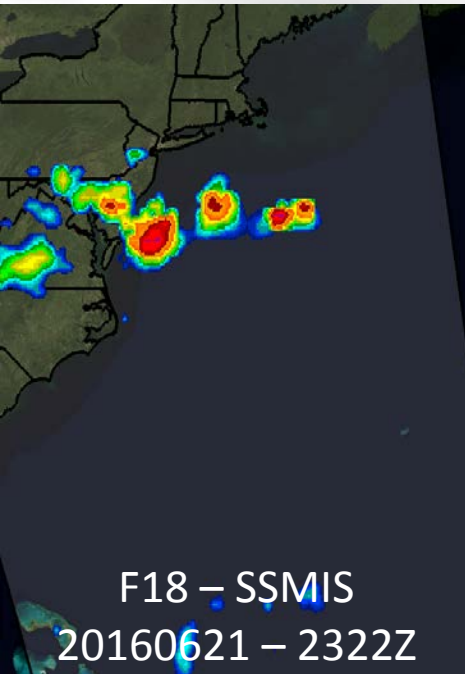


GOES Cloud Type



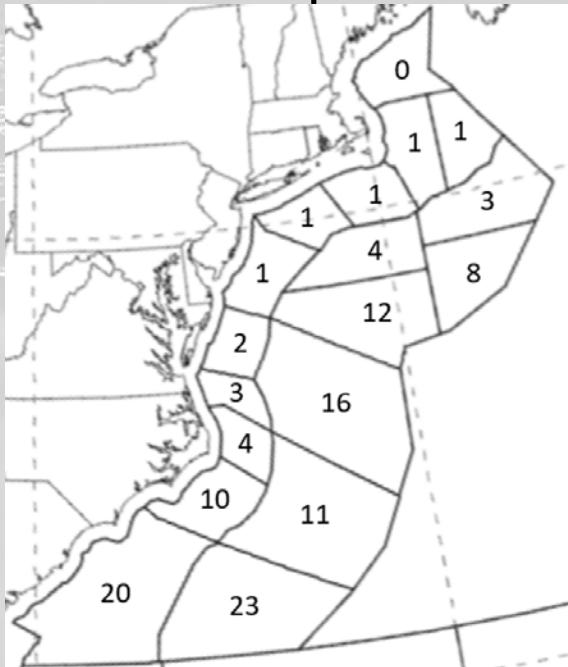
Liquid Super-Cooled Opaque Ice
Cirrus/Multi-Layer Deep Convection

No Radar? Try Passive Microwave

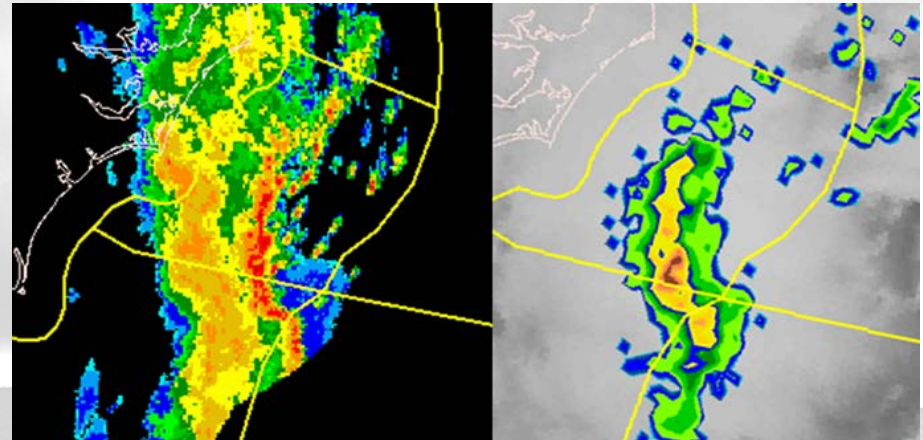


Beginning to Quantify Ocean Storms

- Examine lightning (GLD360) and geostationary imagery to identify occurrences of offshore supercells

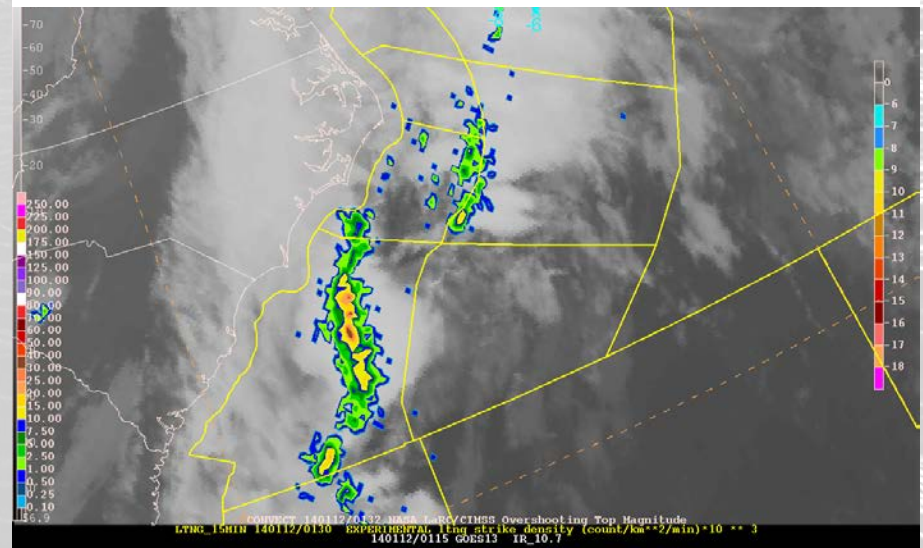


Supercells from Jan-Jun 2014



Base Reflectivity

Lightning Density

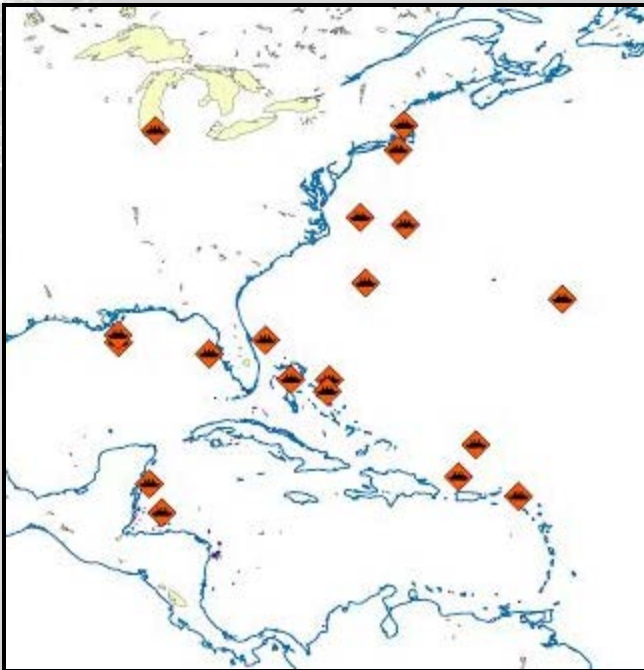


Killian Farrell (UMD-AOSC) & Michael Folmer (CICS-MD)

Event Catalog

- Search of cruise ship logs, news stories, marine reports

Kayla Brown (UMD – AOSC)



Cruise ship visit to Portland postponed because of weather

Carnival Glory rescheduled to Tuesday morning

UPDATED 8:11 AM EDT Jun 04, 2012

Text Size: A A A

PORTLAND, Maine — Carnival cruise lines has postponed a visit to Portland by the ship, Glory because of bad weather.

RELATED

- [Keeping our waters slime free](#)
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The 952-foot Carnival Glory was scheduled to arrive Monday morning. Instead, the ship, carrying nearly 3,000 passengers and more than 1,100 crew members, will arrive Tuesday morning.

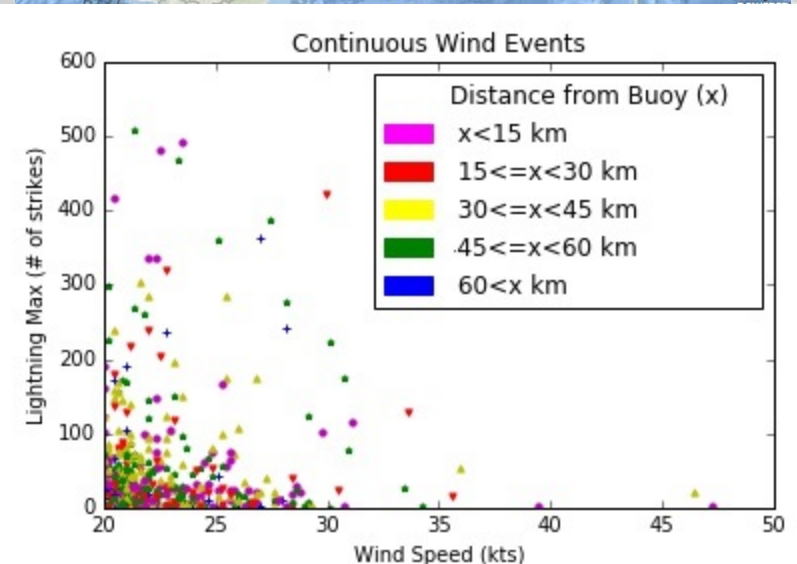
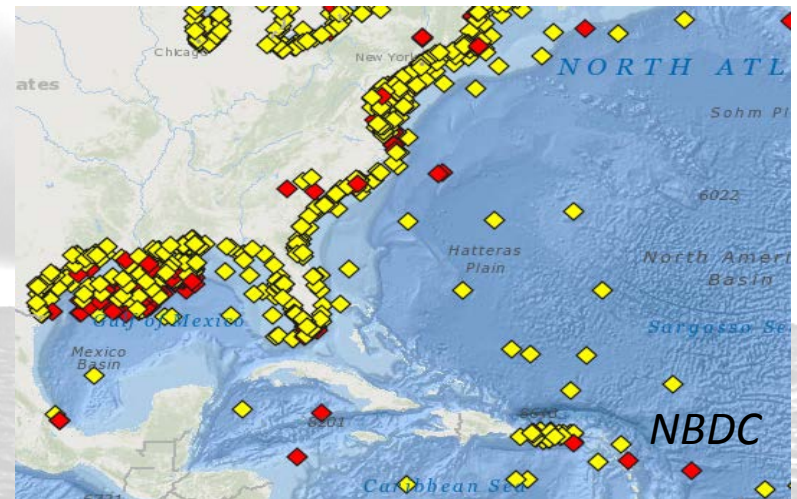
The Carnival Cruise Lines ship will then leave port Tuesday evening, bound for Saint John, New Brunswick. The ship also makes port calls in Halifax and Sydney, Nova Scotia, before returning to Boston on Sunday.

Portland this year expects 59 cruise ships to stop in the port. The busiest part of the season runs from mid-August through October.

Buoy Observations

- Opportunistic encounters between buoys and storm systems
- Collocate lightning density and continuous (10-min) winds
- Characterize radius-of-influence and onset of storms
- Next step: Match with satellite-derived products

Daniel Vitelli (UMD – AOSC)



Summary & To-Do

- Beginning to develop forecasting tool for offshore applications based off of CIMSS' ProbSevere model
- CoRP GOES-R project, ripe for collaboration
- Isolate best predictors of hazardous weather
- Prepare for GOES-R data deluge
- Introduce tool to forecasters and support implementation at OPC, TAF-B, and Pacific Region forecast offices