# Application of Satellite Oceanography to Weather, Water, and Climate Services

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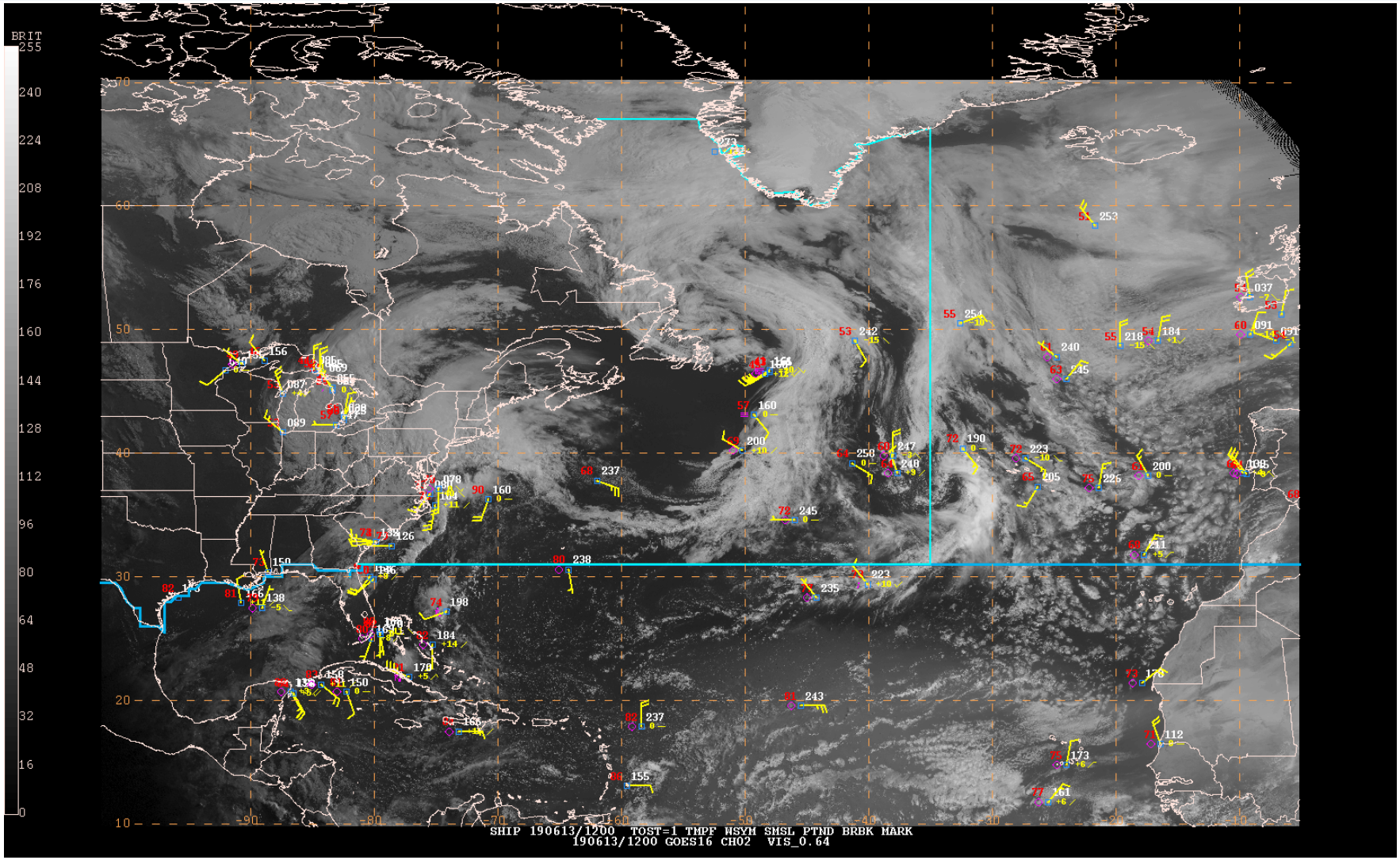
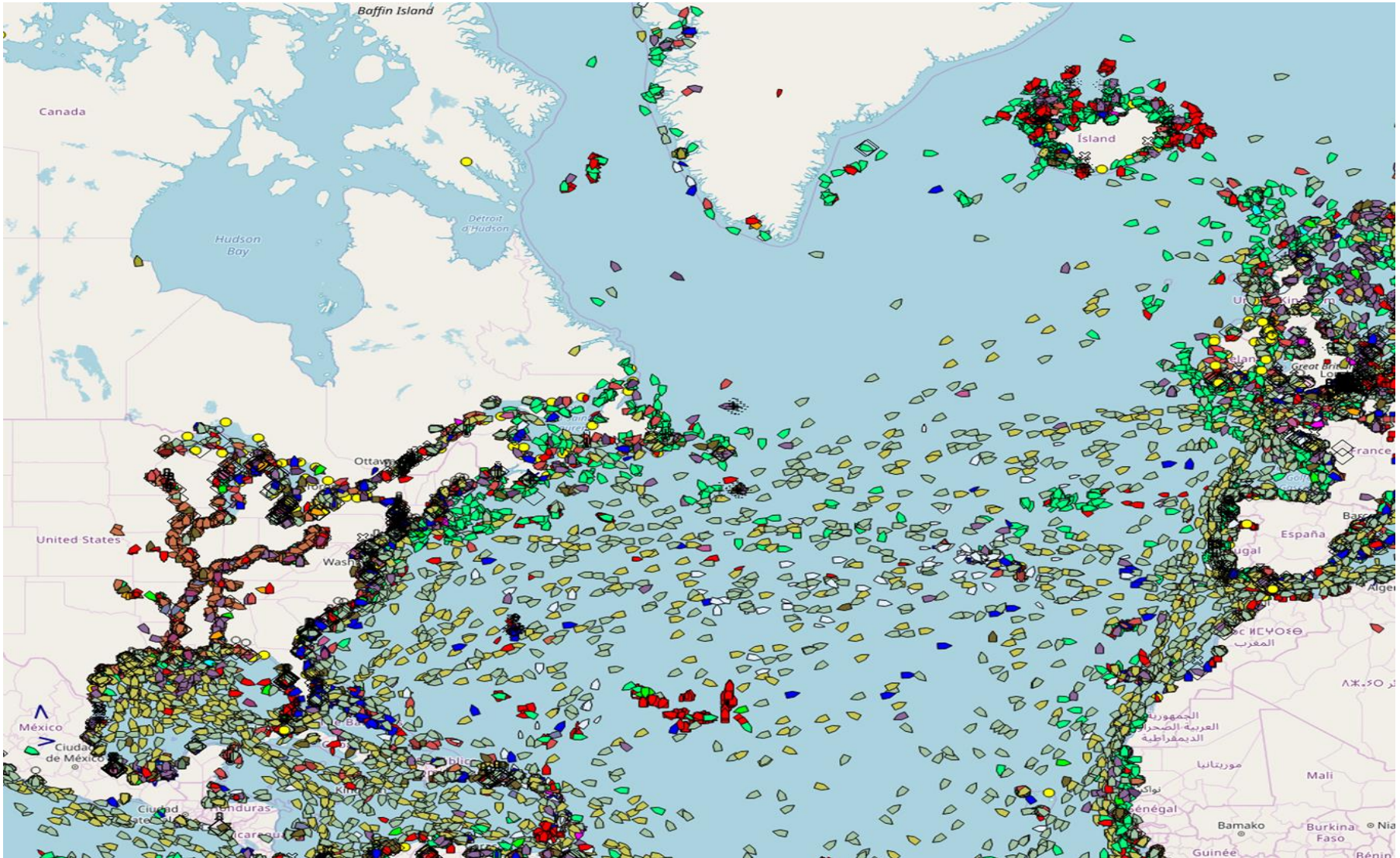
# Ship & Satellite Observations

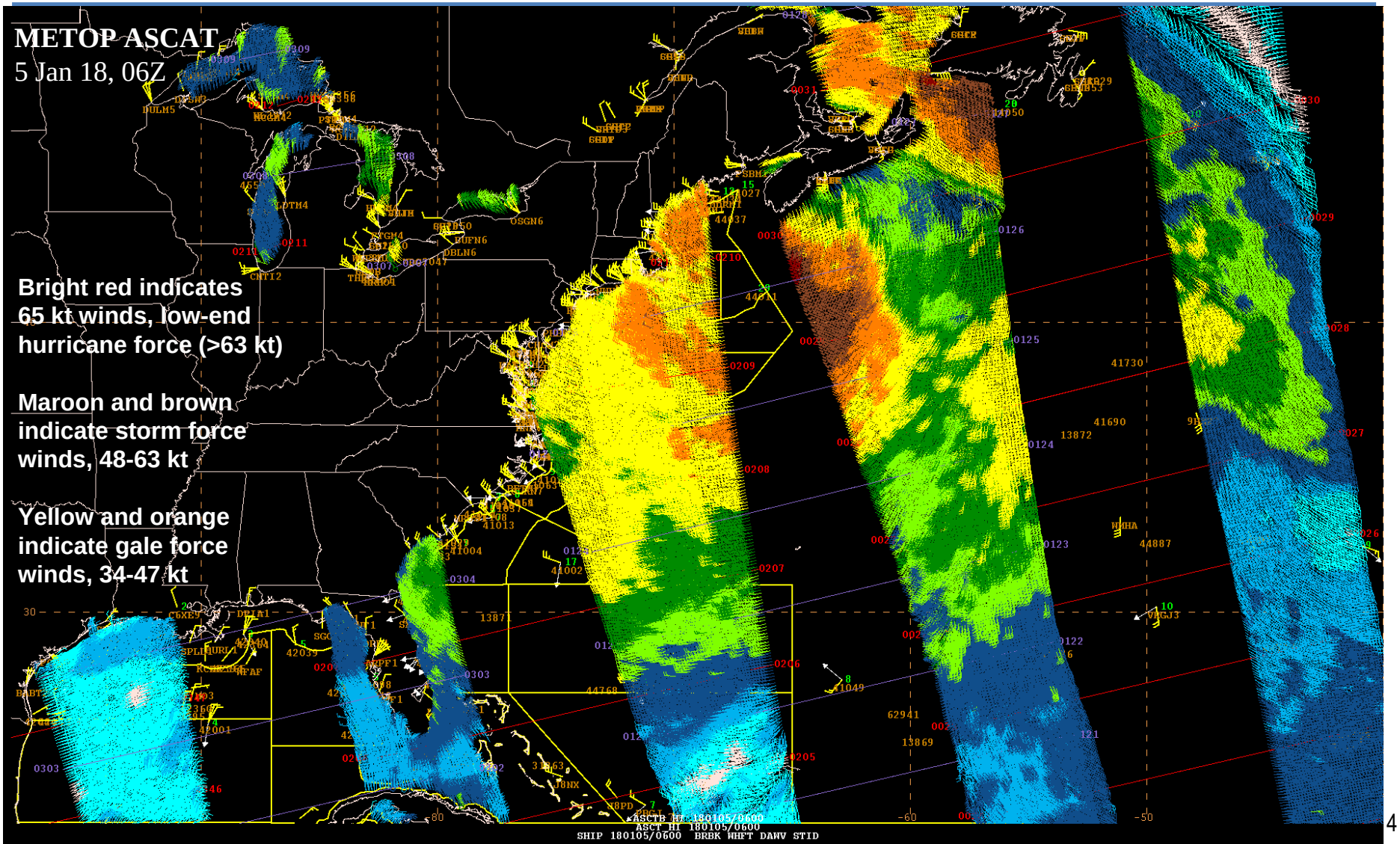


# Actual Ship Traffic

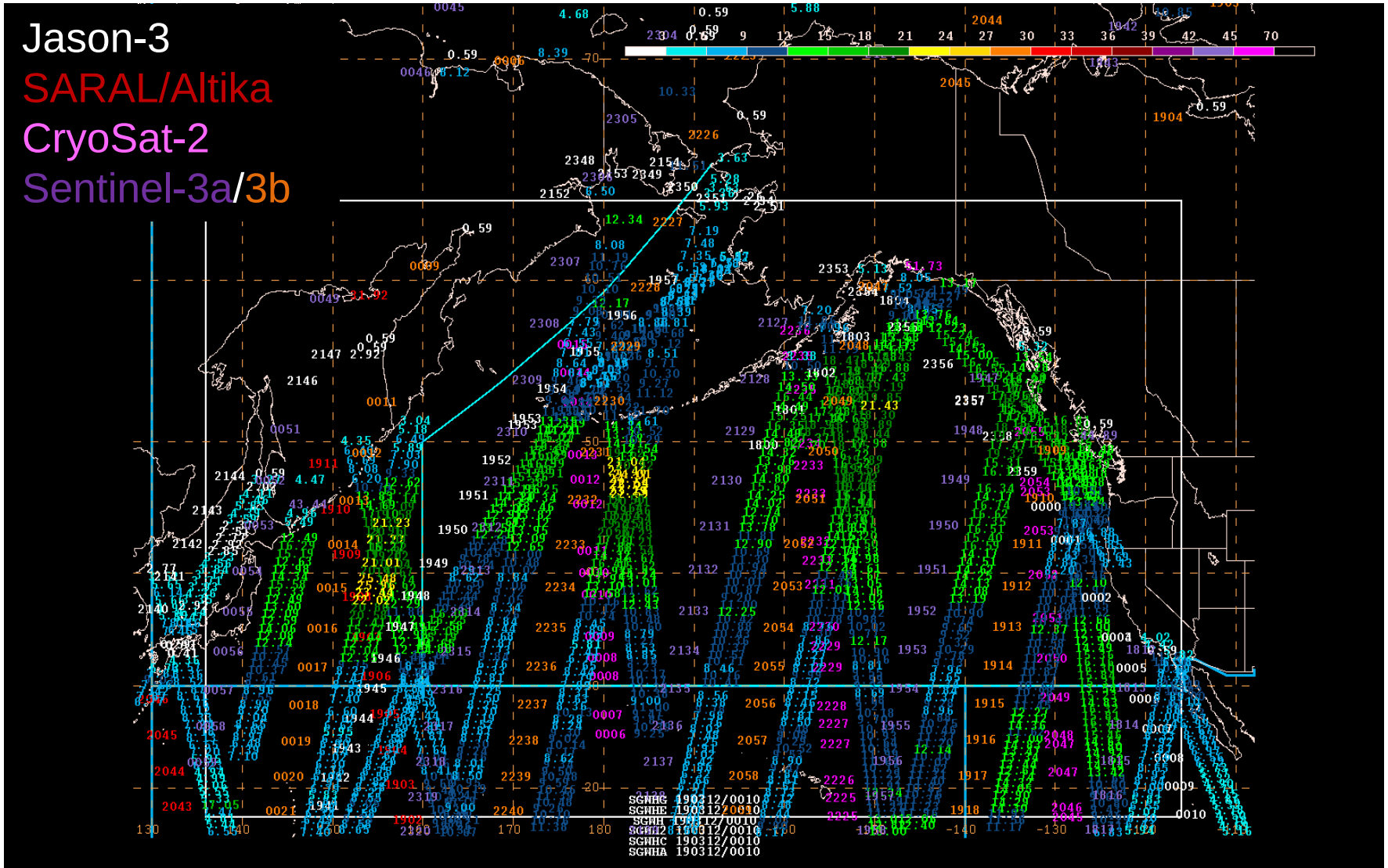


# Observations:

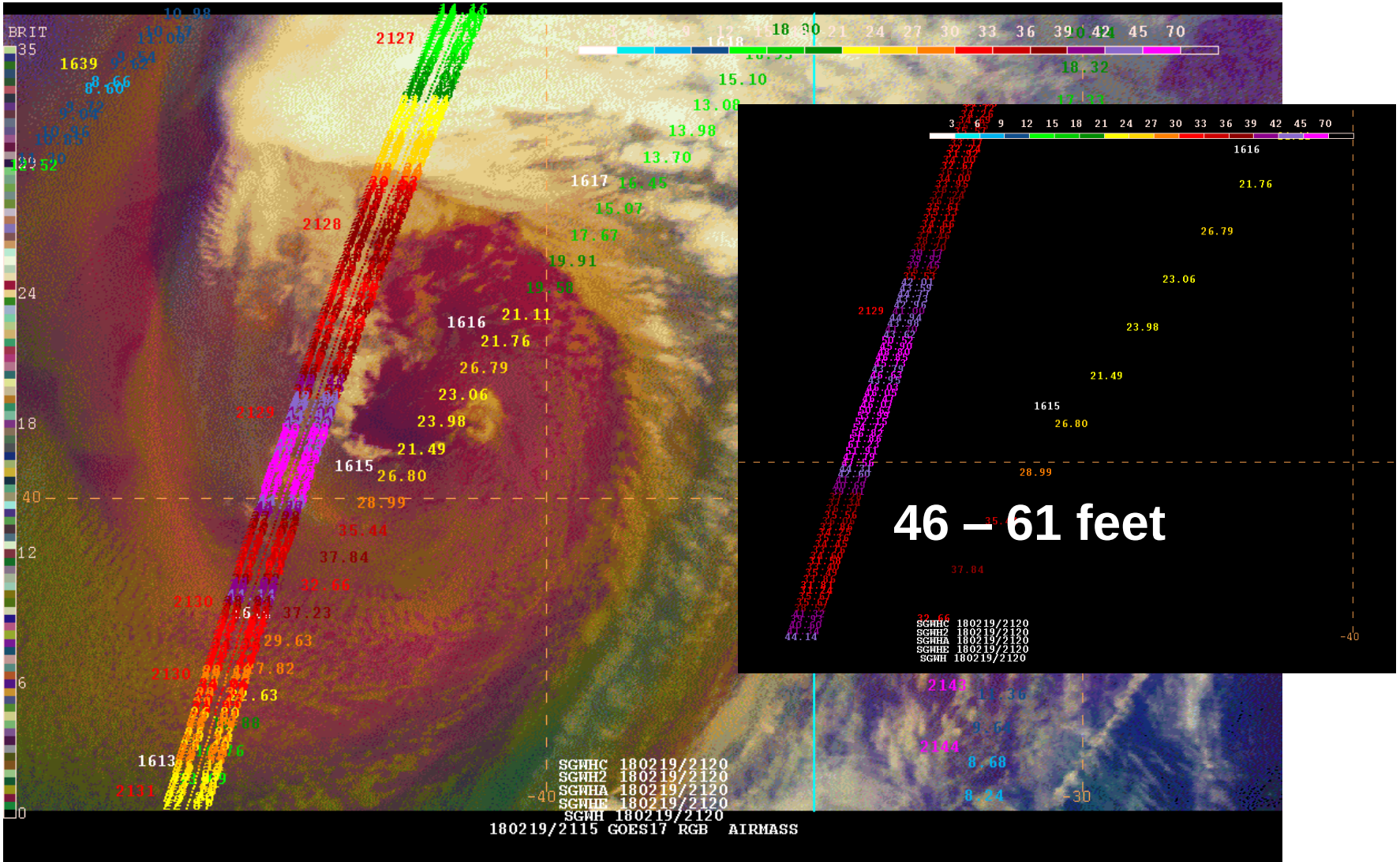
## Extreme Weather, 4 - 5 Jan 2018



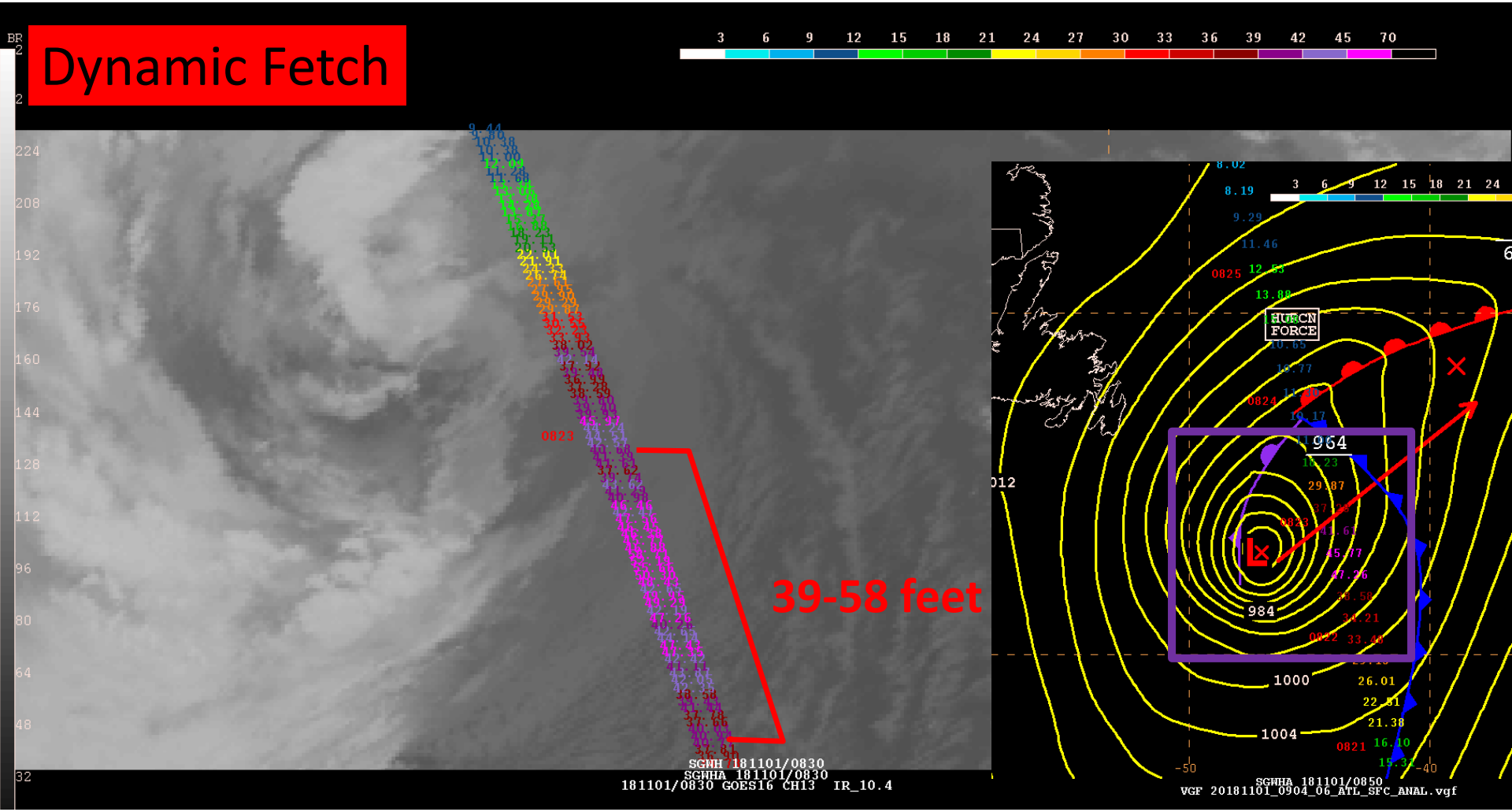
# Measuring Significant Wave Height – 5 Altimeters



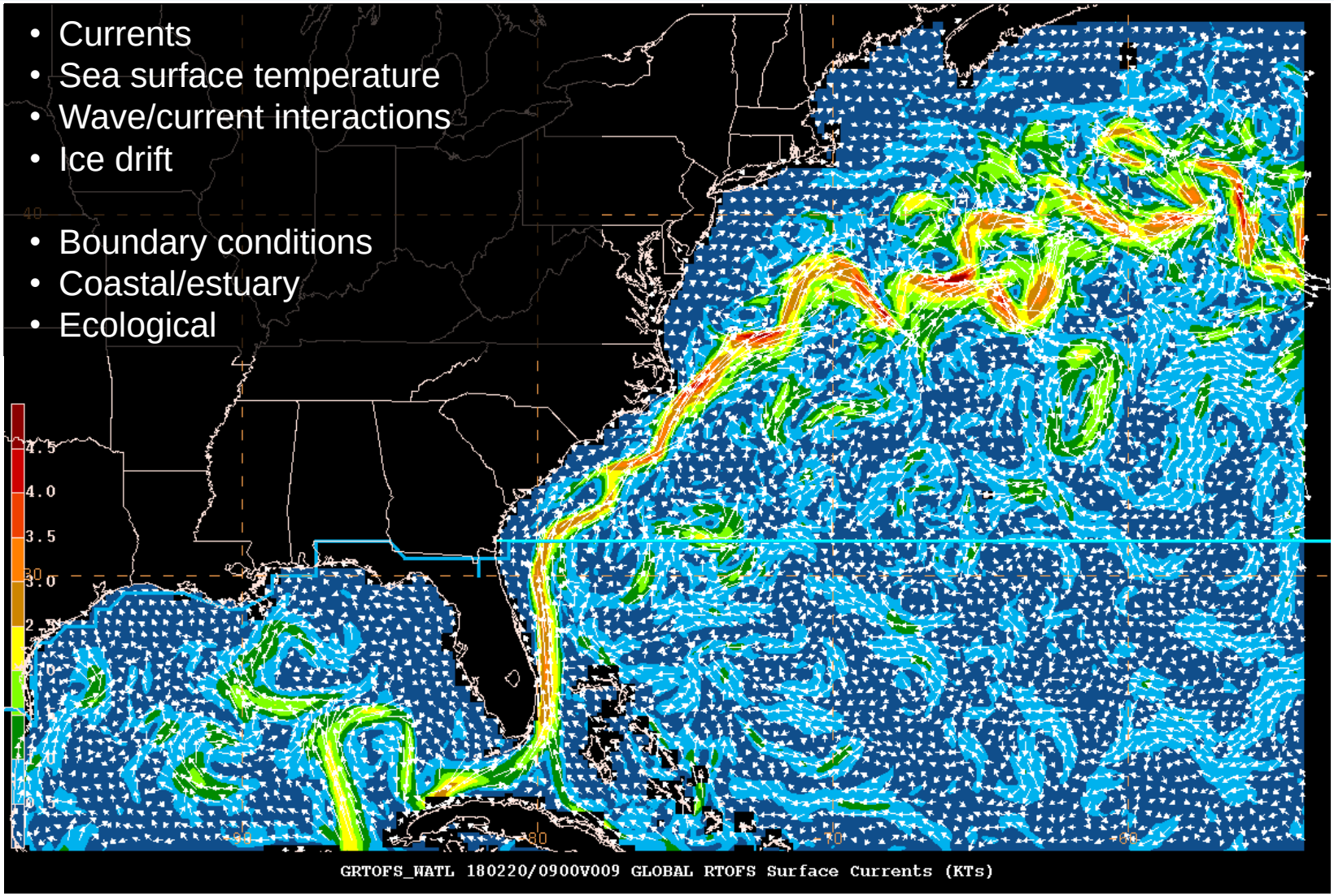
# Extreme Waves



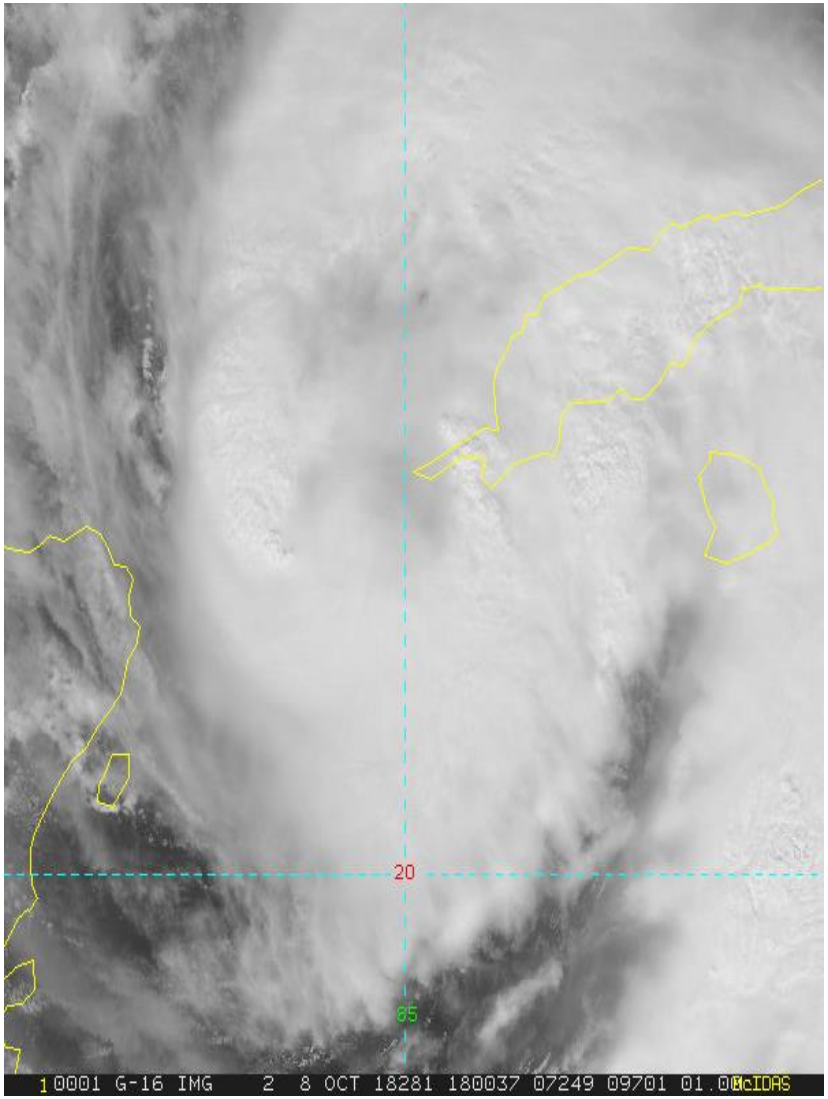
# Post-Tropical Cyclone Oscar
## 1 Nov 2018

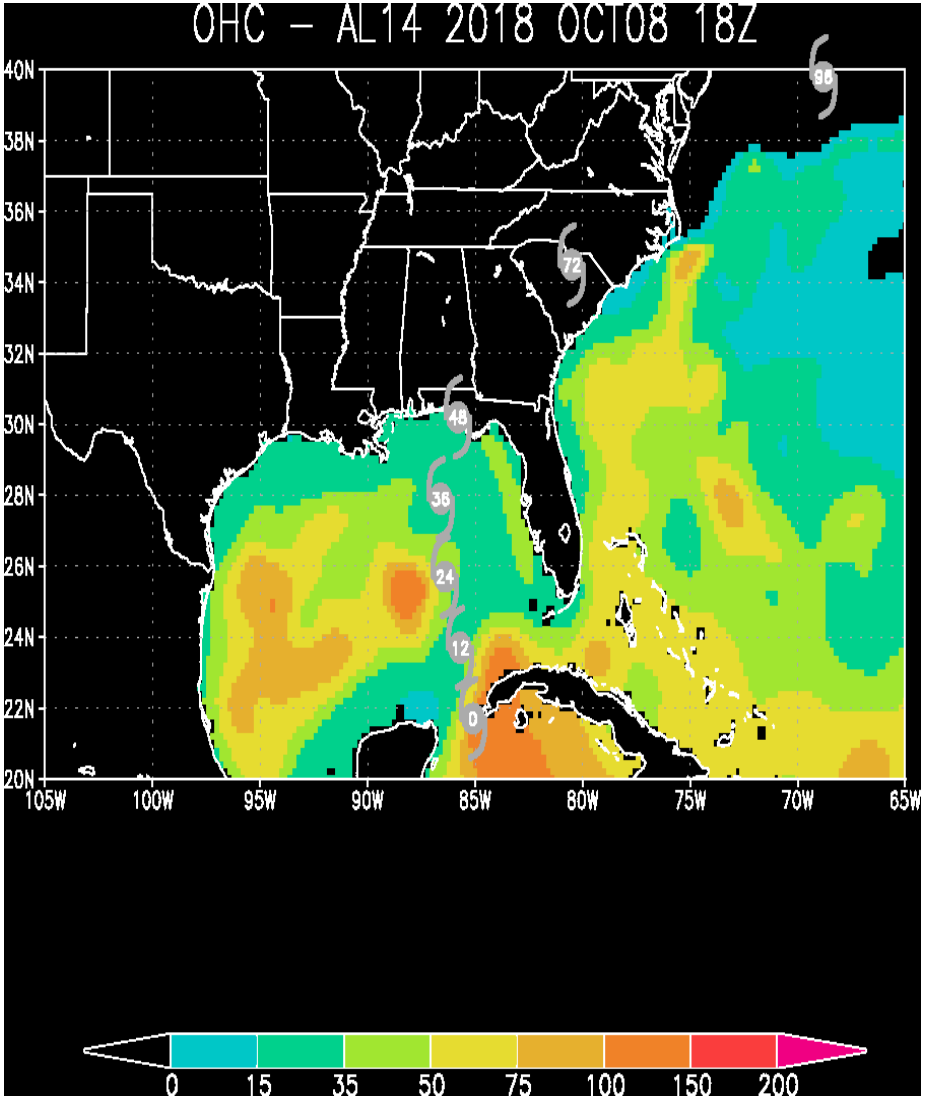


# It’s not just the waves…



# Ocean Heat Content
# NESDIS StAR





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# U.S. National Ice Center

## Providing Environmental Domain Awareness

### *Characterization: Observation, Analysis, and Prediction*


Satellites


Buoys

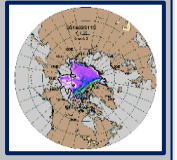

Ship Observations


Aircraft


Webcam

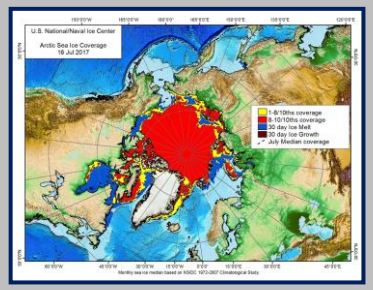

Radar


Surface Observations

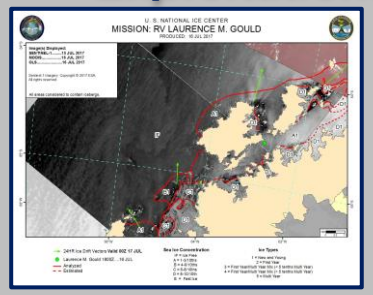

Models

***SME Analysis + Automation + GIS Software = Derived Products***

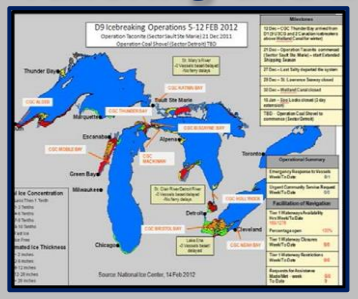
### *Exploitation: Tailoring and Integration*



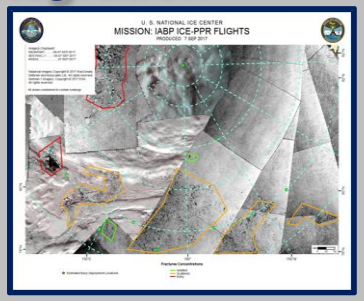
Weekly Hemispheric



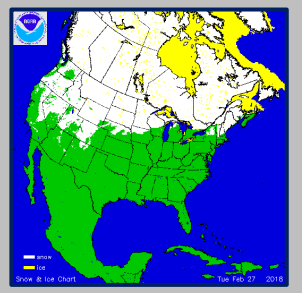
Annotated Imagery



Asset Management



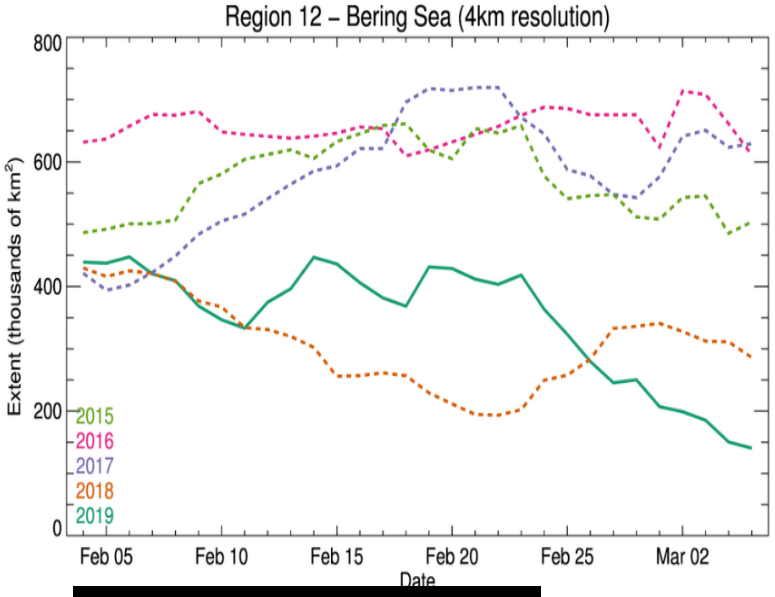
Fractures, Leads & Polynyas

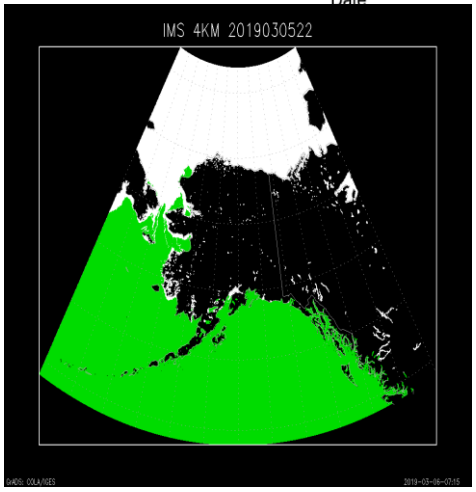


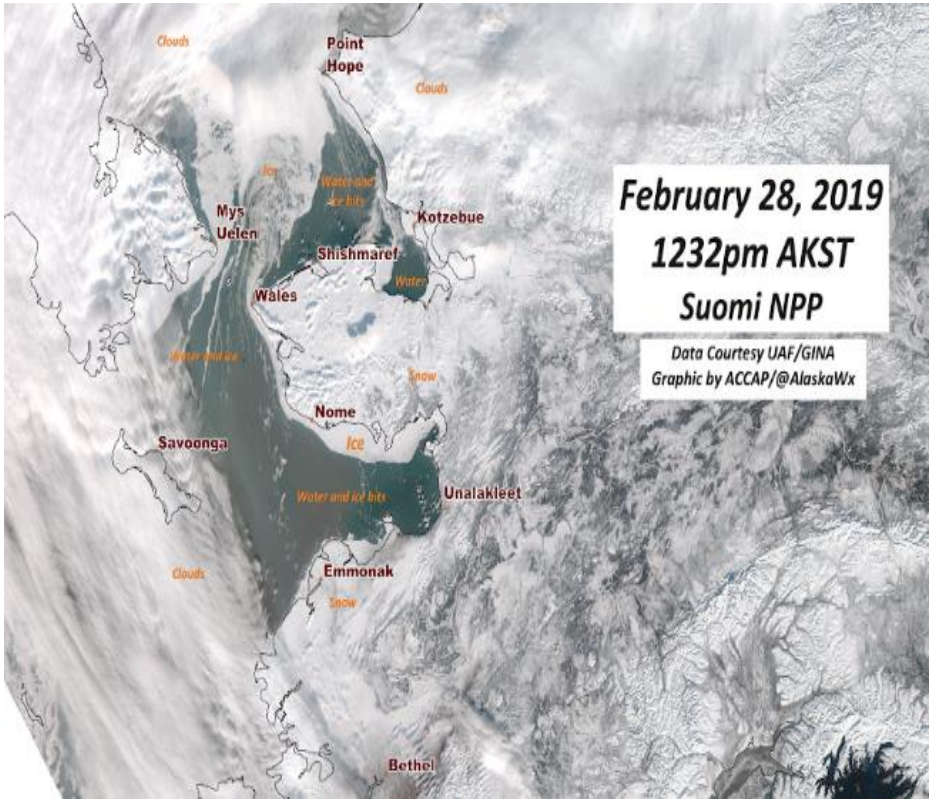
2 X Daily NH Snow Products

# National Ice Center
## Mapping Record Low Sea Ice

NSIDC/NIC MASIE product




Above: USNIC IMS sea ice extent for the Bering Sea. Well below last year's historic low ice conditions.

Left: IMS Analysis from 5 Mar 19

# Summary

- **Satellite data**:
  - Fill crucial data gaps in maritime weather
  - Contribute to weather, ocean, and climate services

- **To improve predictions in a fully coupled earth system, we must get the ocean "right"!**
  - Satellites augment the very limited *in situ* data available over the oceans
  - Increasing numbers of satellites must be validated, quality controlled, and assimilated into models
  - Assure integrity and security of the data
  - Continue to close the gap between research and operations, ocean and weather