

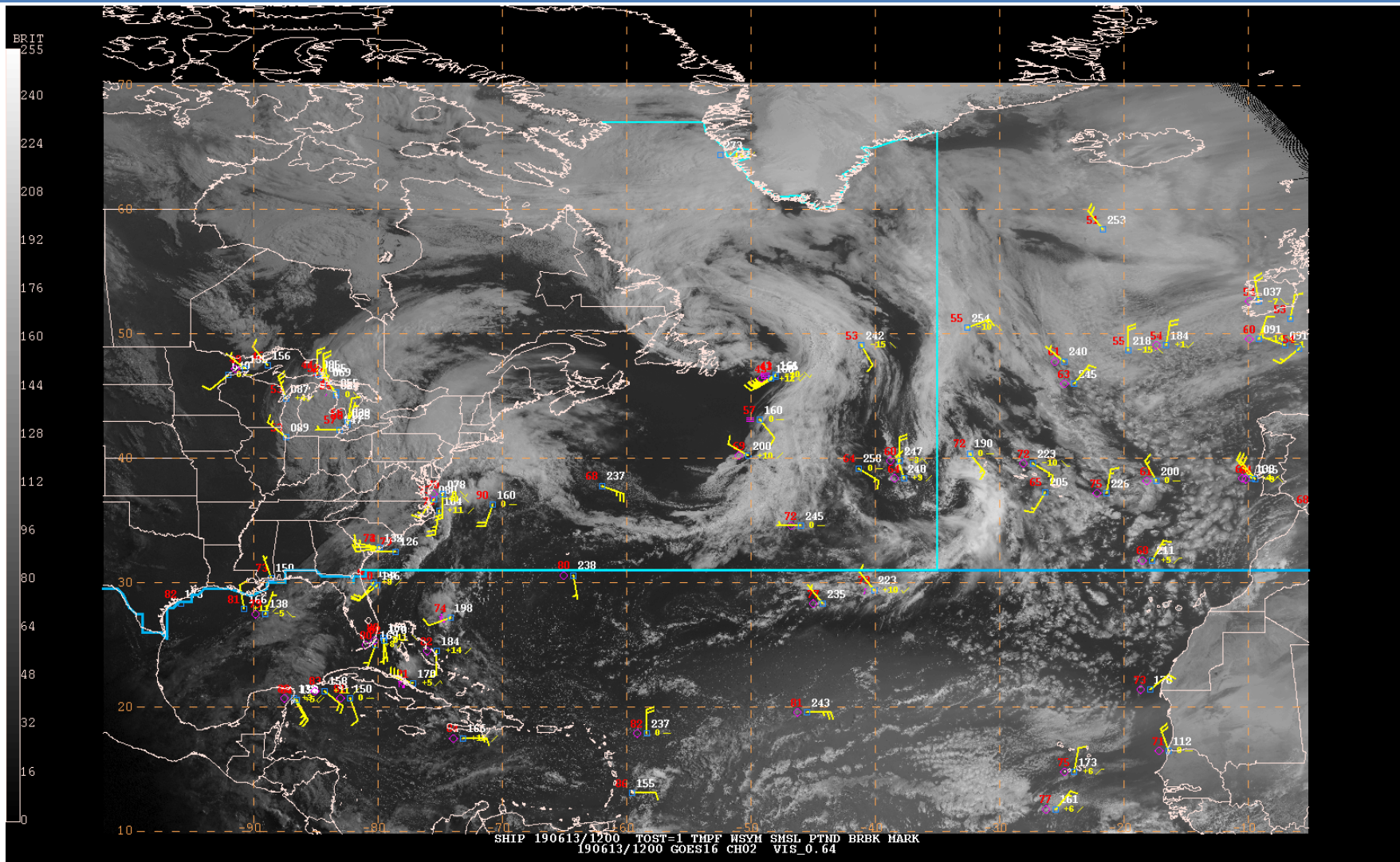
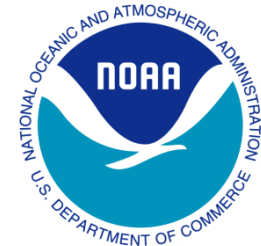


Application of Satellite Oceanography to Weather, Water, and Climate Services

Thomas J. Cuff
Director, Office of Observations
NOAA/NWS
18 June 2019

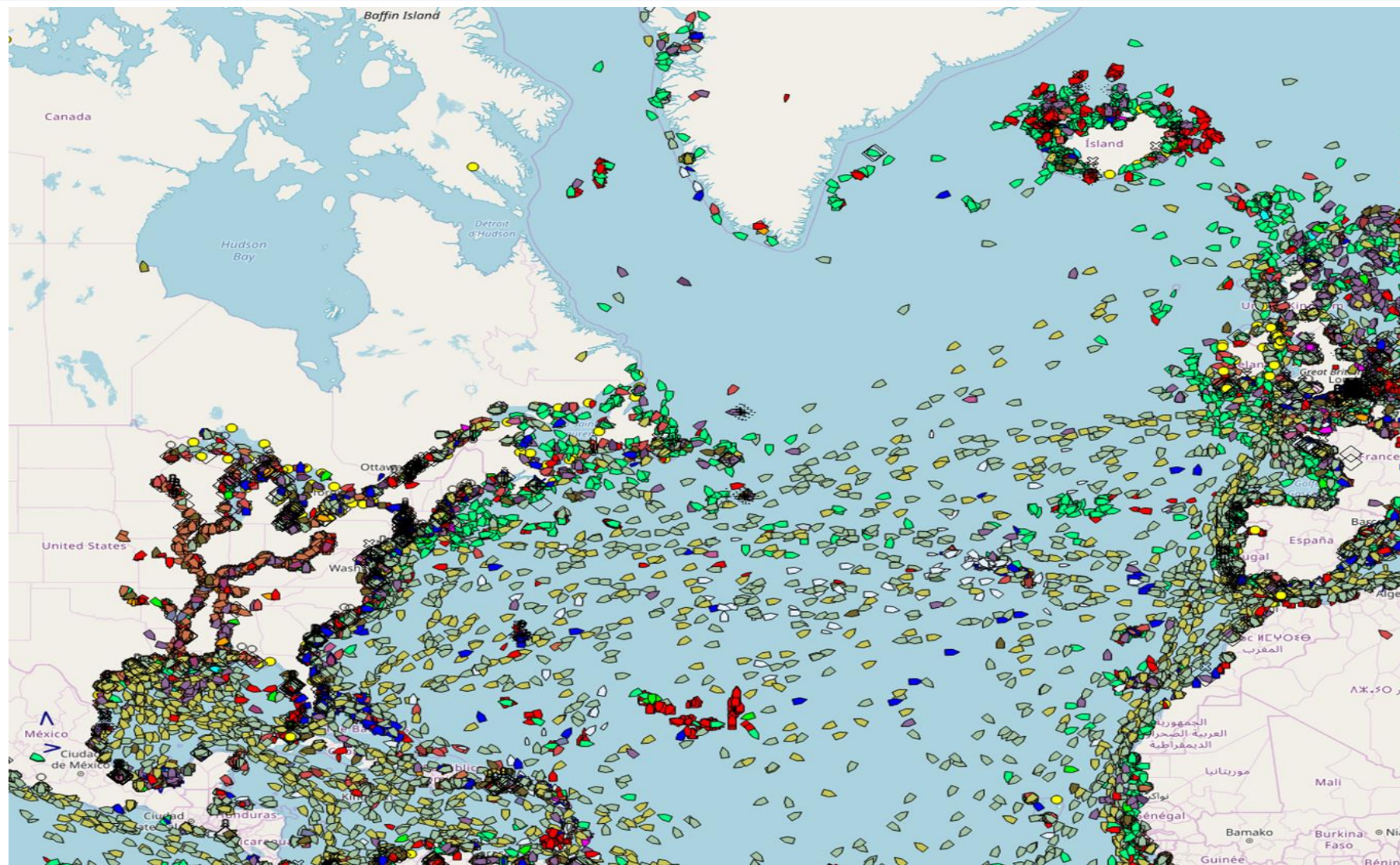
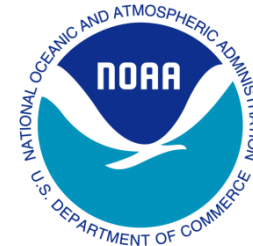


Ship & Satellite Observations





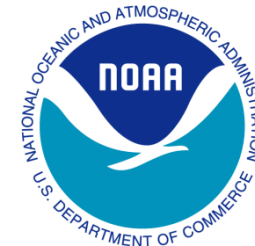
Actual Ship Traffic





Observations:

Extreme Weather, 4 - 5 Jan 2018



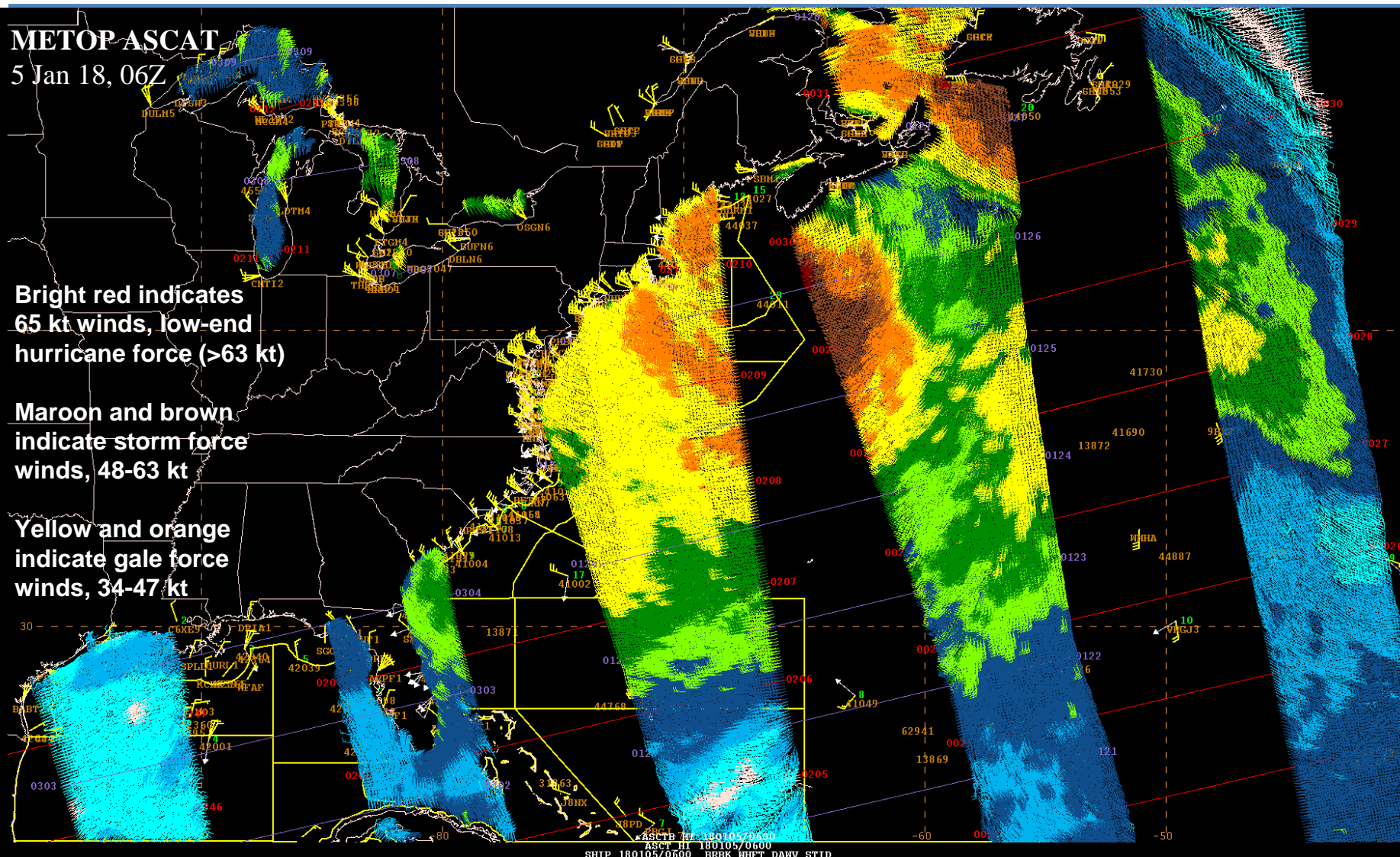
METOP-ASCAT

5 Jan 18, 06Z

Bright red indicates
65 kt winds, low-end
hurricane force (>63 kt)

Maroon and brown
indicate storm force
winds, 48-63 kt

Yellow and orange
indicate gale force
winds, 34-47 kt



ASCAT HI 180105/0600
SHIP 180105/0600 BRK WHF DAMV STID



Measuring Significant Wave Height – 5 Altimeters

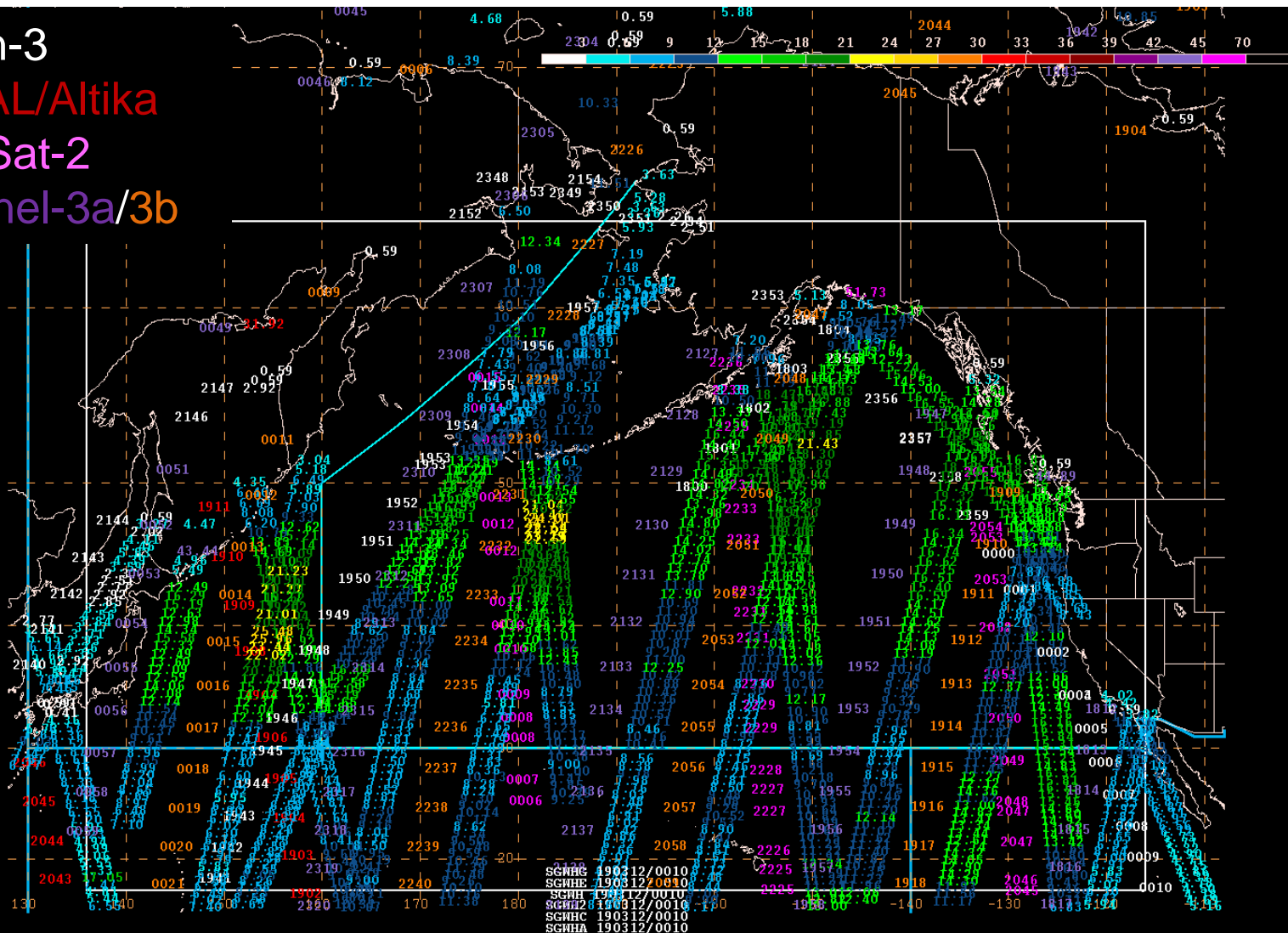


Jason-3

SARAL/Altika

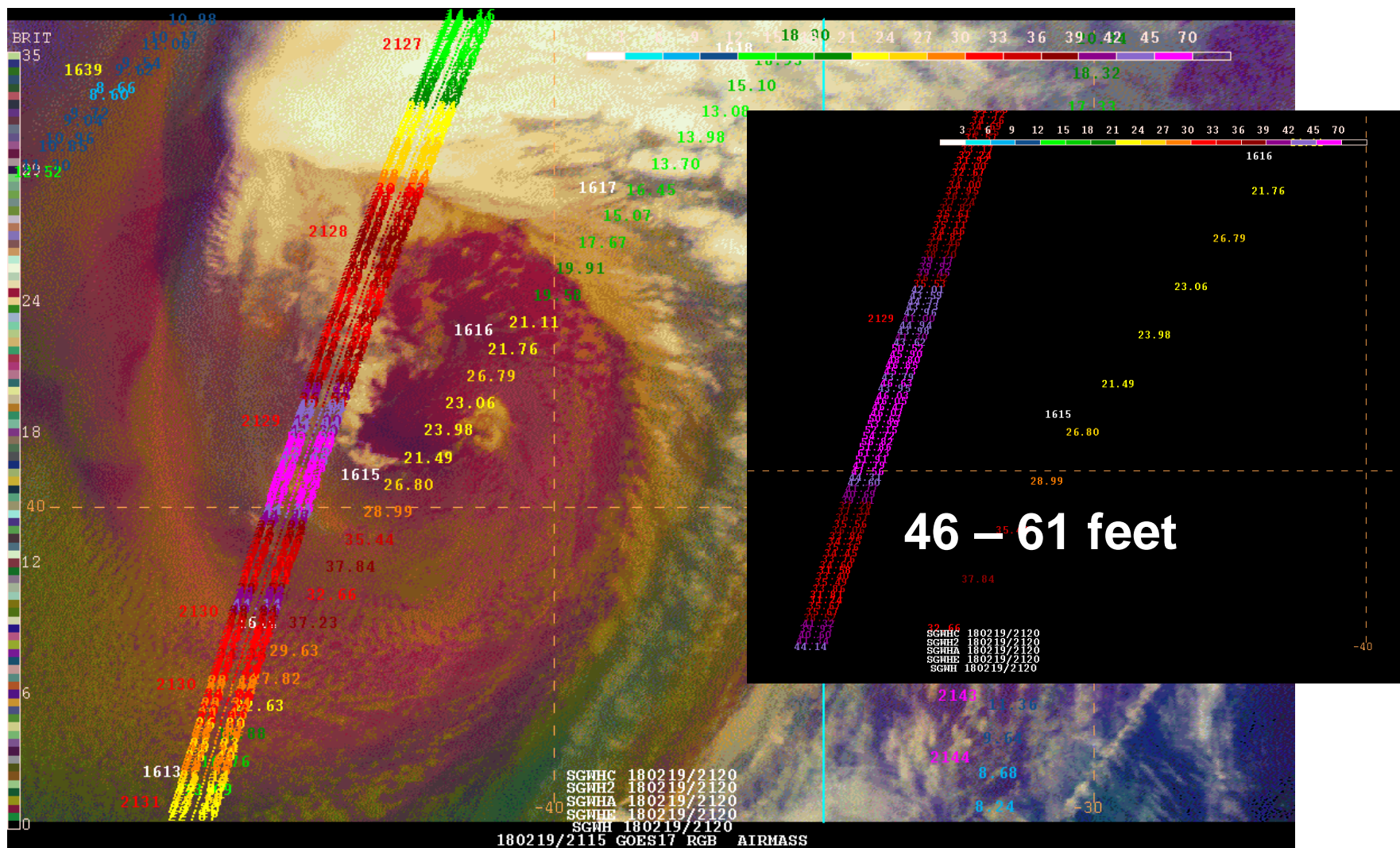
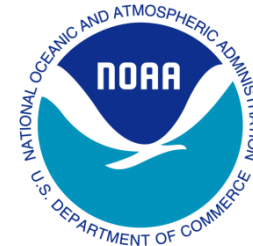
CryoSat-2

Sentinel-3a/3b





Extreme Waves



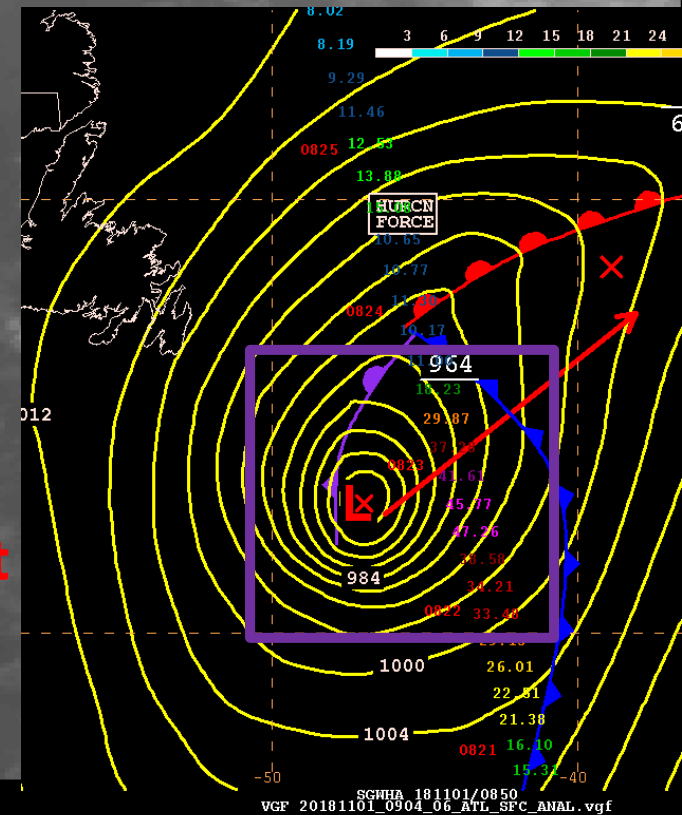
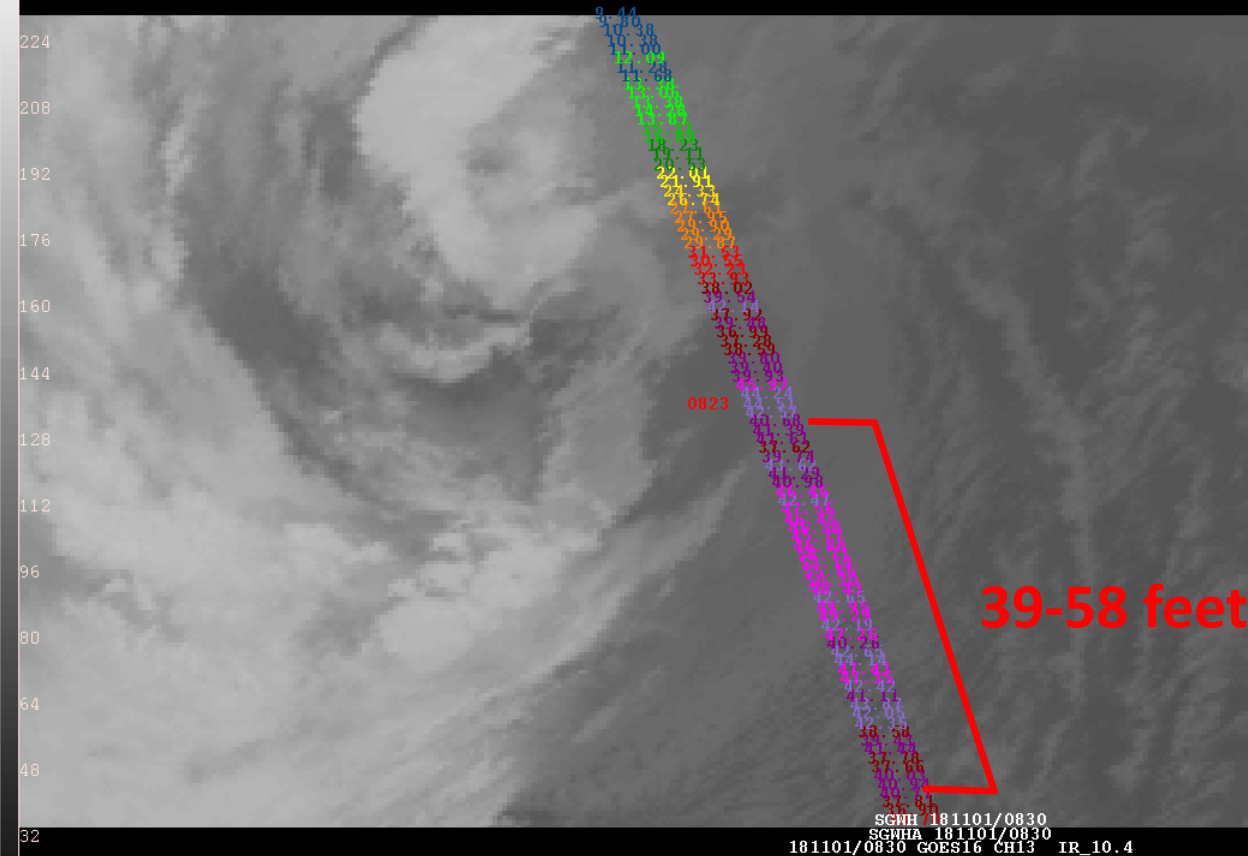


Post-Tropical Cyclone Oscar

1 Nov 2018



Dynamic Fetch

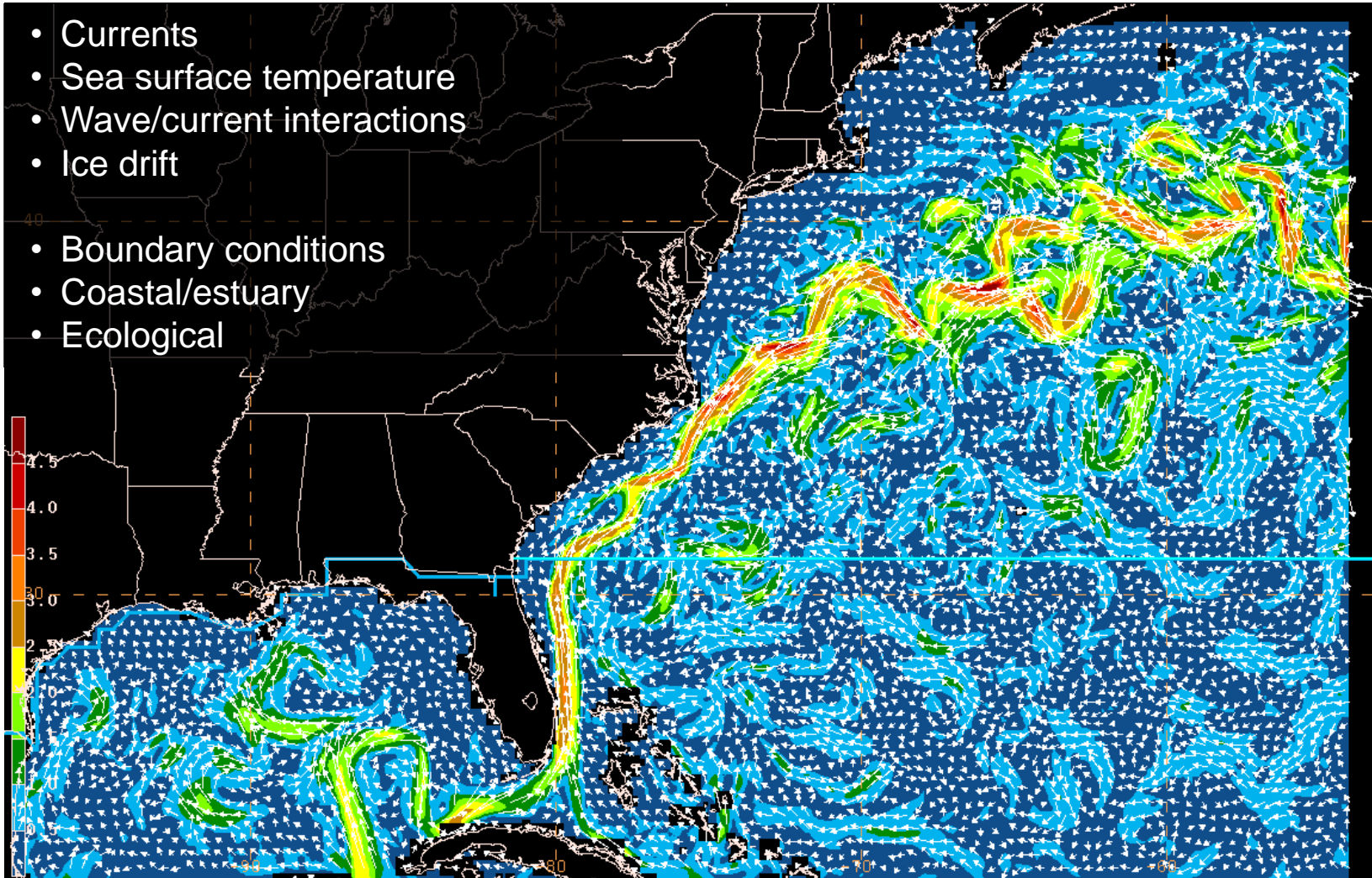




It's not just the waves...



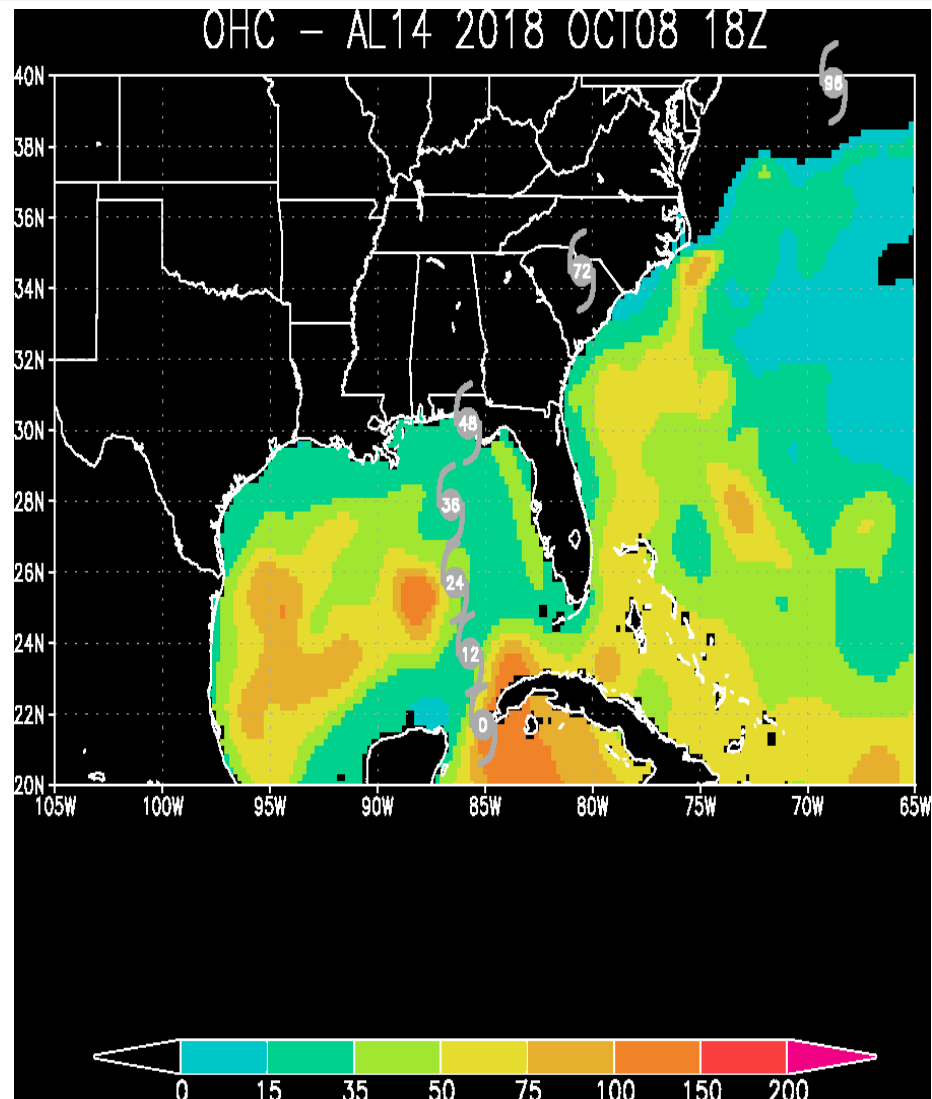
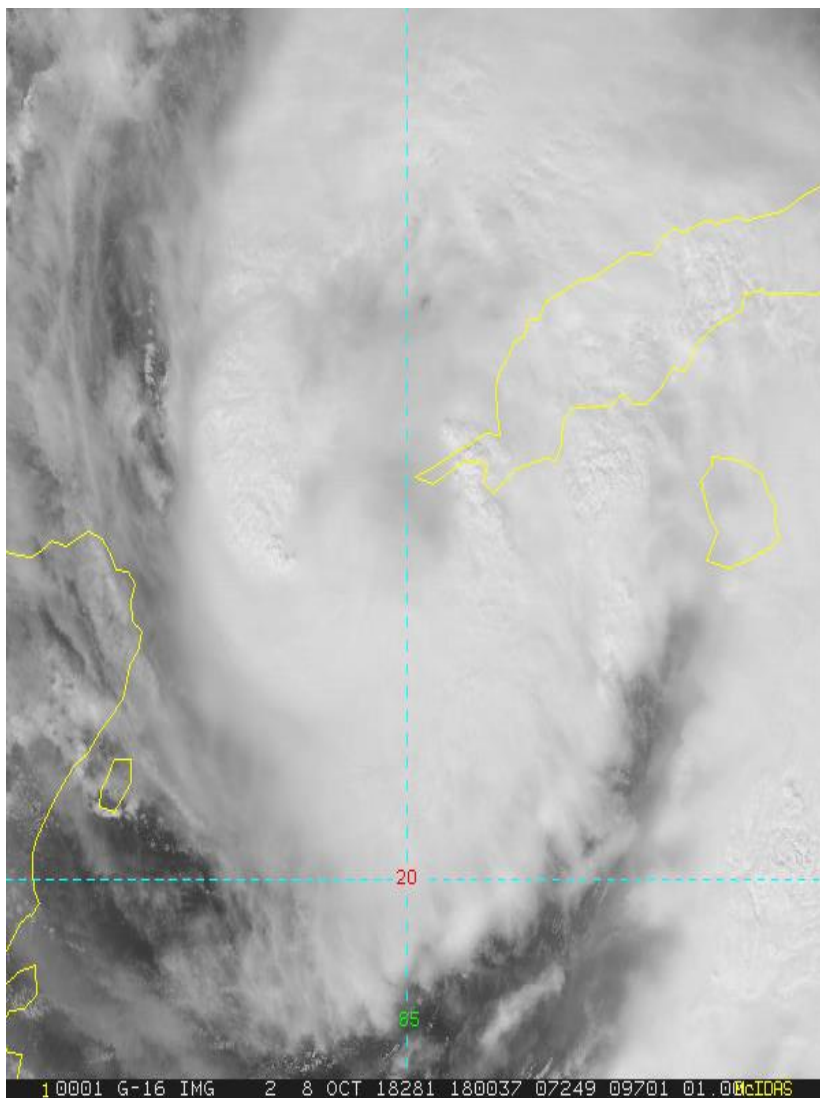
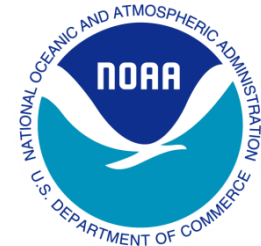
- Currents
- Sea surface temperature
- Wave/current interactions
- Ice drift
- Boundary conditions
- Coastal/estuary
- Ecological



GRTOFS_WATL 180220/0900V009 GLOBAL RTOFS Surface Currents (KTs)



Ocean Heat Content NESDIS StAR





U.S. National Ice Center

Providing Environmental Domain Awareness



Characterization: Observation, Analysis, and Prediction



Satellites



Buoys



Ship
Observations



Aircraft



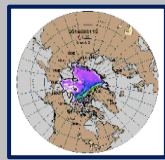
Webcam



Radar



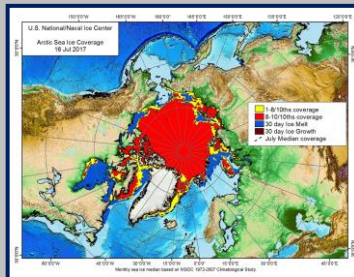
Surface
Observations



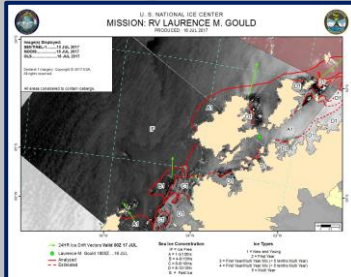
Models

SME Analysis + Automation + GIS Software = Derived Products

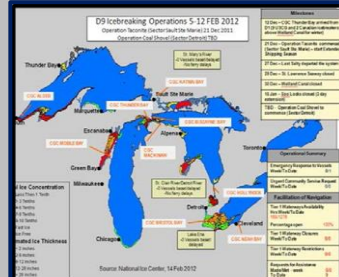
Exploitation: Tailoring and Integration



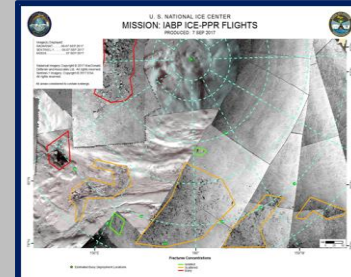
Weekly
Hemispheric



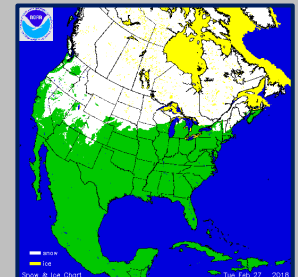
Annotated
Imagery



Asset
Management



Fractures, Leads
& Polynyas

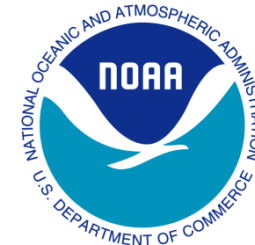


2 X Daily NH Snow
Products

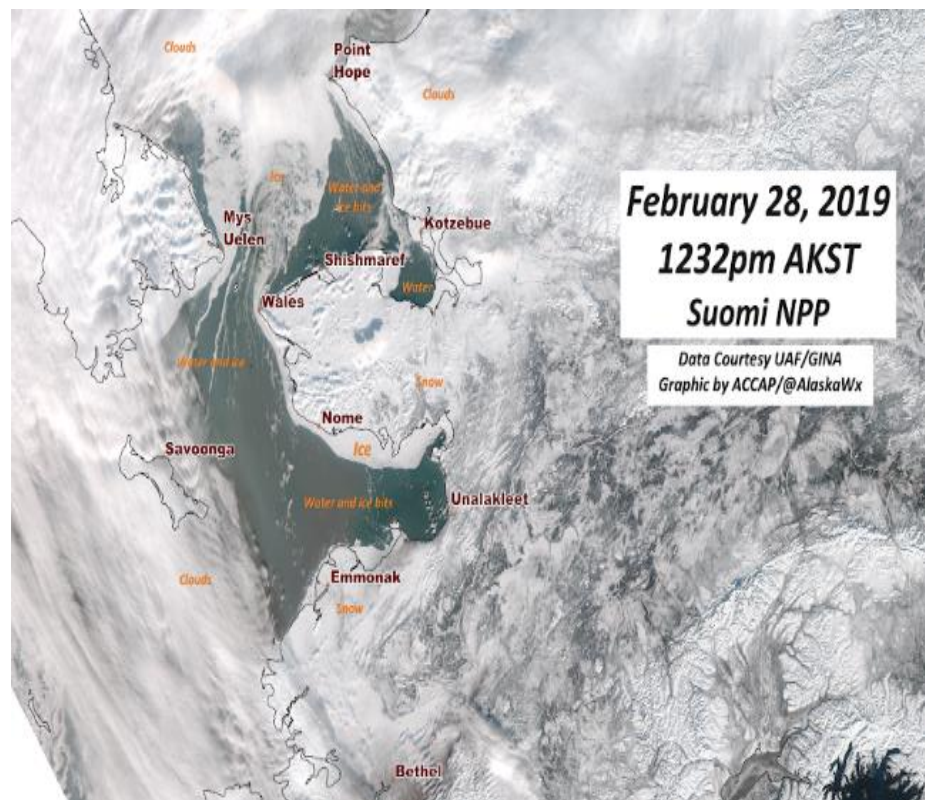
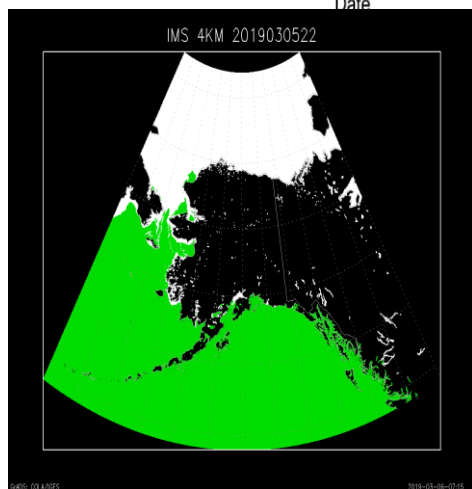
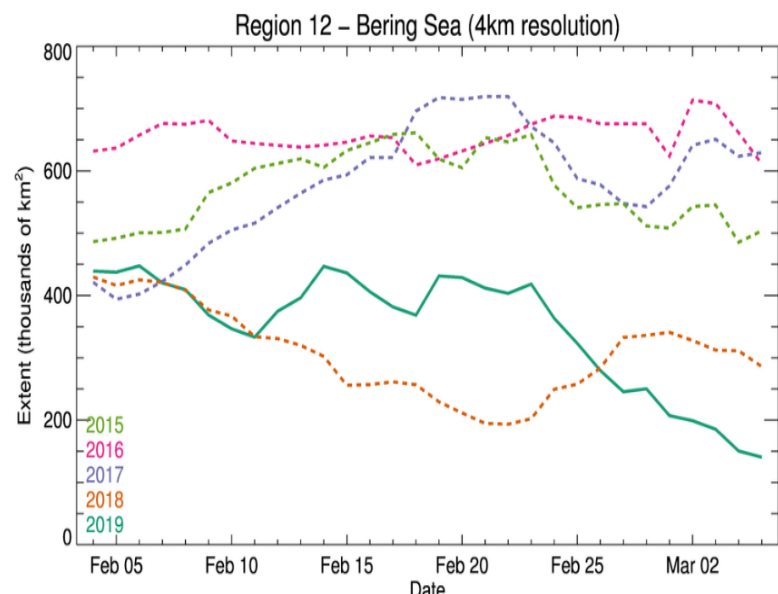


National Ice Center

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