

Probabilistic Wind Speeds and Wave Heights

Joe Sienkiewicz
NOAA/NWS Ocean Prediction Center



SOLAS Ch. V, Safety of Navigation, Reg. 4, (b) “To warn ships of gales, storms and tropical storms...”

IMO Maritime Safety Information (MSI) Weather Warnings and Forecasts, Sea Ice, Navigation Warnings



WORLD
METEOROLOGICAL
ORGANIZATION

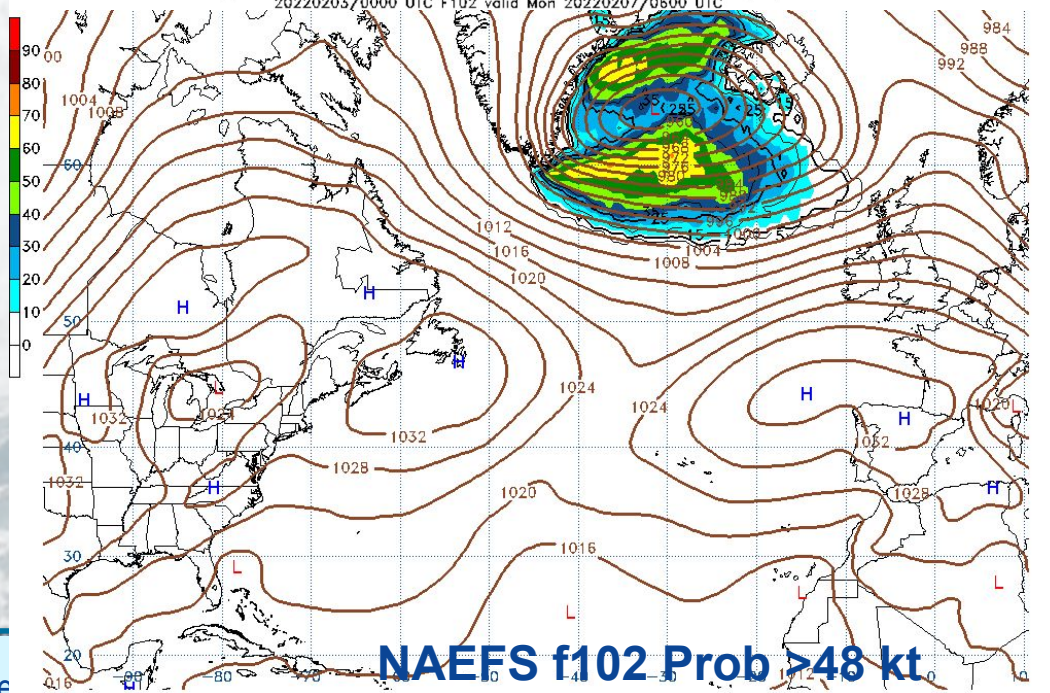
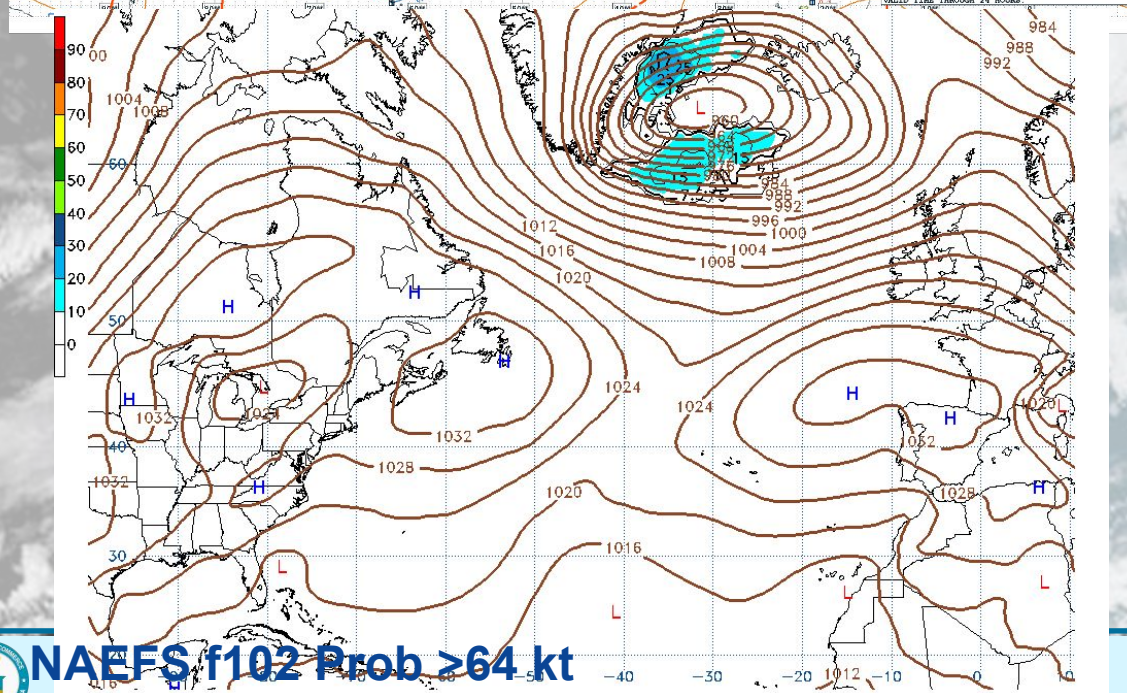
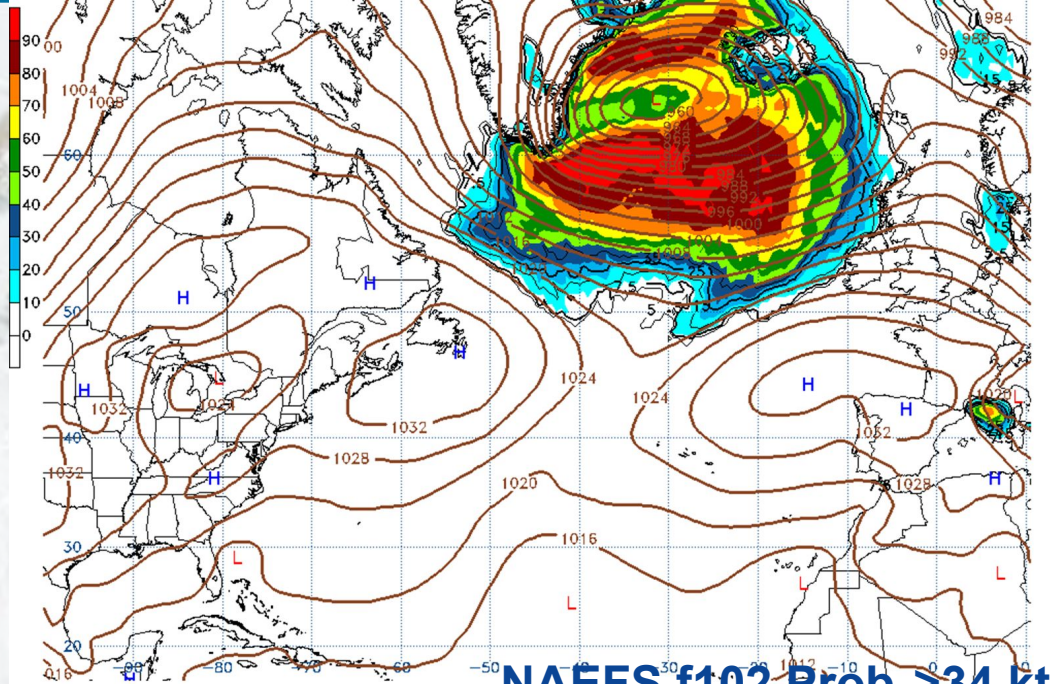
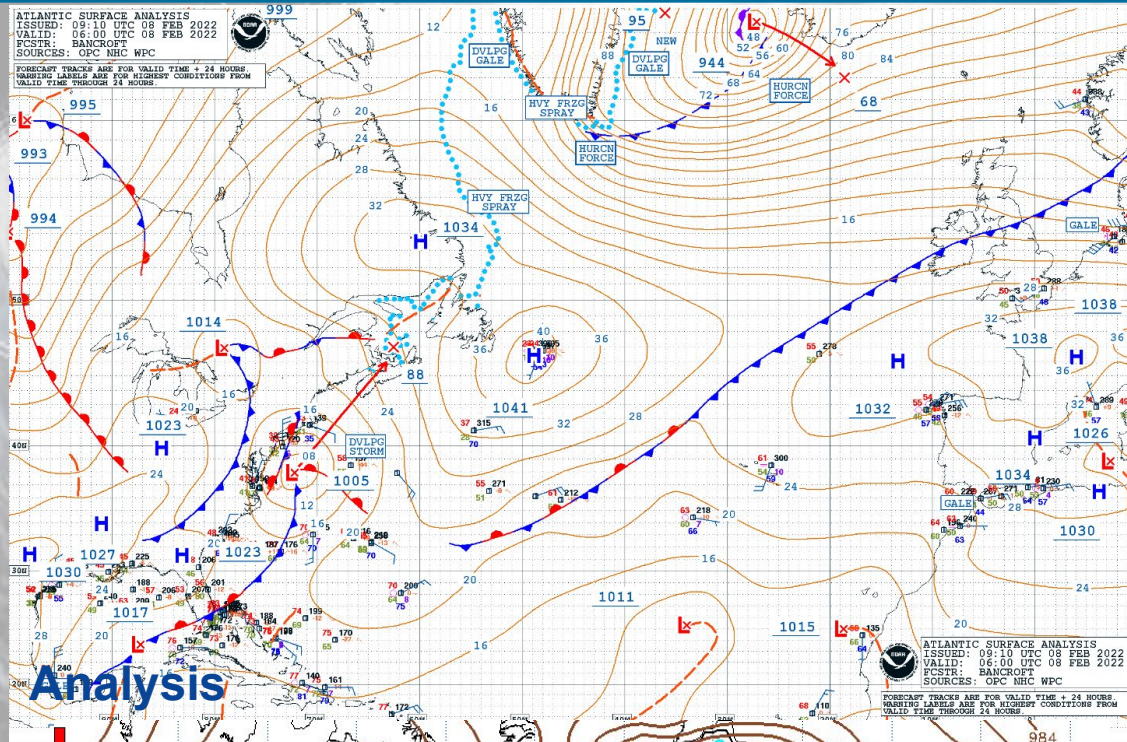
WMO Pub. 558 – Manual on Marine Meteorological Services



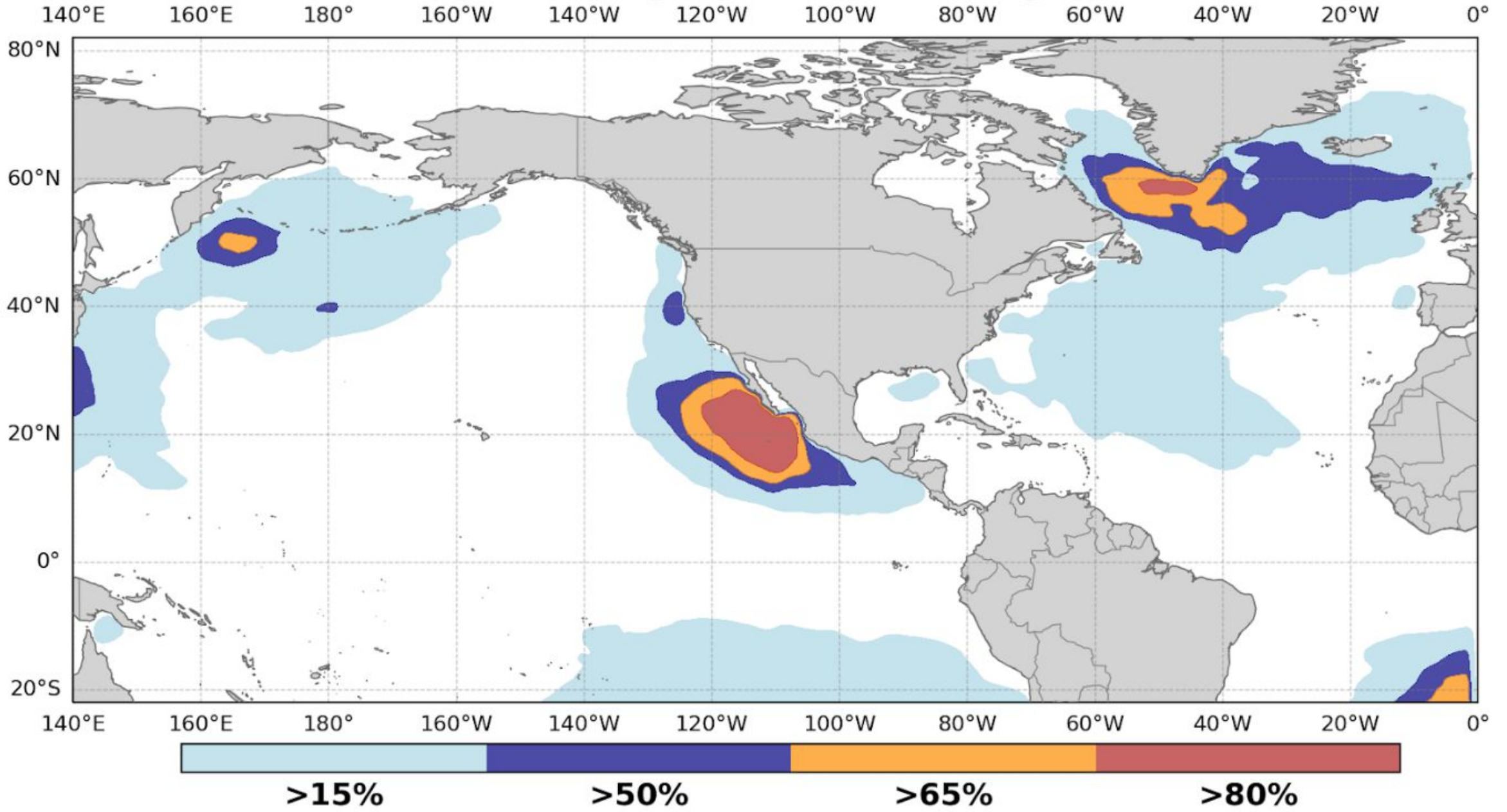
Present state

- Use of probabilistic information
 - Forecasts are still deterministic
 - Ensembles output and probabilities
 - influence decisions
 - GEFS, NAEFS, ECMWF, CMC
 - Not calibrated
 - Can blend models via GFE, also NBM (oceanic)





Week 2 – Valid : August 20, 2023 – August 27, 2023

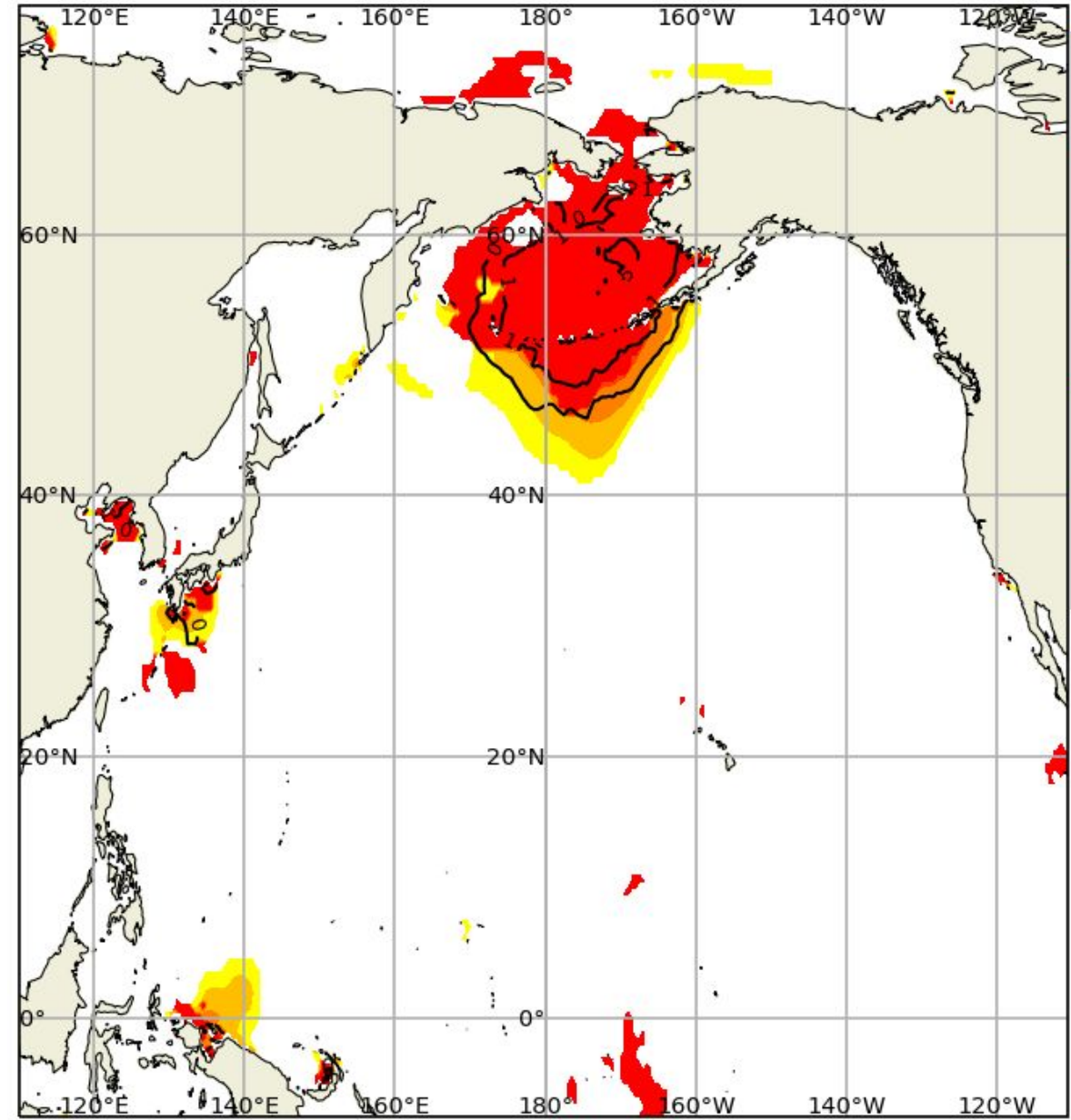
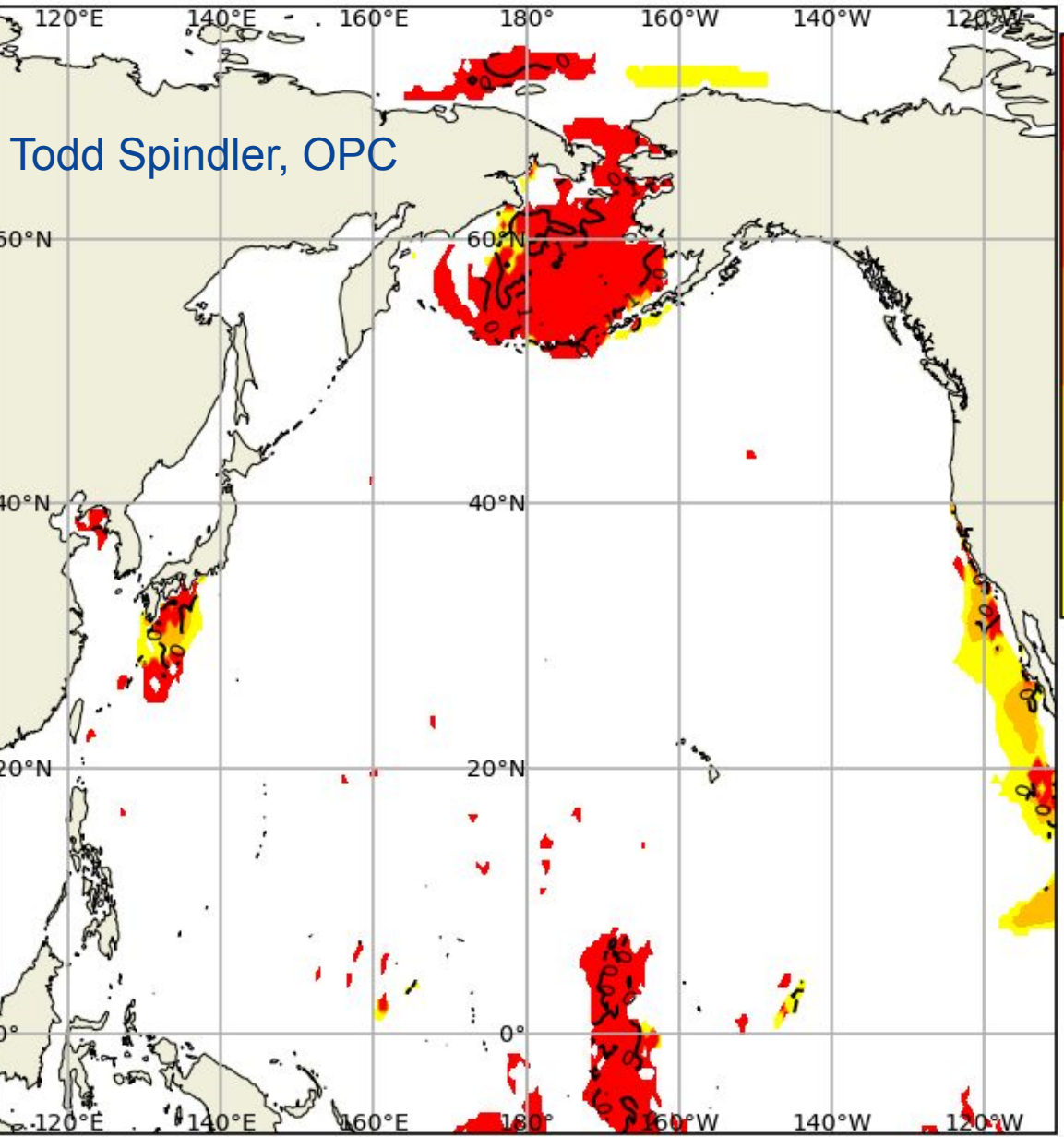


GEFS-Wave 20220912 00Z
Fcst:120H Valid:20220917 00Z

EFI/SOT_90
Wind Speed(knots)

GEFS-Wave 20220912 00Z
Fcst:120H Valid:20220917 00Z

EFI/SOT_90
Significant Height of Combined Wind Waves and Swell(m)



Vessel Avoidance – North Pacific

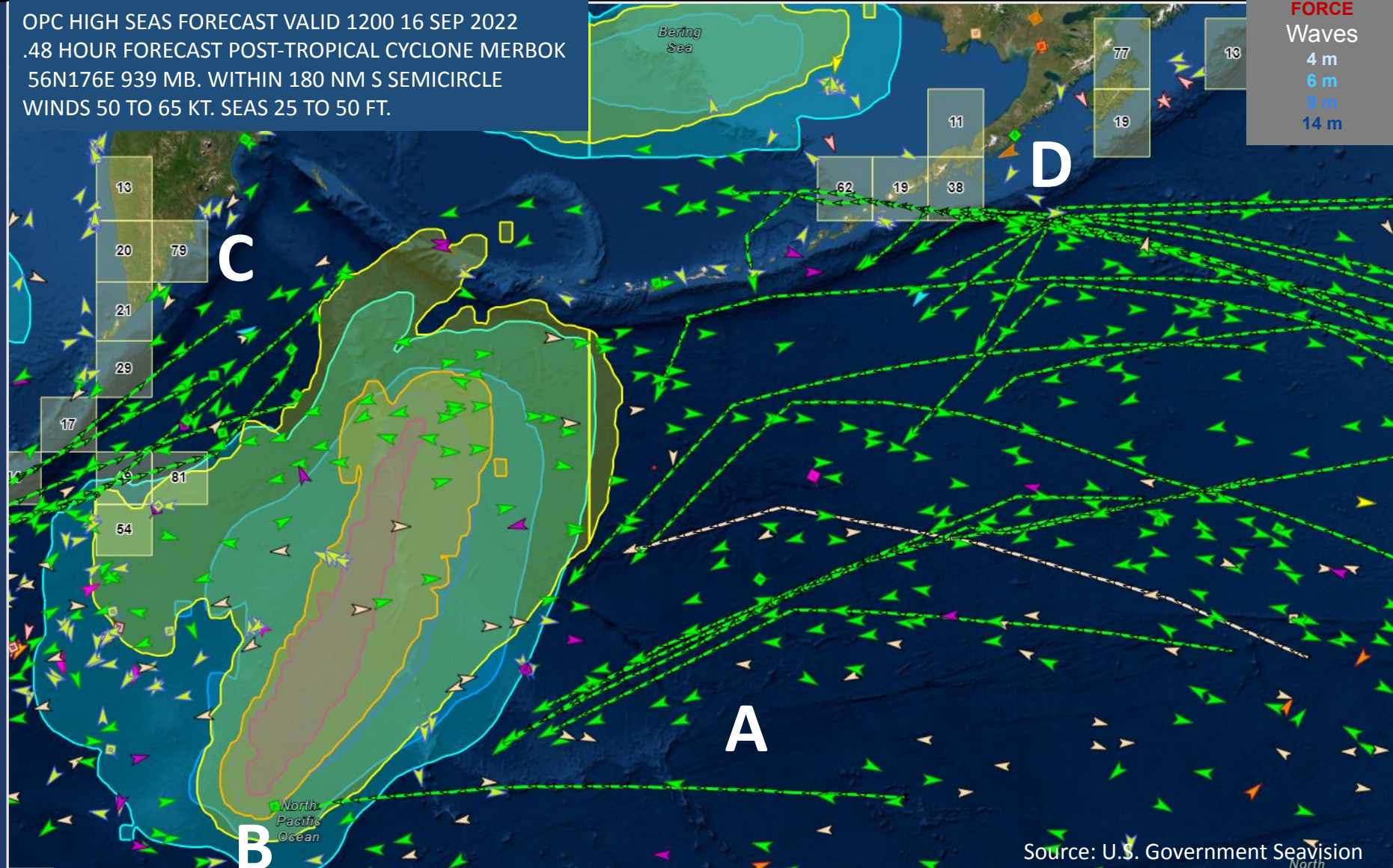
Warnings
GALE
STORM
HURRICANE
FORCE
Waves
4 m
6 m
8 m
14 m

Sep 14, 2022

2015 UTC

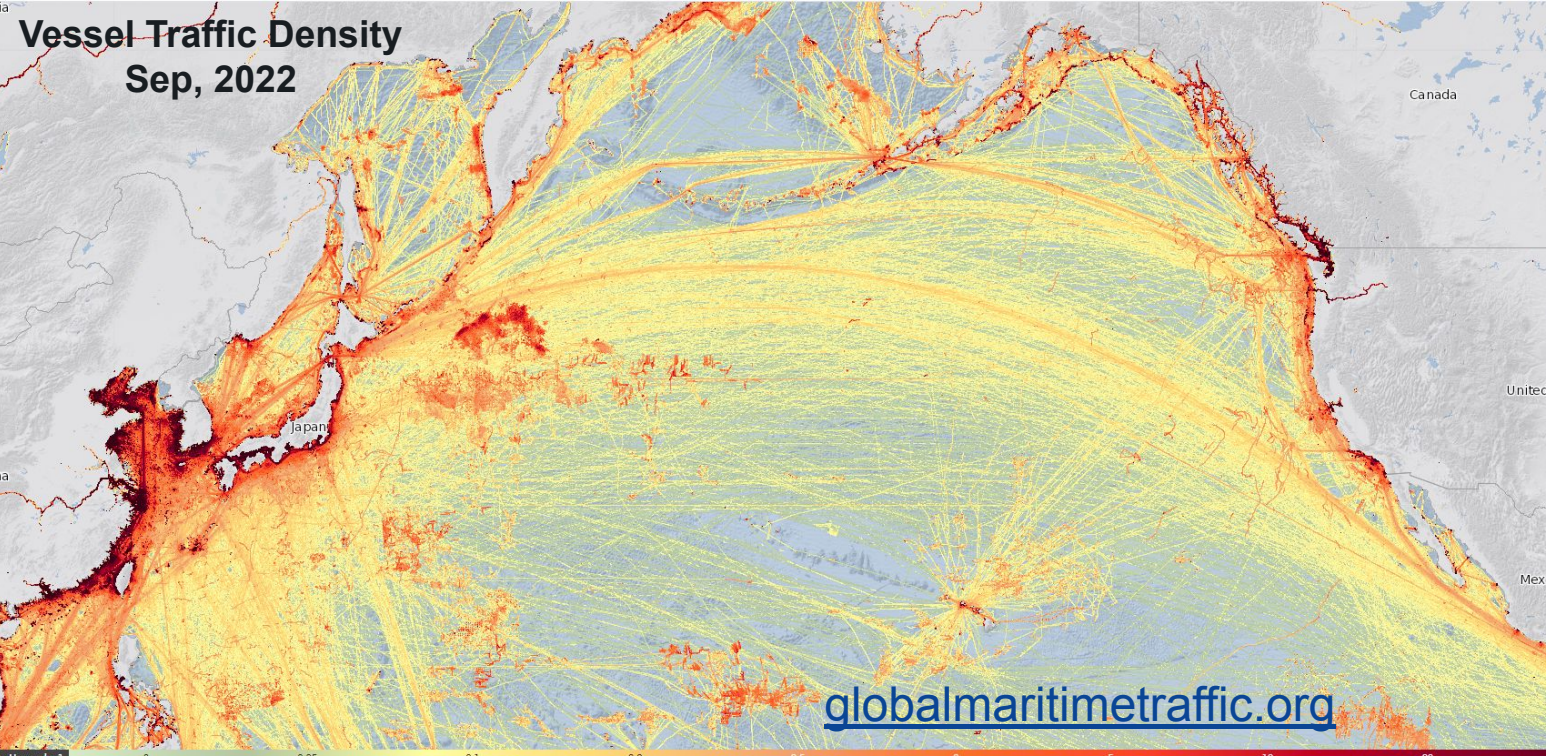
- **A** – E of Typhoon Merbok
West bound vessels altering southwestward to pass well S
- **B** - West bound *African Loon*
hove to after approaching Typhoon Merbok – ship en route Houston to China
- **C** - East bound Great Circle
Vessels slowing or drifting awaiting Merbok's merger, transition, and re-intensification
- **D** – West bound Great Circle
Vessels abandoning Bering Sea transit and altering SW

OPC HIGH SEAS FORECAST VALID 1200 16 SEP 2022
.48 HOUR FORECAST POST-TROPICAL CYCLONE MERBOK
56N176E 939 MB. WITHIN 180 NM S SEMICIRCLE
WINDS 50 TO 65 KT. SEAS 25 TO 50 FT.



• Courtesy: [Seavision](#)



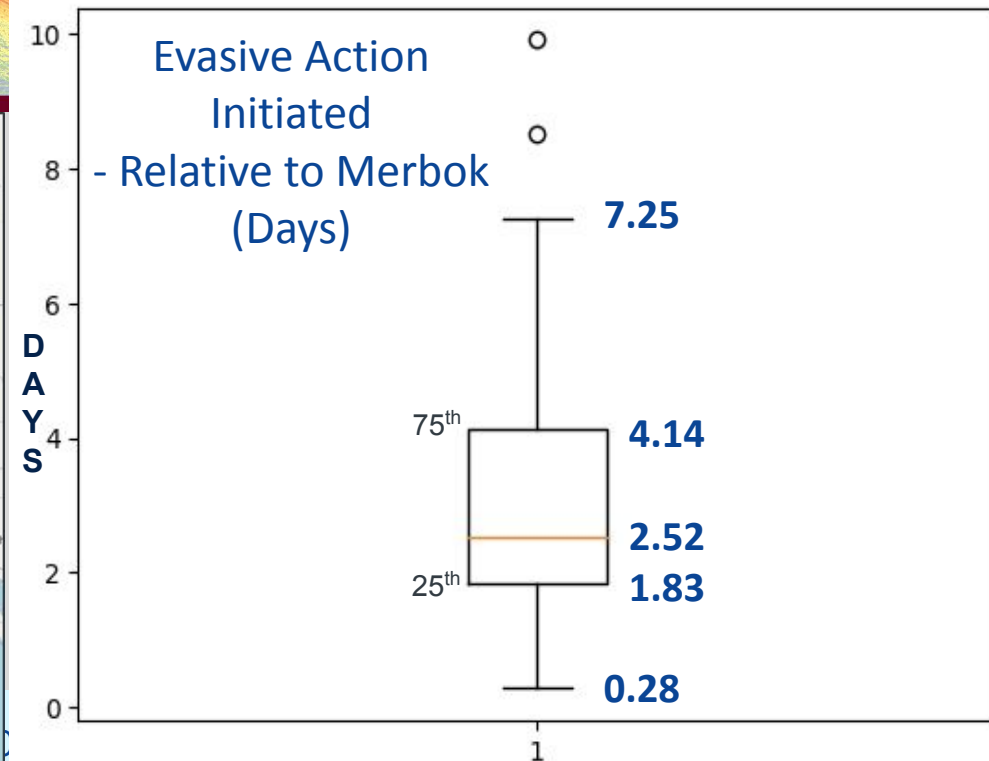
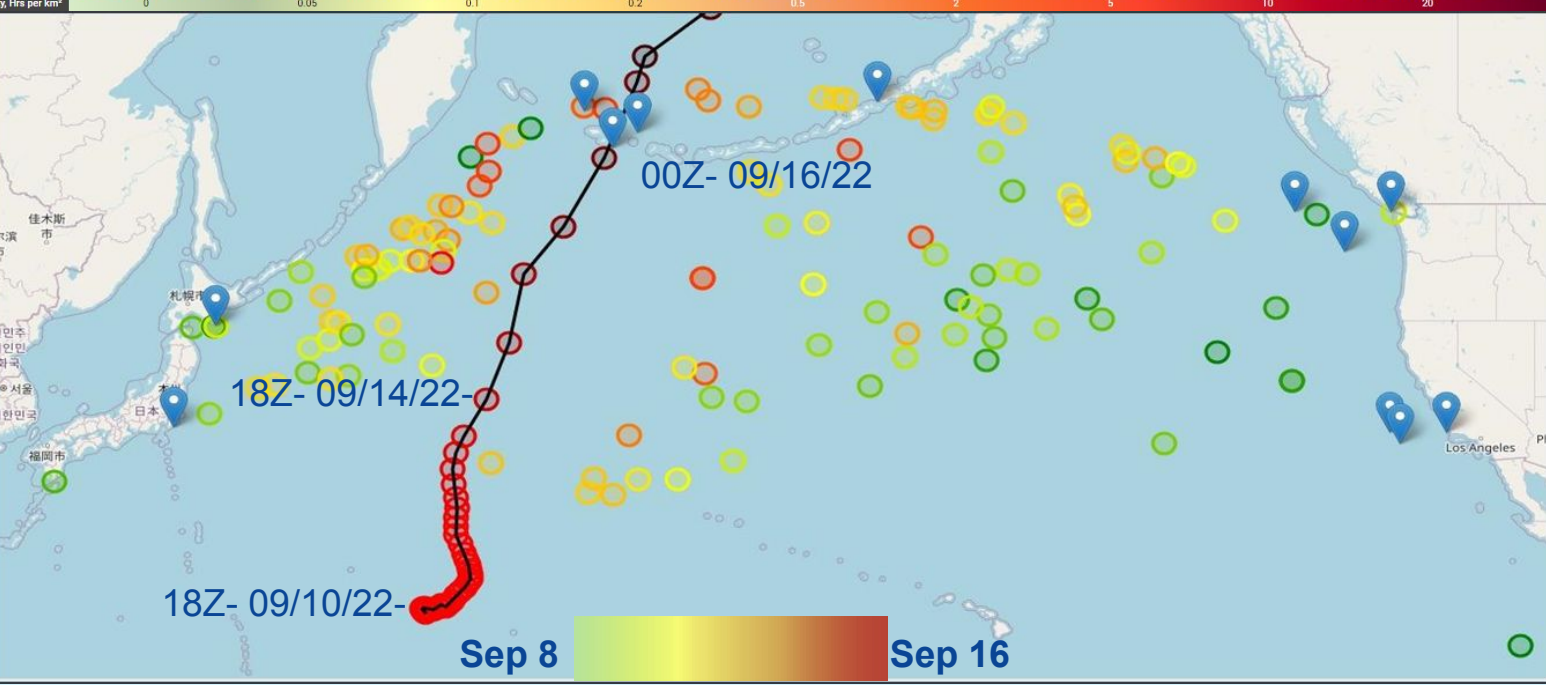


Weather Avoidance - Merbok

126 ships - 25% speed change
- 75% alter course





Total added distance – 20,533.98 nmi

Total added time - 93.07 Days





Future state

- Use of probabilistic information
 - Transitioning to S-412 Warning Polygons
 - Direct display in vessel navigation systems
 - Polygons 24 hour time composites
 - Can be probabilistic based (Should be)
 - Capturing potential of extremes is critical
 - Potential for vessel specific probabilities (thresholds)
 - Wind is wind – waves are waves (NWS CaRDS 18-024)
 - (agnostic to forcing (tropical & extratropical))
- 
- 
- 
- 
- 