



*Warfighting First – Operate Forward – Be Ready*



# ***Navy Tropical Cyclone Forecasting: Capabilities, Challenges, and Opportunities***



***RADM Jon White, Oceanographer of the Navy***



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# Battlespace On Demand

## Linking Data to Decisions



**Decision Superiority: Making better decisions faster than the adversary**

**Decision**

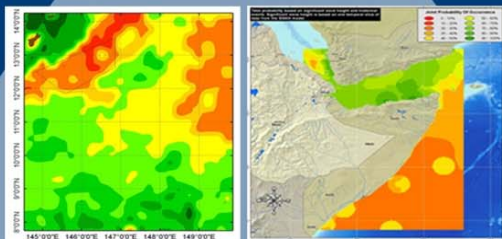


Options  
Courses of Action  
Sensor Employment

Asset Allocation  
Timing  
Quantified Risk

**3**

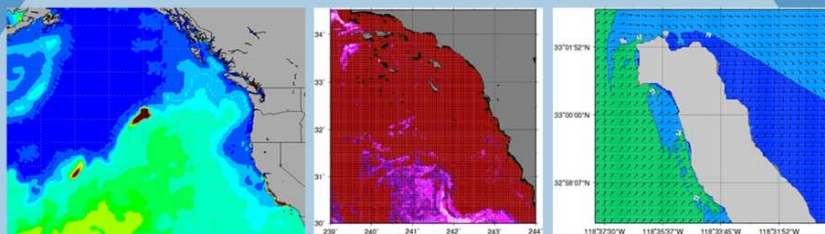
**Impact & Performance**



How the predicted environment affects the Fleet and Joint Forces

**2**

**Environment**



The current and future 4D environment

**1**

**Data & Collections**



Observations,  
measurements,  
satellites, gliders,  
buoys, etc.

**0**

INITIAL AND BOUNDARY CONDITIONS





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Linking Data to Decisions



**Decision Superiority: Making better decisions faster than the adversary**

Decision

Options  
Courses of Action  
Sensor Employment

Asset Allocation  
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Quantified Risk

3

Impact on  
Performance

# Home Field Advantage ... at the Away Games

How the performance environment  
affects the Fleet and Joint Forces

2

Environment

The current and future 4D  
environment

1

Data &  
Collections



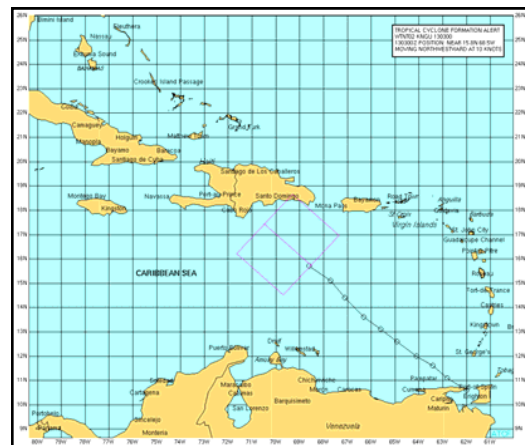
Observations,  
measurements,  
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0

INITIAL AND BOUNDARY CONDITIONS



# Capabilities: Fleet Weather Center Norfolk



- ❑ NHC is WMO forecasting authority for tropical warnings in the North Atlantic and East Pacific basins
- ❑ FWC-N tailors NHC warnings to naval installations and Navy, Coast Guard and Army afloat assets in the Atlantic, Caribbean and Gulf of Mexico
- ❑ Products
  - Destructive Winds Forecast (DWF)
  - Tropical warning graphics, text forecasts and graphical overlays
  - Tropical Cyclone Formation Alert (TCFA)

***NHC is forecast authority; FWC-N provides tailored Navy products***

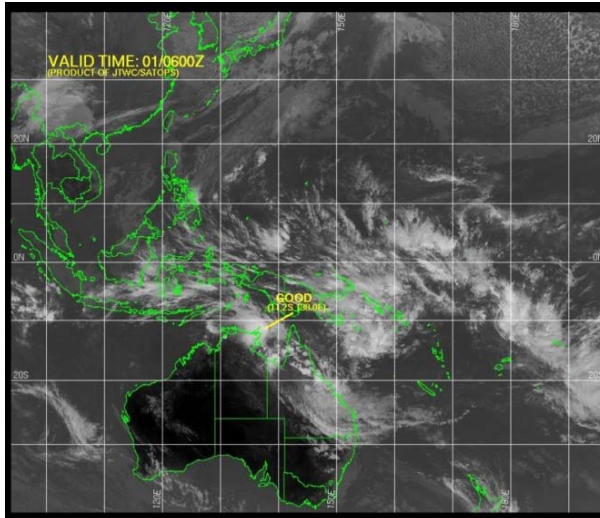




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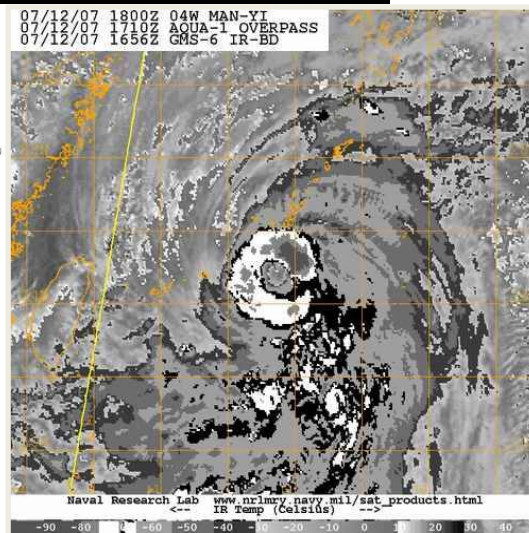
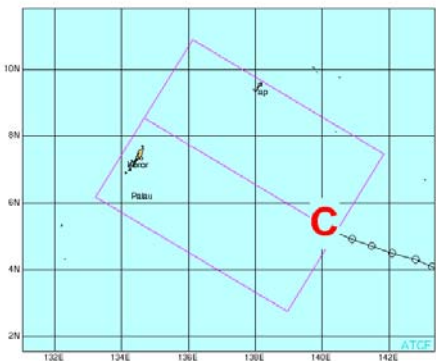


# Capabilities: Joint Typhoon Warning Center



- ❑ JTWC Coordinates with CPHC to produce Navy specific products over the Western Pacific
- ❑ Other installations tailor products for local installations (Yokosuka, Sasebo)
- ❑ Products

- Significant Tropical Weather Advisory
- Tropical Cyclone Formation Alerts
- TC Warnings in Western North Pacific (West of Date Line)



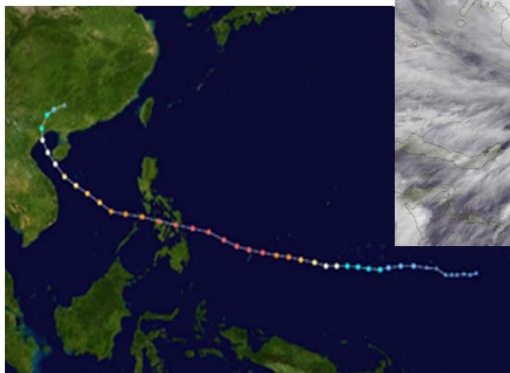
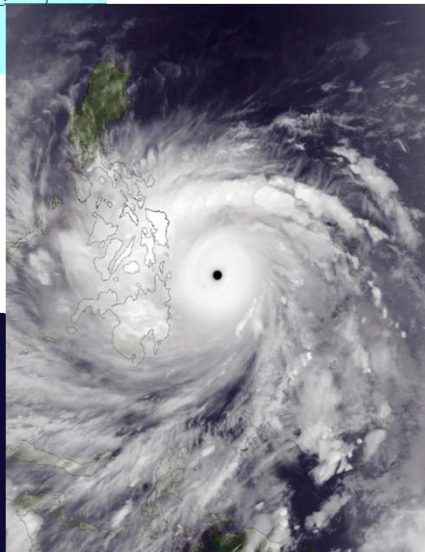
***Tailored Navy products; Many exclusively at Sea***



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## Capabilities: STY HAIYAN



- ❑ JTWC issued 27 warnings and tracked the storm for 9 days total. STY HAIYAN's peak winds approaching 165 kts (196 mph) sustained - a category 5 storm.
- ❑ JTWC's track forecast errors for STY HAIYAN were lower than the JTWC 5-year average errors at all forecast times and were 25-30 percent lower than the 5-year average at 96 and 120 hours.
- ❑ Intensity forecast errors were slightly above (5%) the JTWC 5-year average through 72 hours, slightly lower at 96 hours (5%), and were 37 percent lower at 120 hours.
- ❑ JTWC's exceptional forecast performance ensured the earliest possible start of follow on relief efforts (Operation Damayan)

***Accurate forecasts provided direct impact to Relief Operations***

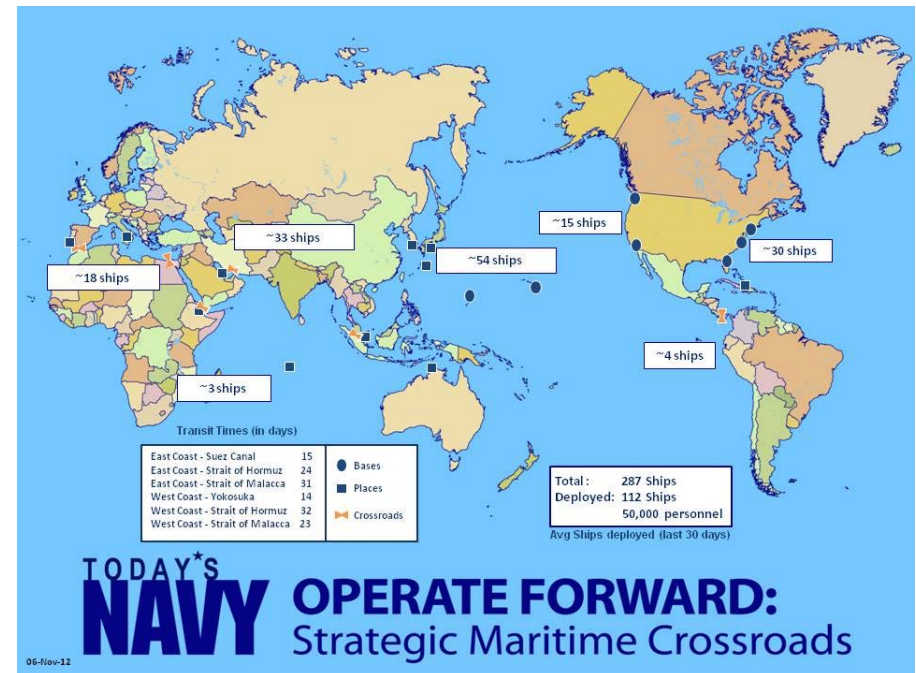




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# Naval Meteorology & Oceanography



***Providing the homefield advantage at the away games***

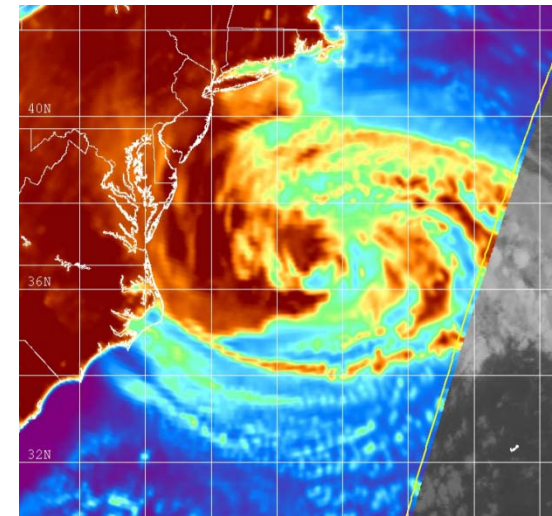
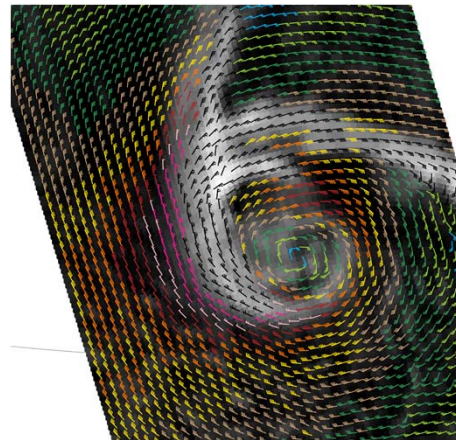


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## Priorities

- ❑ Satellite Data Gaps as Constellations Age
  - Sea Surface Height
  - Ocean Surface Wind Speed/Direction
  - Microwave Sounding (radiances)
- ❑ Truly Coupled Models to better inform winds and seas forecasts at sea



***Accurate winds and seas forecasts in support fleet avoidance decisions Critical to Safety of Fleet Operations both inside and outside of the United States***





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# Questions

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