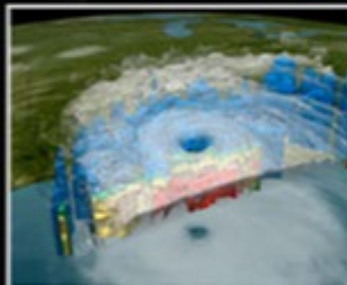
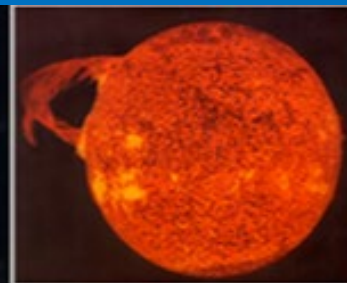
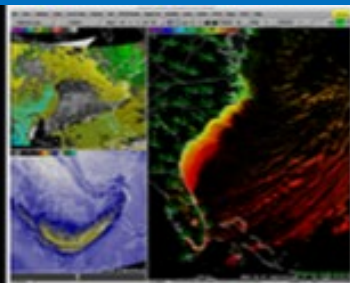




# NOAA

National  
Weather  
Service

# Addressing Tsunami Science and Technology Advisory Panel Findings April 26, 27 2023



# Overview

## URGENT ISSUES RAISED BY NOAA SCIENCE ADVISORY BOARD:

### 1. Addressing Risks associated with TWC operations.

*“By operating the Tsunami Warning System as two independent regionalized components, instead of as a single national capability, the NWS introduces and accepts the risk of systemic inconsistency in warning products and resulting response when a tsunami event occurs. While this is not a “single point of failure,” as there is latent back up capacity, it is rather a “failover failure,” a symptom of not being unified. This situation raises grave concerns on the part of the SAB”*


### 1. End-to-End alerting system.

*“It is not a matter of if, but when the next tsunami will strike the U.S. coastline. The Tsunami Science and Technology Advisory Panel (TSTAP) sees an urgent need for action to ensure our nation is doing more to mitigate this risk and also doing everything possible to prepare and equip the end-to-end tsunami program with the tools and staff necessary to detect, forecast, and alert the public in a clear and timely fashion.”*

Source: Letter of 06Jan2022 from NOAA SAB Chair John Kreider to NOAA Administrator



# NOAA Assessment



**Independent operation of the Tsunami Warning Centers (TWC)** presents challenges. It should be noted that each of NOAA’s Tsunami Warning Centers (the Pacific Tsunami Warning Center in Honolulu, HI, and the National Tsunami Warning Center in Palmer, Alaska) trace their roots to specific catastrophic tsunami events that primarily impacted the States of Hawaii and Alaska, respectively. This legacy carries through to the present day, as is stipulated in Public Law 15-125 Section 504 (Weather Act), which states:




**The Centers shall include—**


**“(A) the National Tsunami Warning Center, located in Alaska, which is primarily responsible for Alaska and the continental United States;**



**“(B) the Pacific Tsunami Warning Center, located in Hawaii, which is primarily responsible for Hawaii, the Caribbean, and other areas of the Pacific not covered by the National Center;**




With the current tools and procedures available to each TWC, they perform an independent analysis of the underlying tsunami event to serve their assigned section of coastline. This has historically hindered efforts to increase operational consistency between the TWCs, and this constraint also severely limits the ability of each Center to serve as real-time failover for the other.




Two years prior to this report being released, NOAA began a comprehensive internal effort to unify TWC operations.

# TWC Unification: Addressing TSTAP Report




Finding/Recommendation	ATOMS	Common Analytic System	Organization
Improve unification and capabilities of the Tsunami Forecast System	X	X	X
Improve tsunami detection and observation systems		X	X
Provide more extensive, consistent, and accurate tsunami messages and products	X	X	X
Develop enhancements to Tsunami Warning Center forecasts and alert systems		X	X
Improve consistency in tsunami preparedness and mitigation products for communities	X	X	X
Produce guidance for improving long-term community resilience to tsunami hazards			X
Improve tsunami hydrodynamic modeling		X	X
Develop tsunami research priorities and leverage research opportunities		X	X



## Recommendation 1 : Improve unification and capabilities of the Tsunami Forecast System



**NOAA Response:** NOAA is actively pursuing alignment both technically and organizationally to improve unification and capabilities of the Tsunami Forecast System

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- Incorporate tsunami product generation, messaging and dissemination **within NWS supported infrastructure: (In development)**
  - Establish modern, **Common Analytic System** between TWCs establishes the technical piece needed for One Event, One Forecast. **(Requirements gathering)**
  - Establish **Single Chain of Command** and Office Functions to Support and Sustain Operations and ensure One Event, One Forecast **(Sr. leadership evaluation)**.
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## Recommendation 2 : Improve tsunami detection and observation systems



**NOAA Response:** NOAA views direct tsunami detection and measurement to be of the highest priority. We also recognize coastal and alternative observations are a critical part of the observation network.



The **Tsunami Warning System** will continue to emphasize real-time direct detection measurement of tsunamis to augment established seismic analysis techniques and explore other observation networks as described.



Direct Detection and Measurement	Expanding Observation Networks
DART (Fourth Generation) - Currently recapitalizing	Web Cams
GNSS-based earthquake characterization to serve as tsunami source - to field FY23	Coastal Gauges
Undersea Cables - endorsed by UN Decade of Ocean Science	Observer Programs
	Remote Sensing









**Recommendation 3** : Provide more extensive, consistent, and accurate tsunami messages and products



**NOAA Response:** The Tsunami Warning System will incorporate tsunami product generation, messaging and dissemination **within NWS supported infrastructure.**

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- TWC legacy, locally-developed product generation and messaging systems will be retired in favor of NWS corporately supported solutions. (ATOMS)
    - This will ensure consistent product generation and messaging between TWCs.
    - Expected delivery FY25
  - NOAA/USGS Table Top exercise planned for May 2023
  - Tsunami.gov - NOAA is seeking to award a contract to redesign the operational website
  - Active TWC/Partner participation to improve service delivery
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## **Recommendation 4** : Develop enhancements to Tsunami Warning Center forecasts and alert systems



**NOAA Response:** With sufficient data at the global and regional scale, detailed forecasts for areas such as the Puget Sound, and the San Francisco Bay Area are possible. NOAA is focused on improving the baseline initial conditions such that sufficient data would be available to support higher resolution forecasts.



**Status:** State requests are being addresses by TWCs as resources allow.

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## **Recommendation 5** : Improve consistency in tsunami preparedness and mitigation products for communities



**NOAA Response:** The NTHMP and its subcommittees, working with NOAA, has opportunities to be more proactive in addressing these inconsistencies across states as the NTHMP Strategic Plan is revised in coming years.



**Status:** NOAA is addressing through NTHMP engagement.





## Recommendation 6 : Produce guidance for improving long-term community resilience to tsunami hazards



**NOAA Response:** NOAA could help develop long-term tsunami resilience strategies by considering impacts of climate-change and promoting vertical evacuation structures.



- Climate impact issues could be addressed by emphasizing such activities within the NTHMP grant program or other NOAA Line Offices.
- NOAA, through the NTHMP grants, supports vertical evacuation **planning**.



**Status:** NOAA Tsunami Program is actively engaging the Office of Coastal Management and Office of Response and Restoration on long-term resilience strategies.





## Recommendation 7 : Improve tsunami hydrodynamic modeling



**NOAA Response:** NOAA's operational tsunami modeling capability is focused on basin-wide impacts, to include regionalized flooding. NOAA recognizes that the scale of modeling referenced in this section is important to emergency managers and planners in determining precise impacts and is working with core partners to meet these more localized needs.



NOAA intends to emphasize bathymetric surveys to support tsunami warning and mitigation.



NOAA intends to develop a data portal for detailed information for advancing research and model development



**Status:** NOAA plans to address improved hydrodynamic modeling via NOAA Research activities and partnership with the NTHMP





**Recommendation 8** : Develop tsunami research priorities and leverage research opportunities



**NOAA Response:** NOAA would benefit from a stronger focus on tsunami research and development in general to include casting a wider net to incorporate other agency initiatives. These recommendations should be pursued through the NOAA Tsunami Program through the Interagency Council for Advancing Meteorological Services (ICAMS).





**Status:** NOAA is actively looking to partner with other agencies and industry on tsunami research initiatives. This includes the USGS, who will participate in a table top exercise with NTWC and PTWC in May 2023. Other opportunities will be addressed through the NWS Tsunami Research and Advisory Council which meets in late FY2023.







# Summary



NOAA welcomes the recommendations raised by the TSTAP Report. Many of the findings represent known gaps and opportunities in the US Tsunami Forecast Warning and Mitigation capability. The TWC Unification Effort will serve to address the highest priority TSTAP Report findings. Other recommendations will be addressed through further enhancing federal/state/local partnerships through the NTHMP.



## Current Activities that address TSTAP recommendations

- Migrate legacy TWC product generation software to the NWS Enterprise-supported Advanced Weather Information Processing System (AWIPS).
  - Common Analytic System Development
  - Evaluation of organizational framework. NOAA's TWCs are currently administered within the regional structure of the National Weather Service. NWS leadership is reconsidering this framework so as to better support consistent TWC operations and management. Expected implementation: Q4 FY24
  - NOAA funds NTHMP member states to enhance their local tsunami hazard mitigation programs through activities such as inundation mapping procedures and evacuation planning
  - NOAA, through the NTHMP grants, supports vertical evacuation planning.
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# Additional Questions