

A map with maximum wave amplitudes for the 11 March 2011 Japan tsunami based on a real time forecast. Credit: NOAA PMEL

# Deepwater and Coastal Tsunami Detection

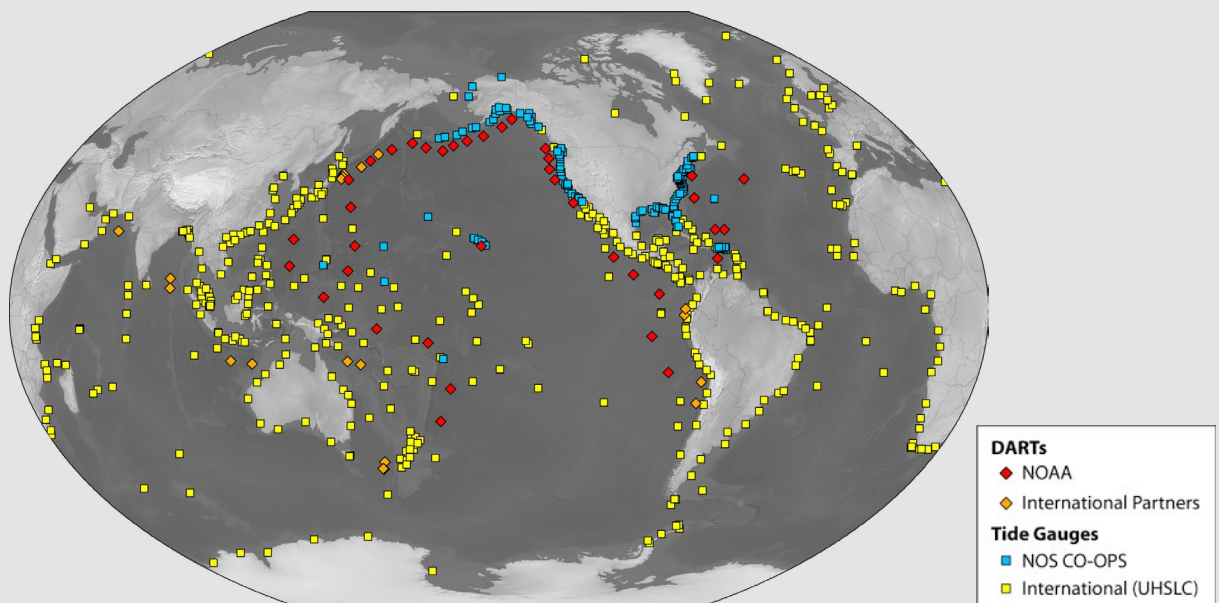
## Improving tsunami warning forecasts and hazard mitigation

### What are water-level data?

Water level data describe sea surface height. Applications of water level data range from making nautical charts to global sea level monitoring. Real-time monitoring of water level data is also essential for tsunami detection and warning. Tsunami waves disperse across the ocean at very high speeds in deep water and essentially go unnoticed. However, when the waves reach the shore, the waves slow down and the height of the wave increases. Modern instrumentation is capable of detecting deep-ocean sea surface height changes and accurately capturing those heights when the wave reaches the shore.

### Water Level Data

- Detect the presence of a tsunami in the deep-ocean
- Measure tsunami arrival and wave height at the coast
- Validate tsunami models



Core sea level monitoring network used by the Tsunami Warning Centers. Credit: NOAA/NCEI.

## How are the data collected?

### Deep-Ocean Assessment and Reporting of Tsunamis (DART)

The DART system is a global array of 62 offshore seabed bottom pressure recorders (BPRs) which detect the tsunami by increased pressure from the wave passing over. Real-time data are transmitted to a nearby surface buoy, which relays the message to tsunami warning centers via satellite that a tsunami is on the way. DART observations confirm the existence or absence of a tsunami far from the coast. High-resolution delayed-mode data are stored onboard the BPR, and, after recovery, are sent to NCEI for archive and processing.



DART Buoy deployed. Credit NOAA/NDBC



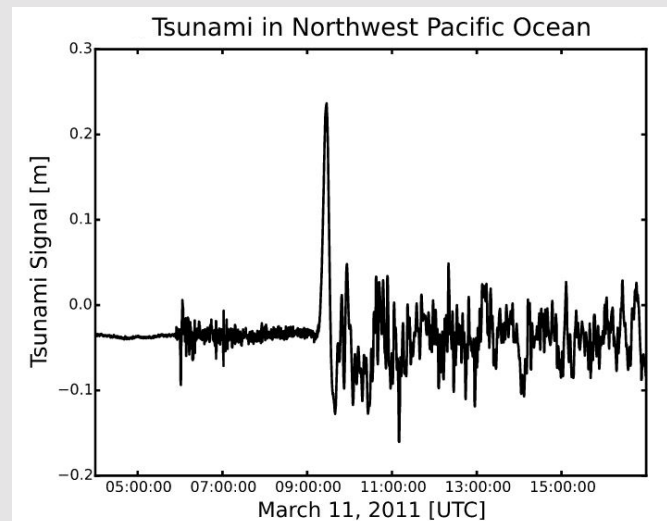
Tide gauge station in Key West, FL.  
Credit: NOAA/NOS

## How are the data used?

NOAA's National Centers for Environmental Information quality control the data and model the tides to isolate the tsunami waves. The high-resolution data are used by national warning centers and researchers to increase our understanding and ability to forecast the magnitude, direction and speed of tsunami events. Preserving and sharing these data improve the forecasts and models necessary for sound management and planning of coastal communities. Water level data are also used for monitoring and improving our understanding of coastal storm surge and nuisance flooding and for studying long-term sea-level change.

### Coastal Tide Gauges

Traditionally measuring tide levels, coastal tide gauges can also detect tsunamis. As a consequence of the 2004 Indian Ocean tsunami event, over 200 U.S. tide gauge stations were upgraded to sample every minute and transmit real-time water levels to tsunami warning centers via satellite. Tide gauges confirm the arrival, size and direction of travel along the coast.



Tsunami as detected by a DART system in the NW Pacific Ocean. Credit: NOAA/NCEI