Explanation of Significance of Trump Tsunami Cuts

NOTE: The National Oceanic & Atmospheric Administration's own Congressional Submission contains this statement:

> "This termination is anticipated to have a 20 percent or greater impact on the accuracy, certainty, and timeliness of NOAA's tsunami watches and warnings"

As explained below, even this admission is a major underestimate of these impacts. Besides the personnel cuts, the NOAA budget plan would eliminate three tsunami-related warning systems:

1) **Local Seismic Networks** (Alaska and Hawaii)

Eliminating these seismic sensors will dramatically decrease the lead time (from about 25 minutes on average, to 0) for the most vulnerable Hawaiian, and Alaskan coastal populations, because over 90% of the casualties occur on the closest coasts to a Tsunamigenic Earthquake.

These seismic sensors (seismometers) record the ground motions produced by a potentially Tsunamigenic Earthquake as its seismic waves pass by the sensor. NOAA's Tsunami Warning Centers (TWCs) use these "seismograms" to estimate an earthquake's chance of producing a Tsunami, based on the causative earthquake's size, location, and other "earthquake source" properties such as mode of faulting, etc.

These seismometers provide the TWC staff with the means to characterize a given earthquakes potential for generating a Tsunami, as much as 25 minutes ahead of the Tsunami's arrival at the closest coasts. This is because the seismic waves form an earthquake travel about 30 times faster than the Tsunami waves from that quake.

The TWCs rely on these seismic stations to provide "local" tsunami warnings to nearby coastal populations (who would otherwise suffer over 90% of the total Tsunami related casualties) within 3 to five minutes after the earthquake begins: as much as 25 minutes ahead of the Tsunami's arrival at these closest coasts.

In addition, while some may argue that these seismometers are not needed because "When the ground shakes so severely that it's difficult to stand, move away from the ocean." Unfortunately, the shaking, even in the "near field" is not always severe. In Nicaragua, 1992, for example, hundreds were injured and 179 killed by a tsunami from an offshore earthquake that few onshore even felt. Other particularly dangerous earthquakes of this kind include the 1975 Kalpana Earthquake, and the 2006 Java Earthquake: which killed over one thousand people. Thus, "near field" seismometers are needed to provide warnings in these cases where even the closest populations feel very little shaking.

The seismic stations also provide input earthquake information to generate a first Tsunami Model for coastal populations further away,

2) **Local Water Level Networks** (Alaska and Hawaii)

Eliminating these dense, near shore water level sensors will decrease the lead time for a Tsunami Warning for coastal populations in Hawaii and Alaska.

These Water Level sensors are located in the near shore, coastal waters off of Alaska and Hawaii. They record the Tsunami itself, as it passes. Because Tsunami waves travel about 30 times slower than seismic waves do, these sensors are located as closely as possible to each other in “dense” networks that cover the Alaskan and Hawaiian coastlines.

These dense water level networks enable a warning for Waikiki, on Oahu, as much as 30 minutes before the Tsunami recorded by a water level sensor on the Big Island closer to the earthquake that generated it. Similarly, a Tsunami recorded on near shore water level sensors near an earthquake off of the Aleutian Islands, would provide a 20 to 30 Minute lead time for a Tsunami Warning to Anchorage.

These water level instruments thus enable:

- Confirmation that a Tsunami was indeed created;
- An estimate of its size;
- Warnings to coastlines further away from the causative earthquake then those warned using the seismic stations; and
- Additional information to model the Tsunami at more distant coasts.

3) **DARTS [Deep-ocean Assessment and Reporting of Tsunamis]** (Pacific and Atlantic)

Without these sea level observations, it isn’t possible to know whether or not if the numerical Tsunami model forecasts are accurate.

Sea level observations are also crucial for the improvement of model forecast for future Tsunami forecasts

DARTs are deep ocean bottom sensors that measure sea level changes and tsunamis. They are located off the oceanic trenches near the subduction zones, where tsunami-genic earthquakes occur.

The DART network and sea level stations are very important parts of the tsunami warning system in part because these sensors provide:

- The most accurate way to model the Tsunami; and
- The most accurate possible warnings to coastal populations far away from the causative earthquake.

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