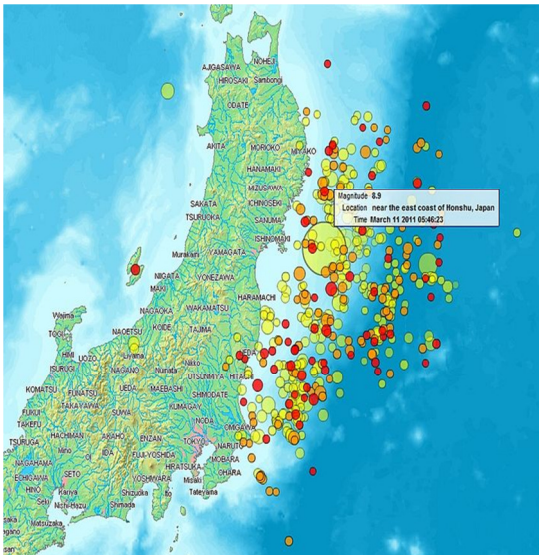


SUCCESS STORY: Peru Navy Tide Gauge Network developed by GEONICA recorded neatly the 2011 Japan tsunami

BACKGROUND

The Directorate of Hydrography and Navigation of Peru (**HIDRONAV**), dependent of Peru Navy, has acquired from **GEONICA S.A.** a System consisting of **Ten (10) Tide Gauges Stations including still images cameras and One (1) Control Center** which are, nowadays, totally functional.

Hence, the Peru Nation has been provided by a Tide Level Registration, Storage, Transmission and Monitoring System along the entire coast and, most importantly, has been set with a Prevention and Early Warning System against possible oceanographic natural disasters.



2011 JAPAN TSUNAMI

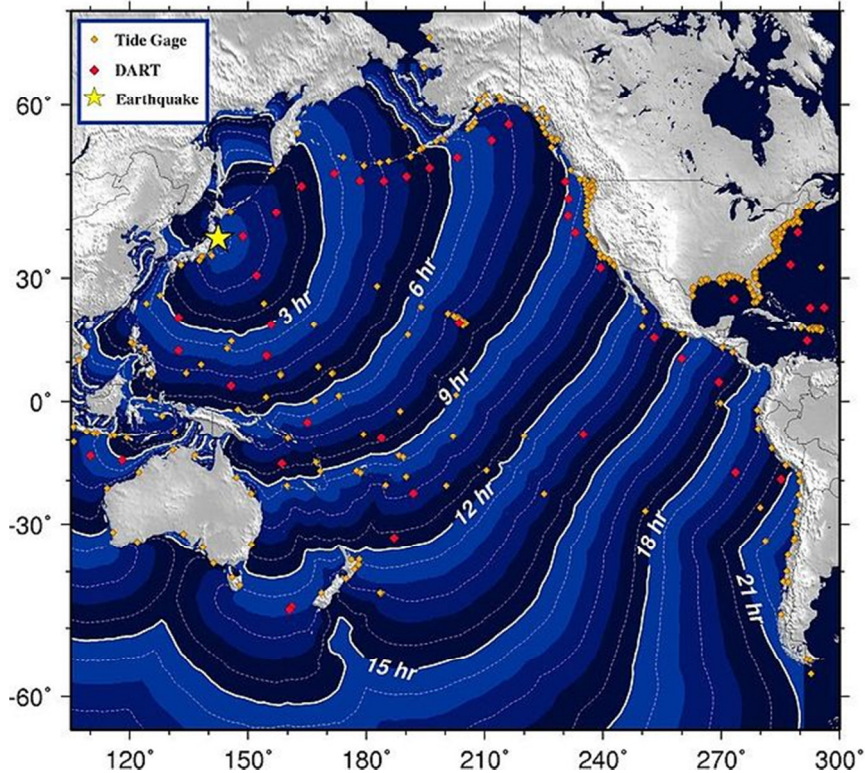
The 2011 Japan earthquake of 9.0 MW1 magnitude generated up to 10m tsunami waves. The earthquake took place at 14:46:23 local time (5:46:23 UTC) on Friday 11th March, 2011. The epicenter was located in the sea, off the coast of Honshu, 130 km east of Sendai, in Miyagi Prefecture, Japan.

After the quake, a tsunami warning has been triggered for the Pacific coast of Japan and other countries, including New Zealand, Australia, Russia, Guam, the Philippines, Indonesia, Papua New Guinea, Nauru, Hawaii, Northern Mariana Islands, United States, Taiwan, Central America, Mexico and South America, Colombia, Peru, Ecuador and Chile.

TSUNAMI ARRIVAL TO PERU

Given that the distance between the epicenter and the coast of Peru is approximately 15,200 km, and that the propagation speed is 724 km/h, the estimated time of arrival of the tsunami to the shores of America is just about 21 hours after the quake, as shown in the following diagram.

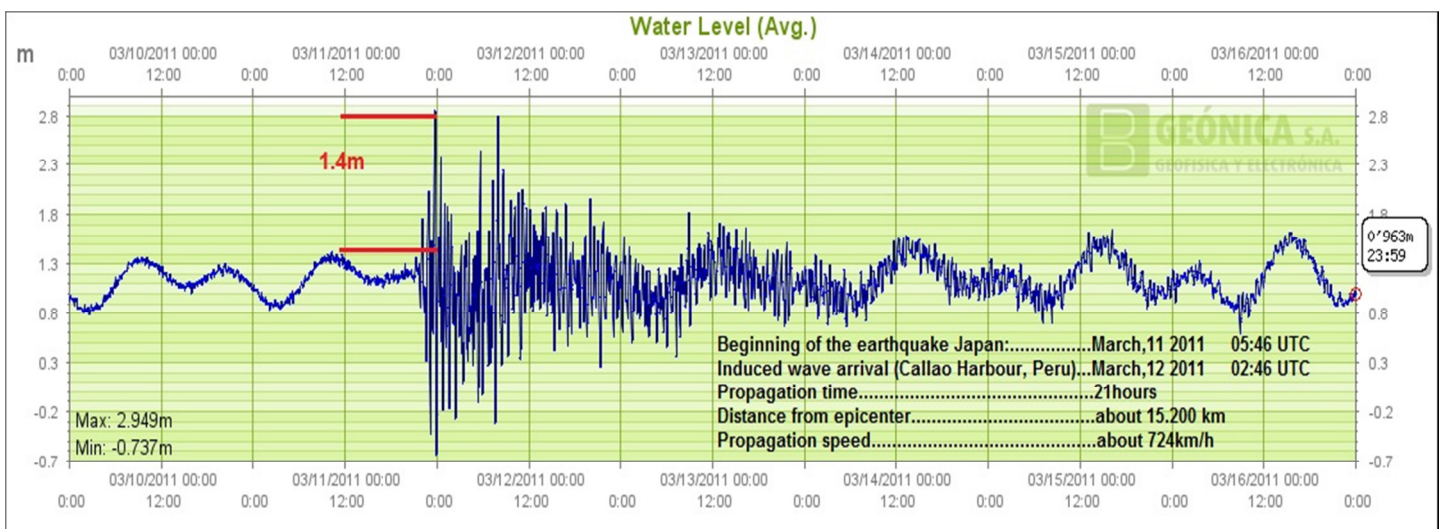
The tsunami took place at 5:46:23 UTC on 11th March; its arrival to the Peruvian coast was expected at 2:46:00 UTC on 12th March. Taking into account that the time zone of Peru is UTC-5, the tsunami appeared at the shores of Peru at around 21:46:00h local time on 12th March.



HOW THE TIDE GAUGE NETWORK REGISTERED THE TSUNAMI

The following chart is taken from data provided between 10 and 16 March 2011 by the gauge located at the Port of Callao. It shows clearly that the estimates made *a priori* were fulfilled. The most relevant data collected were:

- ✓ The tsunami front stroke at the estimated time.
- ✓ The tidal range reached maximum amplitude of approximately 1.4 meters with a total swing of almost 3 meters.
- ✓ In the 12h that followed the tsunami, the tidal cycles remained barely imperceptibles.
- ✓ The ripple persisted in samples received even on 16th March.



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