COASTAL OCEANOGRAPHY

QUALITY THROUGH INNOVATION AND DESIGN

March 2017

Energy, Water, Environment.
Global Sustainable Solutions.

09 Coastal Oceanography - Tides, Waves, Currents. SafePort and Datamar Systems.

Physical Oceanography is one of several sub-domains into which Oceanography is divided. Others include biological, chemical and geological oceanography.

Physical oceanography is the study of physical conditions and physical processes within the ocean, especially the motions and physical properties of ocean waters.

In particular, the term of Coastal Oceanography refers to the physical processes generated at the land-sea interface that are manifested in the form of currents, waves and tides induced by different agents such as wind or the gravitational action of the Sun and Moon phenomena.

ENEA Grupo® offers advanced technical solutions for the measurement of currents, waves and tides, complemented by the measure of all the meteorological parameters of interest in order to know the environmental conditions affecting seaports.

Maritime ports for commercial, fishing and water sports purposes play an important role of great economic importance in the development of a country. For this reason, port management should always seek the highest levels of safety and effectiveness.

Well aware of this fact and with an Engineering Department that boasts the necessary experience and knowledge in the fields of oceanography, meteorology and data transmission solutions, ENEA Grupo® markets the SafePort System. This system integrates the most advanced instrumentation for the measurement of all the meteorological, oceanographic and hydrodynamic parameters of interest, such as tides, waves and currents, complemented by the appropriate telemetry network. In summary, the SafePort System constitutes a tool of tremendous value to those who are responsible of port management, Port Authorities and all potential users of the port infrastructures including: ships of all kinds, fishing boats, yachts, recreational vessels, etc.

DATAMAR 2000C RADAR Tide Gauge marketed by ENEA Grupo®, based on the latest electronic technology, is the ideal solution for measuring, recording and transmitting tide level data, not only due to its high-level features and advanced technical characteristics, but also due to its great versatility and cost effective.

It is important to mention that the Measuring Stations of SafePort System and Datamar allow for an integrated AIS AtoN (Aids to Navigation) transponder. It provides accurate and real time information of the AtoN to all vessels and shore stations in range.

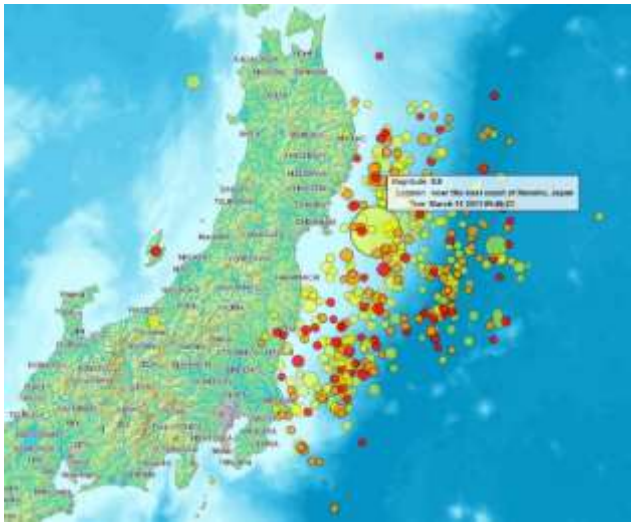
SUCCESS STORY: Peru Navy Tide Gauge Network marketed by ENEA Grupo® recorded neatly the 2011 Japan tsunami

BACKGROUND

The Directorate of Hydrography and Navigation of Peru (HIDRONAV), dependent of Peru Navy, has acquired a System consisting of 12 Tide Gauges Stations including redundant communications using 3G/GPRS and INMARSAT Satellite (bidirectional, real-time, essential for warning systems), still images cameras and 1 Control Center which are, nowadays, totally functional. All these Systems are marketed internationally by ENEA Grupo®.

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

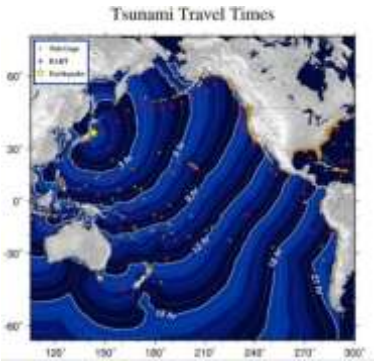
2011 JAPAN TSUNAMI



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..