National Report of Perú to the XVIth GLOSS Group of Experts 11-13 April 2019

The Directorate of Hydrography and Navigation, in its capacity as head of the National Tsunami Warning System and the governing body of Oceanography in Peru, has as one of its main activities, the measurement and monitoring of sea levels and maintains and operates a network of mareographic stations installed along the Peruvian coast.

The study of sea level is an exclusive activity carried out by this Directorate and is the official and technical authority responsible for the installation and maintenance of the tide gauge network in the Peruvian coast. It is also responsible for the processing, filing and dissemination of sea level data; activities that are carried out considering the different specifications on the subject, published by international organizations, such as the Permanent Service for Mean Sea Level (PSMSL) and the Global Sea Level Observing System (GLOSS), both programs of the Oceanographic Commission Intergovernmental (IOC) and the guidelines and standards of the International Hydrographic Organization (OHI).

Measurements of sea level in Peru begin in 1,942, with the installation of pilot mechanical tide gauges in the ports of Talara, Callao and Matarani, by the Inter American Geodetic Survey (IAGS), in coordination with the then Service Hydrographic and Faros de La Marina, currently Directorate of Hydrography and Navigation (DHN). Then, in the years 1,955 and 1,958, the gauge stations of Chimbote and San Juan were installed, respectively.

From 1,970, the DHN takes charge of the maintenance and control of the gauge stations, which, thus established, had changes in location and reference over time. Subsequently, Paita, Lobos de Afuera Island and Pisco gauge stations were installed, with the purpose of monitoring "El Niño" events, following the extraordinary event of 1,982-1,983, and to improve the accuracy of the tide forecast.

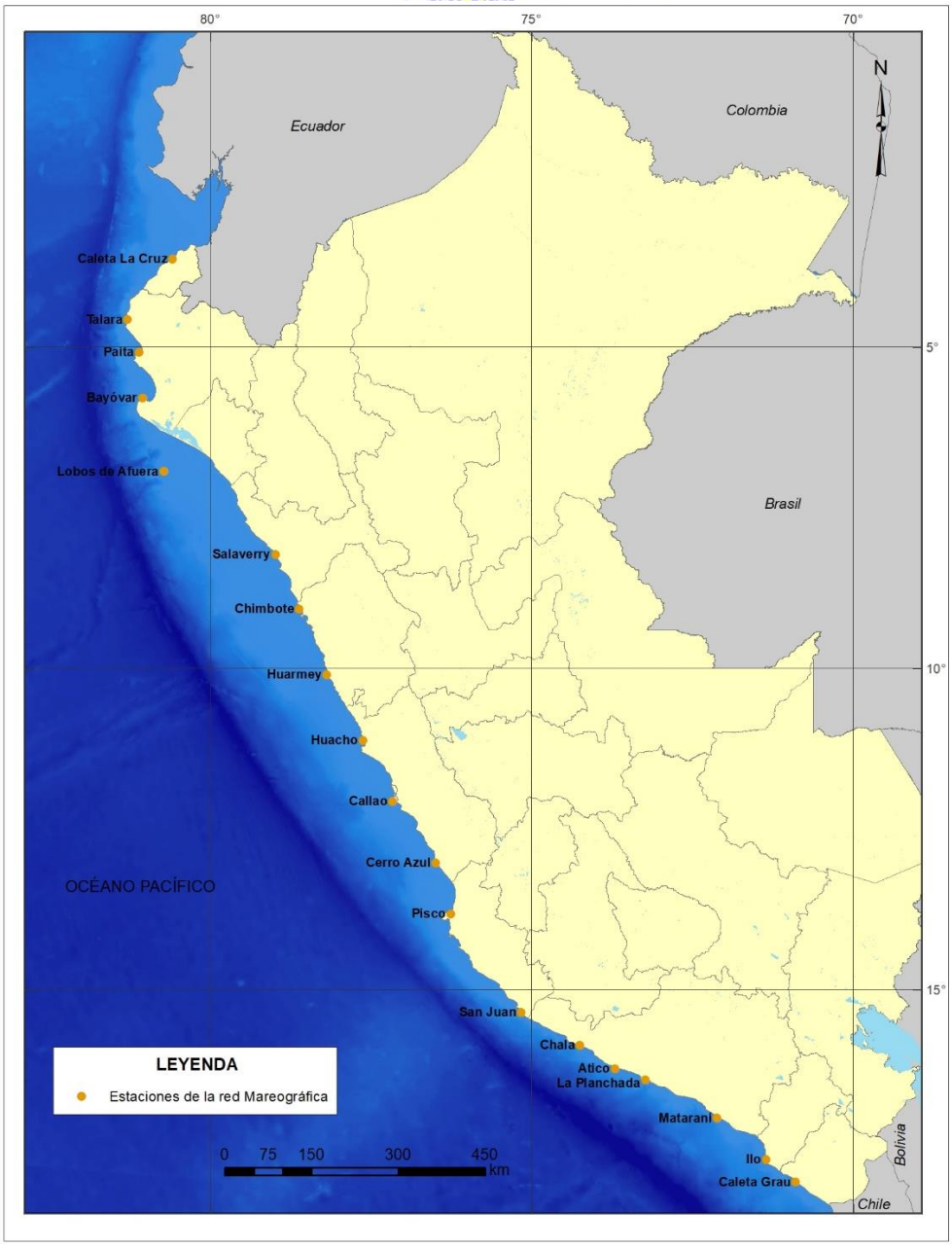
These first equipments were eight standard mechanical gauges, of continuous analogical record, composed of a digital watchmaking system, pulleys, well and float, of monthly transmission by land, housed in booths arranged in the docks. They were also used to calibrate the modern automatic stations and continue the historical series of said gauge stations.

At the end of the year 2,000 and through an agreement with the World Bank, related to the Improvement of the Forecasting and Evaluation Capacity of the El Niño Phenomenon for the prevention and mitigation of disasters in Peru (Naylamp Project), it allowed to update and implement with ten sensors of pressure Sutron brand, hourly record, satellite transmission every three hours GOES-8, conforming automatic meteorological ocean stations, which also housed sea and air water temperature sensors, oxygen, salinity, relative humidity, atmospheric pressure, among others.

Subsequently, and in response to the earthquakes of February 2,010 and August 2,007 on the coasts of Chile and Peru, respectively, which also led to a local tsunami, we prioritized the need to strengthen tsunami early warning systems in order to reduce coastal vulnerability; In that sense, as responsible for the National Tsunami Warning System, in May 2010, ten Geonica radar sensors were acquired, with transmission every diez minutes via cellular GPRS, which will allow the automatic confirmation of the presence of a tsunami in the Pacific Ocean.

In September 2,010, through the Sea Level Center of the University of Hawaii (UHSLC), with financial support from the National Oceanic and Atmospheric Administration of the United States (NOAA), and in support of the PTWC, three donations were obtained by donation complete tide gauge stations (with radar, float and pressure sensors), with a five-minute transmission via GOES satellite, which were installed in Talara, Callao and Matarani. Likewise, GOES GHT transmitter with GPS antenna was obtained for its support and integration into the tsunami warning network. Information from these three stations are available in the Global Telecommunication System (GTS) at the World Bank Sea Level Data Bank (http://www.ioc-sealevelmonitoring.org/station.php?code=call).

Finally, in the year 2,015, through the Project for the Improvement of the Equipment for the Management of Disaster Risk, eight new Sonic Corporation ultrasonic type stations were obtained as a donation from the Japanese JICA Agency, allowing us to extend our National Mareographic Network in nineteen stations.



Peruvian Sea Level Stations Network

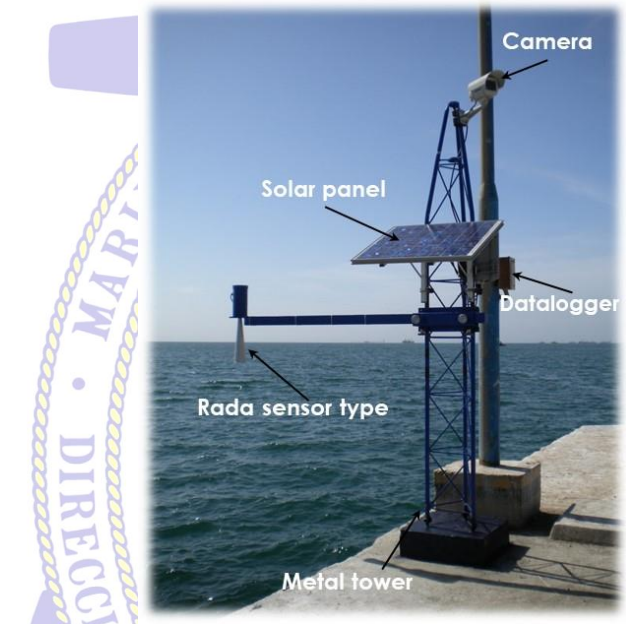
Zone	Station	Location		Creation date
		Latitud	Longitud	
North	La Cruz	Muelle PACIFIC RUBIALES		2015
		03° 38' 00.7" S	080° 35' 14.6" W	
	Talara	Muelle de PETROPERU		1942
		04° 34' 30.36" S	081° 16' 57.93" W	
	Paita	Terminales Peruanos Euroandinos		1981
		05° 05' 01.28" S	081° 06' 27.87" W	
	Bayóvar	Muelle PETROPERU		2015
		05° 47' 38.18" S	081° 03' 16.04" W	
	Lobos de Afuera	Ensenada de Isla Lobos de Afuera		1982
		06° 56' 12.80" S	080° 43' 29.60" W	
Center	Salaverry	Cerca al Muelle N° 2 de ENAPU		2010
		08° 13' 40.55" S	078° 58' 54.58" W	
	Chimbote	Muelle N° 2 de ENAPU		1955
		09° 04' 34.61" S	078° 36' 45.85" W	
	Huarmey	Muelle ANTAMINA		2015
		10° 05' 57.57" S	078° 10' 54.11" W	
	Huacho	Muelle ENAPU		2015
		11° 07' 18.76" S	077° 36' 58.84" W	
	Callao	Espigón norte de la Escuela Naval		1942
		12° 04' 08.21" S	077° 10' 00.42" W	
	Cerro Azul	Muelle MUNICIPAL		2015
		13° 01' 33.3" S	076° 29' 07.8" W	
	Pisco	Muelle La Puntilla		1985
		13° 49' 10.55" S	076° 15' 07.08" W	
South	San Juan	Muelle del ex grifo de la Base Naval		1958
		15° 21' 19.56" S	075° 09' 37.66" W	
	Chala	Desembarcadero Pesquero Artesanal		2012
		15° 51' 58.01" S	074° 14' 53.06" W	
	Atico	Muelle TASA		2015
		16° 13' 52.77" S	073° 41' 39.19" W	
	La Planchada	Muelle CFG INVESTMENT		2015
		16° 24' 17.14" S	073° 13' 15.09" W	
	Matarani	Muelle TISUR		1942
		17° 00' 03.52" S	072° 06' 31.65" W	
	Ilo	Muelle de ENAPU		2000
		17° 38' 40.34" S	071° 20' 54.88" W	
	Caleta Grau	Muelle PRODUCE		2015
		17° 59' 36.63" S	070° 53' 03.43" W	

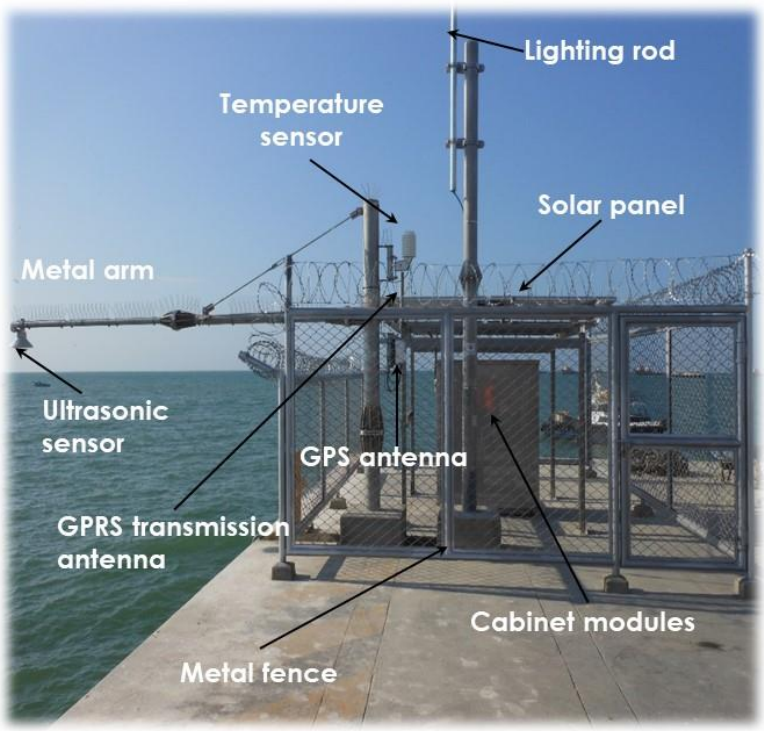
At present, the tide gauge stations are composed of two to three tide gauges (sensors of the radar, float and pressure type), a tide gauge, a surveillance camera and a system of reference points (BMs) or marks for periodic geodesic leveling; all stations have almost real-time transmission (satellite / telephony), which have improved the reception of information for operational and scientific purposes. Also, each station has the constant attention of an ocean-meteorological observer who is responsible for the operation and proper functioning of the equipment installed there. Among the main scientific investigations we have: the monitoring of El Niño and La Niña events, the study of the

increase in sea level associated with climate changes, the detection and monitoring of tsunamis, and the forecast of flooding by brave.

This Directorate participates in the GLOSS program, only with the Callao tide station and whose data is sent automatically; nevertheless, it wishes the incorporation of the National Mareográfica Network to the GLOSS Network, since we currently have modern stations and are available for regional integration.

Currently, the Peruvian tide information can be available in four web platforms: in the international bank of Permanent Service for Mean Sea Level - PSMSL (http://www.ioc-sealevelmonitoring.org/map.php), in the platform of Webtrans Geónica SA (http://webtrans.geonica.com/index.php), at the JASL-UHSLC (https://uhslc.soest.hawaii.edu/network/) and on the website of this Directorate (http: // www.naylamp.dhn.mil.pe/dhn/est_mareograficas/).





Station	Date of Installation	Tide Gauges	Record Interval	Transmission Interval	Transmission
La Cruz	Oct. 2015	Ultrasónico	1 minuto	5 minutos	GPRS
Talara	Dic. 2000	Presión	60 minutos	3 horas	Canal 63 / GOES 8
	10/14/2010	Radar	1 minuto	10 minutos	GPRS/INMARSAT
	10/10/2011	Radar/presión	1 minuto	5 minutos	Canal 217 / GOES
Paita	Dic. 2000	Presión	60 minutos	3 horas	Canal 63 / GOES 8
	05/04/2010	Radar	1 minuto	10 minutos	GPRS/INMARSAT
Bayóvar	Oct. 2015	Ultrasónico	1 minuto	5 minutos	GPRS
Lobos de Afuera	Dic. 2000	Presión	60 minutos	3 horas	Canal 63 / GOES 8
	15/07/2012	Radar	1 minuto	60 minutos	Canal 217 / GOES
	Jul. 2016	Radar	1 minuto	60 minutos	GPRS/INMARSAT
Salaverry	28/03/2010	Radar	1 minuto	10 minutos	GPRS/INMARSAT
Chimbote	Dic. 2000	Presión	60 minutos	3 horas	Canal 63 / GOES 8
	24/03/2010	Radar	1 minuto	10 minutos	GPRS/INMARSAT
Huarmey	Oct. 2015	Ultrasónico	1 minuto	5 minutos	GPRS
Huacho	Oct. 2015	Ultrasónico	1 minuto	5 minutos	GPRS
Callao	20/03/2010	Radar	1 minuto	10 minutos	GPRS/INMARSAT
	28/09/2011	Radar/presión/flotador	1 minuto	5 minutos	Canal 217 / GOES
Cerro Azul	Oct. 2015	Ultrasónico	1 minuto	5 minutos	GPRS
Pisco	Nov. 2000	Presión	60 minutos	3 horas	Canal 63 / GOES 8
	15/04/2010	Radar	1 minuto	10 minutos	GPRS/INMARSAT
San Juan	Nov. 2000	Presión	60 minutos	3 horas	Canal 63 / GOES 8
	20/04/2010	Radar	1 minuto	60 minutos	GPRS/INMARSAT
Chala	05/05/2012	Radar	1 minuto	10 minutos	GPRS/INMARSAT
Atico	Oct. 2015	Ultrasónico	1 minuto	5 minutos	GPRS
La Planchada	Oct. 2015	Ultrasónico	1 minuto	5 minutos	GPRS
Matarani	Nov. 2000	Presión	60 minutos	3 horas	Canal 63 / GOES 8
	25/04/2010	Radar	1 minuto	10 minutos	GPRS/INMARSAT
	10/10/2011	Radar/presión/flotador	1 minuto	5 minutos	Canal 217 / GOES
Ilo	Nov. 2000	Presión	60 minutos	3 horas	Canal 63 / GOES 8
	30/04/2010	Radar	1 minuto	10 minutos	GPRS/INMARSAT
Caleta Grau	Oct. 2015	Ultrasónico	1 minuto	5 minutos	GPRS