

IHO-TWCWG Inventory of Tide gauges and Current meters used by Member States – Correct to 19 May 2020

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Algeria	Long Term (National Network)	3 Analogue gauges type A-OTT-R16	Operated by the Hydrographic Service of the Algerian Navy. Float gauges recording to paper. Digital gauges not yet installed and there is no real time data transmission.
Antarctica (Australia)	Casey, Davi and Mawson Stations	Pressure	600-kg concrete moorings containing gauges in areas relatively free of icebergs have operated for eight years at Mawson and Davis and at Casey for five. A new shore gauge at Mawson will use an inclined borehole to the sea, heated to stop the water from freezing. Access to the sea was gained via an inclined bore hole, with the gauge and electronics in a sealed fibre glass dome at the top of the hole
	Macquarie Island	Acoustic and Pressure	
Australia	Long Term (National Network) State Operated-	SEAFRAME Electromagnetic Tide Pole, Acoustic, Float, Pressure, Bubbler, Radar (in most cases Vegapuls), Gas purge, Radar with Shaft encoder	Operated by Bureau of Meteorology, Australia. Please see www.icsm.gov.au publication “Australian Tides Manual” For details of which type deployed where. As most of the permanent gauges are installed by other Agencies details can be sought.
	Short Term (AHS)	InterOcean S4 Pressure gauge Or RBR TGR-1050	Bottom mounted and usually installed with a tide staff
Bahrain Kingdom of	Mina' Salman at HSD Jetty. Network connected to web base hosted by SLRB.		The whole system was installed May – June 2014 and is still under trial especially with data transfer to SLRB's database. Therefore the BTN system has not yet been released for public access.
	Khalifa Bin Salman Port Tug Boat Jetty. Network connected to web base hosted by SLRB.		The objective is to provide tidal data on-line to users e.i. the International Maritime Community, but primarily to HSD so that HSD has the same freedom as with GPS – you can go anywhere and always have at least tidal data from one tidal station on-line.

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Amwaj Island Marina. Gauge also fitted with temperature sensor. Network connected to web base hosted by SLRB. Fasht Al Jarim. Network connected to web base hosted by SLRB. Reef Island (Bahrain Bay). Network connected to web base hosted by SLRB. Budayyi' Marina. Gauge also fitted with temperature sensor. Network connected to web base hosted by SLRB. Saudi Causeway Island (Coast Guard Base). Network connected to web base hosted by SLRB. Bahrain Sailing Club. Gauge also fitted with temperature sensor. Network connected to web base hosted by SLRB. Durrat Al Bahrain Marina. Network connected to web base hosted by SLRB. Durrat Al Bahrain Marina. Network connected to web base hosted by SLRB. Hawar West Jetty. Gauge also fitted with temperature sensor. Network connected to web base hosted by SLRB.	OTT Radar Type	The system record tidal data every 10 min and the data are transmitted to SLRB's server. Four stations are fitted with temperature sensor to obtain water temperature data from around the Kingdom. They are placed to get data from the whole island. Temperature data are recorded every hour. The system is prepared for adding

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	Hawar East Jetty. Network connected to web base hosted by SLRB.		
Brazil	Long-term stations and one year ports stations	Kalesto OTT – radar sensor RLS OTT Impulse radar sensor	Sensor without pipe well
		SE 200 OTT – float-operated shaft encoder	Well pipe with 200 mm diameter and 4 orifices of 2mm
	Short-term (hydrography)	Thalimedes stand alone - float shaft Encoder - OTT	Well pipe with 200 mm diameter and 4 orifices of 2mm
		Analogic float gauge	Well pipe with 200 mm/300mm diameter and 2/4 orifices of 2mm

Chile	Long-term (National Network)	44 stations with satellite transmission data capabilities. Data Collection Platform: Vaisala DCP model MAWS110 Telemetry options: GOES / INMARSAT-BGAN / GPRS Differential Pressure Transducer (vented) Druck PTX 1830 Radar Tide Gauge Vega QHR-104 1 lake station for landslide tsunامي 1 self-contained platform Aanderaa Instruments -water level sensor 3190 (vented pressure transducer) - datalogger 3634 Data downloaded every 3-6 months	Operated by Hydrographic and Oceanographic Service of the Chilean Navy (SHOA) Every station operates with primary and secondary telemetry option, as well the DCP integrates two sea level sensors, using different technologies and physical principles of operation (hydrostatic pressure and radar waves) Usually submerged sea level sensor housed inside PVC Hydraulic 50 mm and installed with tide staff. Deploy depending of the pier characteristics. Radar sensor downward looking and mounted using heavy-duty mast with extension arm. In few cases radar sensor downward looking has been installed directly on the concrete wall of the pier. Data Sample Interval: Pressure sensor: 1 min average water level of discrete 2 Hz samples Radar sensor: 1 min average water level of discrete 4 Hz samples Data Transmission: GOES: Mainly 5 min (10 and 15 min at specific stations) INMARSAT-BGAN: 1 min GPRS: 5 min Please see Chile National presentation at TWLWG5 http://www.iho.int/mtg_docs/com_wg/IHOTC/TWLWG%205/TWLWG%205-3.1.1-Chile_National%20_Presentation.pdf Real-time sea level information of tide stations is available on the SHOA website: http://www.shoa.cl/mareas/mapa.php Sea level data is also shared with IOC/VLIZ. In this case, real-time sea level data is available on the following website: http://www.ioc-sealevelmonitoring.org/map.php
	Short-term (hydrography)	Aanderaa Instruments -water level sensor 3190 (vented pressure transducer) - datalogger 3634	

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China (MSA)	Long Term	Mechanical Float Type Tide Gauge with digital output A-OTTK20.20.302, and SCA11-3	Tide stations in China are operated by several national and local governmental organizations, This table only shows those operated by China MSA. Usually installed with tide staff
		Pressure Gauge	
	Short Term	Pressure Gauge	
Denmark	Short term for hydrography in Greenlandic waters operated by National Survey and Cadastre	Pressure	
	Long Term National Network operated by Danish Meteorological Institute (DMI) 32 stations in Danish Waters	3 different systems: Pressure sensor supplemented with temperature or temperature plus conductivity Radar (newest 8 gauges) Acoustic (transferred from Danish Maritime Safety Authority)	In a well Data are transmitted every 10 minutes and made available at web page. Map: http://www.dmi.dk/dmi/index/danmark/vandstand.htm Station list: http://www.dmi.dk/dmi/index/hav/maledata/stationsliste.htm Map and station list also includes gauges operated by DCA and harbours.
	Long Term National Network operated by Danish Coastal Authority (DCA) 41 stations in Danish Waters	24 pressure gauges 17 float gauges	Typically in plastic, iron or steel pipe Typically in plastic, iron or steel pipe

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	Long Term National Network operated by Danish National Space Center 3 stations in Greenlandic waters	Sensor: Aanderaa WLR7 pressure, salinity, temperature sensor, air pressure sensor: Vaisala PTU-200 Class A	Configuration: metal pipe attached to pier
	Short term for geodetic field work operated by Danish National Space Center	Sensor: Global Water WL16 pressure sensor (auto air pressure and temperature compensation)	Configuration: weight-down sensor deployed by cable from coast
Ecuador	Long Term National Network	Pressure gauge with digital output. AXYS Technologies	07 stations with GPRS transmission system with solar panels operated by Instituto Oceanografia de la Armada de Ecuador. See http://www.inocar.ec/mareas/mareas.php
		Mechanical Float type tide gauge, IRU-5180 with digital output. Stevens , datalogger Vaisala MAWS201	11 stations with GPRS transmission system with solar panels operated by Instituto Oceanografia de la Armada de Ecuador. See http://www.inocar.ec/mareas/mareas.php
	Short Term Hydrography	Pressure sensor, Cera-Driver SCHLUMBERGER	Operated by Instituto Oceanografia de la Armada de Ecuador Bottom mounted and usually installed with a tide staff. It installs a rule and sensor housed inside PVC
Finland	Long Term National Network operated by Finnish Meteorological Institute.	14 float in a stilling well gauges with absolute encoders, Vaisala Data Logger QML201C.	Data measured and transmitted every minute. Transmission through 3G. More information: http://en.ilmatieteenlaitos.fi/sea-level . Location in Baltic Sea coast, no tides information.

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France	Long-term RONIM network (National Network)	Krohne radars – ELTA dataloggers – OTT HDR DCP – ADSL/GPRS modems	Operated by SHOM Stilling well or open air http://refmar.shom.fr/en/partenaires/producteurs-de-donnees/reseau-maregraphique-ronim http://data.shom.fr/#donnees/catalogue
	Short-term (hydrography)	Sea-Bird SBE 26plus	Moored
Germany	Long Term National Network operated by the Federal Waterways and Shipping Administration (WSV)	Approximately 150 Mechanical float systems : Type tide gauge with electrical transducer, an angle decoder, changing to Radar and microwave gauges is ongoing	Data are measured and transmitted every minute. It is available at web page for showing and download. See web page for WSV : http://www.pegelonline.wsv.de
	Long Term Internal National Network operated by State Agency for Agriculture and Environment Rostock	6 Multi Parameter Probes	Federal State of Mecklenburg-Western Pommerania; See web page http://www.imk-mv.de
	Long Term National Network operated by Schleswig-Holstein's Government- owned company for Coastal Protection, National Parks and Ocean Protection	At least 30 tide gauges	Federal State of Schleswig-Holstein http://www.umweltdaten.landsh.de/public/hsi/index.html
Germany Continued	Long Term National Network operated by Hamburg Port Authority (HPA)	5 tide gauges	Free and Hanseatic City of Hamburg Published by: http://www.pegelonline.wsv.de

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	Long Term National Network operated by Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency.	8 tide gauges	Federal State of Lower Saxony https://www.pegelonline.nlwkn.niedersachsen.de/Start
	Long Term National Marine Environmental Monitoring Network operated by Federal Maritime and Hydrographic Agency of Germany	Approximately 5 current meters	
Iceland	Long Term (National Network) State Operated	Pressure, Druck transducer	Operated by Faxaflóahafnir and the Icelandic Coast Guard. Data are transmitted every 10 minutes and made available at web page http://vedur.mogt.is/harbor/?action=Stations&harborid=1&stationid=1004 For 1 minute interval see http://www.ioc-sealevelmonitoring.org/station.php?code=reyk
	Short Term Hydrographic Surveys	2 Pressure gauges	Installed with a tide staff
Italy	Long Term (National Network) Site: Genova	Mechanical “Thomson” (float) data series since January 1884 OTT thalimedes (float) data series since December 2001 OTT RLS (radar) data series since April 2010	The measurement system is composed of two different instruments: the classical mechanical float tide gauge (Thomson) and electromagnetic codifier (OTT Thalimedes) for converting the lineal movement of the wire float to a digital value with a precision of millimetres or centimetres. The acquisition system is a datalogger with a modern connexion to transmit the data from the tide gauge station to the data centre in Genova. Since April 2010 the system is integrated with a radar sensor (OTT RLS).
	Long Term (National Network) Site: Brindisi	Mechanical “Thomson” float data series since January 1972 OTT Thalimedes (float) data series since December 2003	The measurement system is composed of two different instruments: the classical mechanical float tide gauge (Thomson) and electromagnetic codifier (OTT Thalimedes) for converting the lineal movement of the wire float to a digital value with a precision of millimetres or centimetres. The acquisition system is a datalogger with a modern connexion to transmit the data from the tide gauge station to the data centre in Genova.

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	Short Term Site: Piombino	OTT Kalesto (radar) data from April 2007 to June 2008	The acquisition system is a datalogger with a modern connexion to transmit the data from the tide gauge station to the data centre in Genova.
	Short Term Site: Savona	OTT Kalesto (radar) data since June 2009	The acquisition system is a datalogger with a modern connexion to transmit the data from the tide gauge station to the data centre in Genova.
	Short Term	OTT Orpheus (pressure) OTT Orpheus Mini (pressure) New acquisition 2010	Hydrographic Expedition IIM and UUNN Set of data for short periods of Hydrographic Survey
Jamaica	Long Term - National Network	Acoustic	Operated by the Meteorological Service, Jamaica- Position 17° 55' 33" N - 76° 50' 45" W
Japan	Long-term (National Network)	Japan Coast Guard (JCG) Digital Float Type Tide Gauge - DFT - Sonic Corporation	Tide stations in Japan are operated several national and local governmental organizations including JCG, JMA, and GSI. Sea level data observed at tide stations of three organizations are transmitted to the headquarters of each organization on real-time base. And then, JCG and GSI send the data to JMA in real-time for the purpose of the disaster prevention. Real-time sea level information of tide stations around Japan is available on the following site (Japanese text only): http://www.jma.go.jp/jp/choi/
		Japan Meteorological Agency (JMA) Microwave Tide Gauge Digital Float Type Tide Gauge Acoustic Tide Gauge	
		Geographical Survey Institute (GSI) Digital Float Type Tide Gauge	
	Antarctica Syowa Station	Pressure Gauge – Meisei Electric Co., Ltd.	Operated by Japan Coast Guard. 30-second interval data are transmitted to Japan once an hour.
	Short-term (hydrography)	Pressure Gauge – Rigo Co., Ltd.	Bottom mounted and usually installed with a tide staff.

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Korea Republic of	Long-term (National Network)	Mechanical Float Type Tide Gauge with digital output A-OTT - 28 stations	A digital observation began while starting telemetering system in an after 1997. Currently our country is operating 50 Tidal stations. The Tidal station of a past analogue became a digital method in incense on expansion to national ocean observation network, and it is expanded with a monitoring system to let ocean physics investigation system. Data collected in 50 Tidal stations are servicing real time through the CDMA(Code division multiple access) The goal is determine coastal marine boundaries by basic tidal datums and support for tsunami and storm surge warning systems, climate monitoring, coastal processes and tectonic research. We are operating dual tide gauges at some stations.
		Micro Wave(MIROS, SM-094) - 22 stations	The Microwave equipment therefore provides accurate range measurements and high long term stability. Due to the low frequency of operation, fog, rain and water spray will not cause measurement problems. It is the equipment which is very suitable by a watch of a storm surge. Also, compare it to other equipment, and installation of observation equipment is easy.
		Laser tide gauge (Hanjin, LTC-100) - 7 stations	The laser type gauge installed in the well of tidal stations do not cause light scattering by inside wall of wells. It was additionally installed in 4 stations in 2017
	Short-term (hydrography and shoreline mapping)	RBR TGR-2050	Bottom mounted and usually installed with a tide staff
		Aanderaa WLR7	High precision quartz pressure transducer housed in a pressure case. Measurement cycle is triggered by a high precision clock. Integration time of the pressure measurements eliminates pressure fluctuations due to waves.
Morocco	Short term hydrography	Pressure EOPM Digital Tide Gauge	Operated by the Moroccan Navy (Division Hydrographie et Cartographie)
		Pressure Sutron 8210 Digital Tide Gauge	
Netherlands	Netherlands Long Term (National Network)	Digital Float Gauge (DNM). Radar Tide Gauge: Radac Waveguide. See http://radac.nl/wave-height-tide/	Operated by Rijkswaterstaat Real time information of tide stations around the Netherlands is available on: http://www.rijkswaterstaat.nl/kaarten/waterstand-tov-nap.aspx
		Etrometa Stepgauge. The stepgauge is placed vertically and detects the level of water with a line of metal electrodes	

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	Short Term	SAIV pressure tide gauge. See http://saiv.no/WordPress/wp-content/uploads/2019/10/Datablad_SAIV_TD304_161009LQ2.pdf	Operated by Royal Netherlands Navy, Hydrographic Service
	Currents Long Term (National Network)	ADCP (Acoustic Doppler Current Profiler): https://www.whoi.edu/what-we-do/explore/instruments/instruments-sensors-samplers/acoustic-doppler-current-profiler-adcp/	Operated by Rijkswaterstaat https://waterinfo.rws.nl/#!/kaart/stroming/
New Zealand	Long-term National Network	Gas bubbler with Paroscientific PS2 pressure sensor	4 sites at open coast locations around New Zealand operated by the National Institute of Water and Atmospheric Research Ltd. See http://www.niwa.co.nz/our-services/online-services/sea-levels .
	Long-term National Network	Druck PTX 1830 vented pressure sensors	Network of 17 sites around New Zealand and on off-shore islands established to monitor sea level for tsunamis. Other equipment at sites includes Quanterra digitiser and datalogger, GPS for timing, backup battery power supply. Change the data transmission sentence to: Data transmission technologies: DSL router, VSAT, cellular, BGAN, IPSTAR. Network established and maintained by Land Information NZ in partnership with GNS Science. See http://www.linz.govt.nz/hydro/tidal-info/gauges/sea-level-data-downloads/index.aspx .
	Long-term port installations	Various sub-surface pressure transducers, float and stilling well, down-looking radar and ultrasonic systems	Sites operated independently by either the local port company or regional council.
	Antarctica	Gas bubbler with Paroscientific PS2 pressure sensor	
		Geokon 4500SV vented vibrating wire pressure sensor	Site at Cape Roberts operated by Land Information NZ.
	Short-term (hydrographic surveys)	Valeport 740, Troll 700 vented	Deployed by private hydro survey companies
Norway	Long term stations (national network)	23 digital stilling well gauges with data loggers from Sutron.	Operated by the Norwegian Hydrographic Service. Data transmission: Mobile phone (GPRS).

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		One radar gauge, MIROS SM-094	Water level sampled every second and 1 minute averages are transferred to the NHS approximately every half hour. The data are filtered and 10-minute values are available on Internet, http://www.kartverket.no/en/sehavniva/ Jan Mayen is out of service since August 2016
		One (Jan Mayen) pressure sensor, Sutron logger	
	Short term stations	> 50 pressure sensors, Level TROLL 700 from In-Situ Inc.	Vented pressure sensors with data logger inside.
Oman, Sultanate of	Long Term	Pressure and tide pole	Operated by the hydrographic unit of the Royal Navy of Oman
	Short Term – for hydrographic surveys only	Pressure, Radar sensor and tide pole	Operated by the hydrographic unit of the Royal Navy of Oman
	Long Term – MSL observations		Operated by the University of Hawaii – 3 gauges installed
Papua New Guinea	Long Term	SEAFRAME	Operated by the Bureau of Meteorology Australia, funded by Australian Agency for International Development. More information at: http://www.bom.gov.au/pacificsealevel/index.shtml
Peru	Long Term – National Network (<i>Talara, Paita, Lobos de Afuera, Chimbote, Callao, Pisco, San Juan y Matarani</i>)	8 standard mechanical Tide Gauges	Tide Gauges placed in booths, composed of a digital clockwork system, tackles, float and a tide staff. Continuous analogue recording equipment, monthly broadcast overland, monitored by the Directorate of Hydrography and Navigation.
	Long Term – National Network (<i>Caleta la Cruz, Talara, Paita, Lobos de Afuera, Chicama, Chimbote, Pisco, San Juan, Matarani e Ilo</i>)	10 pressure sensors Hydrolab MS4A/MS5 and datalogger Sutron model 8210	These sensors belong to the automatic meteorological ocean stations. Time recording sensors, transmission by satellite GOES-8 every 3 hours, monitored by the Directorate of Hydrography and Navigation.

	Long Term – National Network (<i>Callao</i>)	1 pressure sensor InterOcean and datalogger Vaisala, model Milos 500	Recording every minute. Transmits the information every minute by radio connexion on the 2.1 Ghz band, monitored by the Directorate of Hydrography and Navigation.
	Long Term – National Network/Tsunamis Warning System (<i>La Cruz, Talara, Paita, Salaverry, Chimbote, Callao, Pisco, San Juan, Matarani e Ilo</i>)	3 pressure sensors Druck 1830 Vaisala, model Handar 555.	Recording every 2 minutes, hourly transmission by satellite GOES, monitored by NOAA/PTWC.
	Long Term – National Network/Tsunamis Warning System (<i>La Cruz, Talara, Salaverry, Chimbote, Callao, Pisco, San Juan, Matarani e Ilo</i>)	10 sensors radar VegaPuls62 type and datalogger GEONICA model Datamar 2000C	Sampling every second and average calculation every minute, transmission by cellular GPRS, monitored by the Directorate of Hydrography and Navigation.
Philippines	Long Term (National network) Hydrography Department, National Mapping and Resource Information Authority.		

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	1 station with tide house 1 station with tide-pole platform	Acoustic Aquatrac, pressure sensor Radar sensor with temperature sensor. SATlink Transmitter	Near real-time telemetry, data are transmitted every minute. For sea level and tsunami monitoring. Installed with tide staff.
	1 station with tide house 1 station with tide-pole platform	Acoustic Aquatrac, pressure sensor Radar sensor. SATlink Transmitter	Near real-time telemetry, data are transmitted every minute. For sea level and tsunami monitoring. Installed with tide staff.
	3 stations with tide house	OTT Float type with Thalimedes	Data transmission through local network. Installed with tide staff.
	3 stations with tide house	OTT Float type with Thalimedes	Data downloadable every 6 months.
	Long Term (National network) Hydrography Department, National Mapping and Resource Information Authority. (NAMIRA) Long term stations		
	11 stations with tide house	OTT Float type with Thalimedes	Data downloadable every 6 months. Installed with tide staff
	16 stations with tide house	Stevens water level recorder float type with Ax sys datalogger.	Data downloadable every 6 months. Installed with tide staff
	1 station – no tide house	Portable wave and tide gauge, Pressure type (Inter-Ocean)	Data downloadable every 3 months. Installed with tide staff
	1 station – no tide house	STS Portable Tide gauge, Pressure type	Data downloadable every 6 months. Installed with tide staff
	Short term stations (Hydrographic Survey) Hydrography Department NAMIRA	STS portable tide gauge, pressure type	Operated by survey ship

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Poland	Long-term (National Network)	Acoustic, Pressure AWAC Nortek (1 unit)	Operated by Institute of Meteorology and Water Management National Research Institute. A current profiler and a wave directional unit is mounted in a frame on the sea bottom and connected to automatic meteorological stations, it is operated in online mode. http://www.baltyk.pogodynka.pl/ftp/kwd/ (internet page is under construction)
	11 long-term (National Network) stations with tide gauge – pressure type	9 stations with damping tube/ float level sensor (encoder) + pressure sensor and 2 stations with no damping tube, with pressure sensor	Operated by Institute of Meteorology and Water Management National Research Institute. (10 min sampling rate, tide gauge height re Amsterdam = -500 cm)
Portugal	Long-term (National Network)	Analog and Digital Float Tide Gauges (OTT), Pressure (Valeport 740, Druck PDCR 1830), Acoustic (Aquatrak), Radar (Krohne, Vegapuls)	Operated by the Portuguese Hydrographic Institute (Instituto Hidrográfico). Radars: installed in open air. Acoustic sensor: installed in stilling well. Pressure sensors (vented): bottom mounted and usually installed with a tide staff.
		Float, Acoustic (Aquatrak)	Operated by the Portuguese Geographic Institute (Instituto Geográfico Português). Installed in stilling wells.
		Radar (Vegapuls), Pressure	Operated by the University of the Azores, Department of Oceanography and Fisheries (Universidade dos Açores, Departamento de Oceanografia e Pescas). Radars: installed in stilling wells or open air.
	Short-term (hydrography)	Pressure (Valeport 740, LevelTROLL 700)	Operated by the Portuguese Hydrographic Institute (Instituto Hidrográfico). Vented pressure gauges.
South Africa and Namibia	Long-term (National Network)-12 gauges	OTT Radar tide gauge- Connected via modem 4x fitted with OTT DCP satellite transmitters	Fitted on davit extending 1.4m from quay wall, 1.2m in height. Surveyed into National benchmark network.
		11x Gauges stream data to FTP site via GMS communications 1x dial up modem communications bi- weekly	

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South Pacific Sea Level and Climate Monitoring Project Nations (12 Pacific Island countries participating in the project are the Cook Islands, Federated States of Micronesia (FSM), Fiji, Kiribati, Marshall Islands, Nauru, Papua New Guinea (PNG), Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu)	Long Term	SEAFRAME	Operated by Bureau of Meteorology, Australia funded by Australian Agency for International Development More details at http://www.bom.gov.au/pacificsealevel/index.shtml
Spain	Tides	Long-term National Network	Pressure Gauge – Aanderaa WLTS 3791 Acoustic Tide Gauge Radar MIROS Operated by Puertos del Estado. Real-time sea level information of tide stations around Spain is available on the following site. http://www.puertos.es/es-es/oceanografia/Paginas/portus.aspx The REDMAR tide gauge network is in operation since 1992. The goal is the real time monitoring of sea level and the generation of historical series for their further study.

		Long-term National Network	Mechanical Float Type Tide Gauge with digital output AOTT Radar tide gauge	Operated by Instituto Español de Oceanografía The Spanish Institute of Oceanography Network: established in 1943, most of the longer time series of sea level belong to this network of 12 stations based on mechanical float gauges with digital output. The measurement system is composed of two different instruments: the classical mechanical float tide gauge (AOTT) and an optical or electromagnetic codifier for converting the lineal movement of the wire float to a digital value with a precision of millimetres or centimetres. The acquisition system can be a datalogger or a PC computer both with a modem connexion to transmit the data from the tide gauge station to the data centre in Madrid. In Algeciras, Santander y Tarifa there is also a radar sensor with a datalogger and modem connection. The actual configuration of the stations provides data every 5 or 10 minutes. Only the station of Palma de Mallorca provides data every minute in order to monitor the seiches.
		Long-term National Network	Mechanical float gauges with digital output OTT models • OWK16 • OTT 20.030 • SEBA R20 Radar sensors: • VEGAPULS62	Operated by Instituto Geográfico Nacional ftp://ftp.geodesia.ign.es/Red_de_Mareografos/
		Short-term (hydrography)	PREASSURE SENSORS: • Valeport 740 • Valeport TideMaster • Valepor MiniTide RADAR SENSORS: • VEGAPULS 62 • Valeport VRS 20	Operated by Spanish Hydrographic Office

	Currents	Long-term National Network	Deep Sea Buoy Network: - SEAWATCH Buoys HF RADARS Stations: - Codar Seasonde	Operated by Puertos del Estado. Real-time currents information around Spain is available on the following site. http://www.puertos.es/es-es/oceanografia/Paginas/portus.aspx
		Short-term (hydrography)	Current profilers: - NORTEK AWAC - NORTEK Aquadop - Teledyne RDI QuarterMaster ADCP	Operated by Spanish Hydrographic Office
Sweden		Long-term National Sea Level network	Radar gauge VEGA Pressure gauge OTT	Operated by Swedish Maritime Administration (SMA) and Swedish Meteorological Institute (SMHI). Station information and real-time information can be found here: https://www.google.com/maps/d/viewer?hl=en&mid=1OEVhr8o0rPW65e996kDTiYZmu8s https://www.smhi.se/en/weather/sweden-weather/sea-levels-waves http://vivadisplay.sjofartsverket.se Archived sea level observations are available here: https://www.smhi.se/klimatdata/oceanografi/ladda-ner-oceanografiska-observationer#param=sealevelrh2000.stations=all The Swedish Sea Level network delivers accurate sea level data in real-time and store data for further analysis. The first systematic Swedish observations of the sea level started 1774 in Stockholm. Since then additional stations have been established and the network has been modernized on several occasions. In 2017, SMA and SMHI decided to establish one Swedish Sea Level network, which consists of about 60 stations, all modernized with duplicated sensors and real-time access to data (every minute). All stations are connected to the land survey datum (Baltic Sea Chart Datum 2000), which is now used as the common reference level for sea level information and nautical charts in the Baltic Sea. The most of the stations are located in the Baltic Sea (no-tidal area). However, on the Swedish west-coast (North Sea), the tidal range is about 0,6 metres during spring tide conditions.
United Kingdom		Long-term (National Network) see	Full-Tide Bubbler http://www.ntsif.org/tgi/system1	Low flow of dry air fed down air tube to the top of the pressure point. Bubbles released when air pressure and water pressure are equal; air line is proportional to the weight of the water column. Sampling rate of 15 minute intervals.

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	http://www.ntsif.org/networks/uk-national-network	Half-Tide Bubbler http://www.ntsif.org/tgi/system2	Similar to above –single measuring nozzle mounted at mid-tide height allowing it to be accurately levelled into geodetic network. Sampling rate of 15 minute intervals.
		Direct Pressure Transducer http://www.ntsif.org/tgi/system3	Differential transducers contained in a watertight housing. The copper nozzle, transducer measuring port and connecting tube are filled with oil so the pressure is transmitted to the crystal element via the oil, thus keeping the transducer components free from the effects of the saltwater. Sampling rate of 15 minute intervals.
		Rosemount WaveRadar Rex wave/tide gauges (see http://www.channelcoast.org) Etrometa step gauge	Downward-looking microwave radar technique to measure distance to the sea surface. Sampling rate of 10 minute intervals. Contact sensor measuring the waterlevel and waves. Sampling rates are standard 2,56 Hz and can be adapted to above 10Hz, depending on the measuring range.
	Short-term (hydrography and shoreline mapping)	Valeport offshore 730 (now known as Valeport Midas WLR)	Precision Resonant Quartz transducer. Optional strain gauge transducer. The interior of the sensor is exposed directly to the water via a captive oil-filled tube.
		Valeport 740 TideMaster (1 & 2 bar)	Vented strain gauge (no stilling well), with stainless steel mounting bracket.
		VRS-20 Radar Level Sensor for the valeport 740	A pulsed k-band radar level sensor designed to work with the TideMaster or as a standalone system.
		Nortek Aquadopp Profiler	ADCP system allowing self-contained deployment in shallow (<100m) water deployments. Can be bottom mounted, on a buoy or mooring line. Surface to bottom velocity profiles over ranges 0.5 to 90m. Water level and current measurement.
		Valeport miniTIDE	Temperature compensated piezo-resistive pressure transducer.
		Aanderaa WLR7	High precision quartz pressure transducer housed in a pressure case. Measurement cycle is triggered by a high precision clock. Integration time of the pressure measurements eliminates pressure fluctuations due to waves.
United States	Long-term (National Network)	Aquatrak downward sound pulse – Sutron Xpert DCP	Sounding tube within 6-inch diameter protective well with parallel plates and 2-inch orifice
		Paroscientific pressure (vented) – Sutron Xpert DCP	Dual- air driven pressure bubbler orifices separated by 1 m vertically

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		Microwave Water Level Sensor, Design Analysis Waterlog® H-3612 and Nile® - Sutron Xpert DCP	Pulse mode, no stilling well, mounted above expected 100 year flood elevation
	Short-term (hydrography and shoreline mapping)	Aquatrak downward sound pulse – Sutron 8210 DCP	Sounding tube within 6-inch diameter protective well with parallel plates and 2-inch orifice
		Paroscientific pressure (vented) – Sutron 8210 DCP	Single orifice air-driven bubbler – usually installed with tide staff
		Microwave Water Level Sensor, Design Analysis Waterlog® H-3612 and Nile® - Sutron 8210 DCP	Pulse mode, no stilling well, mounted above expected high water for duration of deployment
	Currents	Teledyne RD Instruments: • Long Ranger (75 kHz) • Workhorse (300, 600 and 1200 kHz) Nortek: • Aquadopp 3d (600, 1000, &2000 kHz) • Aquadopp 2d (H) (600kHz) • Continental (H) (455 kHz) • AWAC (H) (400kHz) Sontek • SL ADP (H)(250 kHz)	Operated by NOAA-NOS- CO-OPS. Additional instruments may be used by other organizations within NOAA. Unless noted with an (H) instruments are used for vertical profiling.