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SEA-LEVEL OBSERVING ACTIVITIES IN ITALY

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ITALIAN SYSTEM FOR SEA LEVEL MEASUREMENTS

ISPRA is the Governmental Organization which manages the Italian System for Sea Level Measurements. This system includes two tide gauge networks:

1. The National Tide Gauge network (NTG) constituted by 33 stations located into the main ports of the Italian Peninsula and Islands;
2. The Venetian and Northern-Adriatic Tide Gauge Network (VNATG) constituted by 54 stations scattered within the lagoons of Venice and Marano-Grado and at the inlets of the main rivers along the North Adriatic coastline.

The National Tide Gauge Network (NTG)

Map of tide gauge network

The Italian National tide gauge network (RMN) is the leading network for sea level measurement in the Mediterranean. Italian Coasting development (7,375 km) , and its morphology determines the subdivision into two main semi-closed basins: the first one is the Western Mediterranean, bordered by the Strait of Sicily and characterized by large abyssal plains, the second one, the Eastern Mediterranean, much more rugged and dominated by the Mediterranean ridge system.



A list of gauge sites

<i>Gauge station</i>	<i>Lat.</i>	<i>Long.</i>
ANCONA	43° 37' 29.16"	13° 30' 23.46"
BARI	41° 08' 24.74"	16° 51' 57.72"
CAGLIARI	39° 12' 36.69"	9° 06' 51.38"
CARLOFORTE	39° 08' 52.69"	8° 18' 34.03"
CATANIA	37° 29' 53.09"	15° 05' 37.77"
CIVITAVECCHIA	42° 05' 38.25"	11° 47' 22.73"
CROTONE	39° 04' 60.89"	17° 08' 13.40"
GAETA	41° 12' 35.97"	13° 35' 23.05"
GENOVA	44° 24' 36.46"	8° 55' 31.86"
GINOSTRA	38° 47' 06.65"	15° 11' 26.76"
IMPERIA	43° 52' 42.02"	8° 01' 07.91"
ISOLE TREMITI	42° 07' 07.97"	15° 30' 05.64"
LA SPEZIA	44° 05' 47.79"	9° 51' 27.52"
LAMPEDUSA	35° 29' 59.38"	12° 36' 15.98"

LIVORNO	43° 32' 46.63"	10° 17' 57.62"
MARINA DI CAMPO	42° 44' 33.48"	10° 14' 18.00"
MESSINA	38° 11' 46.73"	15° 33' 48.65"
NAPOLI	40° 50' 29.06"	14° 16' 09.10"
ORTONA	42° 21' 21.24"	14° 24' 53.50"
OTRANTO	40° 08' 49.74"	18° 29' 49.52"
PALERMO	38° 07' 17.08"	13° 22' 16.79"
PALINURO	40° 01' 47.68"	15° 16' 31.05"
PONZA	40° 53' 42.64"	12° 57' 56.12"
PORTO EMPEDOCLE	37° 17' 08.72"	13° 31' 36.64"
PORTO TORRES	40° 50' 31.94"	8° 24' 14.09"
RAVENNA	44° 29' 31.38"	12° 16' 57.83"
REGGIO CALABRIA	38° 07' 18.19"	15° 38' 56.10"
SALERNO	40° 40' 35.91"	14° 45' 03.02"
SAN BENEDETTO DEL TRONTO	42° 57' 18.44"	13° 53' 23.13"
TARANTO	40° 28' 32.17"	17° 13' 25.55"
TRIESTE	45° 38' 57.81"	13° 45' 28.58"
VENEZIA	45° 25' 05.59"	12° 25' 35.50"
VIESTE	41° 53' 17.10"	16° 10' 37.24"

An overview of the gauge technology employed in the network

Each station is equipped with a level tool that gauges and records the tide level by radar. The sampling frequency is adjusted on data every 10 minutes. The gauging reliability in each station is ensured also by a shaft-encoder, recording digital form the locally measured tide curve.

All these stations are equipped with tools to gauge such meteorological parameters as atmospheric pressure, air temperature and humidity, wind direction and speed, water temperature; the stations of Trieste, Venice, Vieste, Otranto, Messina, Palinuro, Carloforte, Imperia and Livorno are also equipped with a multiparametric probe to measure the parameters of conductivity, temperature, pH and Redox thus constituting the first network of coastal water quality stations. The stations in Imperia, Marina di Campo, Carloforte, Ponza, Napoli, Porto Empedocle, Ginostra, Otranto, Isole Tremiti and Ancona intended to measure anomalous waves agree with the guidelines of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the Northeast Atlantic area , Mediterranean and connected seas (ICG / NEAMTWS) - Italian Regional Emergency Center - Ministry of Foreign Affairs MFA-DGDC. The Tide Network was projected for the detection and characterization of early tidal waves (tsunami), its propagation and characterization of exceptional breaking sea.

Web, email etc. addresses of data banks and of sources of further information

ISPRA dedicates itself wholeheartedly to real-time diffusion of its data, which takes place through the IOC sea level station monitoring facility (<http://www.ioc-sealevelmonitoring.org/list.php?order=delay&dir=asc&contact=28>), as well as to the general public through a dedicated web site ([http://www.isprambiente.it/site/it-IT/Servizi per l'Ambiente/Rete Mareografica Nazionale/](http://www.isprambiente.it/site/it-IT/Servizi_per_l'Ambiente/Rete_Mareografica_Nazionale/), currently using the mirror **Error! Hyperlink reference not valid.**).

On these web site you can access three distinct sections (tide gauge, anomalous waves and water quality) to facilitate consultation and downloading data, graphics and documents.

Following information and documents are available online:

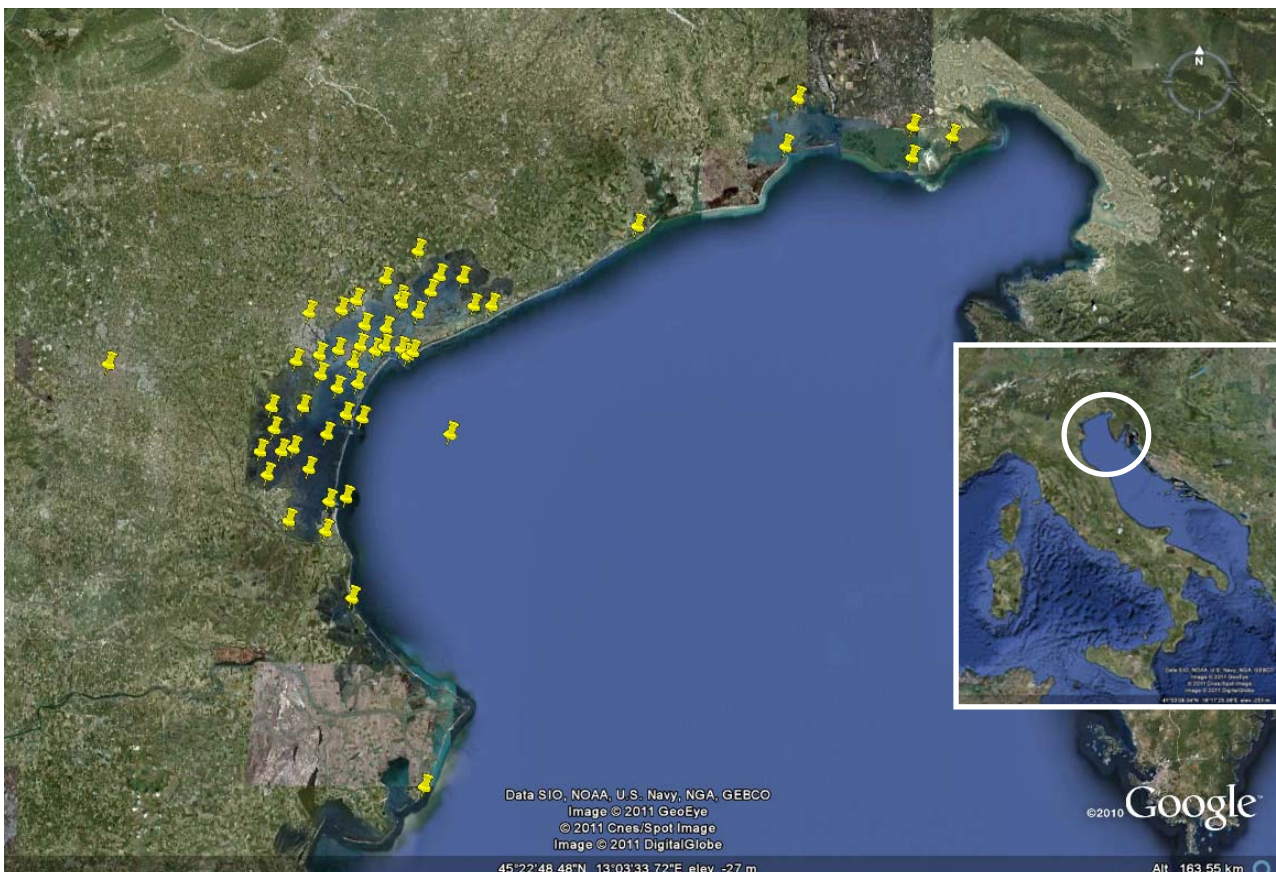
- 1) real time data;
- 2) historic data;
- 3) table with harmonics;
- 4) cards monographic station of the new precision leveling;
- 5) display the morphology of the tide gauge sites on the satellite map and through interactive photo gallery.

Data are updated hourly, whereas documentation is revised as changes occur.
For further information contact the mail address: retemareografica@isprambiente.it

The Venetian and Northern-Adriatic Tide Gauge Network (VNATG)

The VNATG is now constituted by a 54 Tidal Gauge system network distributed in the lagoon basin and along the North Adriatic coastline. Twenty-five of these stations are equipped for real time data transmission the processing centre of ISPRA –Venice Lagoon Service located in Venice . The 54 tide gauge stations, the data processing Centres and the Radio Relay Network constitute the Real Time Tidal Gauge System of the Lagoon of Venice. This system is a fundamental part of the weather and marine monitoring system of Italian Seas, controlled by ISPRA including the NTG mentioned and National Sea Waves Measuring Network. In addition, the ISPRA –Venice Lagoon Service has the capability to exchange data measured in real time between the networks of the Environmental Operating Centres of the North-Eastern Regions of Italy (Veneto, Friuli Venezia Giulia and Trentino-Alto Adige).

The Venetian and Northern-Adriatic Tide Gauge Map (VNATG Map)



List of tide gauge sites of the Venetian and Northern-Adriatic Tide Network

<i>Gauge station</i>	<i>Lat.</i>	<i>Long.</i>
BARENE DELLA GRISA	45,289783	12,189336
BOTTE TREZZE	45,197028	12,204603
BRONDOLO	45,183817	12,274506
BURANO	45,487503	12,415486
CAMPALTO	45,478733	12,300239
CANAL ANCORA	45,524314	12,485906
CAORLE	45,591628	12,861528
CASON FIGHERI	45,319144	12,175003
CAVALLINO CENTRO	45,484750	12,551336
CAVALLINO DARSENA	45,485542	12,585528
CHIOGGIA VIGO	45,223617	12,280433
COL VISENTIN	46,056236	12,281964
DIGA NORD MALAMOCCO	45,334450	12,341625
DIGA SUD CHIOGGIA	45,228547	12,312767
EX POVEGLIA	45,374556	12,293450
FARO ROCCHETTA	45,339217	12,311011
FOCE PO'	44,844939	12,464147
FUSINA	45,418400	12,259378
GRADO	45,683128	13,383439
BELVEDERE	45,724600	13,385703
GRASSABO'	45,521456	12,529878
LE SALINE	45,503656	12,469311
LIDO DIGA NORD	45,423083	12,436553
LIDO DIGA SUD	45,418108	12,426436
LIDO METEO	45,430150	12,382950
LIGNANO	45,697858	13,143267
MARANO LAGUNARE	45,762106	13,166847
MARGHERA	45,474208	12,239158
MEDA - BOCCA LIDO -	45,426744	12,414564
COLLEGIO MOROSINI	45,424694	12,365211
MOTTE DI VOLPEGO	45,391847	12,261831
MURANO	45,458225	12,344664
PADOVA METEO	45,402769	11,858542
PETTA DE BO'	45,266422	12,241781
PAGLIAGA	45,519222	12,383336
PIATTAFORMA (8)	45,314242	12,508314
PORTO CALERI	45,095244	12,325369
POVEGLIA	45,380672	12,332658
PRIMERO	45,711000	13,461031
PUNTA DELLA SALUTE	45,430692	12,336658
SACCA SESSOLA	45,407500	12,323350
SAN GIORGIO IN ALGA	45,425169	12,294947
SAN NICOLO'	45,430892	12,382597
SANT' ERASMO	45,454033	12,385572
SETTEMORTI	45,293753	12,212408
TAGLIATA VECCHIA	45,409858	12,215350
TESSERA	45,491233	12,328531
TORCELLO	45,495689	12,411822
TORSON DI SOTTO	45,348583	12,229525
TREPALADE	45,557317	12,444950

TREPORTI	45,474172	12,445842
VAL GRANDE	45,312583	12,275081
VALLE AVERTO	45,348347	12,169931
VALLE FOGOLANA	45,257869	12,163067
VALLE MOROSINA	45,288944	12,148975

Gauge technology employed in The Venetian and Northern-Adriatic Tide Gauge Network (VNATG)

Each of these stations is equipped with a floating tool that gauges and records the tide level electronically. The sampling frequency is adjusted on data every 10 minutes. The gauging reliability in each station is ensured by a second, also floating, mechanic and electronic tools, recording on a paper diagram and digital form the locally measured tide curve.

A limited number of these stations, according to their location, are also equipped with tools to gauge such meteorological parameters as atmospheric pressure, rain, wind direction/speed within the Venice lagoon, as well as wind direction and speed along the Northern Adriatic coastline.

GPS technology in the Venetian and Northern-Adriatic Tide Gauge Network (VNATG)

Punta della Salute tide gauge station has been equipped with a co-located suitable GPS. GPS data have elaborated by the University of Bologna in order to detect the effect of land subsidence in the sea level measurements. Moreover, two new co-located GPS devices have been installed at the tide gauge stations of Venezia - Lido Diga Sud and Grado along the North Adriatic coastline.

Data availability in particular from the GLOSS Core Network stations

The ISPRA – Venice Lagoon Service has the capability to exchange data measured in real time between the networks of the National Civil Protection and the Environmental Operating Centres of the North –Eastern Regions (Veneto, Friuli Venezia Giulia and Trentino Alto Adige).

The time series data are available in digital form (on-line) since 1989; in particular, Venezia – Punta della Salute time series data of mean sea levels is available in digital form since 1924 (www.ispravenezia.it).

Addresses, Web, and further information

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Other Italian Governmental Organizations managing tide data

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Trieste Molo Sartorio tide gauge is owned by the Italian National Research Council and is operated by the Trieste laboratory of the Institute for Marine Sciences. It is located at 45°38'50.1"N latitude, 13°45'34.1"E longitude. The station was established in October 1859 on Molo (pier) Sartorio about 20 m from present position, to which it was moved in 1926. In 2009 the station was included in the GLOSS Core Network (No. 340).

Four float tide gauges are active, namely two analog instruments manufactured by Ott (1961) and Pagan (about 1970) and two digital Ott Thalimedes instruments (2000-2004) with near-real-time data transmission. An tide gauge manufactured by Fuess in 1911 is no longer in operation.

The tide gauge zero is 3.993 m below the local benchmark, located within the cabin, whose height is quoted relative to the national geodetic network managed by Istituto Geografico Militare.

A GPS antenna is located on top of the building hosting the tide gauge. It is owned and operated by the University of Bologna.

Monthly and annual sea level means are provided to the PSMSL every year; Delayed Mode hourly data are provided to GLOSS every month since June 2009.

Data are also provided in near-real-time to regional Civil Protection Agency. The latest 48-hour sea-level diagram is displayed at www.ts.ismar.cnr.it/node/15.

The archive includes monthly and annual means since 1875 (with gaps), hourly values since 1905 (with gaps) and 1/minute data since 2001.

Information on the tide gauge is also available at www.ts.ismar.cnr.it together with astronomic tide predictions.

Other Regional Organizations exchanging tide data with ISPRA Networks

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