



**International Hydrographic Organization (IHO)**  
**1<sup>st</sup> meeting on Tides, Water Level & Currents Working Group (TWCWG1)**  
25 - 29 April 2016, Niterói, Rio de Janeiro, Brazil.

## **NATIONAL REPORT – ITALY**

The Italian Hydrographic Institute of the Navy reports on its structure and gives a general overview on the oceanographic network in Italy. The available infrastructures and platforms, the current work undertaken by the National Tidal network, the possible development of a HF RADAR network (surface current/waves remote sensing), including the revitalization of oceanographic activity and studies are described.

### **1. Hydrographic Office/Service**

#### **1.1 Italian Hydrographic Institute of the Navy (Istituto Idrografico della Marina – IIM)**

The IIM has its headquarters in Genoa.

The IIM depends directly on the Chief of Staff of the Italian Navy (see Annex A). The direct link with the Chief of Staff is through a new Department in Rome (Hydrographic and Oceanographic Office) governed by the Director of IIM.

The new national Hydrographer – Captain Luigi Sinapi – was appointed Director of the IIM on 18<sup>th</sup> October 2015.

<http://www.marina.difesa.it/conosciamoci/organizzazione/comandienti/scientifici/idrografico/Pagine/direttore.aspx>

#### **1.2 IIM Structure**

A new organization is being implemented in the first semester of 2016 in order to face the demanding duties connected with National and International Obligations (Annex B).

The main changes in the structure are related to:

- **A new Oceanographic Center & Geophysics Study Department**
- **A new Nautical Documentation Production Section (database oriented)**
- A new Editorial and Distribution Department
- A new Logistics Department
- A new External Relations and Marketing Department

### **2. Oceanographic and Geophysics activities**

#### **2.1 General**

The IIM has always played an active role in the study and in the protection of the sea, from a scientific, technological and environmental point of view, through projects carried out with universities and research centers in Italy and abroad.

#### **2.2 Operational Oceanography and Geophysics Studies/Committee**

For the Oceanographic products and forecast, the IIM cooperates with national Research Centers, Universities and Institutions; in particular, until 2014 the IIM was involved in the National Group for Operational Oceanography (GNOO), using “Mediterranean Forecasting System” (MFS) and MyOcean data. The GNOO was a group composed by several military and civilian entities and institutes operating within the Italian METOC context.

The IIM carried out scientific surveys and studies on oceanography, geophysics, and marine environment (e.g. the ‘MREA’ research survey in Sept.-Oct. 2014 in the Gulf of Taranto) in cooperation with other National research Centers such as the National Institute of Geophysics and Volcanology (INGV), the National Council of Research (CNR), the National Research Agency for New Technologies and Environment (ENEA) and the University of Bologna.

The IIM is also a member of the Italian Oceanographic Commission (*Commissione Oceanografica Italiana* – COI).

### 2.3 Platforms/Vessels

Oceanographic and geophysics surveys are carried out from the ITN HSV MAGNAGHI and two coastal hydrographic vessels of the NINFE Class (ITN CRV ARETUSA and GALATEA), fitted with oceanographic data collection equipment, such as CTD, XBT, Sub Bottom Profiler, Rosette system, single beam echo-sounder, multi beam echosounder, current meters, Side Scan Sonar, ADCP, Sea Bottom Sampler, magnetometer.

#### Hydrographic Survey Vessel (HSV) MAGNAGHI

The HSV MAGNAGHI is the first survey vessel designed and built completely in Italy for the Italian Navy. Delivered to the Italian Navy in 1975, the *Magnaghi* has been in service for almost 40 years. It has been regularly modernized and constantly upgraded. It is fitted with single-beam echo sounders, 33 and 210 KHz, and 12, 38 and 200 KHz, multi-beam echo sounder (50 KHz), two side scan sonars (hull-mounted and towed), differential and RTK satellite positioning systems, geodimeter, portable tide gauge, XBT bathythermograph, CTD profiler with rosette system used for water sampling at different depths, one ROV with closed circuit TV system, one gravity corer, current meters, Van Veen grabs and a weather station. The ship is equipped with suitable digital data logging and processing systems interfaced with oceanographic and hydrographic sensors.

More information available here:

<http://www.marina.difesa.it/EN/thefleet/ships/Pagine/magnaghi.aspx>

#### Coastal Research Vessels NINFE Class (CRV ARETUSA and CRV GALATEA)

These catamarans, totally built in Fiber Reinforced Plastic (FRP), are specifically designed to perform hydro-oceanographic activities.

The main activities are:

- Sea depth measuring by means of state of the art echo-sounders;
- Detecting of wrecks and other features dangerous for navigation;
- Geodetic and Topographic surveys of harbors and coasts;
- Minimum depth;
- Data collecting - tides, sea current, oceanographic and seawater parameters;
- Collecting of data and information to update the sailing directions.

The data gathered are checked and validated through the use of dedicated SWs. The results are then processed by the IIM for the production of:

- Paper charts and ENCs
- Military Cartography
- Nautical, technical and scientific publications useful to navigators.

More information available here:

<http://www.marina.difesa.it/EN/thefleet/ships>

#### CRV LEONARDO

Since 2010 the CRV LEONARDO has been manned by Italian Navy crews, under Italian Navy flag. It is a multipurpose unit of the Coastal Research Vessel (CRV) type designed for environmental and acoustic research.

The CRV LEONARDO is available for charter by eligible organizations within the NATO nations and is used by the NATO Centre for Maritime Research and Experimentation (CMRE) in La Spezia.

The ship is equipped with wet and dry laboratories, diving facilities and an impressive suite of deck handling cranes, winches and one A-frame, providing the necessary facilities required for shallow seas scientific research operations. Thanks to its moon pool for quick deployment of research equipment, HiPap 500 acoustics tracking and location device linked to the vessel's DP system, Kinematic GPS, the CRV LEONARDO provides a near perfect AUV/ROV surface tracking platform.

More information available here:

<http://www.cmre.nato.int/research/research-vessels/crv-leonardo>

<http://www.marina.difesa.it/EN/thefleet/ships/Pagine/leonardo.aspx>

## 2.4 METOC Support

The IIM provides meteo-oceanographic support to the Italian Navy through a METOC service, carried out by Geophysics Division.

The Military Oceanographic Section manages an operation-support service and includes a Study and Data Management sub-section.

It can organize an Operational Unit for direct support to Naval Operations. Italy was Lead Nation for NATO IMetoc support to NRF in 2013 and 2014 providing oceanographic (OC) support in cooperation with CNMCA, the Italian Air Force Meteorological and Climate Centre.

The IIM can provide high resolution sea-state information in shallow waters using the SWAN mathematical model, and current circulation information and products in specific areas using the DHI Mike3 mathematical model, for specific study or forecast purposes.

## 2.5 Involvement in National/International Oceanographic Committees

Italy is one of the founding members of UNESCO's Intergovernmental Oceanographic Commission (IOC), created in 1960 to promote international cooperation and coordinate programs in research, sustainable development, protection of marine environment, capacity building.

The IIM is a member of the Italian Oceanographic Commission (*Commissione Oceanografica Italiana* – COI), as established by the President of the National Research Council (*Consiglio Nazionale delle Ricerche* – CNR). COI is based in Rome and has the following tasks:

- represent the Italian oceanographic community at the IOC
- act as the National Coordination Body for the IOC;
- provide guidelines and proposals for effective Italian participation in IOC activities;
- make proposals on the organization of the Italian participation in the IOC (General Assembly, Executive Council and Committees / subsidiary bodies);
- provide the necessary support to the National Research Council on issues concerning international initiatives and activities promoted by IOC;

Inside the COI there are a number of informal WGs related to specific oceanographic fields where IIM personnel (scientists, professors, hydrographers) are involved.

More information available here:

<http://titano.sede.enea.it/Stampa/skin2col.php?page=eneaperdettagliofigli&id=143>

<http://www.dta.cnr.it/index.php/it/attivita/organismi-nazionali/coi#organizzazione>

## 2.6 Italian Tide gauge network (IIM/ISPRA – Annex C)

The Italian Tide Gauge Network is the most important sea level measurement network in the Mediterranean Sea due to the fact that Italy has more than 7800 km of coastline and splits the Mediterranean Sea into two parts:

- the Western basin;
- the Eastern basin.

### 2.6.1 The IIM Tide Gauge Network

The IIM contributes to the Italian Tide Gauge Network sharing sea level data from 4 Tide Gauge Stations.

The IIM operates two long-time-period tide stations (Genoa and Brindisi), provided with a state of the art radar and a digital gauges and two more recent tide gauge stations (Gioia Tauro and Augusta). All are connected through GSM network to the IIM data center. This data center provides to store, verify and validate the various sets of data before moving to the various post processing options (Definitions of average annual and monthly, redefinition or calculation of new harmonic).

The Tide gauge station located in Genoa is among the oldest in the Mediterranean, collecting sea level data since 1884 (IIM 3174 Publication – *Il Mareografo fondamentale di Genova "Analisi delle variazioni del livello del mare dal 1884 al 2006"*). In 1956 the Italian Geodetic Commission, using a range of 10 years of measurements (1937-1946) established the average level of the sea in Genoa as the reference point for the *conventional* Mean Sea Level (MSL) of the Italian Height Leveling Network.

The IIM ensures the annual production and distribution of the periodical publication "Tide Tables" (I.I. 3133), in order to disseminate tidal prediction to mariners for the safety of navigation purposes. The data recorded at the tidal stations are exchanged with HOs and National Research Center/Institutes. The IIM is planning a future integration of its tidegauge stations in the ISPRA Tidegauge network in order to give accessibility to the tidal data from the ISPRA web portal and EuroGOOS/EMODNET portal.

### 2.6.2 Institute for Environmental Protection and Research (Istituto Superiore per la Protezione e Ricerca Ambientale – ISPRA)

The Italian National Tidegauge Network (RMN – *Rete Mareografica Nazionale*) continuously monitors the sea level and a number of related meteorological and physical parameters.

RMN includes 36 coastal stations. It is the one of the most important networks for sea level measurement in the Mediterranean, collecting real time series of sea level and meteorological parameters every 1 minute. It integrates the National meteorological system. Data gathered are used for determining tides and seiches and can support the identification and characterization of early tidal waves (tsunami) and of storm tides. Some stations also provide data used for the qualitative characterization of environmentally sensitive marine areas.

More information available here:

<http://www.mareografico.it/?syslng=ing>

<http://eurogoos.eu/member-product/italian-national-tide-gauge-network-rmn/>

<http://www.mongoos.eu/in-situ-and-forecasts>

### 2.6.3 ISPRA – VENICE LAGOON SERVICE

ISPRA manages a Real Time tidal gauge network in the lagoon and along the north-western Adriatic coast. The Venice Lagoon Service's activities deal with to the following issues: collecting, processing and dissemination of tidal data, daily tidal forecasting service and forecasting and warning for

exceptional or atypical high tides (storm surges) and promotion of activity in the research field related to the lagoon.

The Venice Lagoon Service manages a network of 52 tide gauge stations equipped for the systematic measurement of water level and other related parameters, such as wind direction, wind speed, atmospheric pressure, precipitation, and wave-height in the Lagoon of Venice and in the north-western Adriatic coast.

The most tide gauge stations have been operating for several decades. The Venice Lagoon Service manages time series of tide data covering more than 120 years. Each of these stations is equipped with modern tools that gauges and records the tide level electronically according to the protocols set by international scientific organization (WMO – IOC).

Correct functioning of this system is fundamental for warning and predicting of exceptional or atypical high tides (storm surges) and the management of the hydraulic system.

Tide gauge station of *Punta della Salute* is also equipped with a co-located suitable GPS in order to detect the continuous vertical shifts of the local Zero Tide Level which is the reference benchmark for tide measurements in the lagoon.

More information available here:

<http://www.venezia.isprambiente.it/home>

<http://eurogoos.eu/member-product/venice-lagoon-and-north-adriatic-tide-gauge-network-rmlv/>

## **2.7 National HF RADAR networks**

### **2.7.1 MOONGOOS Service**

The Mediterranean Operational Network for the Global Ocean Observing System (MONGOOS) has been established in 2012 to further develop operational oceanography in the Mediterranean Sea. MONGOOS comprises the previous activities of MOON and MEDGOOS.

A service of High Frequency (HF) radar systems measure the speed and direction of ocean surface currents in near real time. This technology is based on the emission of electromagnetic waves and the study of the echo after reflection by the sea surface. The velocity of the surface current can be derived from the change in frequency between the emitted and reflected signal. This is a result of the Doppler effect, which is the apparent change in frequency of a wave produced by the movement of the source with respect to the observer.

These radars can measure currents over a large region of the coastal ocean, from a few kilometers offshore up to 200 km, and can operate under any weather conditions. They are located near the water's edge, and need not be situated atop a high point of land.

The map in ANNEX E shows the HF Radar Systems that are or have been in operation in the Mediterranean Sea:

<http://www.mongoos.eu/hf-radars>

### **2.7.2 CALYPSO Project**

CALYPSO is a 2-year project partly financed by the EU under the Operational Programme Italia-Malta 2007-2013, and co-ordinated by University of Malta with other partners from Malta (Transport Malta, Civil Protection Department and Armed Forces) and 4 Italian partners (ARPA Sicilia, IAMC-CNR Capo Granitola, Universities of Palermo (UNIPA) and Catania (CUTGANNA)). The consortium consists of research entities and also public entities with responsibilities for civil and environmental protection, surveillance, security and response to hazards.

The main project deliverable is the setting up of a permanent and fully operational HF radar observing system, capable of recording (in real-time with hourly updates) surface currents in the Malta Channel. The system consists of HF radar installations on the northern Malta and southern Sicilian shores at selected sites and combines stations to elaborate and publish data to users (see ANNEX E).

<http://oceanica.research.um.edu.mt/cms/calypsoweb/index.php?lang=en>

<http://www.mongoos.eu/-/calypso-real-time-viewing-of-sea-surface-currents-in-the-malta-channel>

### 2.7.3 SICOMAR Project (Sistema di Controllo MARino)

The SICOMAR project (CONTROL SYSTEM Marino) is funded under the cross-border cooperation program Italy - France "Maritime". The project intends to address in an integrated manner the issue of safety at sea and the marine environment monitoring, an area from cross-border heritage of extraordinary richness *hosting the Cetacean Sanctuary* which has seen, even in very recent times, the emergence of major environmental problems.

The HF radar sub-net with two Sea-Sonde antennas 13.5 MHz was installed in January 2015 in Livorno (Italian Naval Academy) and in San Vincenzo (Harbor building) – see ANNEX E. The system acquired in the framework of the SICOMAR project (cross-border Italy-France program) to support safety at sea and marine monitoring, managed by LaMMA Consortium (CNR-Regione Toscana and Italian Navy). The monitoring system includes a fully equipped Wave Glider, two Ferryboxes (on the ship routes Livorno-Bastia-Toulon and Livorno-Cagliari), integrated with an existing network of buoys and X-band wave radars, and HR predictive models.

Future expansion: towards the Corsica channel, the Southern Tuscan Archipelago (North Tyrrhenian) and the Ligurian Sea/Gulf of La Spezia (in collaboration with CNR-ISMAR and IIM).

<http://www.lamma.rete.toscana.it/progetti/sicomar>

### 2.7.4 Gulf of Manfredonia HF Radar Network in (2013-2015)

The Institute of Marine Sciences (ISMAR) of the National Research Council of Italy (CNR) established a High Frequency (HF) Coastal Radar Network for the measurement of the velocity of surface currents in coastal seas. The network consists of four HF radar systems located on the coast of the Gargano Promontory (Southern Adriatic, Italy).

The network has been operational since May 2013 until June 2015 and covers an area of approximately 1700 square kilometers in the Gulf of Manfredonia. Quality Assessment (QA) procedures are applied for the systems deployment and maintenance and Quality Control (QC) procedures are performed on the data generation pipeline.

The network provides hourly sea surface velocity data in realtime mode that are published for visualization and access. In order to produce data in interoperable formats, according to the standards of Open Geospatial Consortium (OGC) for the access and delivery of geospatial data, a netCDF architecture has been defined on the basis of the Radiowave Operators Working Group (ROWG) recommendations and compliant to the Climate and Forecast (CF) Metadata Conventions CF-1.6.

HF radar data have been validated by comparison with *surface currents* velocities measured by drifters deployed within the radar coverage. The data produced by the ISMAR HF radar network are presently used in a number of applications, ranging from oil spill and SAR to fishery and coastal management applications.

<http://radarhf.ismar.cnr.it/>

<http://ieeexplore.ieee.org/xpl/abstractAuthors.jsp?reload=true&arnumber=7271524>



## 2.7.5 CNR-ISMAR RITMARE Project

### SP5-WP2 - Observational systems based on remote sensing data

The RITMARE Remote Sensing Observing System is strengthening and extending the capabilities of the Mediterranean satellite observing system to meet the new challenges in the field of physical, biogeochemical and biological marine sciences. Starting from pre-existing systems, the SP5-WP2 Partners (among which IIM) wide signed and developed an Integrated Remote Sensing Observing System able to provide access to the space and non-space remote sensing data and products.

An Italian integrated coastal radar system wish to be implemented by networking all the national systems, with the ambitions of integration HF and (see **ANNEX F**). The coastal radar Action aims at creating a network of coastal radars (HF and X band), able to provide real time information on ocean currents and sea state. The network fosters a number of activities:

- a. collaboration between participants and exchange of scientific experiences/applications;
- b. exchange of information on presently adopted QA/QC procedures with the goal of establishing common standards and common practices;
- c. setting, testing and implementation of interoperability protocols.

The coastal radar system covers a number of key regions. In some of the sites, information from radar data will be merged with other environmental data obtained from satellite measurements at high and very high resolution.

The action includes also the development of hard-software technology able to employ the traditional X-band radar, used for instance in ferry boats, as tools able to retrieve sea state parameters and to estimate surface currents.

Leader project: CNR

Participants: IIM, CNR IAMC, CNR IREA, CNR ISMAR, DIST Univ. Parthenope, OGS  
[http://www.emodnet-physics.eu/hfradar/docs/confirmed/3.%20RITMARE\\_eurogoos.pdf](http://www.emodnet-physics.eu/hfradar/docs/confirmed/3.%20RITMARE_eurogoos.pdf)

The RITMARE Remote Sensing portal (<http://ritmare.artov.isac.cnr.it/thredds/catalog.html>), interfaced with the RITMARE web portal (SP7), provides access to near real time and long time series of satellite and coastal radar data. Presently includes: SST, OC, wind data produced by CNR ISAC; HF radar data produced by CNR-ISMAR and University of Parthenope at the website: [http://ritmare.artov.isac.cnr.it/thredds/ritmare/CoastalRadarOS/RADAR\\_HF/catalog.html](http://ritmare.artov.isac.cnr.it/thredds/ritmare/CoastalRadarOS/RADAR_HF/catalog.html)

## 2.8 New platform/equipment

### NRV ALLIANCE

The larger of CMRE's ships is now operated by an Italian military crew under an Italian Navy Flag. On 9 April 2016, at the Italian Naval Base in La Spezia (Italy), the Raising of the Italian Flag Ceremony was held in the presence of Italian and NATO civilian and military authorities, including Vice Admiral Ignacio J. Horcada Rubio, SACT Representative in Europe, Vice Admiral Filippo Maria Foffi, Commander in Chief of the Italian Naval Fleet, Major General Albert Husniaux, NATO STO (Science and Technology Organization) Chief Scientist, and Rear Admiral (Ret.) Hank Ort, STO CMRE Director.

The NATO Research Vessel Alliance is one of the only two NATO-owned research vessels, supporting the STO (Science and Technology Organization) CMRE (Centre for Maritime Research and Experimentation), based in La Spezia (Italy), to *fulfill* its mission for the common benefit of all NATO member nations.

On 1 January 2016, the custody of NRV Alliance transitioned from the Supreme Allied Command Transformation (the NATO Command in Norfolk, USA) to CMRE, as part of the STO creation and

NATO and CMRE reform process started in 2012. As a consequence of the transition, the previous flagging agreement with Germany ceased on 31 December 2015 and Italy offered to take over the ship.

Thanks to NRV Alliance and CRV Leonardo, CMRE is the only NATO entity that can work through the entire maritime technology development process, from concept to prototype testing at sea.

NRV ALLIANCE, when not engaged in NATO research, is available for charter to NATO nations and international organizations with NATO nation membership. Throughout its operational service, NRV ALLIANCE has been maintained at a high standard of quality, service, and distinction. This premium underwater acoustic and oceanographic research platform is capable of providing any type of vessel chartering need. While specialized, the research ship has been used for all types of ocean charters. NRV ALLIANCE charter clients may include military, government, or defense related organizations within the NATO nations. If individual vessel requirements are needed, advising services are available to help with local contractors in the La Spezia area.

Previous charters have included ocean archaeology, historical and environmental investigation, and marine mammal research.

More information available on following websites:

<http://www.cmre.nato.int/news-room/blog-news-archive/42-rokstories/348-new-flag-for-the-nato-research-vessel-alliance>

## 2.9 New publications & updates

Since the 7<sup>th</sup> Tidal and Water Level Working Group Meeting the following Publications have been produced and are available on paper

Number	Title	Edition
I.I. 3132	EFFEMERIDI NAUTICHE 2016	2015
I.I. 3133	TAVOLE DI MAREA 2016	2015

The Publications are updated via the NtM (*Fascicolo Avvisi ai Naviganti*) booklet which can also be downloaded free of charge from the IIM section in the Italian Navy Official Website.

## 3. Specialization Courses and Capacity Building

### 3.1 Courses Offered of and/or demanding for Capacity Building

For military personnel applications must be submitted to the Italian Ministry of Defense.

### 3.2 Training received, needed, offered

#### 3.2.1 Hydrographic/Cartographic field

Presently, IIM offers training courses for hydrographers:

- Hydrographic Surveyor FIG/IHO/ICA Category A – University Master Course in Marine Geomatics open to military and civilian personnel;
- Hydrographic Surveyor FIG/IHO/ICA Category B – for Officers, Petty officers;
- short modular course/on job training in Hydrography for Officers, Petty officers from foreign Countries.

The Hydrographic Surveyor courses are held in English and recognized by the International Board of Standard of Competence (IBSC), to give students from all over the world the opportunity to train at IIM and to make Italian students more language proficient.



The Italian Academy Foundation of the Italian Merchant Marine Academy (<http://www.accademiamarinamercantile.it/home/>), in collaboration with its international section IMSSEA (International Maritime Safety Security Environment Academy), a training agency IMO, is pleased on developing the next year a bilateral agreement for a new IHO Category B course, as a proposal received from IIM and as an offer not only for military people but also for national and foreigners civilian students, pursuing EU financing for Capacity Building.

### 3.2.2 Oceanographic/Geophysics field

In order to feed in the next years the initial organic of the newly formed oceanographic and geophysics component at IIM, the Italian navy has been identified one vessel Officer for the frequency of Master of Science in marine in Marine Science in core areas of Oceanography.

This course shall be performed at the Post Graduate School of the US NAVY of Monterey (CA – USA), from November 2016 and will take for a period of about 24 months and preparatory achievement of expertise in oceanography.

In addition, in 2017, a Master of Science in Oceanography open to civilian as well as to military students (national/international) will be organized by the University of Bologna (UNIBO), in collaboration with IIM. IIM is also pursuing to open a similar offer (Master of Science in Oceanography) at the end of 2017.

### 3.3 Status of national, bilateral, multilateral or regional Development projects with hydrographic component (In progress, planned, under evaluation or study)

Hydrographic/Cartographic cooperation/data exchange/agreements in force:

#### TUNISIA:

The Italian Hydrographic Institute and the Tunisian Hydrographic Office are coproducing two INT charts of the Strait of Sicily; Hydrographic Expert meetings were held in Genoa/Italy (2013/2015) and Bizerte/Tunisia (2014) to discuss cooperation in hydrographic survey/chart production.

#### LIBYA:

As per the agreement signed by the Libyan Navy and the Italian Navy, a number of hydrographic surveys were carried out in 2005 and 2007 and the cooperation for the chart of the Tripoli Harbour went on until 2010. The works will continue ~~resumed~~ as soon as ~~after~~ the political situation in Libya is become stable. Hydrographers from both countries met in Rome in June 2013.

#### LEBANON:

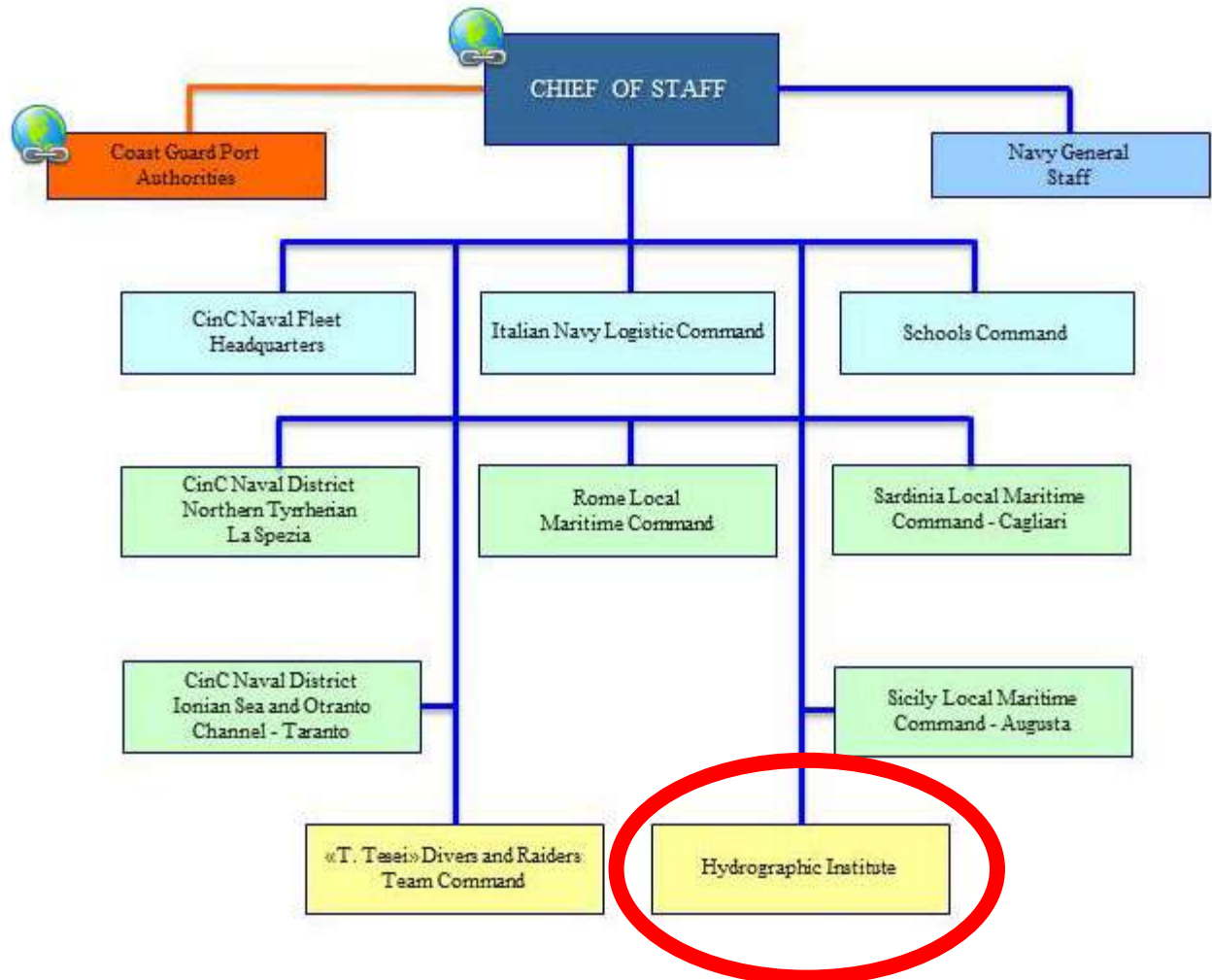
Different meetings were held in Beirut in 2014/2015 with a delegation from the Italian Navy and some Hydrographic Experts. The idea is to create a Lebanese Hydrographic Service, managed by the Lebanese Navy, with the help of several cooperating Navies (UK, France, Italy, Turkey, etc.).

Italian contribution:

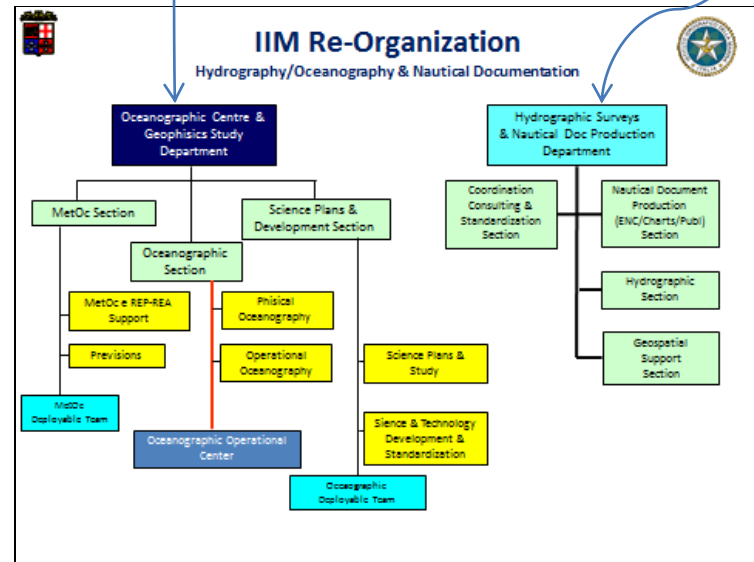
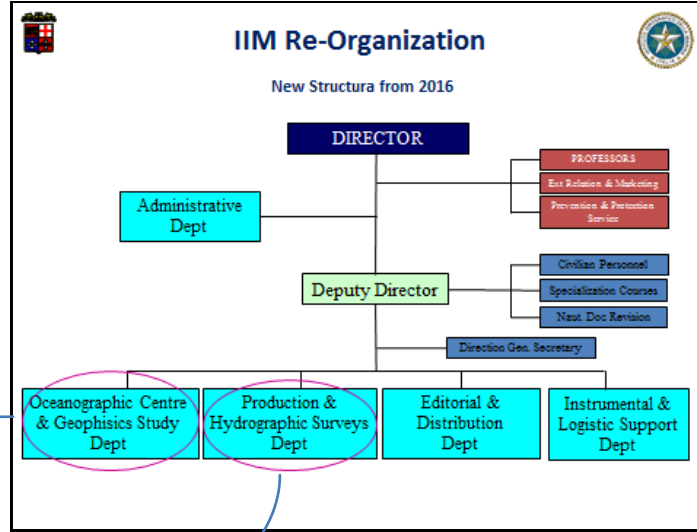
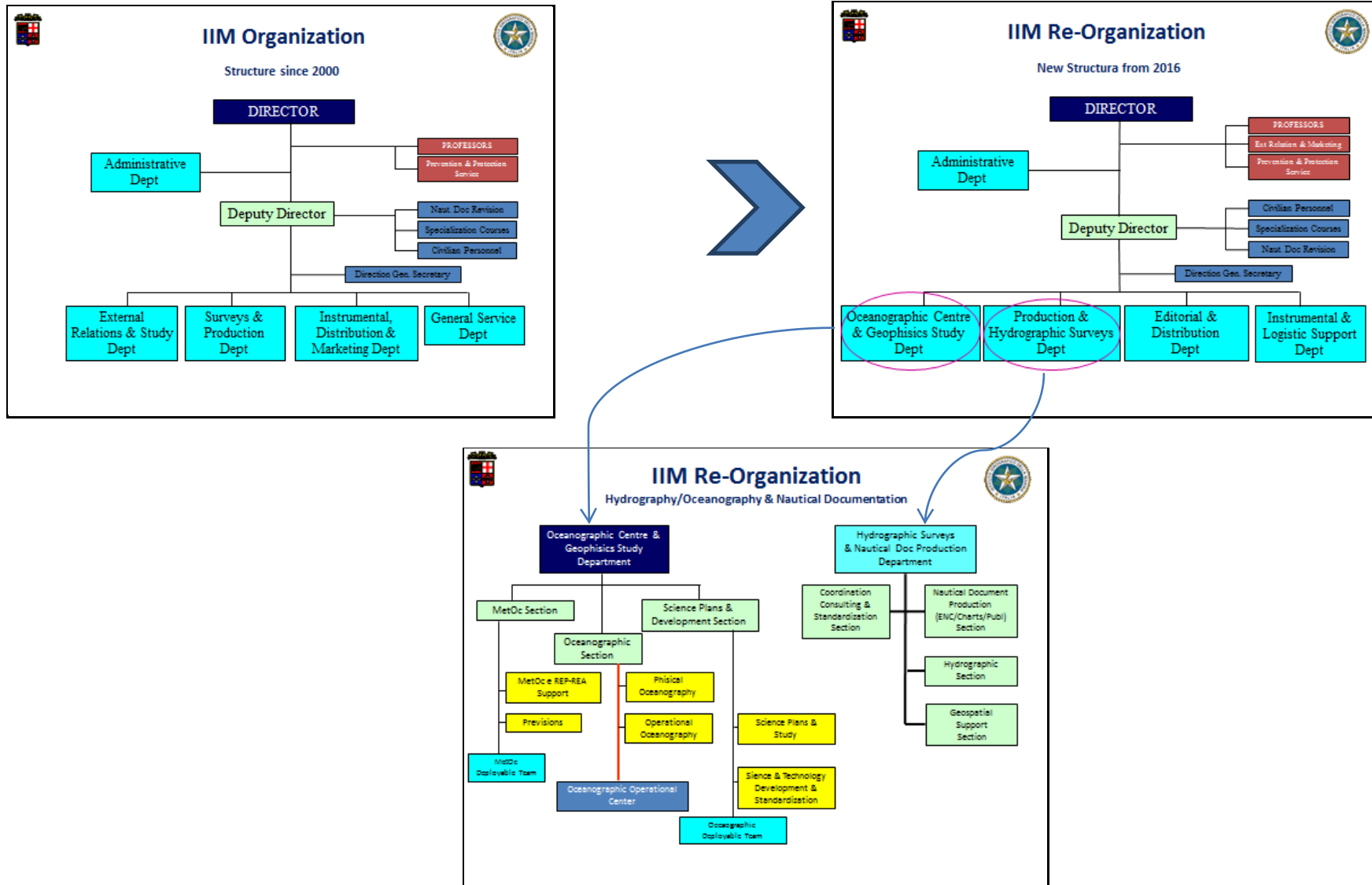
- Course in Hydrography FIG/IHO/ICA Category A (2014/2015): 1 Lebanese Navy Officer;
- Course in Hydrography FIG/IHO/ICA Category B (2014/2015): 1 Lebanese Navy Officer;
- Course in Hydrography FIG/IHO/ICA Category B (2015/2016): 1 Lebanese Navy Officer and 1 Petty Officer;
- One hydrographic Survey Boat fitted with modern equipment for harbour survey should be delivered in 2<sup>nd</sup> semester of 2016 to the Lebanese Navy;
- Developing an administrative arrangement in the field of hydrography and nautical cartography as suggested IHB in the IHO M2 Publication;  
[https://www.iho.int/iho\\_pubs/IHO\\_Download.htm](https://www.iho.int/iho_pubs/IHO_Download.htm)

- ability to provide hydrographic activity in Lebanon (Port of Beirut) with HSV MAGNAGHI in 2016;
- ability to provide advice to establish a new Lebanon tide gauge network, and also to monitor and to restore the local height network leveling and the geodetic reference frame network.

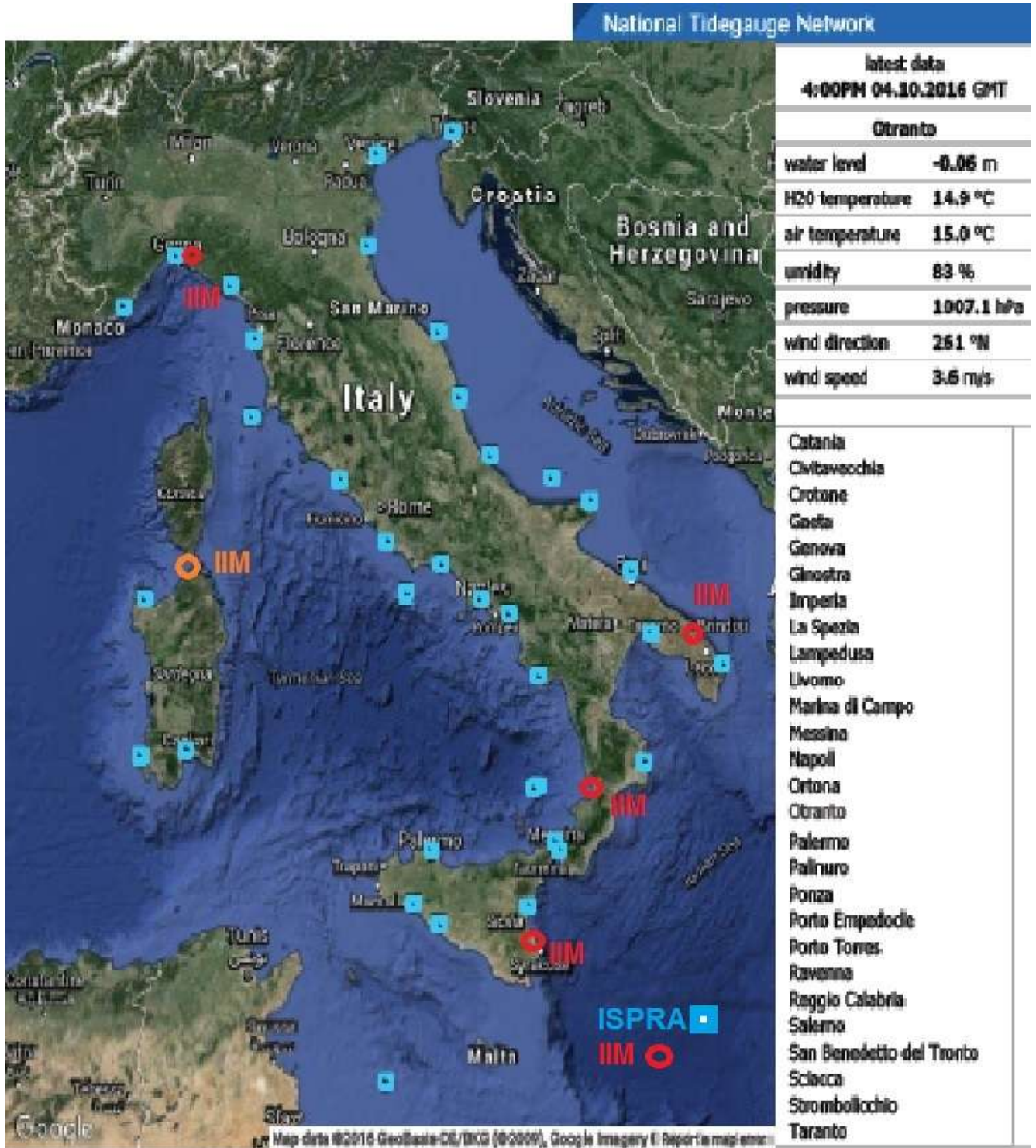
## Organization Chart of the Italian Navy



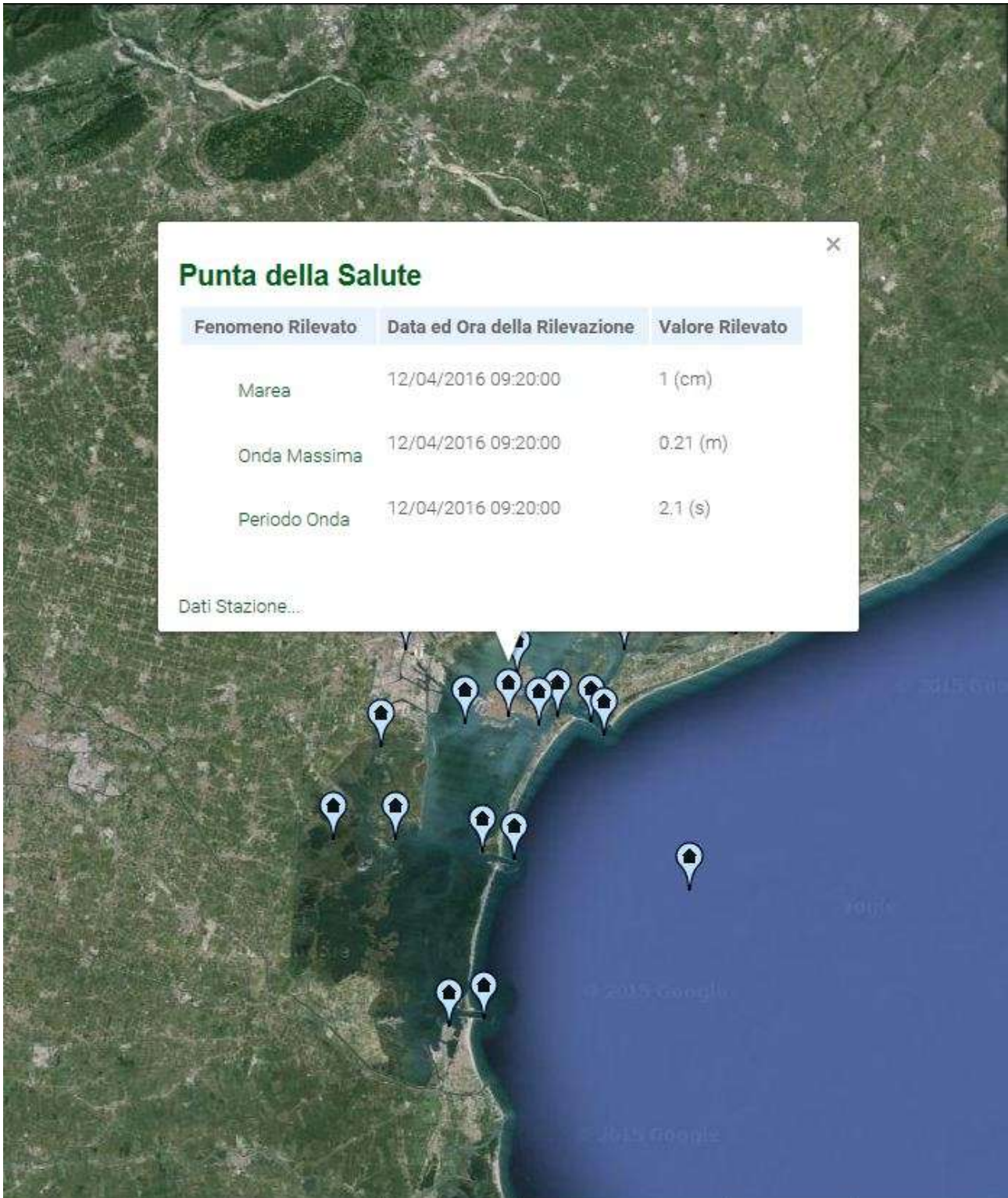
# Organization Chart of the Italian Navy Hydrographic Institute (IIM)



NATIONAL TIDEGAUGE NETWORK  
(IIM & ISPRA)





**VENICE LAGOON TIDEGAUGE NETWORK  
(ISPRA)**



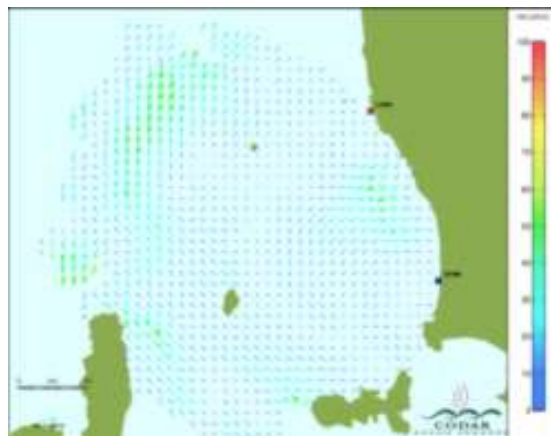
**MONGOOS SERVICE  
KNOWN HF RADAR NETWORK in MEDITERRANEAN REGION**



**SUB NET CALYPSO (SICILY)**



**SUB NET SICOMAR (TUSCANY)**



**SUB NET ISMAR CNR (PUGLIA)**



Development of National HF RADAR Network in Italian Region

