WP 5
Marine Domain

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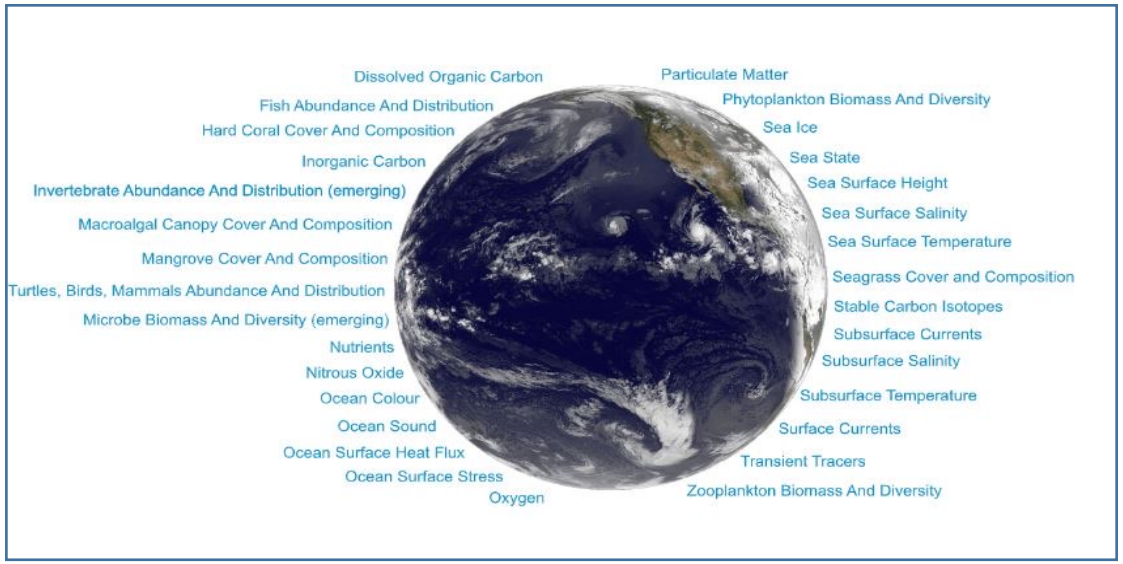
ITINERIS
Italian Integrated Environmental Research Infrastructures System

WP5: Marine Domain – International Context

Global Ocean Observing System

Observing the ocean is essential to quantify the changes that have occurred in the recent past and to monitor current changes and predict the future

Ocean Essential Variable (EOV) includes the EBVs & ECVs



WP5: Marine Domain – International Context

Integrated system designed to meet many requirements:

- Climate
- Weather prediction
- Global and coastal ocean prediction
- Marine hazards warning
- Transportation
- Marine environment and ecosystem monitoring
- Naval applications
- 8 of 9 Societal Benefits

- Tide gauge stations
- Drifting Buoys
- Moored Buoys
- Cabled observatory
- Profiling Floats
- Ocean gliders
- Ships of Opportunity
- Ocean Reference Stations
- Ocean Carbon Networks

The Global Ocean Observing System GOOS

EOOS

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

A Decade to provide the <u>global framework</u>:

- to support efforts to reverse the cycle of decline in Ocean health & create improved conditions for sustainable development
- to structure and boost scientific efforts at national and international levels
- to empower governments and societies with science-based solutions

WP5: Objectives

The ITINERIS Marine Domain aims to **integrate all marine RIs** to guarantee **access to Italian facilities**, **services and marine data and to ensure long term monitoring of EOVs, EBVs and ECVs.**

This will allow:

- to establish the **Italian Integrated Ocean Observing System (IOOS)** able to contribute to **European and International** effort on **ocean observations**: European Ocean Observing System (EOOS) and Global Ocean Observing System (GOOS).
- to contribute to **the major challenges** of **UN Ocean Decade of Science for Sustainable Development:** predicting improving quality and interoperability of ocean data, for three critical themes:

climate, operational services, marine ecosystem health

WP5: Marine Domain RIs

The 11 RIs involved in the WP: 8 Research Infrastructures developed in the ESFRI and for this reason with a strong international characterization and established links with extra-EU similar initiatives. + 3 National Large infrastructures

Euro-Argo ERIC allows active coordination and strengthening of the European contribution to the international Argo programme to explore the open ocean.

https://www.euro-argo.eu

EMSO aims to observe the oceans in the long term, better understand the phenomena in and under them and their interactions and roles in terrestrial systems through a multidisciplinary approach.

https://emso.eu

DANUBIUS-RI mission is to facilitate and contribute excellent science on the continuum from river source to sea; to offer state-of-the art research infrastructure; and to provide the integrated knowledge required to sustainably manage and protect River-Sea Systems.

https://www.danubius-ri.eu/

In the ICOS Ecosystem component the green-house gases exchanges between ecosystems and atmosphere and monitored continuously and distributed in near real time together with meteorological and ecosystem state variables

www.icos-ri.eu

WP5: Marine Domain RIs

The eleven RIs involved in the WP. 8 Research Infrastruttures developed in the ESFRI and for this reason with a strong international characterization and established links with extra-EU similar initiatives.

JERICO-RI is an integrated pan-European multidisciplinary and multi-platform research infrastructure dedicated to a holistic appraisal of coastal marine system changes.

https://www.jerico-ri.eu/

eLTER-RI is a pan-European in-situ research infrastructure whose mission is to study long-term ecological changes in terrestrial, freshwater and transitional ecosystems through a holistic 'whole system' approach.

https://www.elter-ri.eu/

The **Eurofleets+ project** will facilitate open access to an integrated and advanced research vessel fleet, designed to meet the evolving and challenging needs of the user community.

https://www.eurofleets.eu/

SIOS is a collaborative effort to develop and maintain a regional observational system for long-term measurements in and around Svalbard, addressing Earth System Science questions related to Global Change

https://sios-svalbard.org/

WP5: Marine Domain RIs

+ 3 National Large infrastructures

INFN LNS
Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali del Sud

LNS is a national RI based in Sicily, hosting unique facilities for astroparticle, nuclear and applied physics and marine science. LNS owns and operates the largest scientific subsea cabled network in Europe .

https://www.lns.infn.it/en/

Laura Bassi is an icebreaker class research vessel, It operates in polar areas carrying out research and logistic activities for the Italian polar projects

https://www.ogs.it/it/content/nr-laura-bassi

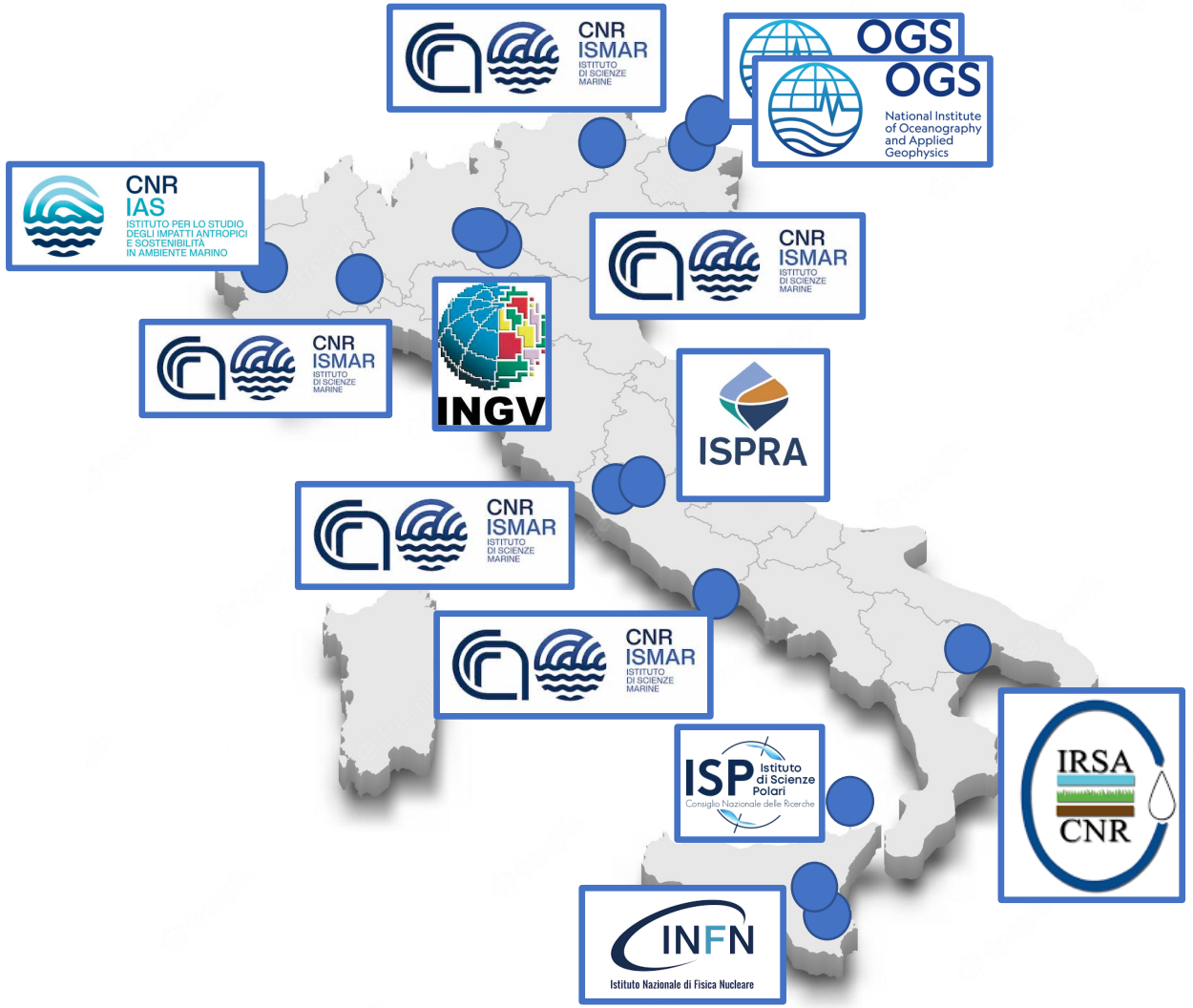
GeoSciences

ISPRA

GeoScience is a network of Italian Regions and Regional Environmental Agencies providing access to data, service and scientific knowledge to carry out monitoring and environmental impact and strategic assessment procedures.

WP5: Participants in the WP

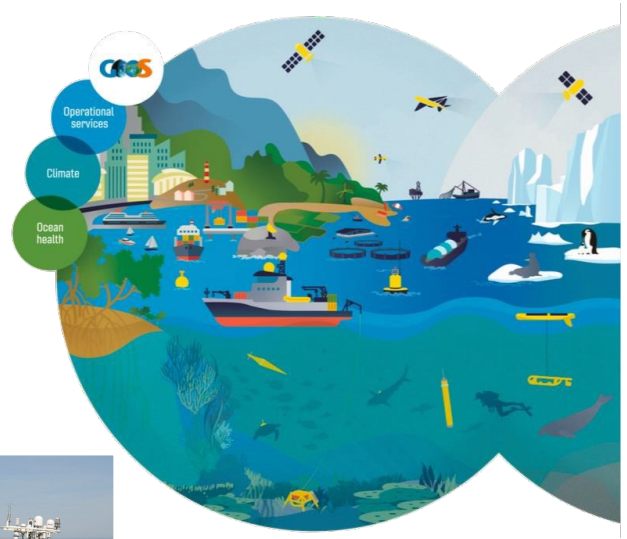
- CNR-ISMAR-Venezia
- CNR-ISMAR-Bologna
- CNR-ISMAR-Lerici
- CNR-ISMAR-Roma
- CNR-ISMAR-Napoli
- CNR-IAS-Genova
- CNR-IRSA-Taranto
- CNR-ISP-Messina
- OGS_OCE-Trieste
- OGS_CGN-Trieste
- INGV-BO -Bologna
- INGV-WIS - Catania
- INFN-LNS -Catania
- ISPRA - Roma



Objective 1 - Integration and harmonization of Marine Domain RIs towards IOOS - Italian Integrated Ocean Observing System

Contributing RIs: all

The aim is to **harmonize data and products** from the different RIs and **build up an integrated system of systems** able to ensure continuity of data and services and to respond to user requirements and contribute international effort

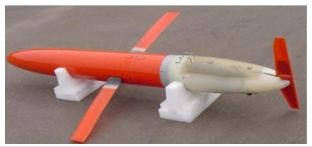


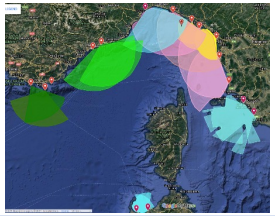
How:

- **Integration and harmonization** of Marine Domain RIs
- **Design and implementation of IOOS**
- Implementation of the **ITINERIS Marine Data Store**
- Upgrade the RIs by installing **new instrumentations responding to the digital requirements**
- Enounce capability of the **RI marine facilities to transfer data from offshore to inshore**







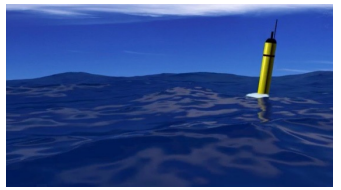


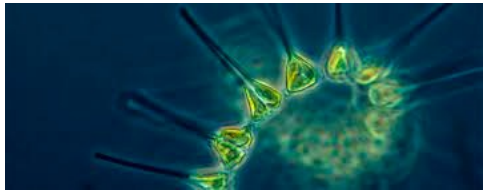

Objective 2: Fill the gaps in biological and ecosystem observations
Contributing RIs: Euro-Argo, DANUBIUS, JERICO, eLTER, SIOS

The aim is to **fill the crucial data gaps in EOVs and EBVs observations** in order to ensure monitoring of biochemistry, biological and ecosystem EOVs measurements as national contributions to EOOS, GOOS and GEO BON.

How:

- Exploiting **new automated technologies** to acquire biological data
- Acquire **new technologically advanced sensors** and **install on autonomous platforms, marine observational sites** and **systems** and remote sites to address the digital revolution (e.g. **smart observatories, Argo floats, gliders, drifters**)
- Reduces the existing gap of EOVs data from instruments moored **in deep waters** (e.g. **cabled observatory**)
- Make available **NRT biological data** through **the IOOS Marine Data Store** interfaced with the ITINERIS HUB.





Objective 3 - Expand capability of NRT ship-based ocean observations
Contributing RIs: EUROFLEETS, Laura Bassi

The aim is to expand the Italian capacity to acquire and make available in near real time (NRT) physical, biogeochemical and geological ocean variables providing highest accuracy measurements obtainable only with research ships.

How:

- **Design the Italian contribution** to the international **research fleets** effort **on full-depth, NRT continous measurements from coast-to-coast ;**
- **Acquisition & installation of autonomous systems** on board of Italian research ships: Laura Bassi & Gaia Blu;
- **Development of systems for NRT data quality control and data transmission from RV to the IOOS Marine Data Store;**
- Definition of the procedures for **data policy and access to fleets and observations;**
- **Adaptation of the procedures in order to guarantee FAIR data release.**

Objective 4: Develop Pilot services to tackle overarching marine issues
Contributing RIs: All

The aim is **to demonstrate the impact of the integration and harmonization of** data and facilities from different RIs by **developing five pilot services** to tackle **overarching marine issues and to respond** to key stakeholder requirements.

How:

Evaluate the impact of improved data availability **on modelling data assimilation and evaluation of model prediction**

- Develop **prototype services** for monitoring the **coastal marine environment** in support to Marine Strategy Framework Directive and Water Framework directive;
- **Prototype services integrating Eulerian and Lagrangian measurements** to **improve the representation of open sea environments**
- Identification of **new marine protected areas** for the implementation of EU Biodiversity Strategy 2030
- Impact of improved data availability **on data-driven models to describe the 4D ocean state**

WP5: Most relevant expected outcomes

- **Implementation of the Italian Integrated Ocean Observing System** (already existing in other Countries)
- Address the challenge to structure **the Italian National Ocean Data Center (IOOS-NODC) as a distributed system**, strengthening the role played by Italy in the European framework.
- **Contribute to GOOS & EOOS and G7/FSOI**
- Address the **challenges of Ocean Decade** and contribute to the implementation of the **Agenda 2030**.
- **RIs data and services harmonized and integrated**, data gaps in biological and ecosystem observations filled and NRT data and **products available to the research community** as well as to stakeholders.
- **New technologically advanced sensors** acquired and installed on autonomous platforms, marine observational sites and systems and remote sites **to address the digital revolution**
- Installation of **underway and/or continuous** acquisition systems and **real time data transmissions** of data on board the **Italian Research Vessels** and contribute to international program (eg GO-SHIP)
- Many WP5 core actions are based on the Southern Italian regions, increasing the infrastructural potential and leverage on their capacity building and development
- WP5 will invest also in new generations of scientists and engineering and project managers to allow the full operativity of the IOOS, with a focus on the South.

WP5: Inter-relation with other WPs

WP5 is linked to:

- ❑ WP2 for improving FAIRness and made data and products accessible in ITINERIS Hub
- ❑ WP2 for access to Marine RI resources & data
- ❑ WP3 for training activities.
- ❑ WP7 for integration of marine geological data in the Marine Data Store
- ❑ WP8 for exploring and making WP5 data interactively exploitable through VRE tools

Potential inter-relation are expected with WP4, WP6 for the natural exchange processes between the atmosphere and marine and terrestrial ecosystems domains

International Impact

- ESFRI-European Strategy Forum on Research Infrastructures
- Copernicus Marine Service
- Copernicus Climate Change
- Copernicus Coastal HUB
- EMODNET – European Marine Observational and Data Network
- EU Mission: Restore our Ocean and Waters
- EU Partnership for the Blue Economy
- EU Horizon Europe
- GOOS – The Global Observing System
- GEO-GEOSS Group on Earth Observation / System of Systems
- ESA – European Space Agency
- EUMETSAT - European Organisation for the Exploitation of Meteorological Satellites
- EOSC -European Open Science Cloud
- ENVRI – Community