Consiglio Nazionale delle Ricerche

R/V “GAIA BLU”: CURRENT STATUS AND FUTURE INVESTMENTS

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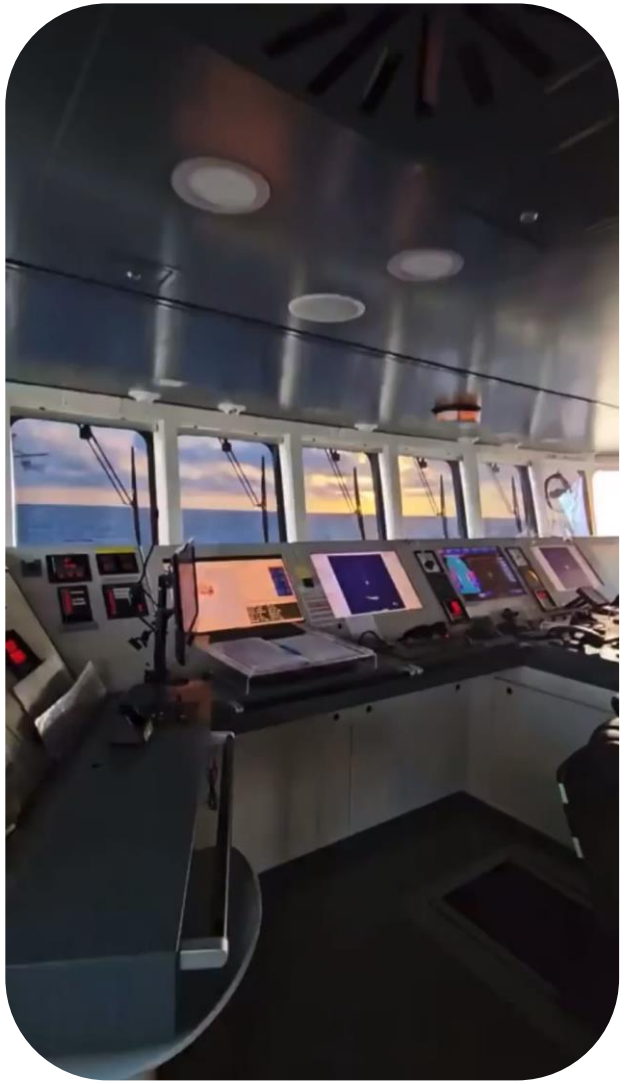
27th ERVO MEETING – 02-04 June 2025. Tórshavn, Faroe Islands

R/V GAIA BLU - TECHNICAL SPECIFICATIONS

Length overall: 82.90 m
Beam overall: 13.00 m
Draft (design): 4.80 m
Gross tonnage: 2024 t
Engine Power: 2 x 2941 kW
Bow Thruster: 1 x 400 kW, DP0
Maximum speed: 17 knots
Cruising Speed: 11 knots
Survey Speed: 8 knots
Endurance: 36 days
Scientific Personnel: 22 people + 2 technicians
Crew: 18 people
Cabin: 23

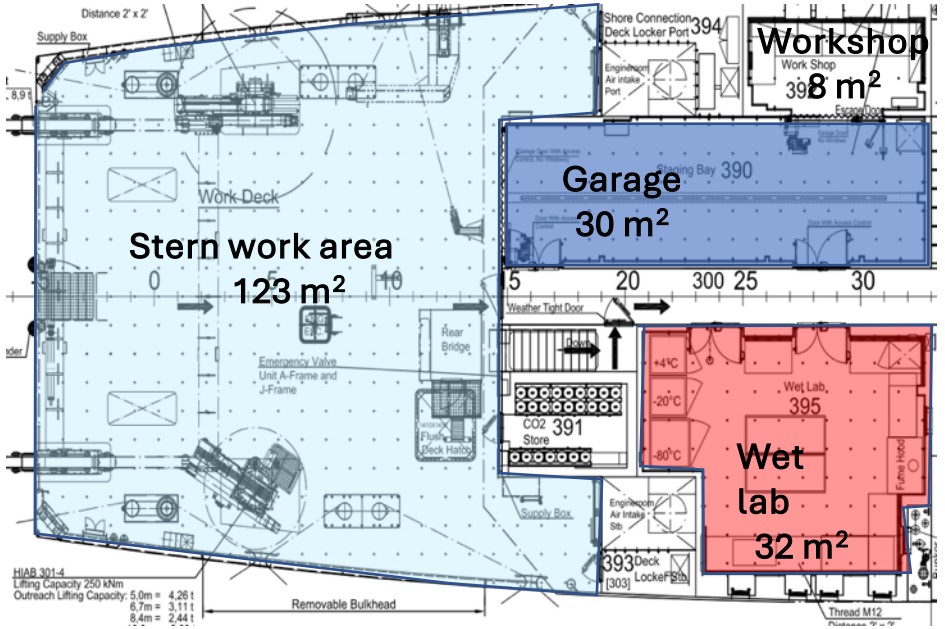
R/V GAIA BLU – OPEN AND ENCLOSED SPACES



Stern work area

11.4 m x 10.8 m,
Gru HIAB 121-2, 133 kN port
Gru HIAB 301 – 4, 250 kN starboard
A-frame 89 kN, with Ibercisa winch 90 kN, 6000 m with 12 mm steel cable for box corer, multicorer, mooring, dredging, etc.

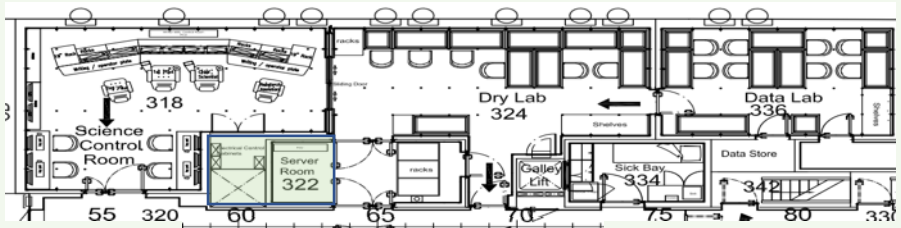
J-frame (32 kN) with winch 2000 m texile cable for plancton nets, Photosynthetically Active Radiation-PAR sensors, small grabs/corers, Go-Flo

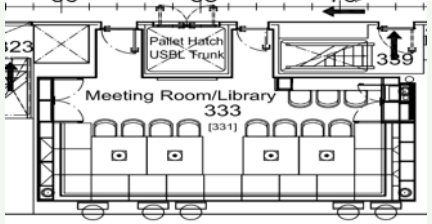


Science Control Room
28 m²

Dry Lab
26 m²

Lab /Office Space
17 m²





Conference Room
Library

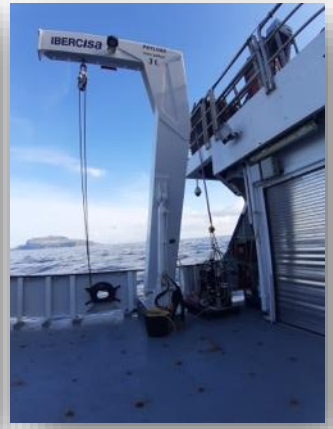
LIFE ON BOARD

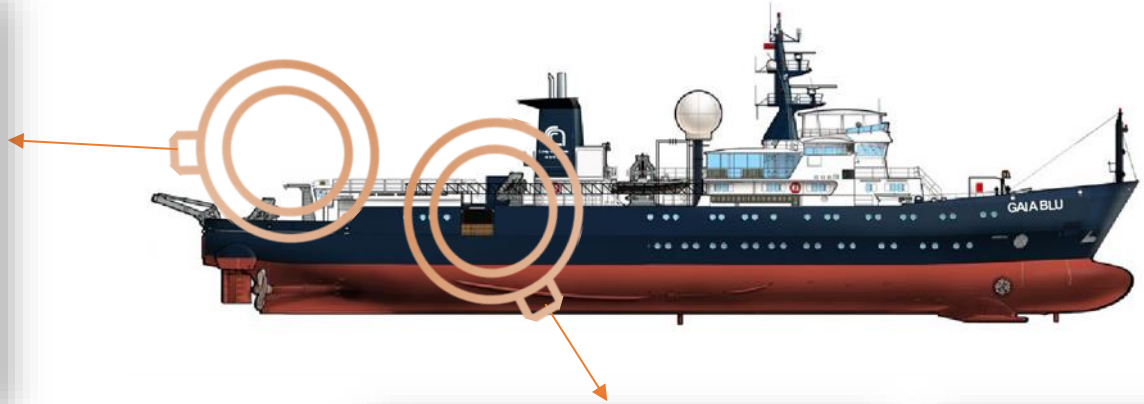
- Laundry, Gym, Sauna
- Large outdoor spaces for taking a break, making presentations, BBQ
- Area on the upper bridge for cetacean sightings and other activities

SURVEY EQUIPMENT - GONDOLA

- Kongsberg **EM304 (50 kHz)** Deep Water Multibeam echosounder (1000-5000m)
- Kongsberg **EM712 (70-100 kHz)** Intermediate Water (200-1000/1200 m)
- Kongsberg **EM 2040-04 (200-400 kHz)** Shallow Water (< 250 m) - technical design
- Konsberg Seapath 380 + MRU 5 **Differencial Positioning, Heading and Attitude System**
- Valeport: MIDAS SVP (6000 m), MiniSVS, VA500 - **Sound Velocity Sensor and Profiler**
- Kongsberg EK60 - **Fishery Research Echosounder**
- Kongsberg EA600 - **Single Beam echosounder**
- Teledyne Workhorse 300 kHz Acoustic Doppler Current Profiler (**ADCP**)
- Teledyne Pinnacle 45 kHz Acoustic Doppler Current Profiler (**ADCP**) - technical design
- Knudsen **Chirp 3260** 12kHz and array .5KHz 3260 sub bottom profiler - technical design
- Simrad SH90 - **Forward Looking sonar**
- Kongsberg HiPAP 352(P) – Ultra-short baseline system (USBL), **Underwater Positioning**

RESEARCH DEPLOYMENT SYSTEM & SURVEY EQUIPMENT – OCEANOGRAPHY



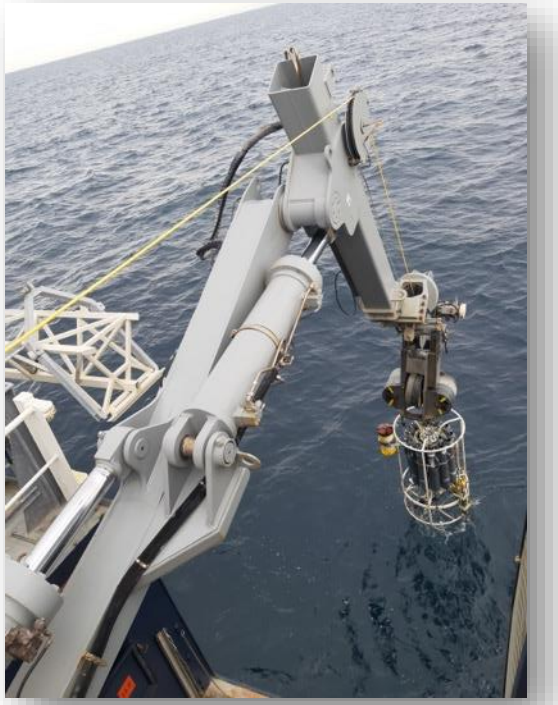


CTD AND WATER SAMPLER

	PAYLOAD	NOMINAL SPEED	POWER	WIRE
IBERCISA ELECTRIC CTD WINCH	4-9 tons	77.2 m/min	110 kW	Vectran - 6000m Ø10mm
ALLIED MARINE CRANE CTD HANDLING LARS	9 tons	-	-	-

	WATER DEPTH	N. WATER SAMPLER
2 SEABIRD CTD + WATER SAMPLER SYSTEMS (ONE GEOTRACES ULTRA-CLEAN)	up to 6000 m	24 @ 10 l

	PAYLOAD	NOMINAL SPEED	POWER	WIRE
HYDRAULIC MULTIPURPOSES WINCH	3 tons	25 m/min	110 kW	Dyneema - 2000m Ø8mm
IBERCISA J-FRAME	3 tons	-	-	-



RESEARCH DEPLOYMENT SYSTEM & SURVEY EQUIPMENT - GEOLOGY

A-frame

Carmacoring Handling System

CNR CP-20 piston core drill

J-frame

CORING

	PAYLOAD	NOMINAL SPEED	POWER	WIRE
IBERCISA ELECTRIC CORING WINCH	4-9 tons	77.2 m/min	110 kW	6000m Ø12mm
IBERCISA HYDRAULIC J-FRAME CORING	9 tons	-	-	-

	SAMPLE LENGTH	SAMPLE DIAMETER
CARMA CORING PISTON CORER	up to 25 m	100 mm

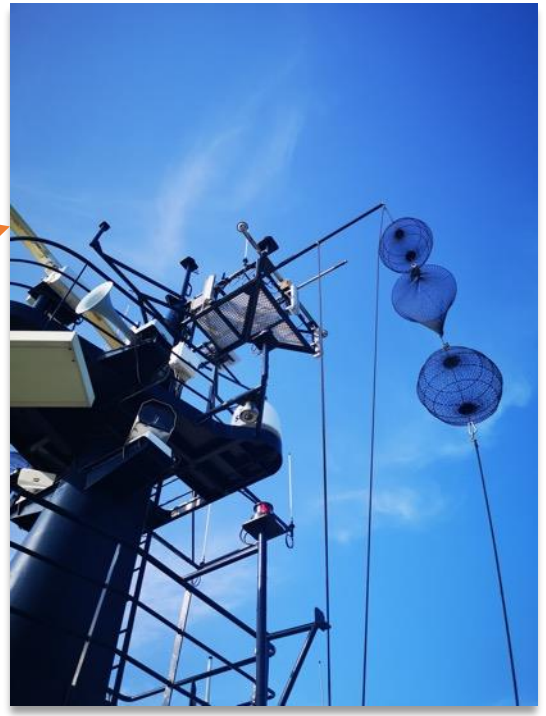
BOX CORING

	PAYLOAD	NOMINAL SPEED	POWER	WIRE
IBERCISA ELECTRIC MULTIPURPOSES WINCH	4.1 tons	77.2 m/min	110 kW	6000m Ø12mm
MacARTNEY HYDRAULIC A-FRAME	8.9 tons	-	-	-

	SAMPLE LENGTH	SAMPLE DIAMETER
OCEANIC BOX CORER	up to 50 cm	32 cm

SCIENTIFIC INSTRUMENTS – METEOROLOGY

- Ecosearch SM45 control unit,
- Apogee, SP-510 Thermopile Pyranometer, SL-510 – Thermopile Pyrgeometer, LI-COR, LI-192 – Campbell Scientific PAR Sensor, CSAT3B – Triaxial Sonic Anemometer; SI-111 – Precision infrared radiometer
- Campbell Scientific, CR1000X – Datalogger, FishSky 360° with Mini PC – All Sky Camera



R/V GAIA BLU is the first vessel in the Mediterranean, and the second in the world (following the "Marion Dufresne" operating in the Indian Ocean), to be equipped with an **onboard automatic photometer for studying aerosol dynamics. This innovative instrument enables advanced aerosol detection in the marine environment.**

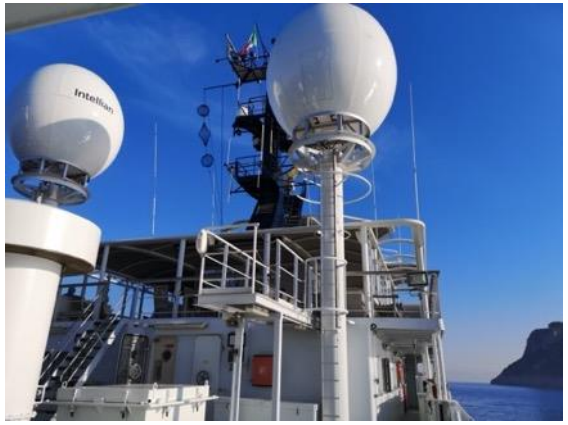
The CIMEL 318-T sensor was developed by researchers at the AGORA laboratory (Laboratoire d'Optique Atmospherique - LOA (**CNRS /Universitè Lille 1**) and CIMEL Electronique company of the **European Space Agency**.

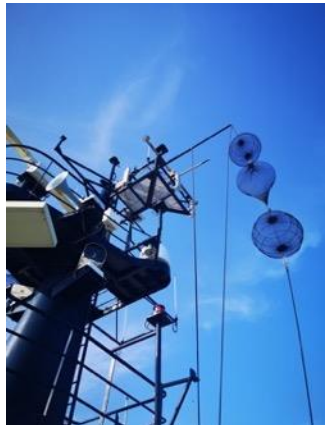
OTHER FACILITIES

- Storage Deck for 10 and 20' containers, electricity and water for container lab
- Fully wired ship
- Fast Rescue boat / working boat **Palfinger FRSQ 630**
- Water line for continuous sampling
- **MilliQ water**
- Guildline Autosal Salinometer 8400B
- Stoves, microscopes
- Tritrino Plus Titrator
- **Data center (Storage: 112 TB)**

Internet Access – communication and outreach

- VSAT System, dual tracking antennas Intellian (V240 C model)
- SeaTel 97 series
- C Band
- Land communication system (LTE), 5G
- **Starlink Flat High Performance Kit (Maritime/Energy)**

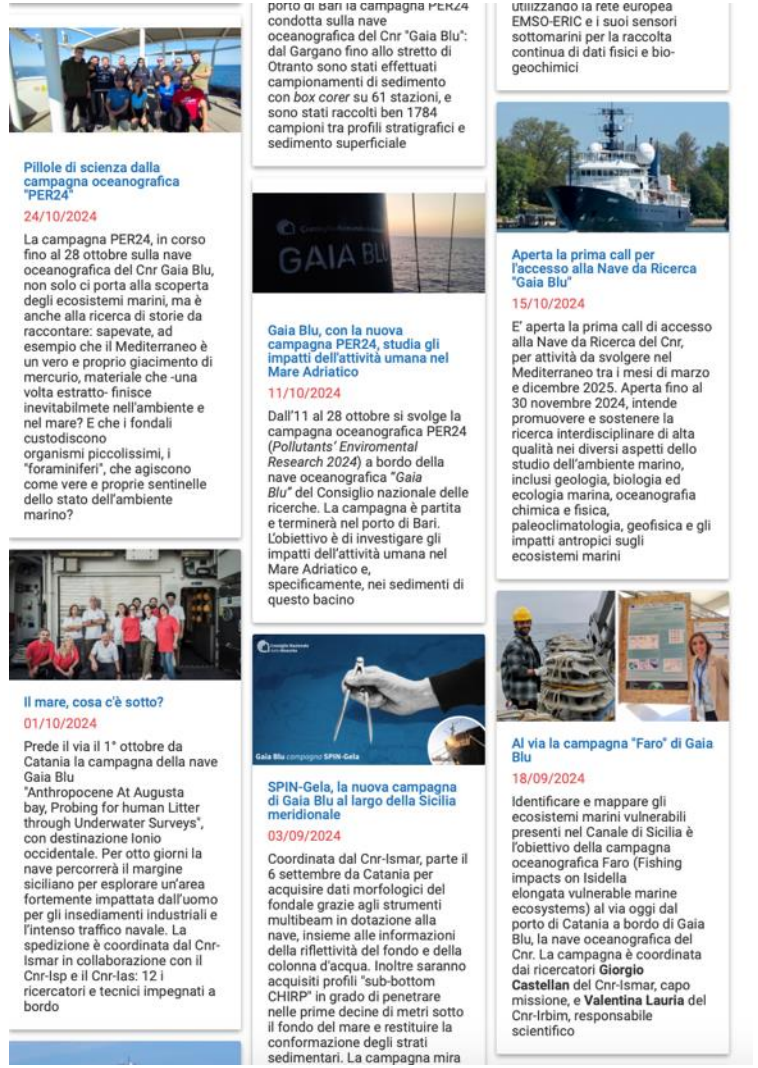




2024 OVERVIEW

- 120 researchers onboard
- 19 scientific cruises
- 244 days @ sea
- 46 core samples
- 31 box-corer
- 56 ROV diving
- 250 visitors

GAIA BLU
RESEARCH VESSEL



Pillole di scienza dalla campagna oceanografica "PER24"

24/10/2024

La campagna PER24, in corso fino al 28 ottobre sulla nave oceanografica del Cnr Gaia Blu, non solo ci porta alla scoperta degli ecosistemi marini, ma è anche alla ricerca di storie da raccontare: sapevate, ad esempio che il Mediterraneo è un vero e proprio giacimento di mercurio, materiale che -una volta estratto- finisce inevitabilmete nell'ambiente e nel mare? E che i fondali custodiscono organismi piccolissimi, i "foraminiferi", che agiscono come vere e proprie sentinelle dello stato dell'ambiente marino?

porto di Bari la campagna PER24 condotta sulla nave oceanografica del Cnr "Gaia Blu": dal Gargano fino allo stretto di Otranto sono stati effettuati campionamenti di sedimento con *box corer* su 61 stazioni, e sono stati raccolti ben 1784 campioni tra profili stratigrafici e sedimento superficiale

utilizzando la rete europea EMSO-ERIC e i suoi sensori sottomarini per la raccolta continua di dati fisici e bio-geochimici

Gaia Blu, con la nuova campagna PER24, studia gli impatti dell'attività umana nel Mare Adriatico

11/10/2024

Dall'11 al 28 ottobre si svolge la campagna oceanografica PER24 (*Pollutants' Enviromental Research 2024*) a bordo della nave oceanografica *"Gaia Blu"* del Consiglio nazionale delle ricerche. La campagna è partita e terminerà nel porto di Bari. L'obiettivo è di investigare gli impatti dell'attività umana nel Mare Adriatico e, specificamente, nei sedimenti di questo bacino

Aperta la prima call per l'accesso alla Nave da Ricerca "Gaia Blu"

15/10/2024

E' aperta la prima call di accesso alla Nave da Ricerca del Cnr, per attività da svolgere nel Mediterraneo tra i mesi di marzo e dicembre 2025. Aperta fino al 30 novembre 2024, intende promuovere e sostenere la ricerca interdisciplinare di alta qualità nei diversi aspetti dello studio dell'ambiente marino, inclusi geologia, biologia ed ecologia marina, oceanografia chimica e fisica, paleoclimatologia, geofisica e gli impatti antropici sugli ecosistemi marini

Il mare, cosa c'è sotto?

01/10/2024

Prede il via il 1° ottobre da Catania la campagna della nave Gaia Blu "Anthropocene At Augusta bay, Probing for human Litter through Underwater Surveys", con destinazione Ionio occidentale. Per otto giorni la nave percorrerà il margine siciliano per esplorare un'area fortemente impattata dall'uomo per gli insediamenti industriali e l'intenso traffico navale. La spedizione è coordinata dal Cnr-Ismar in collaborazione con il Cnr-Isp e il Cnr-Ias: 12 i ricercatori e tecnici impegnati a bordo

SPIN-Gela, la nuova campagna di Gaia Blu al largo della Sicilia meridionale

03/09/2024

Coordinata dal Cnr-Ismar, parte il 6 settembre da Catania per acquisire dati morfologici del fondale grazie agli strumenti multibeam in dotazione alla nave, insieme alle informazioni della riflettività del fondo e della colonna d'acqua. Inoltre saranno acquisiti profili "sub-bottom CHIRP" in grado di penetrare nelle prime decine di metri sotto il fondo del mare e restituire la conformazione degli strati sedimentari. La campagna mira

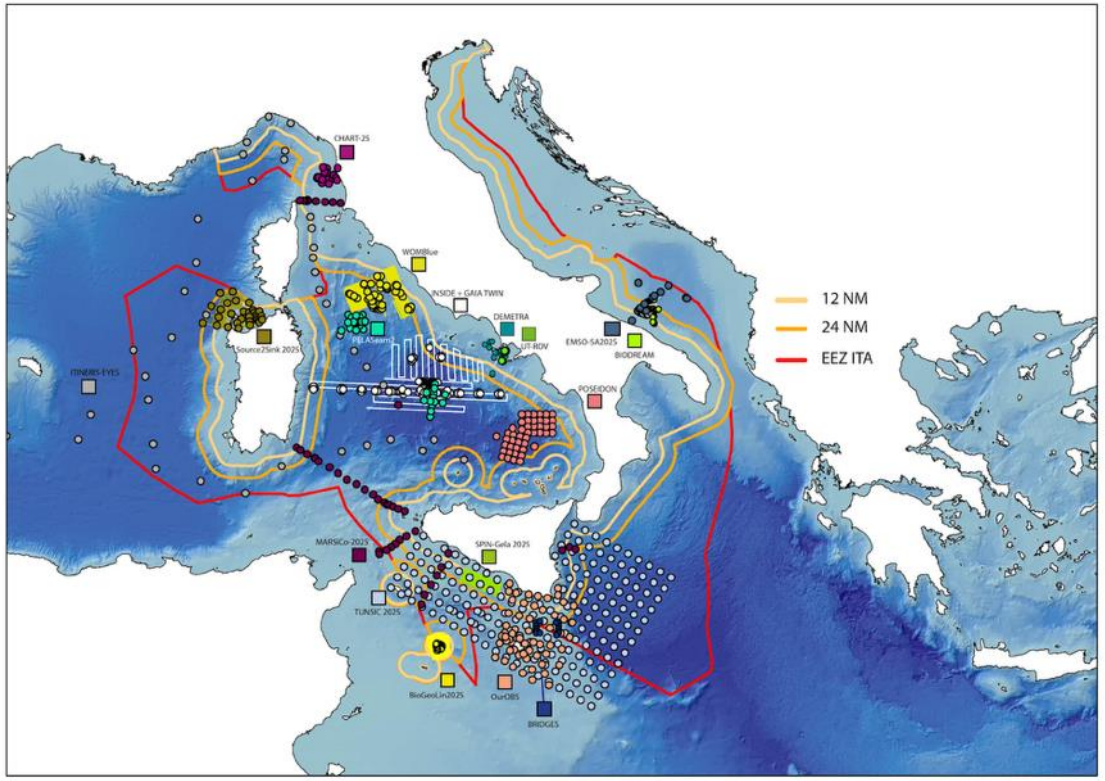
Al via la campagna "Faro" di Gaia Blu

18/09/2024

Identificare e mappare gli ecosistemi marini vulnerabili presenti nel Canale di Sicilia è l'obiettivo della campagna oceanografica Faro (Fishing impacts on Isidella elongata vulnerable marine ecosystems) al via oggi dal porto di Catania a bordo di Gaia Blu, la nave oceanografica del Cnr. La campagna è coordinata dai ricercatori **Giorgio Castellan** del Cnr-Ismar, capo missione, e **Valentina Lauria** del Cnr-Irbim, responsabile scientifico

2025 CRUISE PROGRAMME

- Mach 2025 – January 2026
- 18 scientific cruises
- 250 days at sea



GAIA-TWIN: Digital Twinning of Research Vessel Gaia Blu for Enhanced Ship Response Monitoring and Prediction
8-12 june 2025; PI: Matteo Diez (CNR)

GAIA-TWIN develops **adaptive, data-driven and model-free digital twins of R/V Gaia Blu** using high-resolution motion and environmental data collected during transits and surveys.

Women in Blue: training opportunities in ocean science
1-7 august 2025; PI: Marzia Rovere (CNR)

Approved by International Seabed Authority (ISA) Partnership Fund (PF) and led by CNR-ISMAR to provide advanced training in deep-sea research for women scientists from Argentina, India, Nigeria, Ghana, Nepal, Bangladesh, Mauritius, Tonga, Kiribati.

ITINERIS

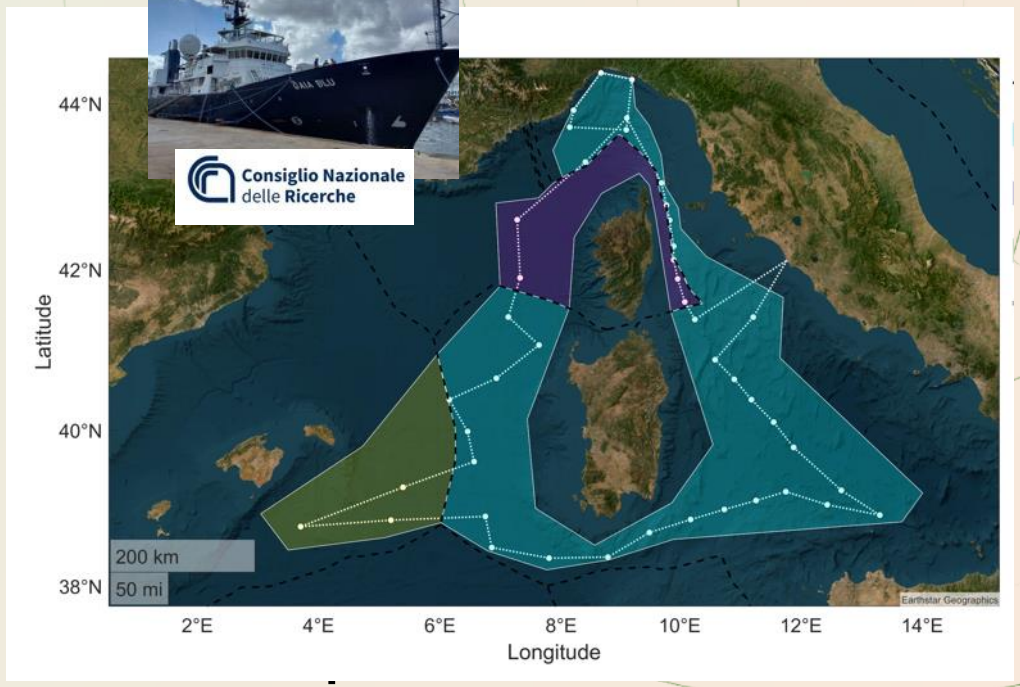
InTegrating, INnovating, Evolving Research InfraStructures for hEalthY and prEdicted marine ecosystemS

ITINERIS' EYES

8-30 july 2025

PI: Emanuele Organelli (CNR)

Central Mediterranean



IR0000032 – ITINERIS, Italian Integrated Environmental Research Infrastructures System
(D.D. n. 130/2022 - CUP B53C22002150006) Funded by EU - Next Generation EU PNRR-Mission 4 "Education and Research" - Component 2: "From research to business" - Investment 3.1: "Fund for the realisation of an integrated system of research and innovation infrastructures"

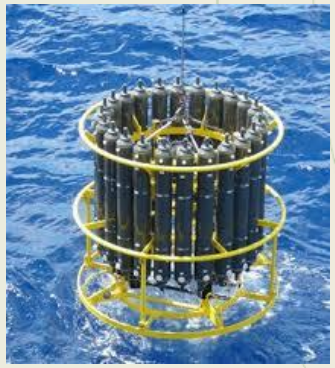
Finanziato dall'Unione europea NextGenerationEU
Ministero dell'Università e della Ricerca
Italiadomani

ITINERIS

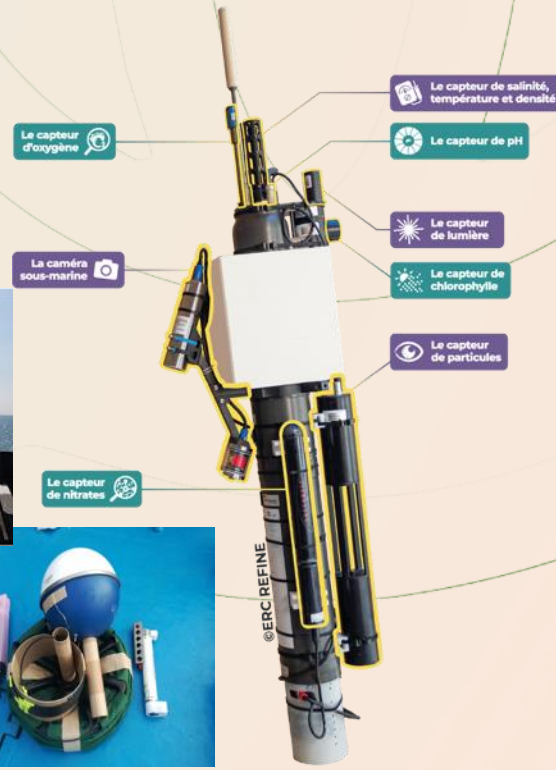
INVESTIMENTS

9 BGC-Argo floats (EuroArgo)
8 drifter SVP-BGC (Jerico)
40 drifter CARTHE (Jerico)
Underwater Vision Profiler per zooplancton (e-LTER)
Radiometric calibration system (Danubius)
LIDAR (ACTRIS)
Hyperspectral radiometry (EUROFLEETS)
Continuous light absorption and backscatter measurements(EUROFLEETS)
Ferrybox (ICOS-EUROFLEETS)

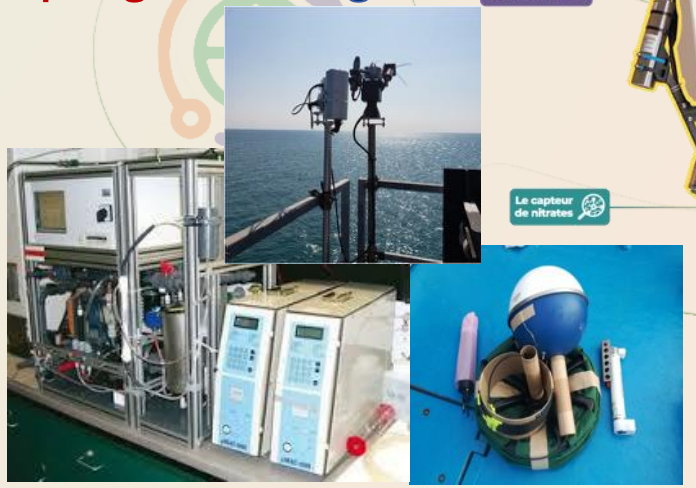
Discrete sampling



Autonomous platforms



Continuous sampling & moorings



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INVESTIMENTS – CO2 OBSERVING SYSTEM

A **Ferry-Box** (4H-JENA) is equipped to measure underway **T,S,DO, chlorophyll, turbidity, C-DOM** and three parameters of the carbonate system that allow it's complete charachterization:

***p*CO_2 , pH** and **Total Alkalinity**

(Contros HydroC CO_2 and Hydro FIA - pH and TA- 4H Jena)

The system is designed to be routinely operational, currently it is in a test phase being installed in April 2025

A higher degree of automation is needed for the entire underway water supply system, which currently requires some manual operations, or dedicated personnel to monitor the instrument's functioning during each research cruise.

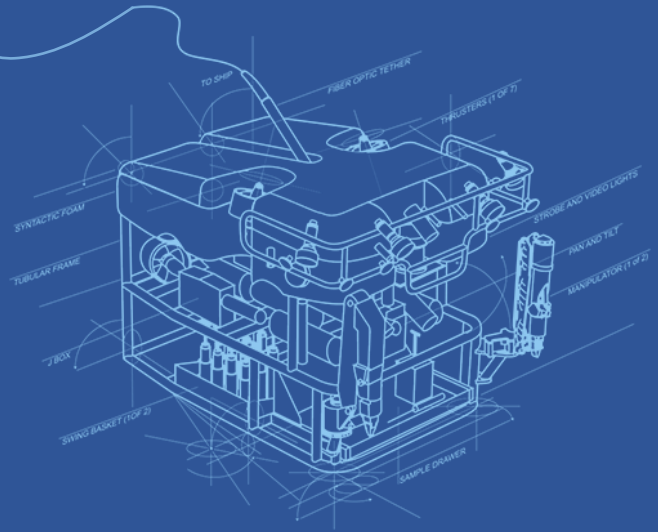
Data are transmitted in near real-time to on-land data center. Integration into the Italian data repository IT-IOOS (https://www.re3data.org/repository/r3d100014593) is currently underway. A quality-controlled dataset is planned to be published annually in the SOCAT database.

PI: Carolina Cantoni (CNR)

Remotely Operated Vehicle (ROV)
(Light-working class)

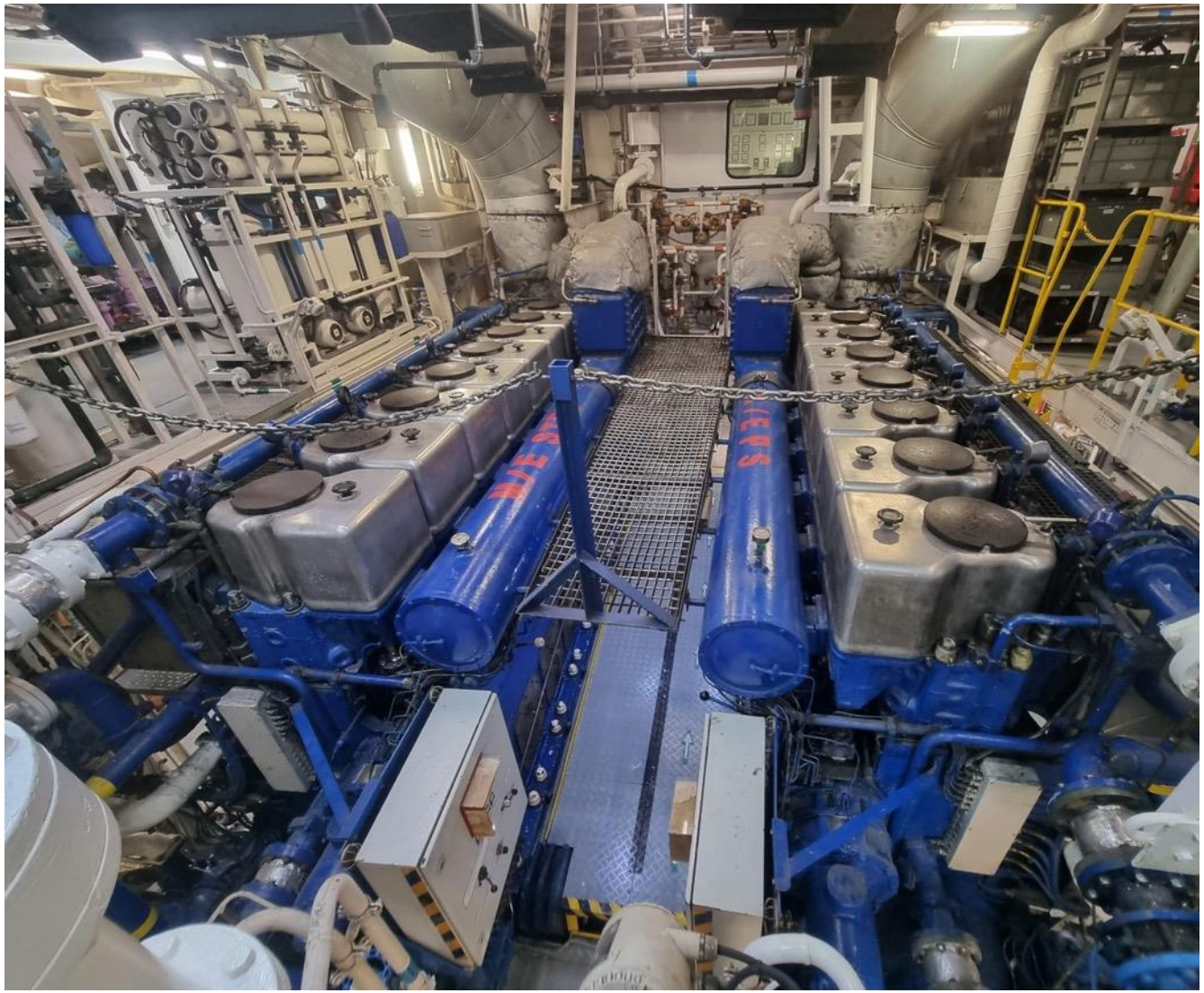
AEGIR 250
Ocean Robotics

Depth: 3000m
Launch weigth: 550kg
Payload: 40kg
7 thrusters
Speed: 3 knots



PI: Paolo Montagna (CNR)

FUTURE INVESTIMENTS – ENGINES REPLACEMENT



PROPULSION ENGINES

2 x 2941 kW DEUTZ MWM TBD 510 L8

- Aged (1981)
- Spare parts are hard to find and extremely expensive
- High fuel consumption
- Significant carbon footprint
- High ETS cost when will be applied

NEED TO BE REPLACED WITHIN A 2-3 YEAR PERIOD
New high-efficiency engines and downgrade of total propulsive power to reduce fuel consumption and CO_2 emissions

PI: Leonardo Langone & Emilio Notti (CNR)

FUTURE INVESTIMENTS – POLAR CODE

The Polar Code requires ships intending to operating in the defined waters of the Antarctic and Arctic to apply for a Polar Ship Certificate, which classifies the vessel as Category A ship - ships designed for operation in polar waters at least in medium first-year ice, which may include old ice; Category B ship - a ship not included in category A, designed for operation in polar waters in at least thin first-year ice, which may include old ice; or Category C ship - a ship designed to operate in open water or in ice conditions less severe than those included in Categories A and B.

PAST: DNV ✠ 100 A5 E2 Special Purpose Ship

NOW (2022): RINA ✠ - Special service - research ship - unrestricted navigation - ✠ AUT-UMS - ICE CLASS I B

GOAL: POLAR CLASS PC7 WITH A COST OF ca. 450keuro

MISSION PROFILE: the R/V is expected to operate in Arctic polar waters, limited to the summer period (June – September), in the area between the Norwegian islands of Svalbard and the southern coast of Greenland, up to a maximum latitude of approximately 83°N.

Polar Class	Ice description (based on WMO [1] Sea Ice Nomenclature)
PC1	Year-round operation in all polar waters
PC2	Year-round operation in moderate multi-year ice conditions
PC3	Year-round operation in second-year ice which may include multi-year ice inclusions
PC4	Year-round operation in thick first-year ice which may include old ice inclusions
PC5	Year-round operation in medium first-year ice which may include old ice inclusions
PC6	Summer/autumn operation in medium first-year ice which may include old ice inclusions
PC 7	Summer/autumn operation in thin first-year ice which may include old ice inclusions

NEW: MES (Marine Evacuation System) 4 x 25 pers. liferafts; GSK (Group Survival Kit) ; de-icing system; Polar Immersion suit; Meteofax; GNSS - Global Navigation Satellite System, GMDSS A4 - Global Maritime Distress and Safety System; Ballast water management system; battery and radio heating system. Personnel training to new procedures.

PI: Mauro Sclavo (CNR)

INTERNATIONALIZATION

AQUARIUS

Sustainable Blue Economy Partnership

JPI OCEANS

UN OCEAN CONFERENCE NICE 2025 FRANCE

Eurofleets

All-Atlantic Floating University Network (@SeaNetwork)

Consiglio Nazionale delle Ricerche

Thank you for the attention