

Alfredo Martins
EMSO Strategic Workshop
Rome 12/03/2025

Inventory on the EMSO Capability

EMSO RFs

14 RFs

3 Test sites

11 Observatory sites

Some institutions are science research organizations with varying degrees of support engineering capabilities

Some institutions (ex. INESC TEC, Ifremer, UPC, CNR, MI ...) **do technology development**

Diversity of platforms, deployments and instruments

5 sites in the Atlantic sea

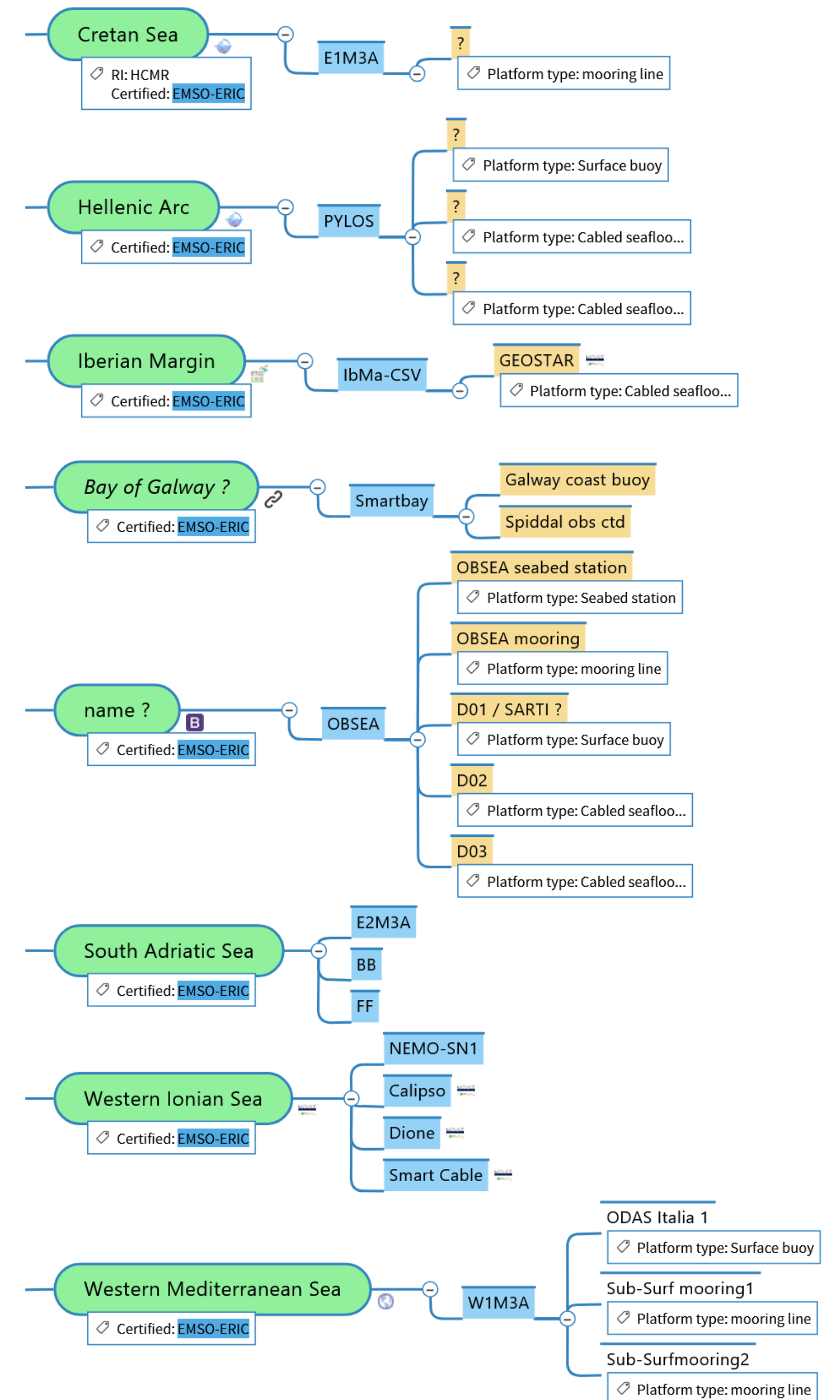
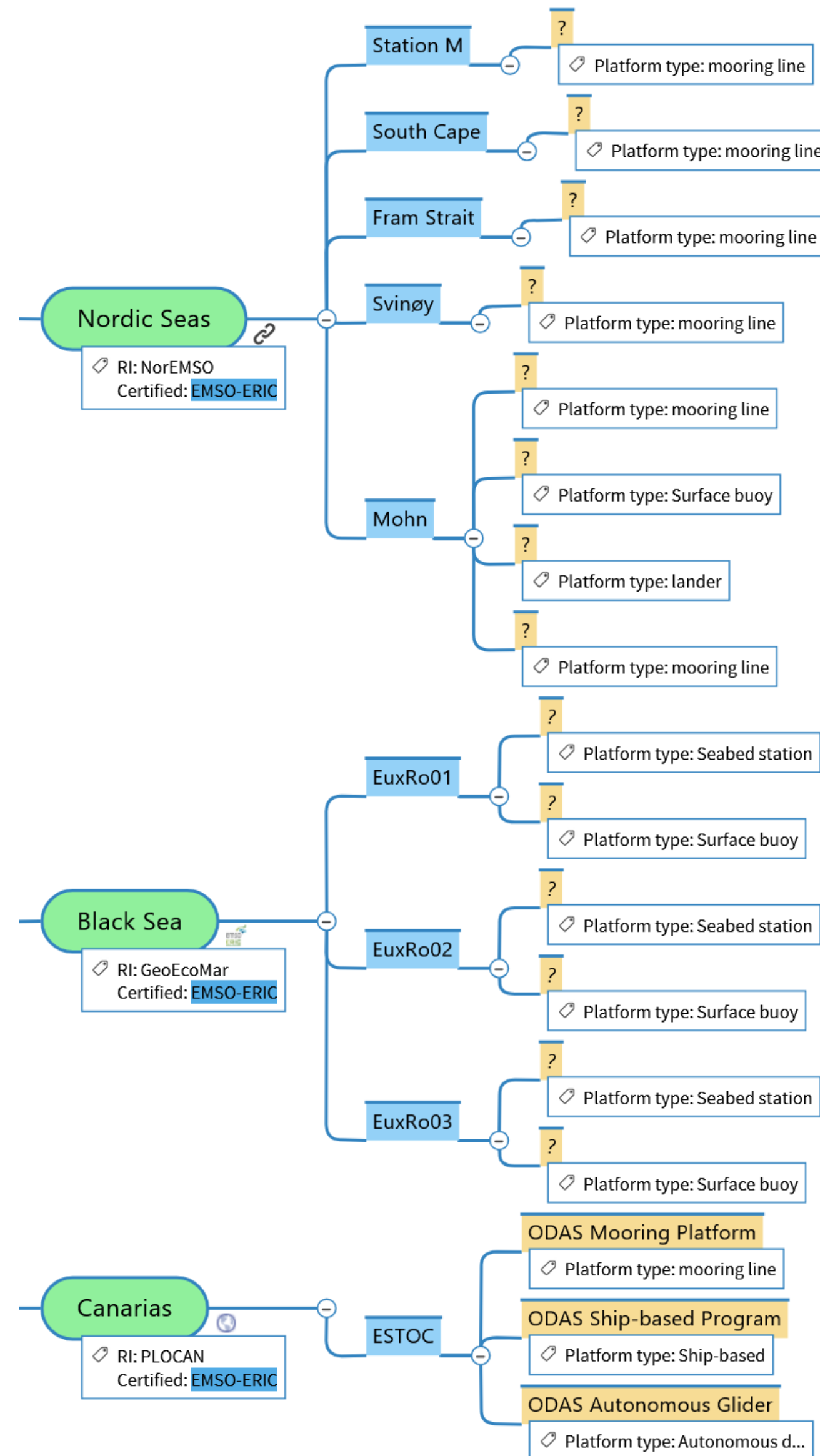
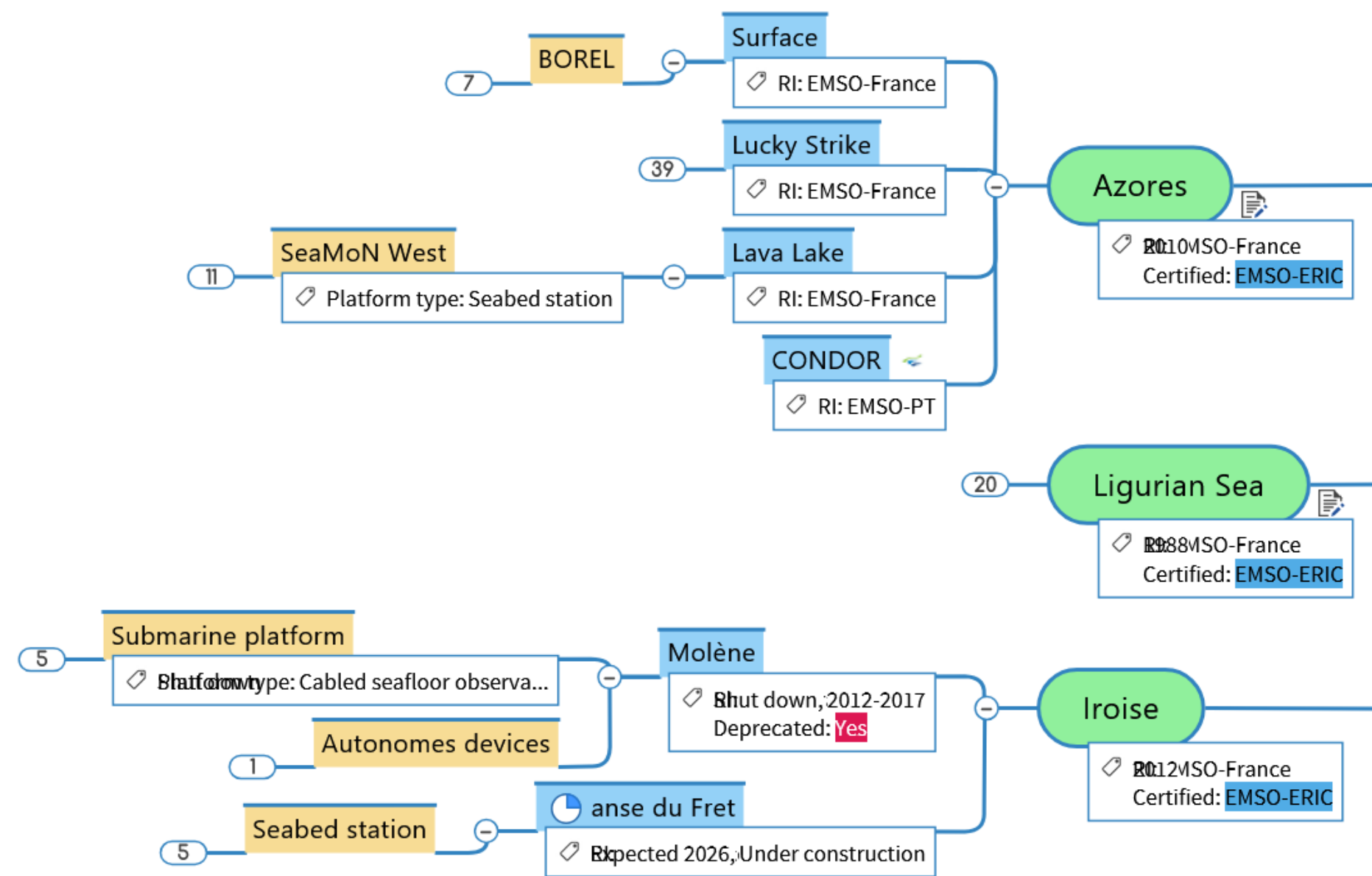
1 site in the Arctic sea

7 sites in the Mediterranean sea

1 site in the Black Sea



EMSO observatories and platforms



TEST SITES

Smart bay, Molene and OBSEA

Shallow depth (~20m)

Easy access

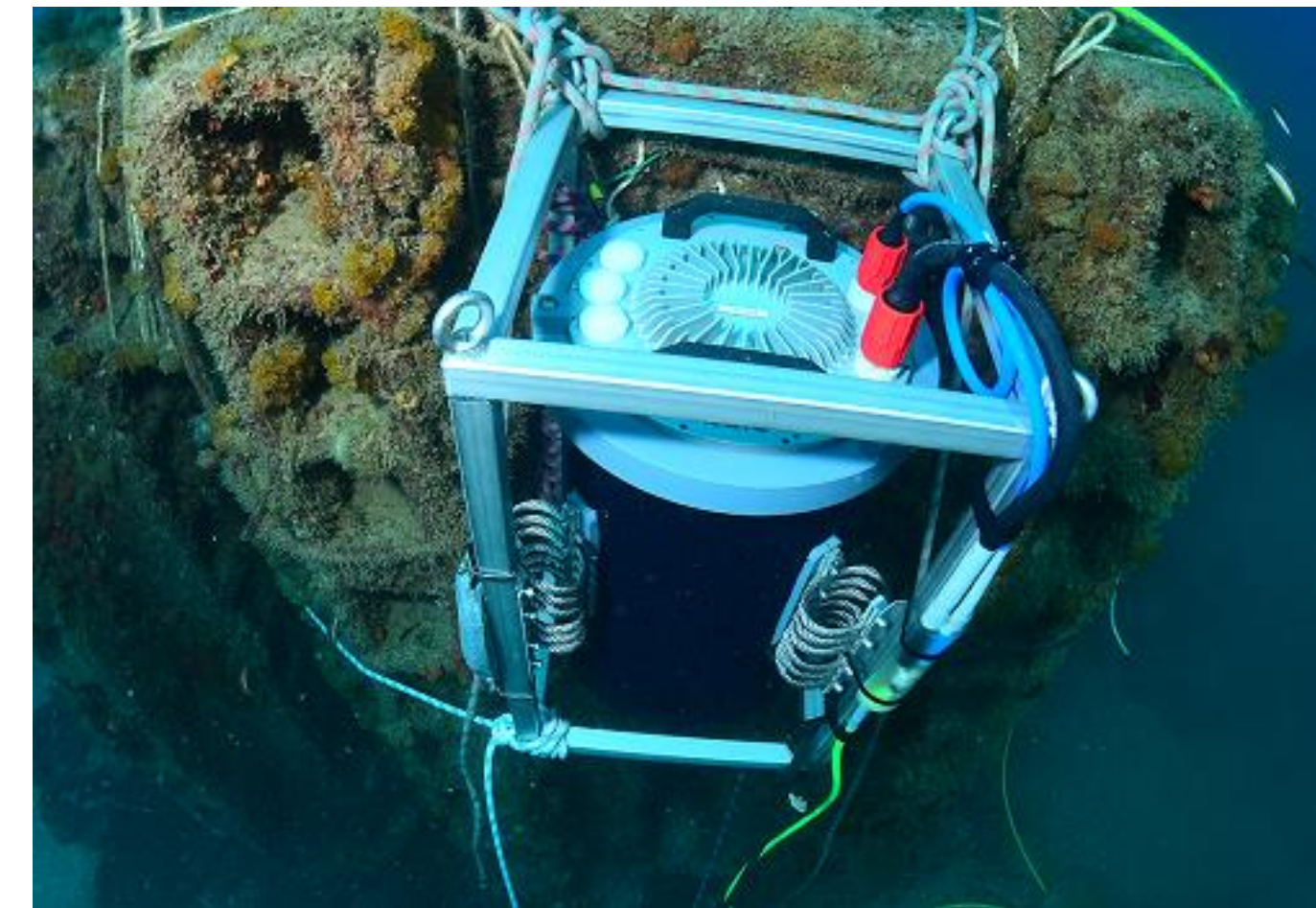
Sensor and system innovation

New technology test and validation – physical access

Real time data



OBSEA – UVP6 camera



OBSEA – Cytosub



Molene



OBSEA



SmartBay



OBSERVATORY SITES

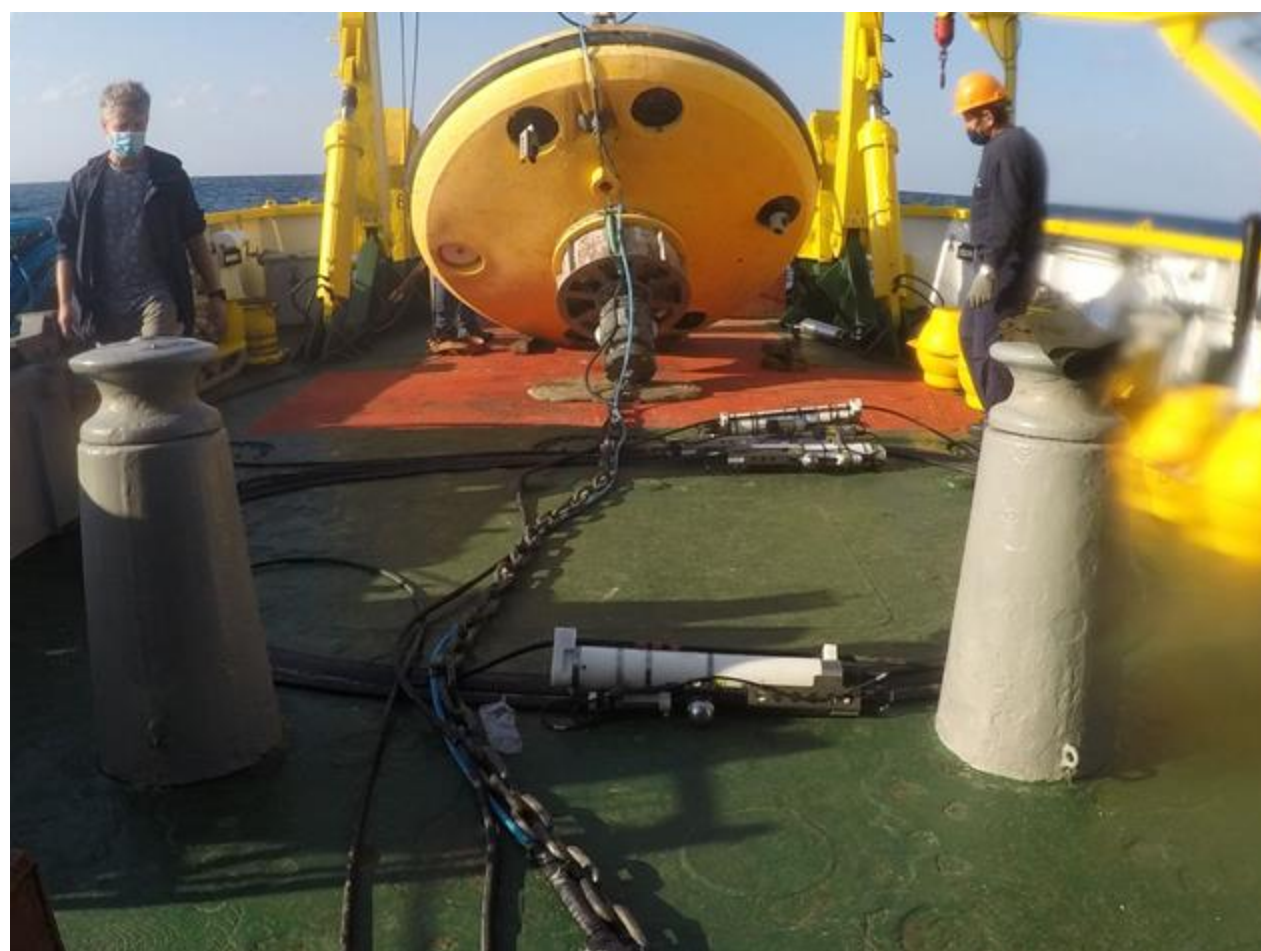
Open ocean

Deep (deepest Canarias ESTOC 3630m)

Long time series

Higher logistical and maintenance requirements

Varying number of platforms and instruments

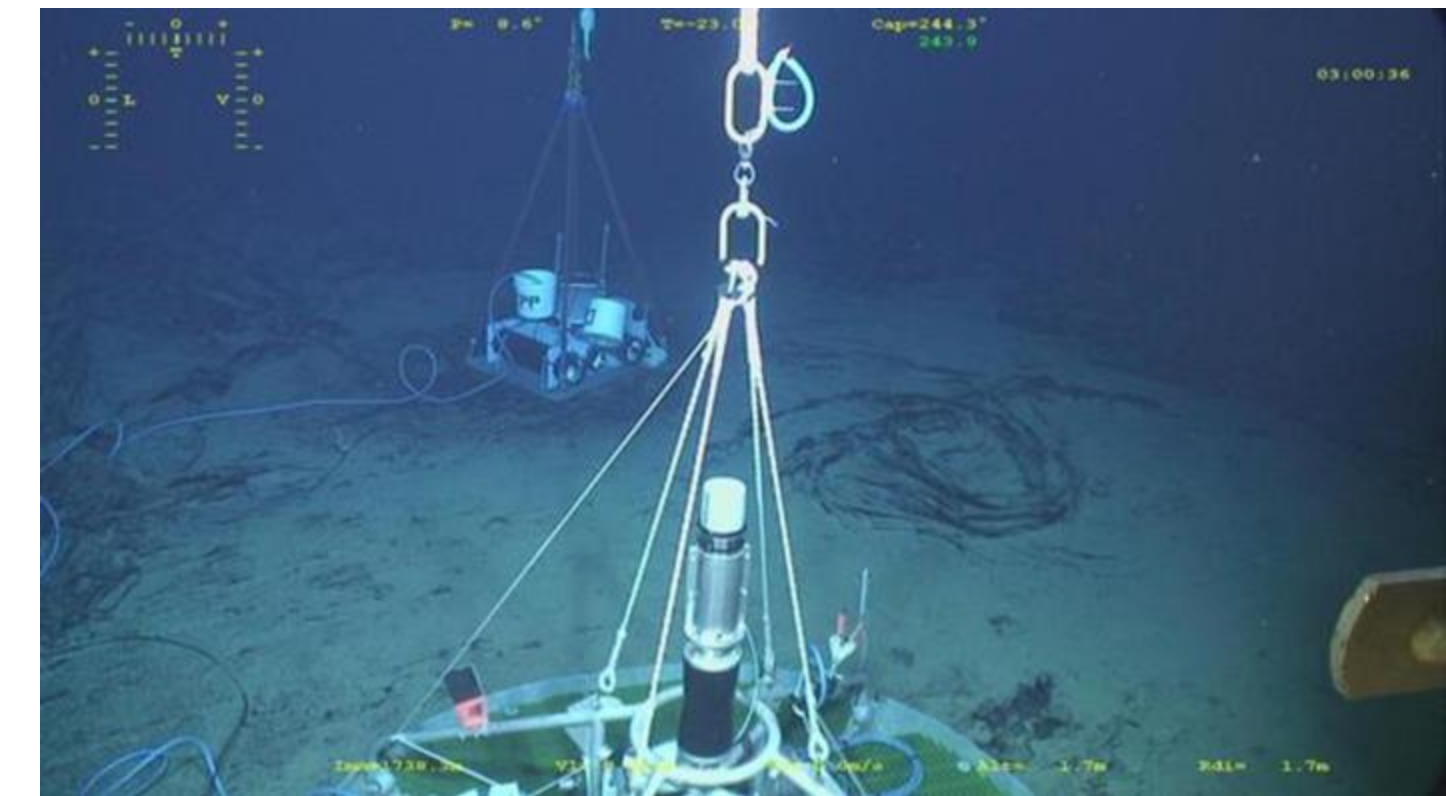


Cretan Sea

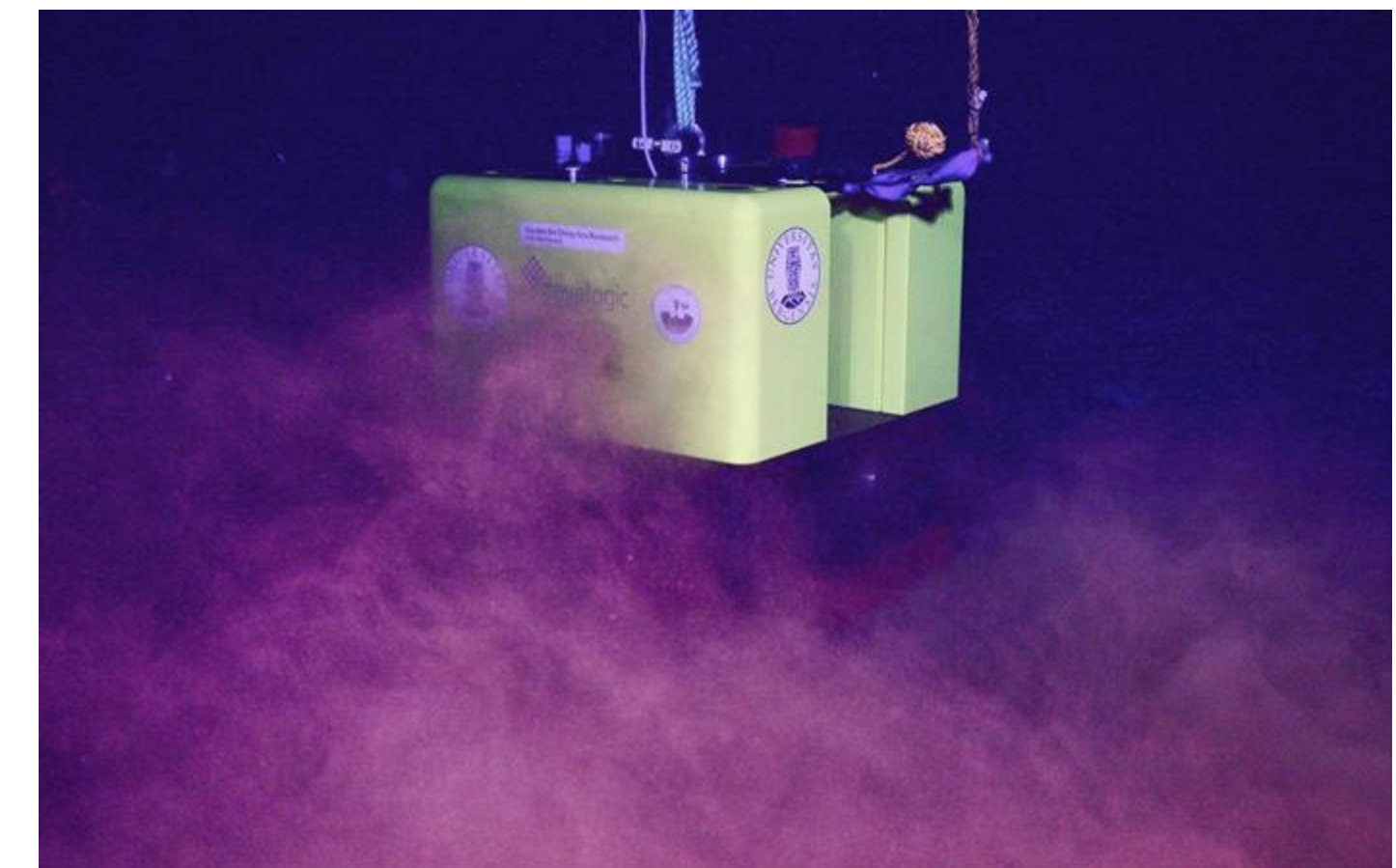


Western Med

Azores



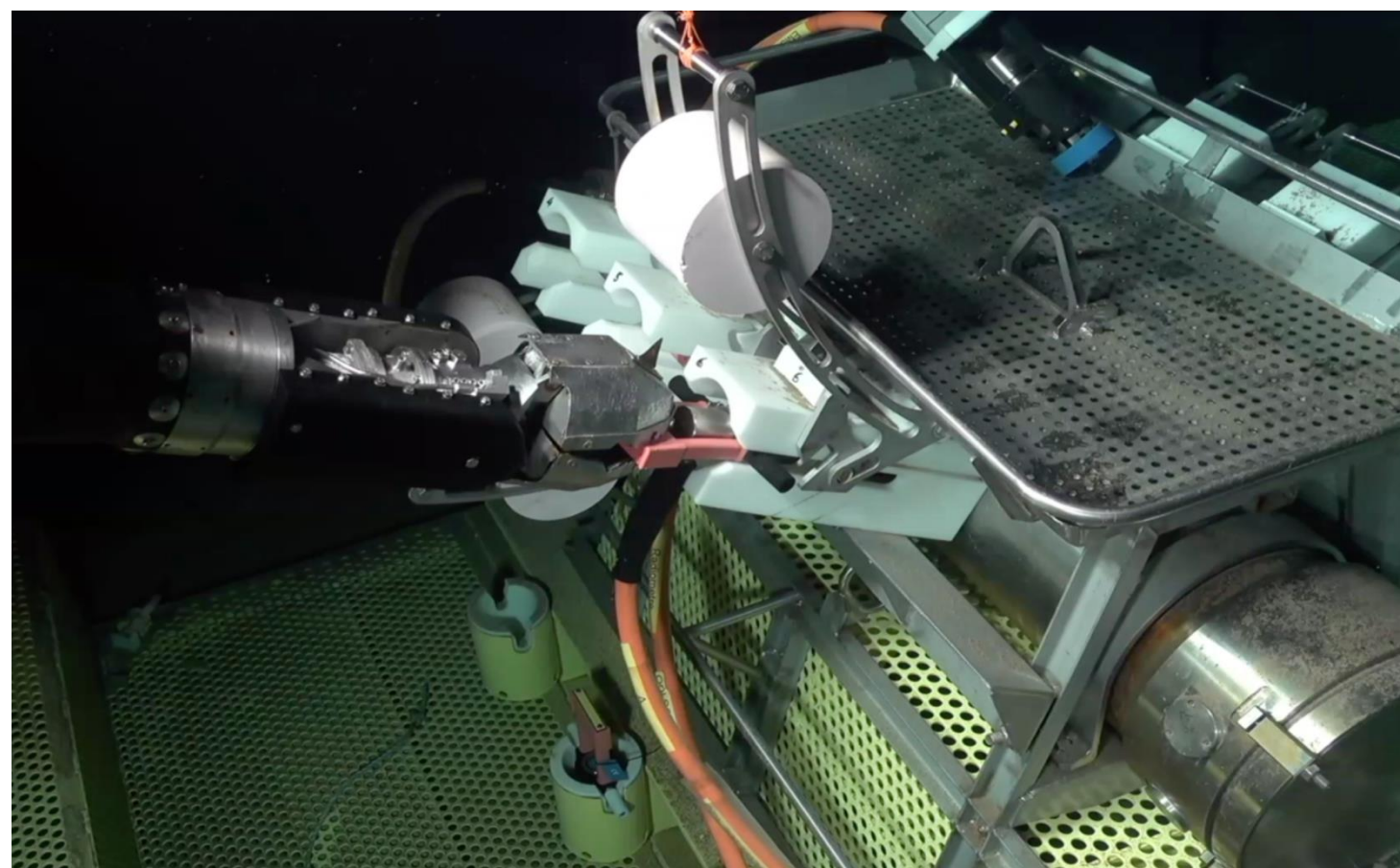
Nordic seas



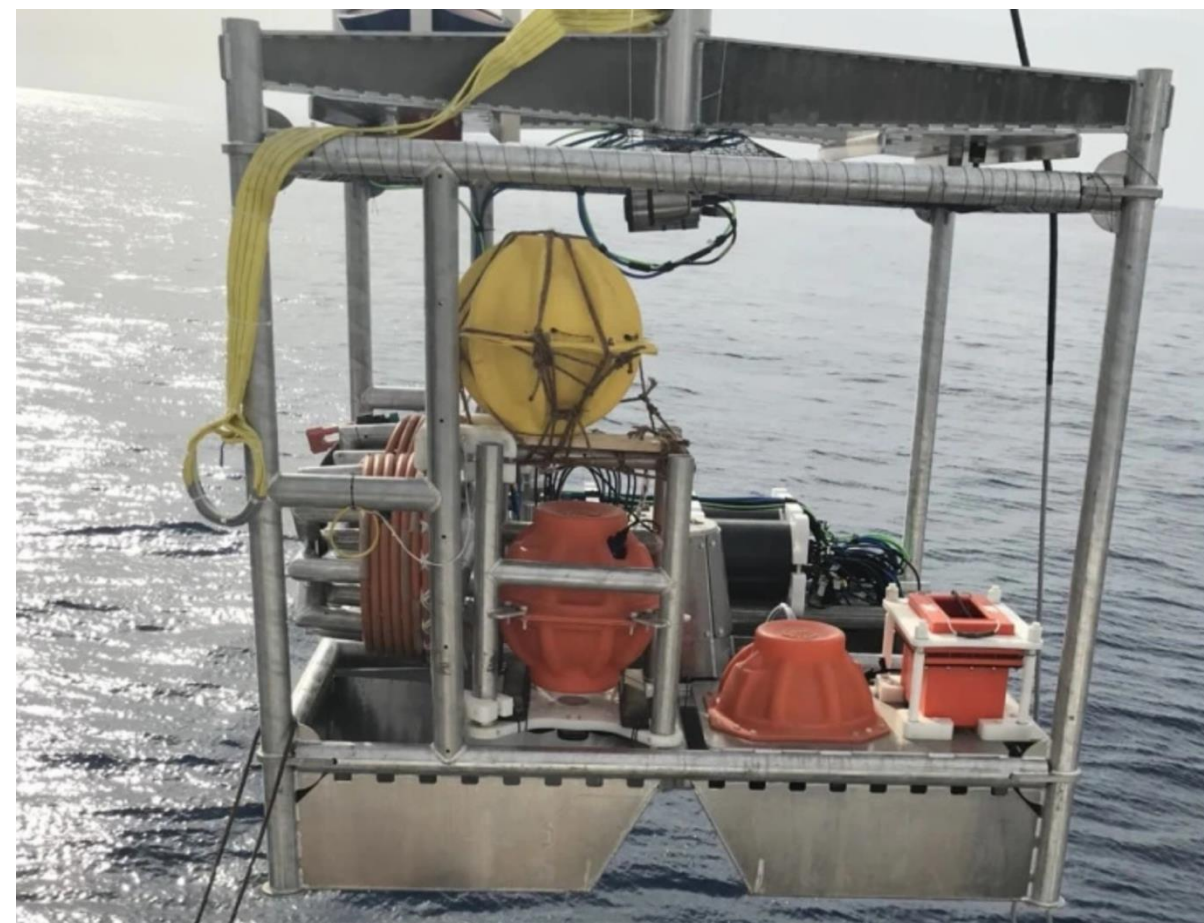
Western Ionian



OBSERVATORY SITES



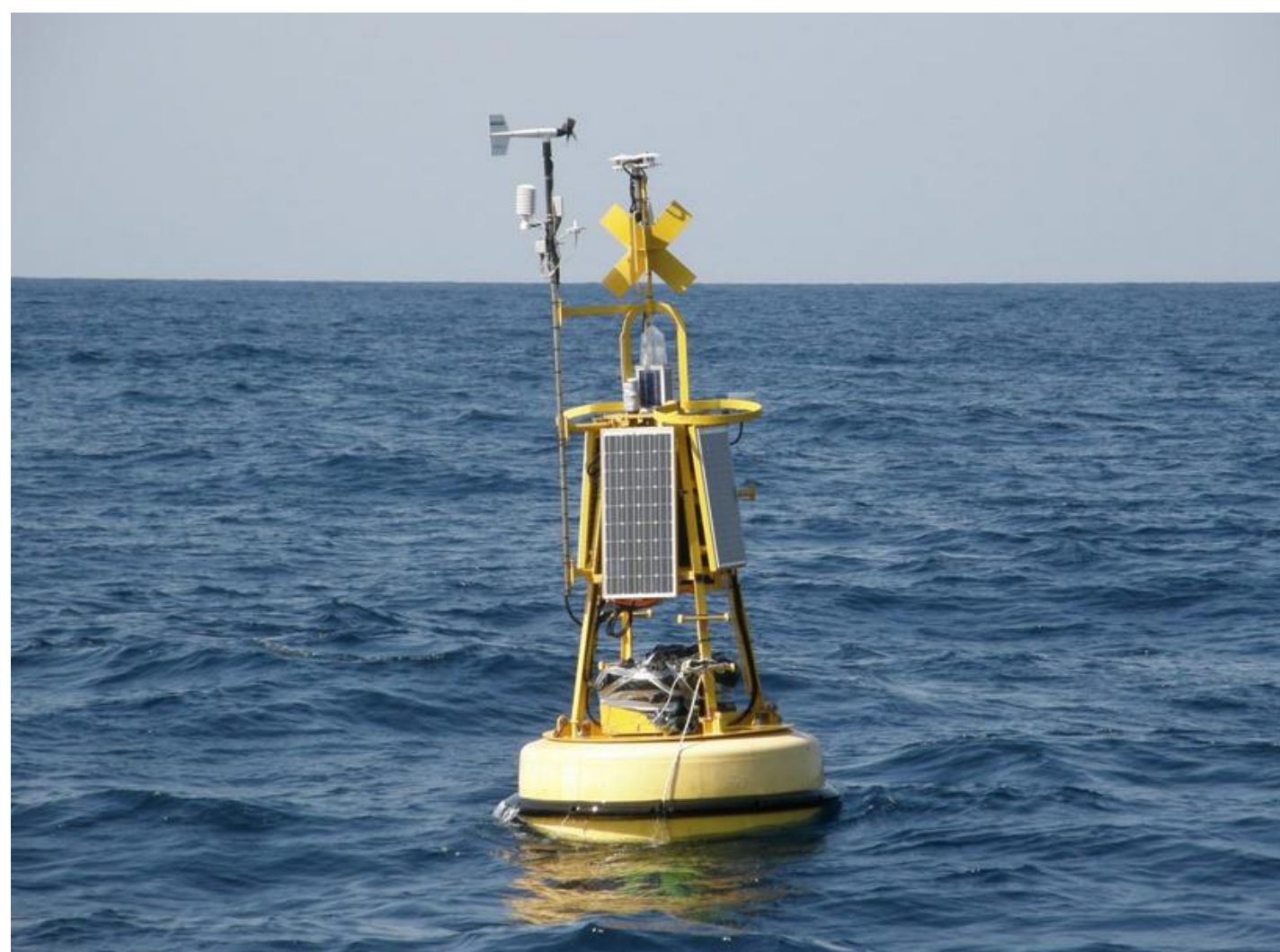
Ligurian sea



Hellenic arc



Canarias



South adriatic



Iberian Margin



Black sea

Data communications and delivery

Mode

Real time – ex. cabled observatories

Delayed mode – ex. standalone seabed observatories

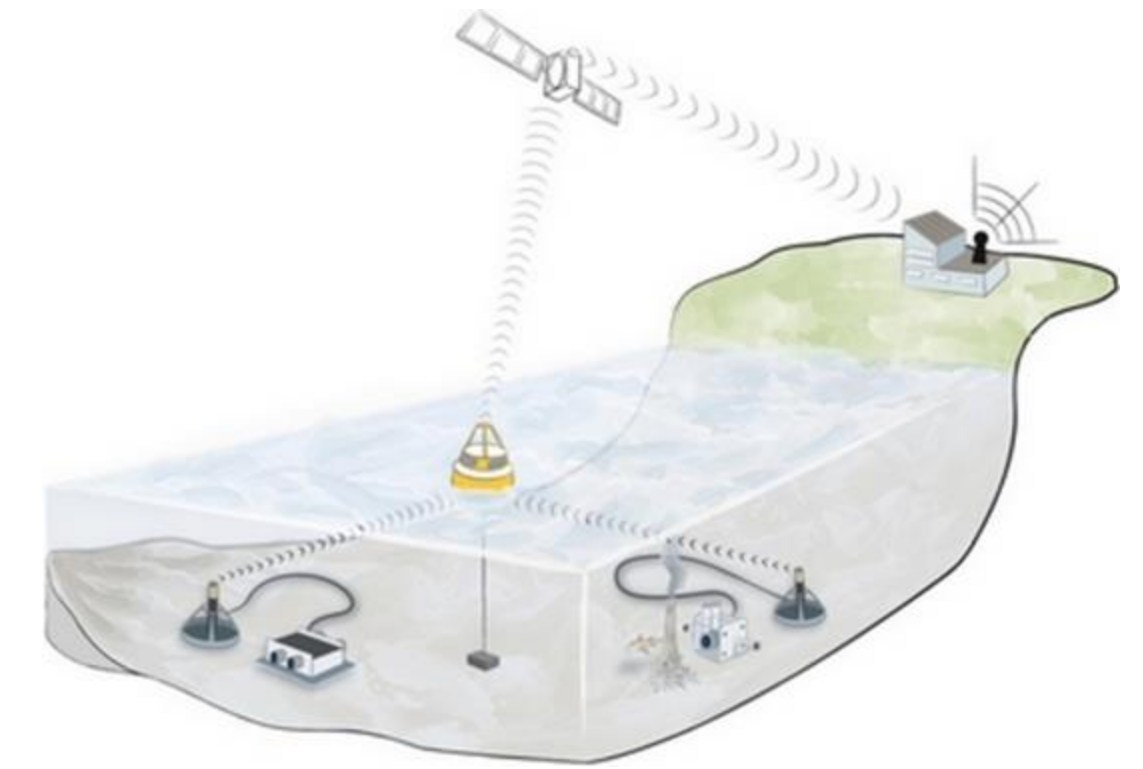
Communication system

Cable transmission (fiber optic)

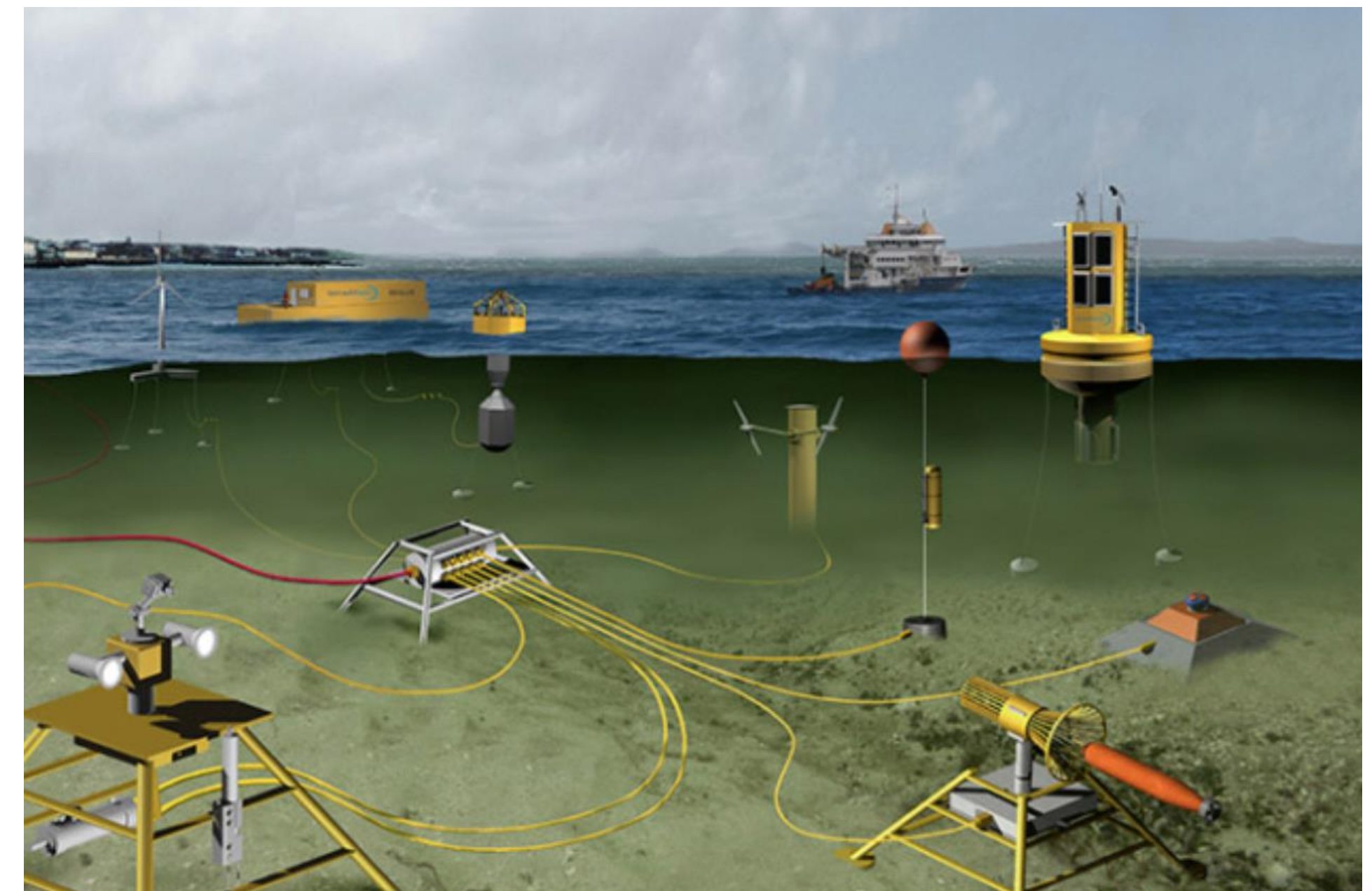
Surface buoy wireless data transmission (ex with mooring lines)

Acoustic communication from seabed nodes to buoy with satellite communication

Data collection from local data logger



Acoustic comms - Satellite (Azores)



Smartbay conceptual image

Platform types

Cabled seabed observatory

Standalone seabed observatory

Mooring (with or without surface buoy)

Vertical profiler mooring

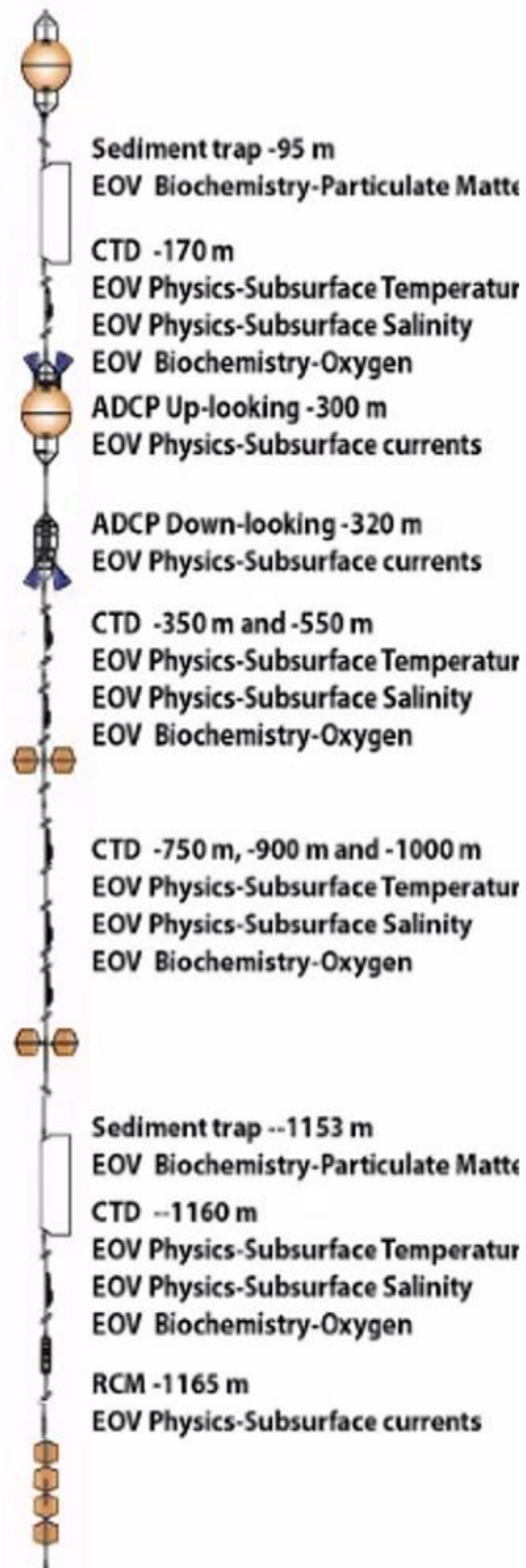
Experiments with smart cables

Mobility systems (ex: bathybot crawler)

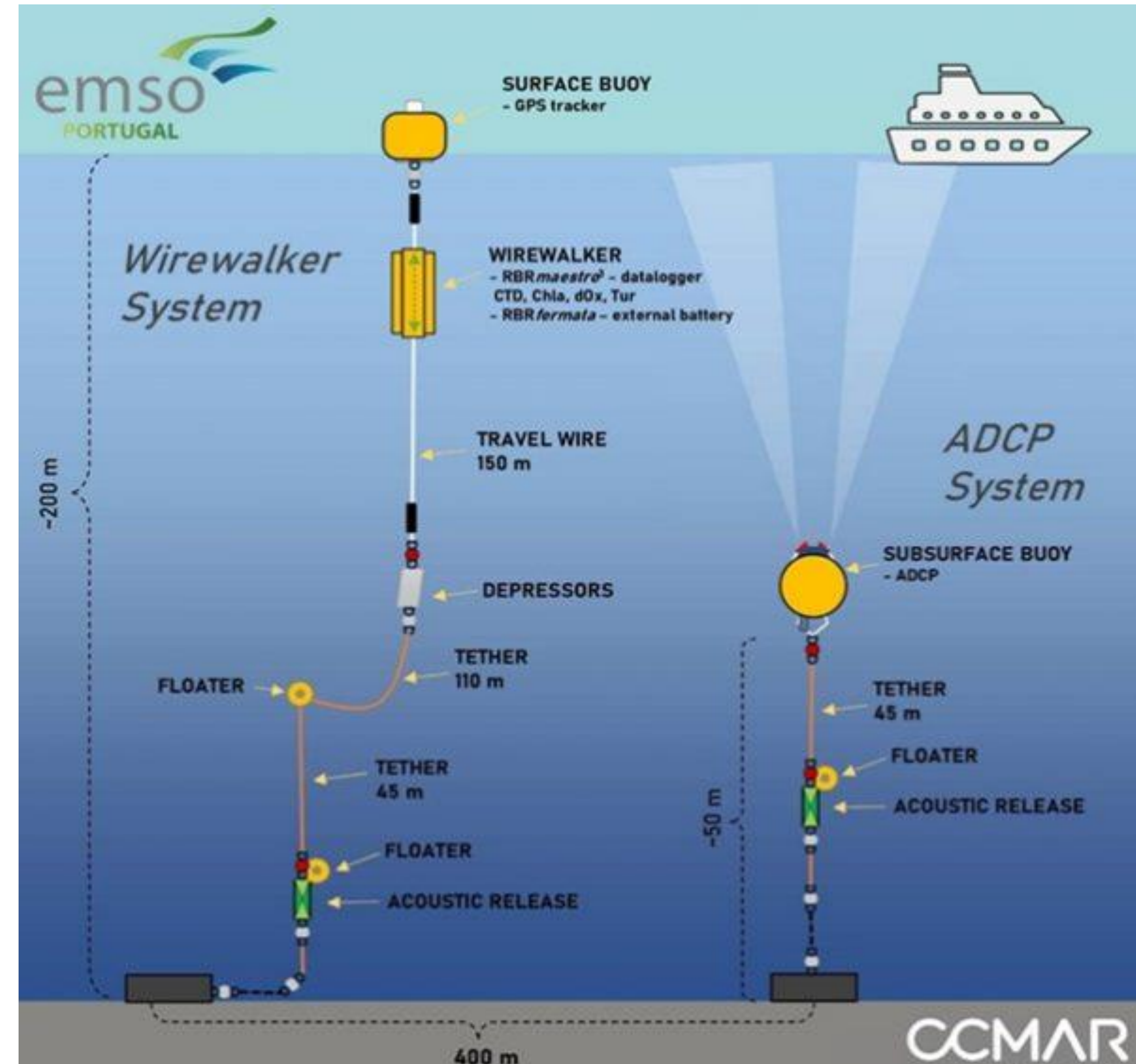
Mooring line a frequent platform

Common combination with surface buoy

MOORING E2M3A - depth 1200

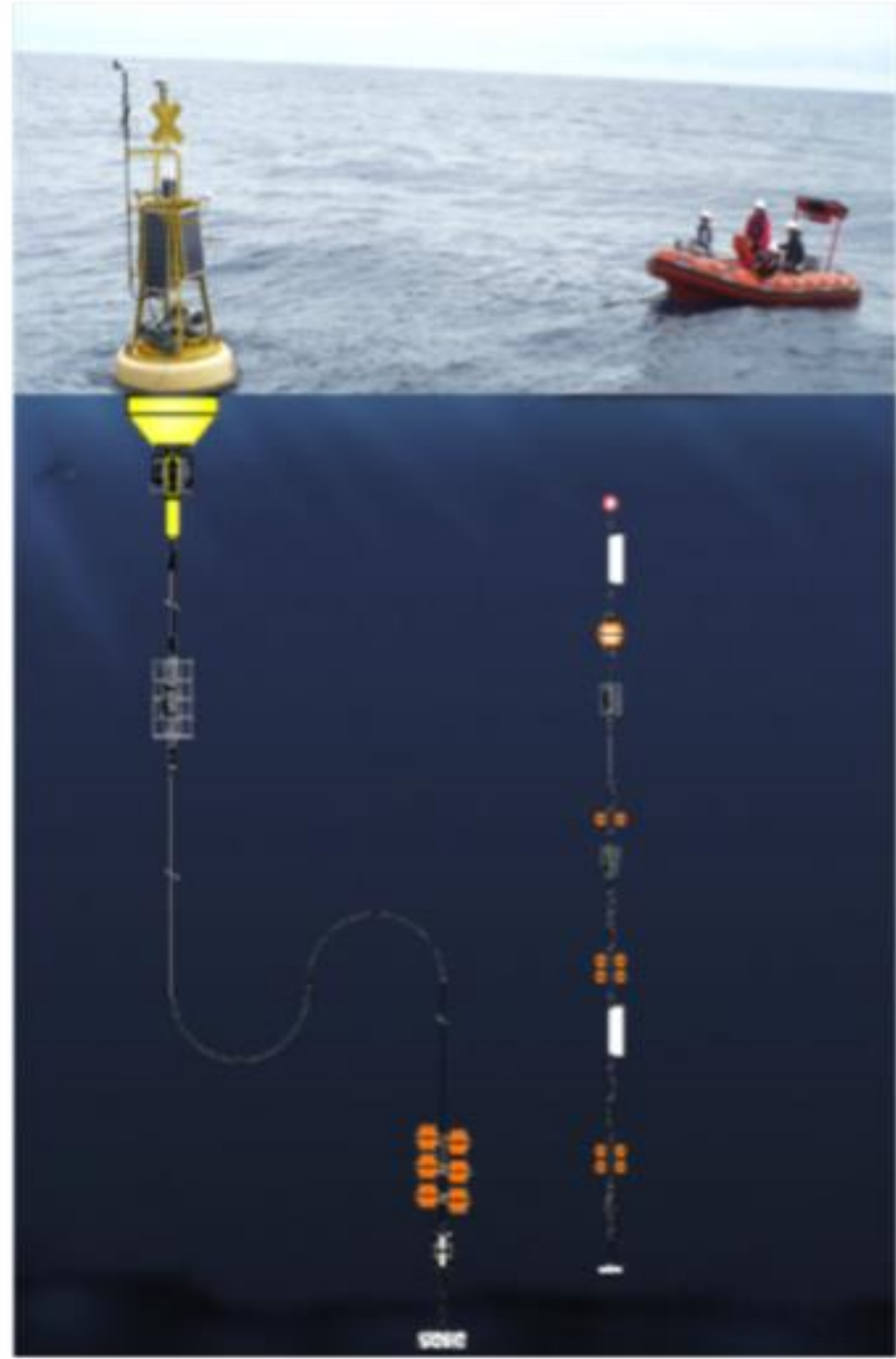


Mooring line with surface buoy (South Adriatic)

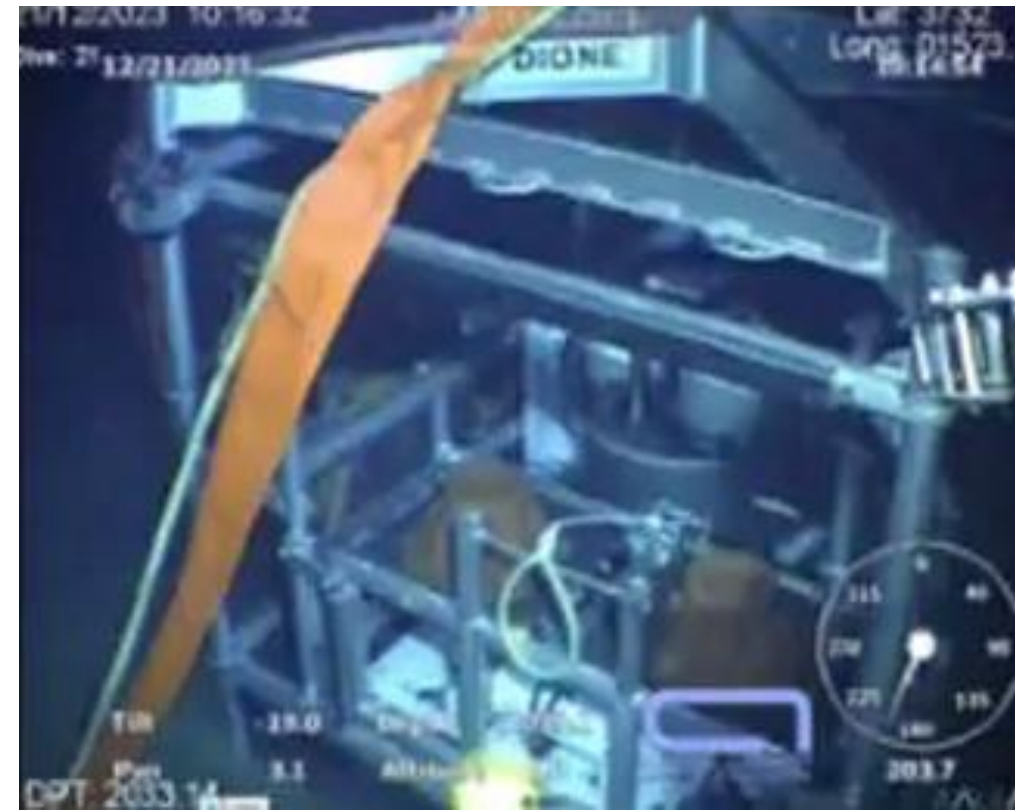


Vertical profiler mooring (Iberian margin)

Platform types



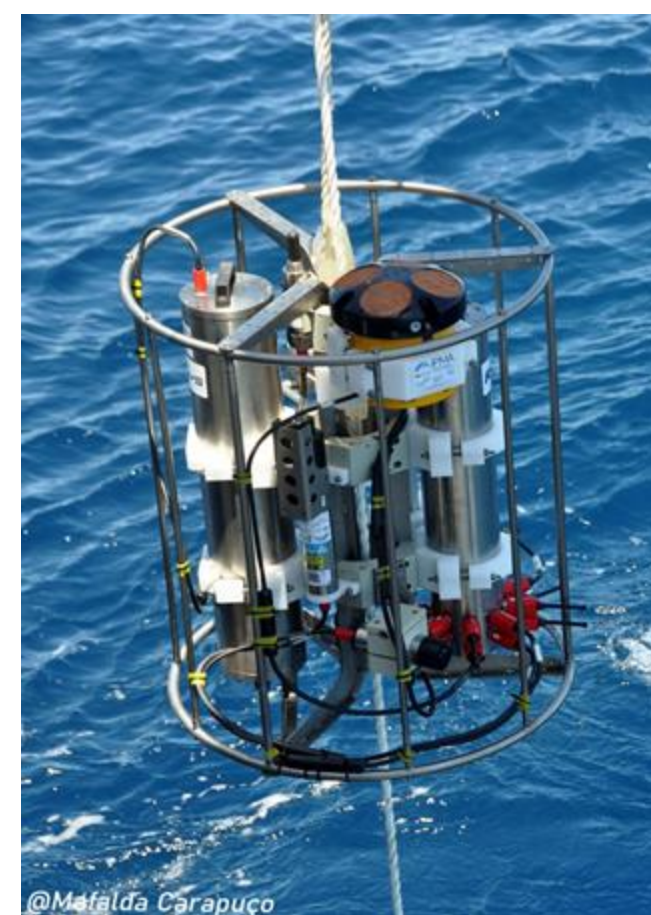
Mooring line (South Adriatic)



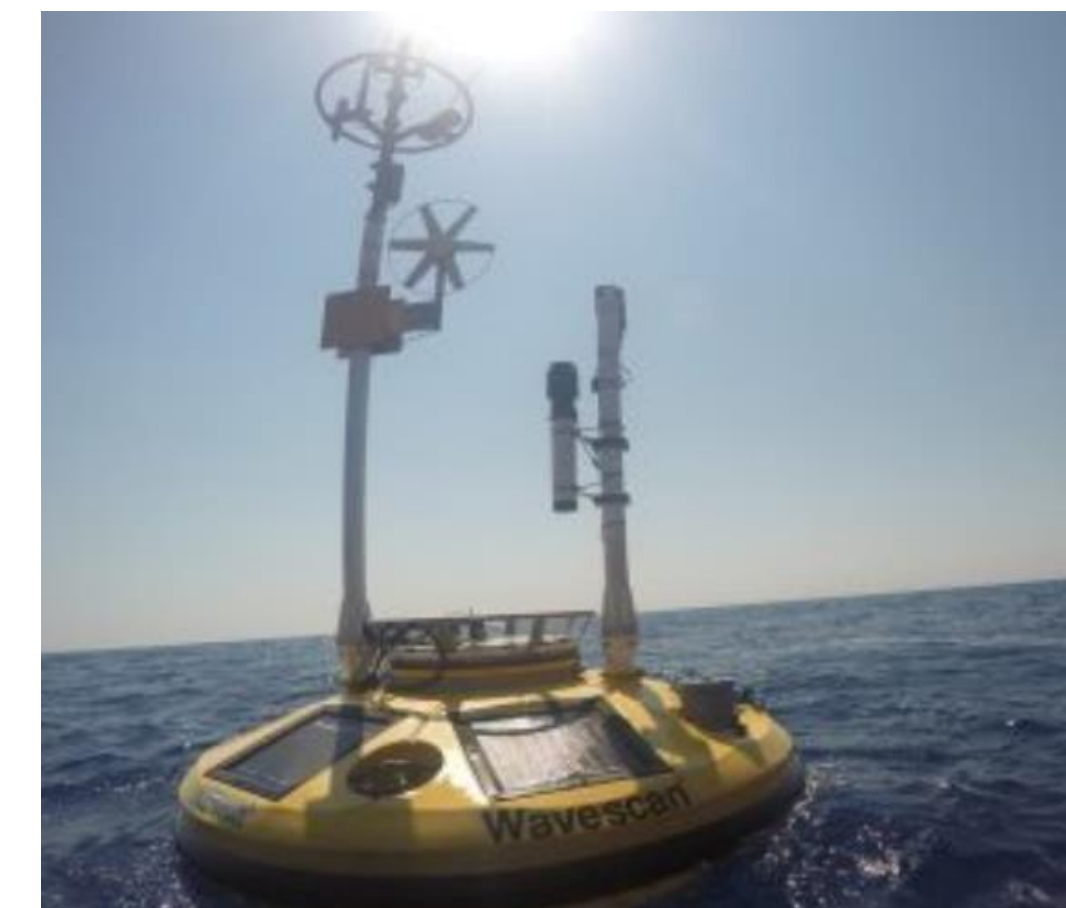
Seabed cabled observatory (Western Ionian)



Bathybot crawler (Ligurian sea)



Standalone EGIM (Iberian margin)

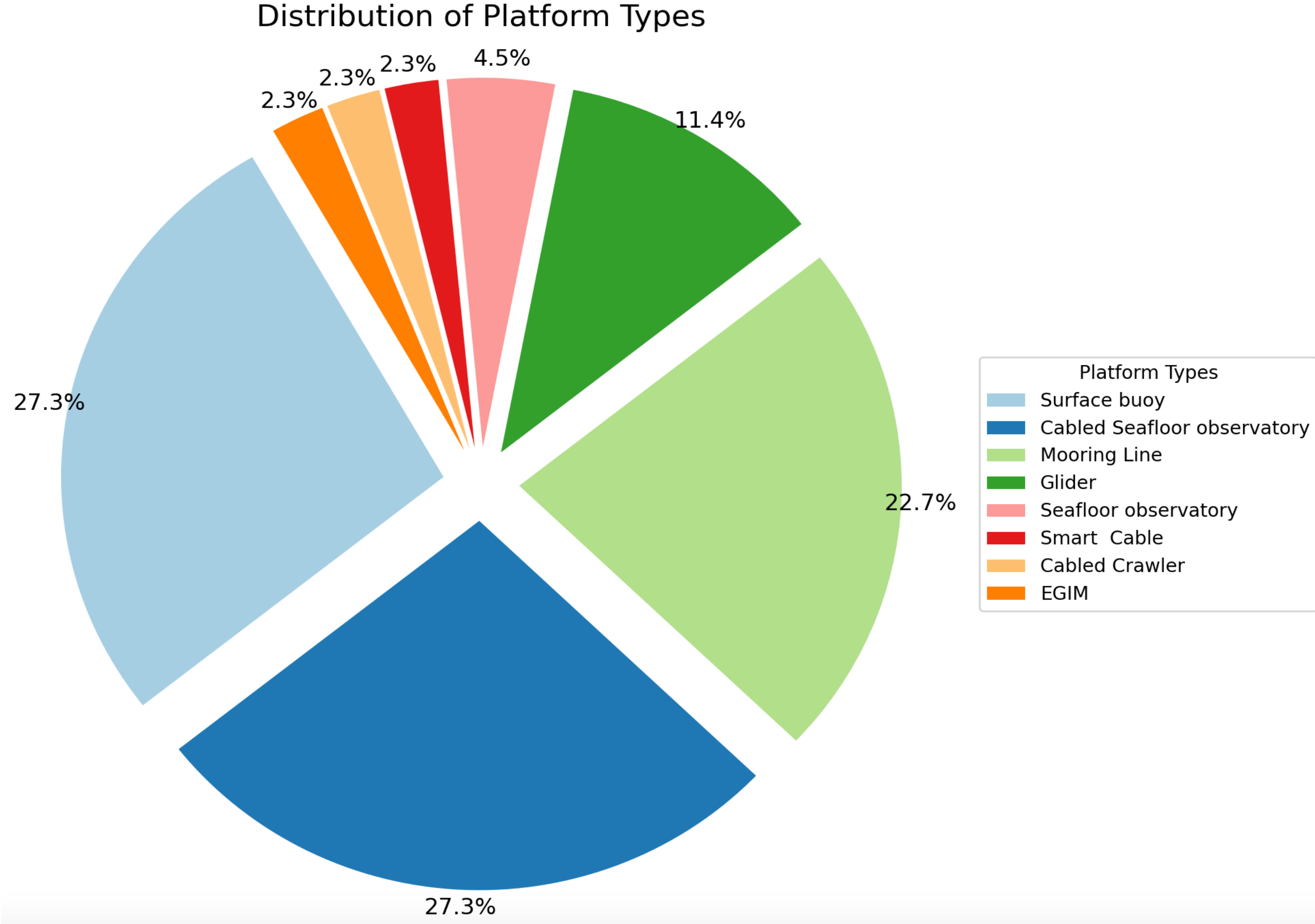
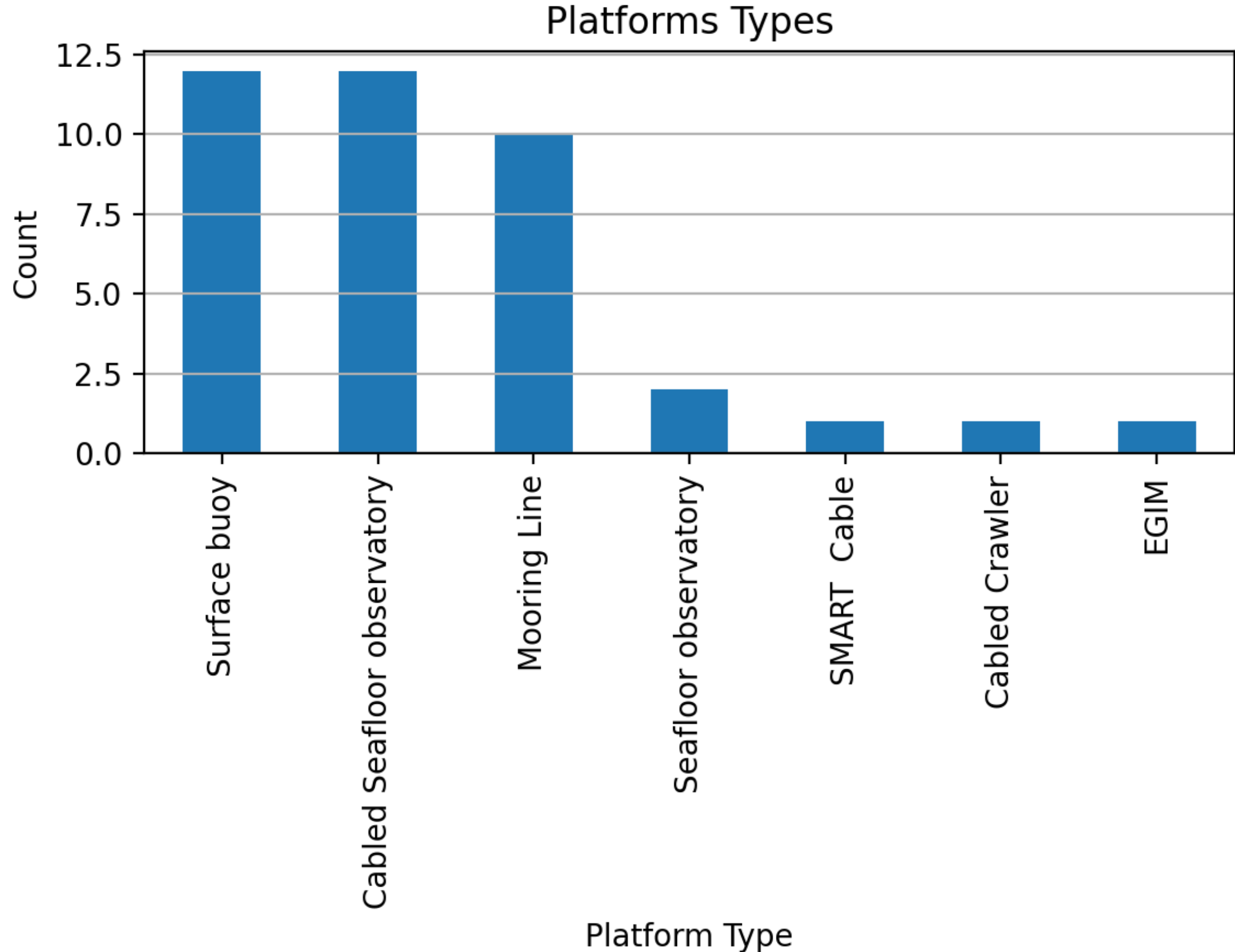


Surface bouy (Cretan Sea)



Surface SPAR bouy (West Med)

PLATFORM TYPES



Preliminary still incomplete data

WIDE VARIETY OF SENSORS

Water parameters

Oceanographic conditions (waves, currents)

Seismic information

Imaging sensors

Biological information

Meteorological information

CTD

ADCP

O₂

Hydrophone

Fluorometer

Turbidity

Seismometer

Pressure gauge

Gravimeter

pH

Chlorophyl

Magnetometer

Accelerometer

IMU

CO₂

Imaging

Plankton imaging (ex. UVP6)

Flow Cytometry

Meteorological station (wind, pluviosity etc)

...

SENSORS

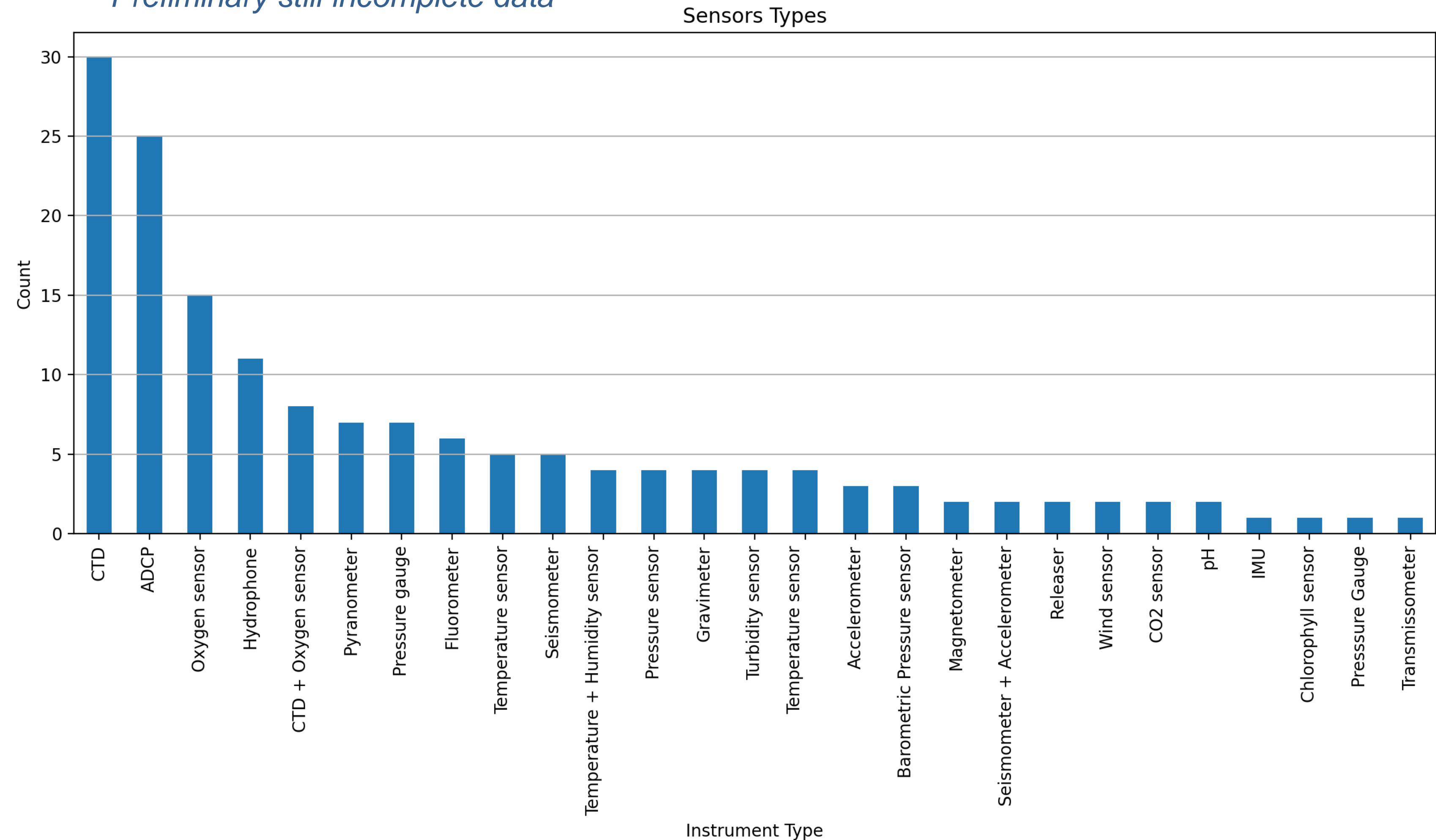
Common sensors: CTD, ADCP, O2 ...

Varying number of sensors and sensor types for each platform (from 1 to 10)

New sensors tested in EMSO participated projects and test sites (UVP6 camera, cytosub,...)

Smart cables and distributed fiber optic sensing starting to appear in EMSO

Preliminary still incomplete data



MAINTENANCE (some examples)

Azores

12 month period R/V Atlante

Western Ionian

Cable infrastructure 3 years with cable laying vessel

Mooring 6 month R/V Gaia Blu



Italian R/V Gaia Blu - West Ionian (CNR)



Italian R/V Gaia Blu MEUCCI cable laying vessel – West Ionian

Ligurian Sea

12 month Albatross mooring line RV Tethys II

Inspection with ROV Ariane from R/V Europe

West Med

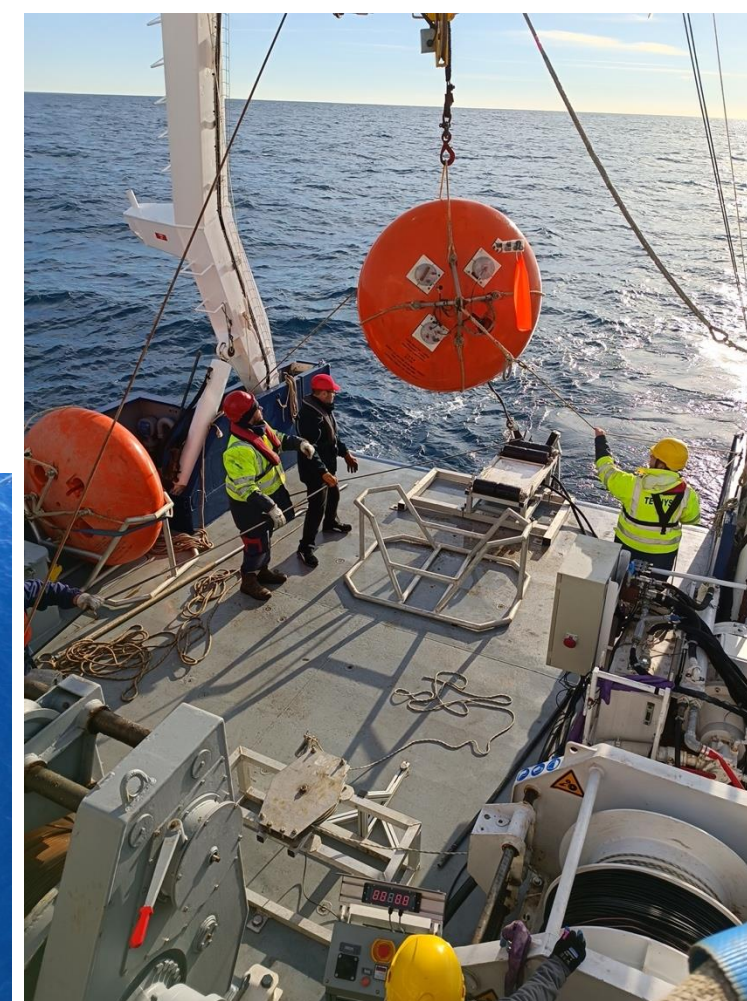
6 – 12 month , small 10m boat

Molene, Iroise sea

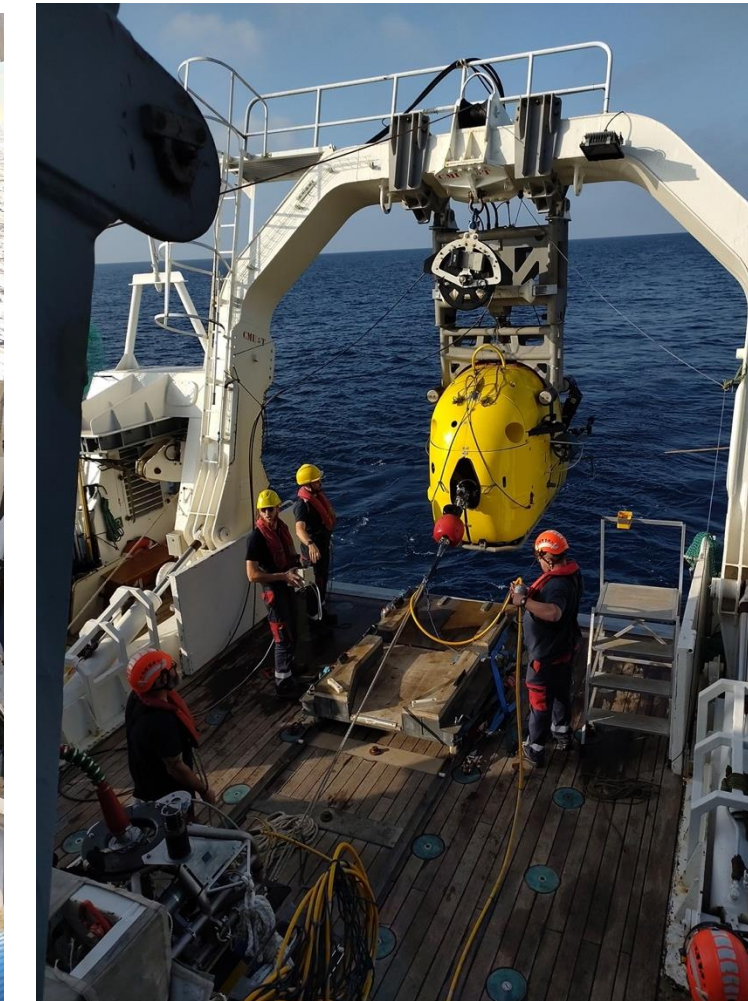
6 month



Small boat O&M in West Med



Albatross mooring deployment -Ligurian



ROV Ariane –Ligurian



SmartBay deploying

MAINTENANCE

Varying periodicity or event-based (common **6 to 12 month** period)

Multiple types of support vessels (from rib boats in shallow near shore sites to oceanographic research vessels in open sea)

Ship size also depend on size of equipment and type of deployment

Operations support at sea-bed, divers for shallow water, ROVs for deep

Maintenance cruise are a relevant factor in the O&M cost



Need to extend periods between maintenance and reduce time and logistics in those operations



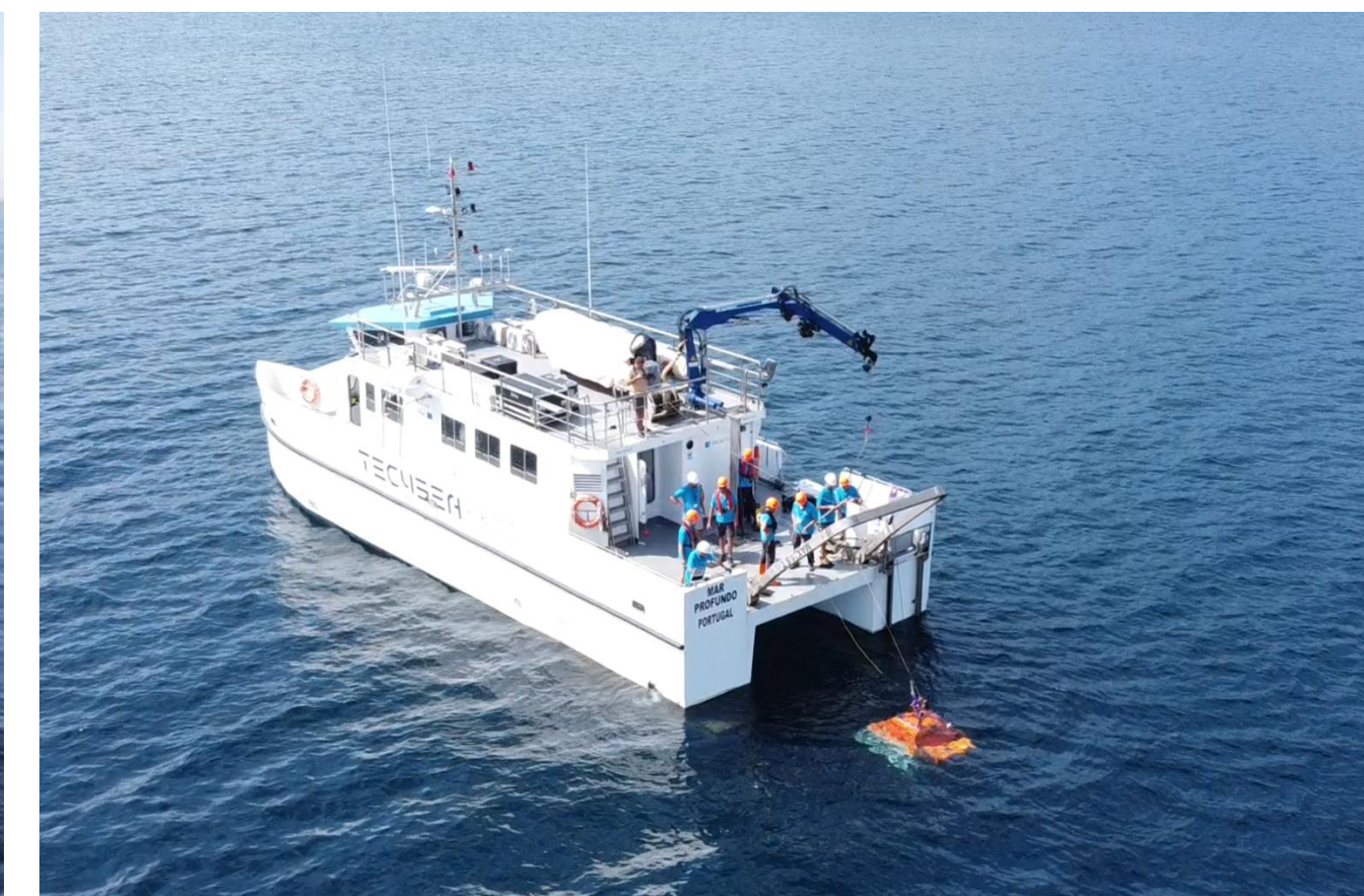
Portuguese R/V Mario Ruivo – Iberian Margin (IPMA)



French R/V L'Atlante - Azores (Ifremer)



Rib-boat in SmartBay



Portuguese R/V Mar Profundo (INESC TEC)

Mobile extension of fixed point observatories

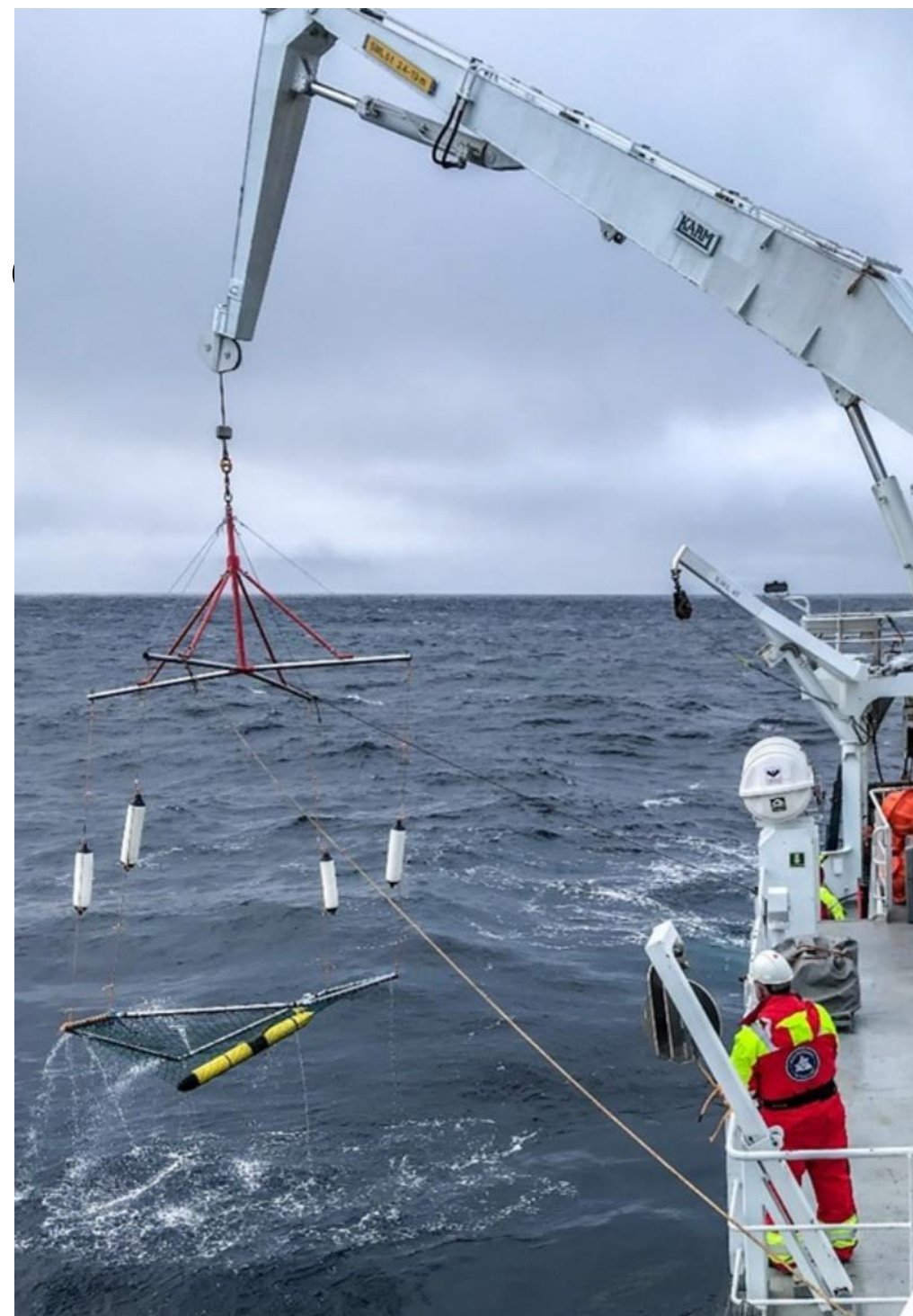
Some experiments on mobile extension of observatories

Ex: Ligurian Sea – Bathybot crawler on the seabed

Glider transects in the “area” of observatories provide additional and wide space coverage

Ex: Nordic seas, canaries, ...

Tests with mobile lander (TURTLE robot + EGIM)



Glider recovery on Nordic seas



Bathybot



TURTLE with EGIM

Thank you for your attention.



Observing the ocean to save the earth