



EXPLORING KEY SCIENTIFIC QUESTIONS WITH THE EMSO REGIONAL FACILITIES OR GROUP OF REGIONAL FACILITIES

Iberian Margin

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*EMSO Strategic Workshop
Rome, 11-13th March 2025*



IBERIAN MARGIN IN A NUTSHELL

Location: Cape Saint Vincent (N 36.85°, W 8.92°)

Distance from land: 18 km (30 km)

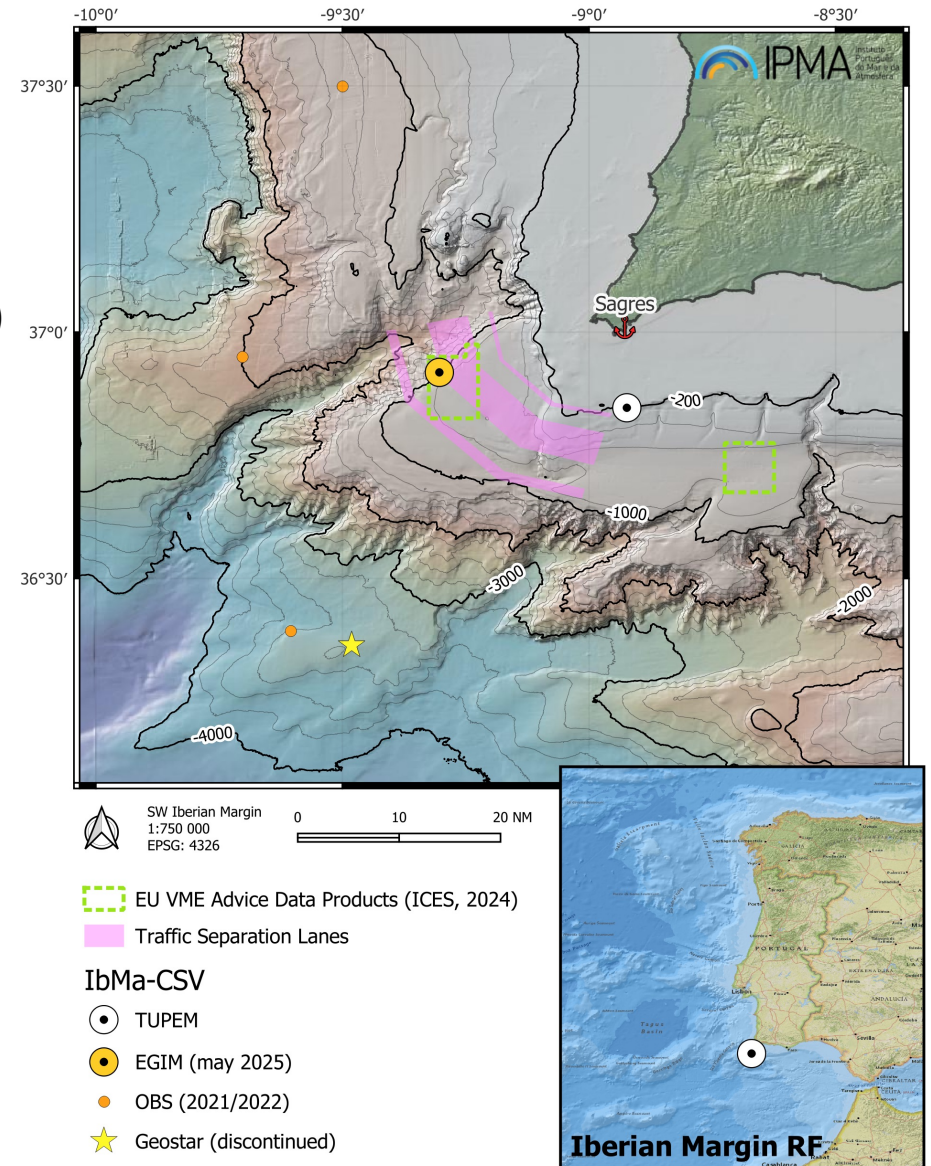
Max water depth: 200 m (1200 m)

Date 1st deployment: 2021 (TUPEM)

Supported by: CCMAR, IDL, CINTAL

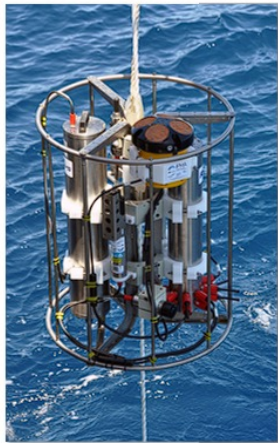
Operated by: IPMA

Regional Team Leader: Carlos Sousa



IBERIAN MARGIN IN A NUTSHELL

RF specificity Science and technology



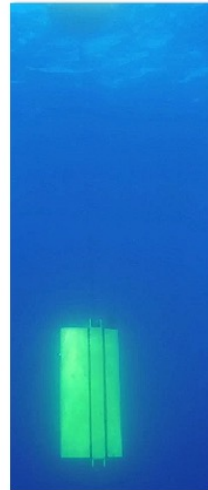
EGIM

Target:

Near bottom at ~1200m depth
9 to 12 months autonomy

Parameters:

- conductivity, temperature
- bottom pressure
- dissolved oxygen
- turbidity
- passive acoustics
- subsurface currents (ADCP)



Wirewalker

Target:

~ 5 profiles/hour @ 4 Hz (150 m)
~ 0.2 m vertical resolution
~ 3 months autonomy

Parameters:

- conductivity, temperature
- dissolved oxygen
- turbidity
- chlorophyll-a
- fDOM
- subsurface currents (ADCP in a separate mooring)



OBS

Ocean Bottom Seismometer:

- SILICON AUDIO (240s-1500Hz) @ 500Hz in three channels
- GURALP Aquarius (120s-100Hz) @ 250Hz in three channels

Passive acoustics:

- Hydrophone HTI-04-PCA (100s-8KHz) @ 500Hz

Microbiological cages



Acoustic platform

Calibrated hydrophone:

- Listening frequency below 1 kHz
- Preferably below the thermocline

Compass compensated vector hydrophone:

- marine mammals' detection and bearing estimation
- Listening frequency above 15 kHz

Complementary platforms

- Modular sea bottom platform (COSTOF2 based)
- Gliders (SLOCUM + Seaexplorer)
- Mobile lander (Turtle)
- Autonomous Surface Vehicle (AutoNaut 5)

Land based

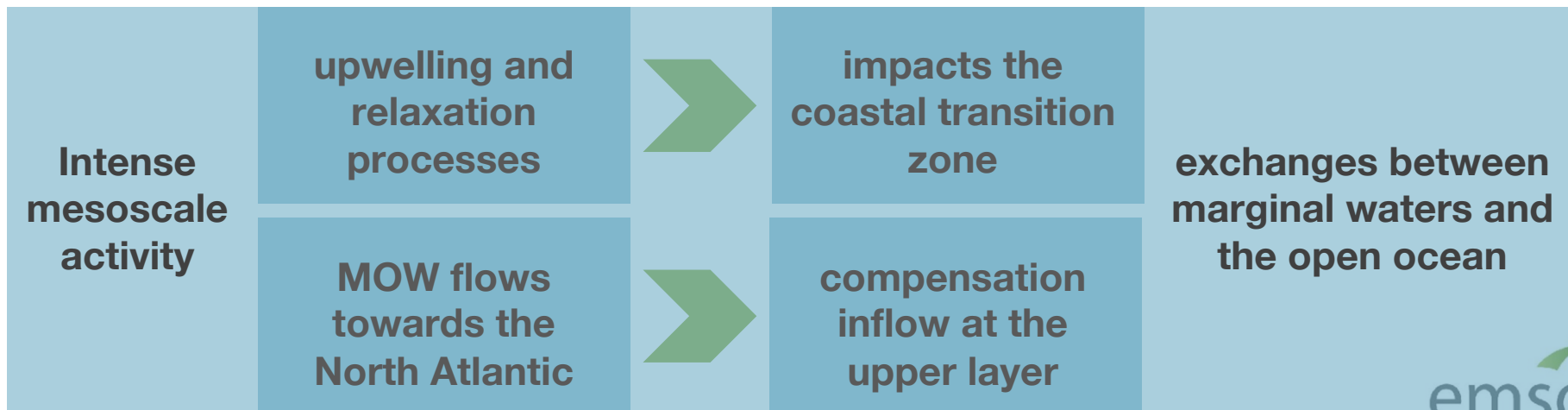
- Reference borehole seismometers
- Tidal stations
- Geology laboratory (<https://emso-gold.ipma.pt>)
- Marine Biotechnology laboratory (pressurized bioreactor)

IBERIAN MARGIN: SCIENTIFIC CHALLENGES

Key scientific question 1:

How does the temporal variability of open ocean EOVs impact and propagate from local to regional scales?

Processes, observed at the local scale, linking to regional scales of variability





IBERIAN MARGIN: SCIENTIFIC CHALLENGES

Key scientific question 1:

How does the temporal variability of open ocean EOVs impact and propagate from local to regional scales?

What is the structure of the water column, its variability on all time scales, and its response to forcing factors, including climatic changes?

Long-term, high-resolution monitoring of:

- Upper water column structure and coastal circulation (top 150 m)
- Intermediate level characteristics and variability (at ~1200 m depth)

Does local variability prompt to implications on regional scales and potentially on global scale?

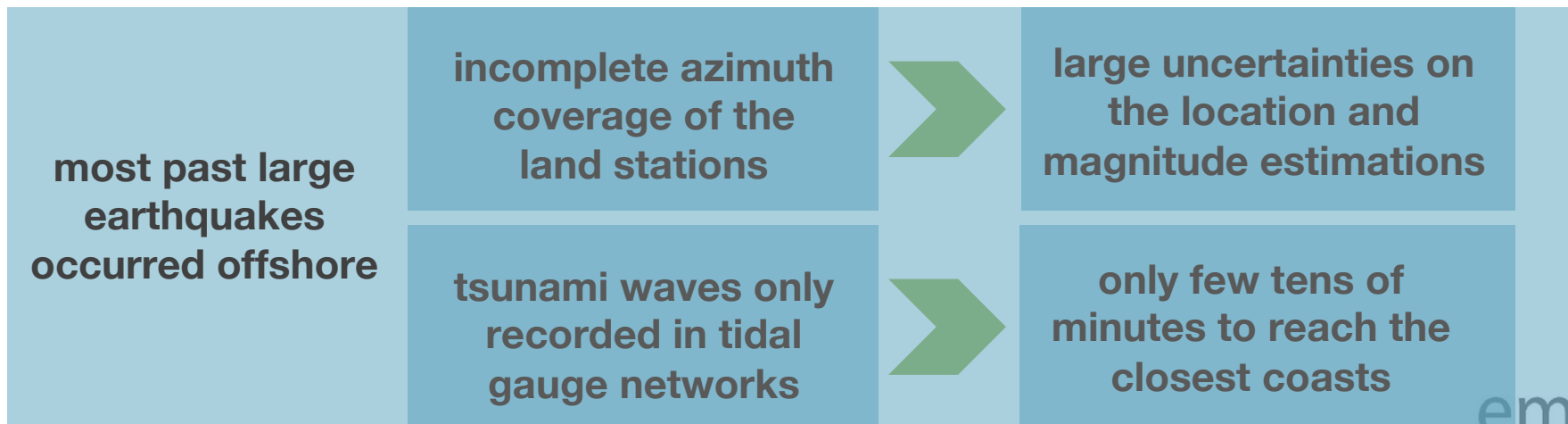
- Upper layer is local but exchanges EOVs to the open ocean
- MOW exchanges salt and heat to the North Atlantic

IBERIAN MARGIN: SCIENTIFIC CHALLENGES

Key scientific question 2:

What are the spatiotemporal scales and variability of the processes preconditioning and triggering natural hazards events?

Land-based seismometers provide less coverage





IBERIAN MARGIN: SCIENTIFIC CHALLENGES

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What are the spatiotemporal scales and variability of the processes preconditioning and triggering natural hazards events?

What elements are needed for an Earthquake Early Warning System (EEWS)?

Geophysical sensors installed on telecommunication cables likely to occur in early 2027, however:

- Fiber Optic Sensing (FOS) studies show large variation that is also a function of local coupling conditions
- OBS observations vs absolute pressure gauges remain an essential tool to calibrate and validate the transfer function between strain and ground motion



IBERIAN MARGIN: SCIENTIFIC CHALLENGES

Key scientific question 3:

What are the impacts of geophysical dynamic events, climatic and anthropogenic changes on open ocean benthic and pelagic ecosystems?

Vulnerable Marine Ecosystems (VME) monitoring

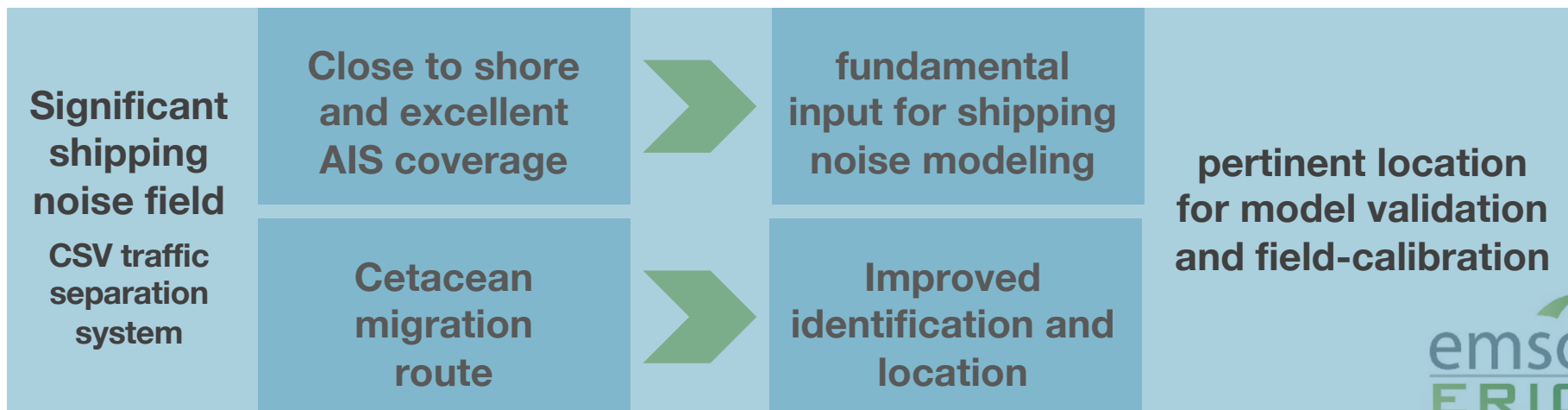


IBERIAN MARGIN: SCIENTIFIC CHALLENGES

Key scientific question 3:

What are the impacts of geophysical dynamic events, climatic and anthropogenic changes on open ocean benthic and pelagic ecosystems?

Ocean soundscape off Cape Saint Vincent





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What are the impacts of geophysical dynamic events, climatic and anthropogenic changes on open ocean benthic and pelagic ecosystems?

What is the current status of VMEs? Is there a discernible disturbance related to climate change?

- Sustained monitoring with low-cost landers equipped with cameras and EOVs sensors.

What is the anthropogenic noise component in the CSV region? And how does it impact sound sensitive species?

- Calibrated acoustic hydrophone for shipping noise modeling
- Compass compensated vector hydrophone for marine mammals' detection and bearing estimation





IBERIAN MARGIN: SCIENTIFIC CHALLENGES

Key scientific question 5:

How to develop innovative observation technologies and strategies for the open ocean and increase EMSO observatory capabilities?

tbd



IBERIAN MARGIN: LOOKING AHEAD

How does your Facility represent regional scale ?

| | Hydrodynamics and hydrology | Biochemistry, ecology | Geology and Geophysics |
|--|---|-----------------------|------------------------|
| Future objectives | <ul style="list-style-type: none"> • Increase spatial coverage: <ol style="list-style-type: none"> a) new Iberian Margin site on the west (north) coast of continental Portugal b) deploy moving platforms in cross-sections that intersect fixed platforms • Establish synergies with CAM SMART Cable System • Acquire near real time data • Add new EOVS sensors, namely dedicated to carbon fluxes observation • Improve model parametrizations with reference data towards better forecasting • Construct long-term oceanographic time series as a scientific patrimony and a legacy for future marine research and management | | |
| Challenges/Technology that EMSO ERIC may provide to support | <ul style="list-style-type: none"> • Sustainable ship time management for reduced platforms downtime • Increased Data services/products require significant Data management skills (and HR), bottlenecked by limited funding for this specific task • Focus on AI and Ocean Twins must address RF knowledge base imbalance | | |



Thank you for your attention!





Observing the ocean to save the earth

