Following the Mediterranean path through the Atlantic: the MEDWAVES cruise

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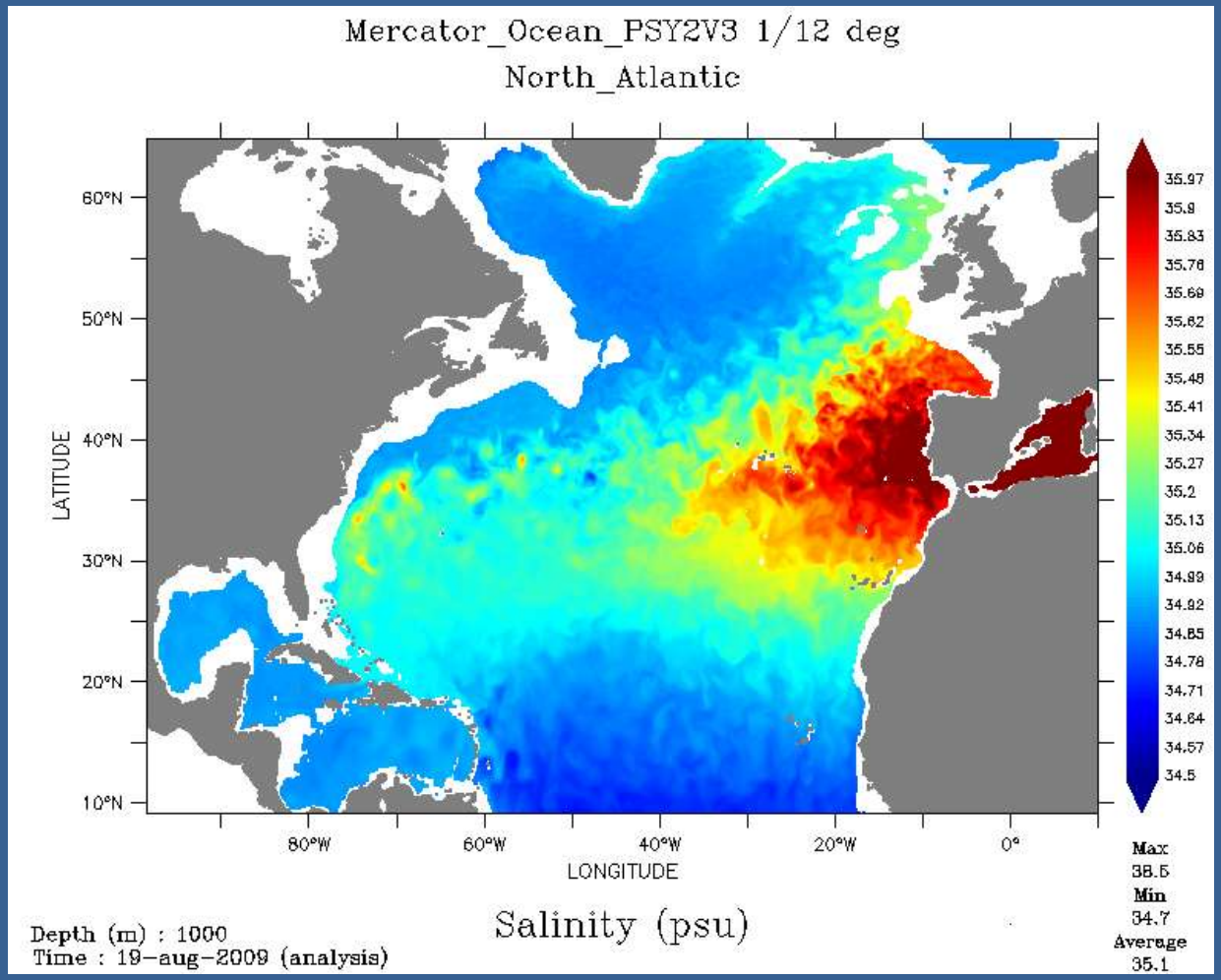
MEDWAVES Background



Mercator Ocean Salinity: Analysis map for 1,000 m on 19.08.2009. The high salinity water of the Mediterranean outflow (red) spreads out from the Strait of Gibraltar to fill the eastern Atlantic both to the north and south

MEDWAVES Background

MEDiterranean out flow WAter and Vulnerable EcosystemS

MEDWAVES was focused in contributing to a better understanding of the Atlantic-Mediterranean biodiversity and connectivity, and it addressed the role of the Mediterranean waters in making this connectivity across two of the ATLAS case study sites:

Alboran Sea - Strait of Gibraltar - Gulf of Cádiz (c.s. 7)

and

Azores (c.s. 8)

MEDWAVES Aims

(1) to characterize physically and biogeochemically the MOW to understand its interaction with the AMOC stream

(2) to explore the relationship between the oceanographic settings of the target areas and the ecosystems therein

(3) to characterize the communities of the targeted areas and identify potential VMEs and EBSAs

(4) conduct population genetic analysis aiming at understanding the connectivity between the Mediterranean Sea and the Atlantic Ocean

The MEDWAVES Research Vessel

Operator: Unidad de Tecnología Marina (UTM, CSIC)
Country: Spain
Website: http://www.utm.csic.es/sarmiento.asp
Vessel Type: Multipurpose Research Vessel
Vessel Class: Global
Scientist berths: 26
Length: 70.5m

MEDWAVES participants

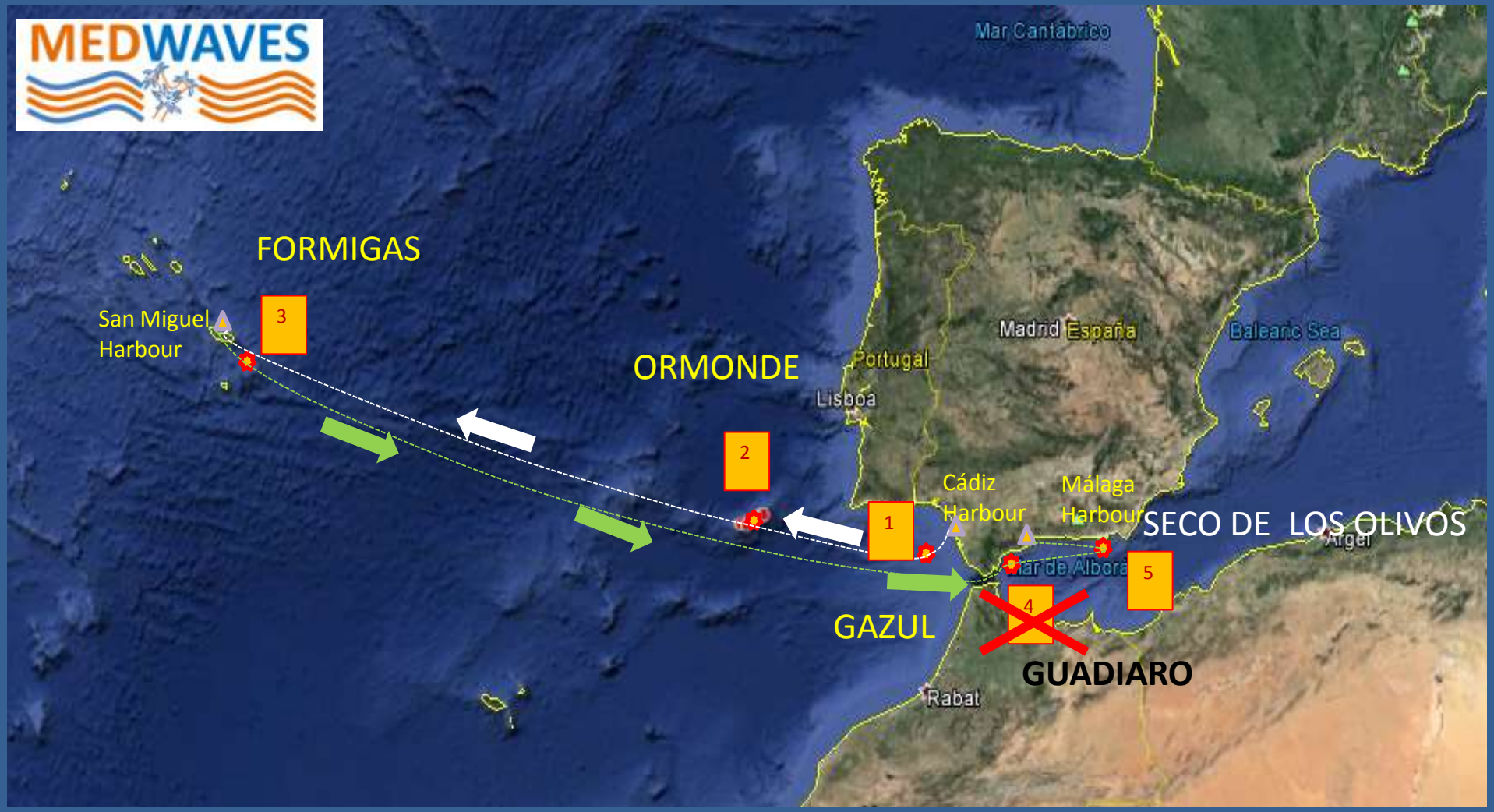
38 participants
(scientist /technicians)

19 participants
(crew)

Eight nationalities:

Spain, Portugal, Italy, France, Greece, Croatia, United Kingdom, Canada

MEDWAVES itinerary



MEDWAVES teams

Physical Oceanography
WP1

Biogeochemical Oceanography
WP1 WP2

Geomorphology and habitat mapping
WP3 WP6 WP7

OFOP Annotation ROV dives
WP3 WP6 WP7

Organic Matter analyses. Soft bottoms
WP2 WP3

Ecophysiology
WP2 WP6 WP7

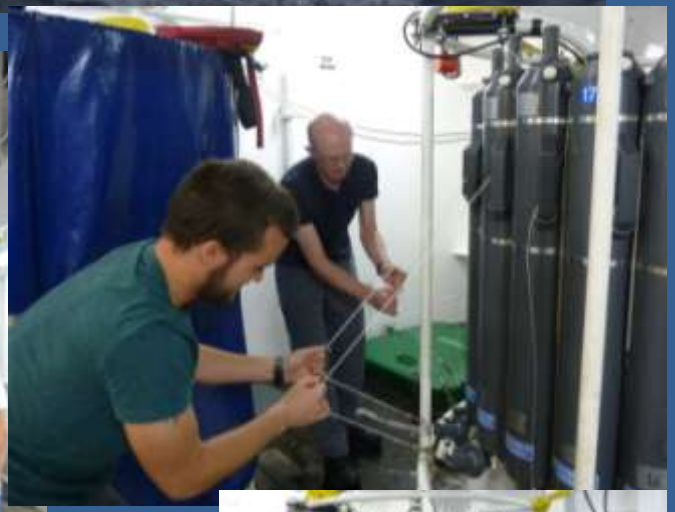
Evolutionary biology
WP4 WP6 WP7

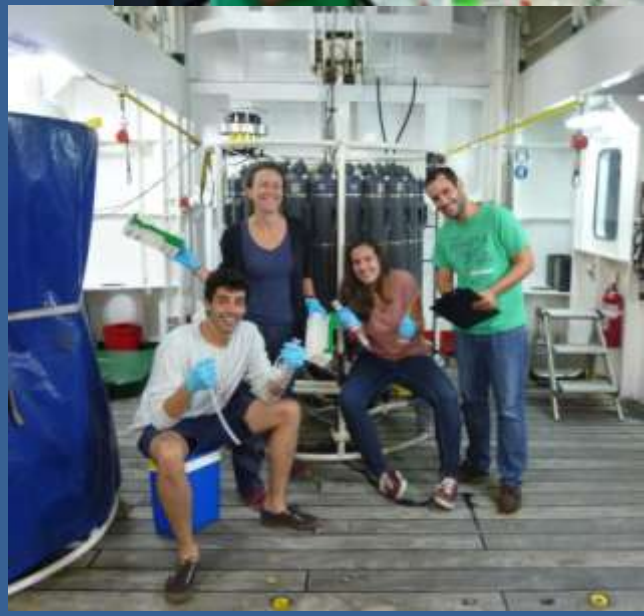
MEDWAVES outputs will also feed WP5 WP8 WP9

MEDWAVES sampling

CTD-Rosette
LADCP
Irradiance Sensor

Biogeochemical
Oceanography team





Physical Oceanography team

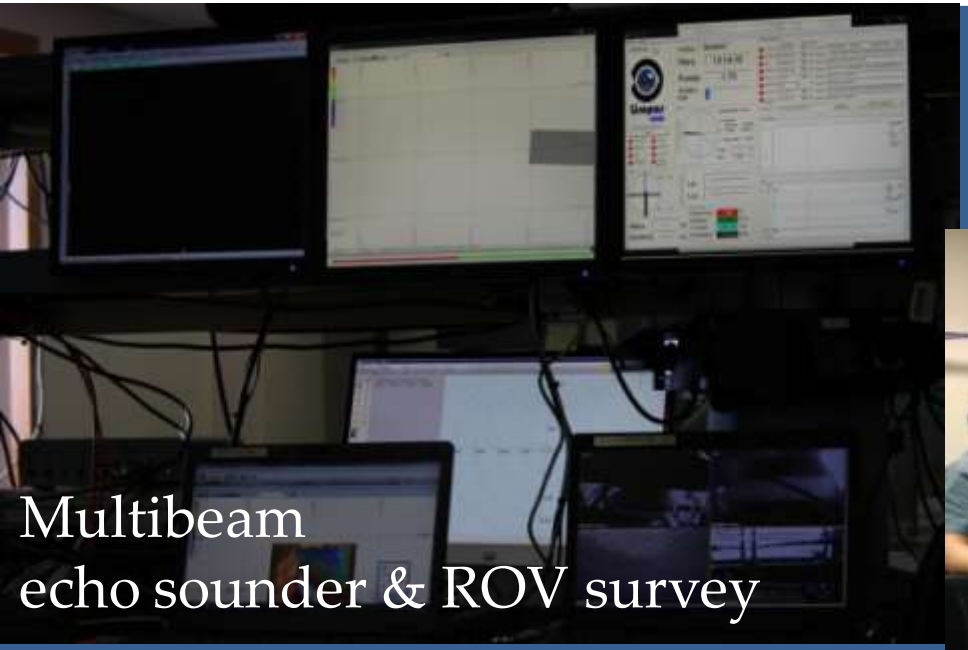
MEDWAVES sampling

Box Corer

Van Veen Grab

Benthic team. Biodiversity. Soft bottoms.
Sediment characterization

MEDWAVES sampling



Multibeam
echo sounder & ROV survey

Habitat mapping and
Geomorphology team

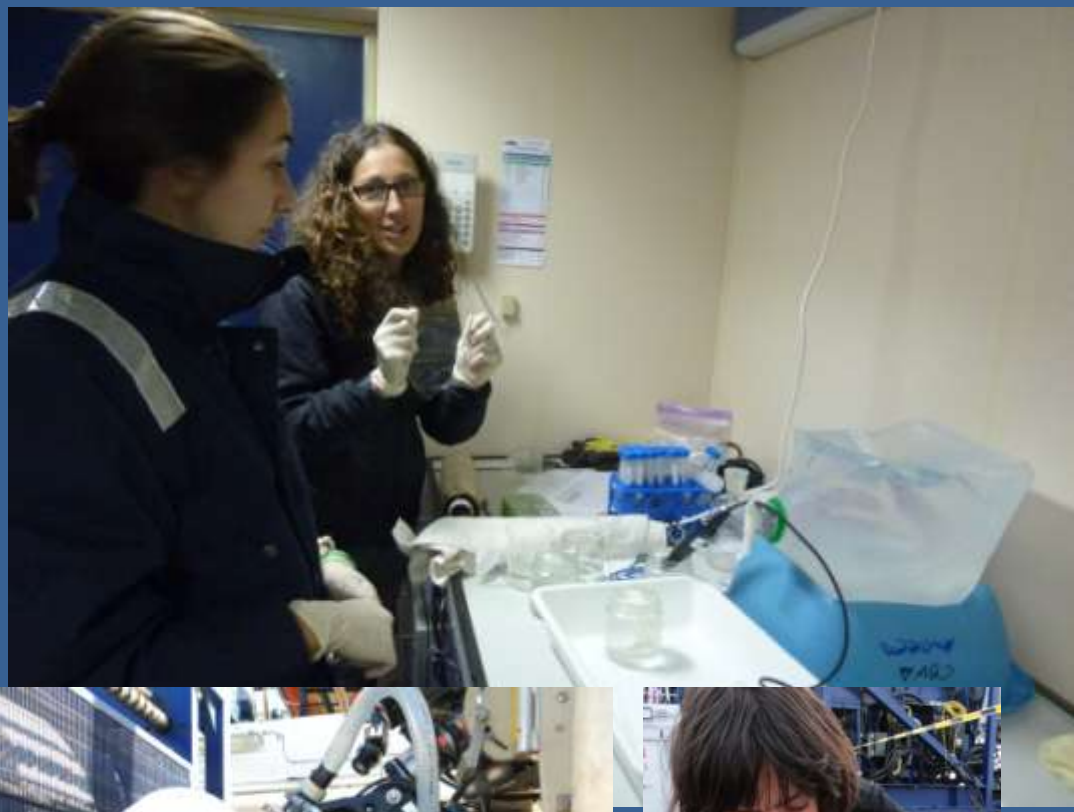
MEDWAVES sampling

- Super Mohawk (subAtlantic)
- 2,000 meters depth
- HD video camera
- HD still digital camera

Habitat mapping, Benthic team. OFOP
Annotation / ROV dives

MEDWAVES sampling

ROV



ROV survey team, Benthic team.
Ecophysiology

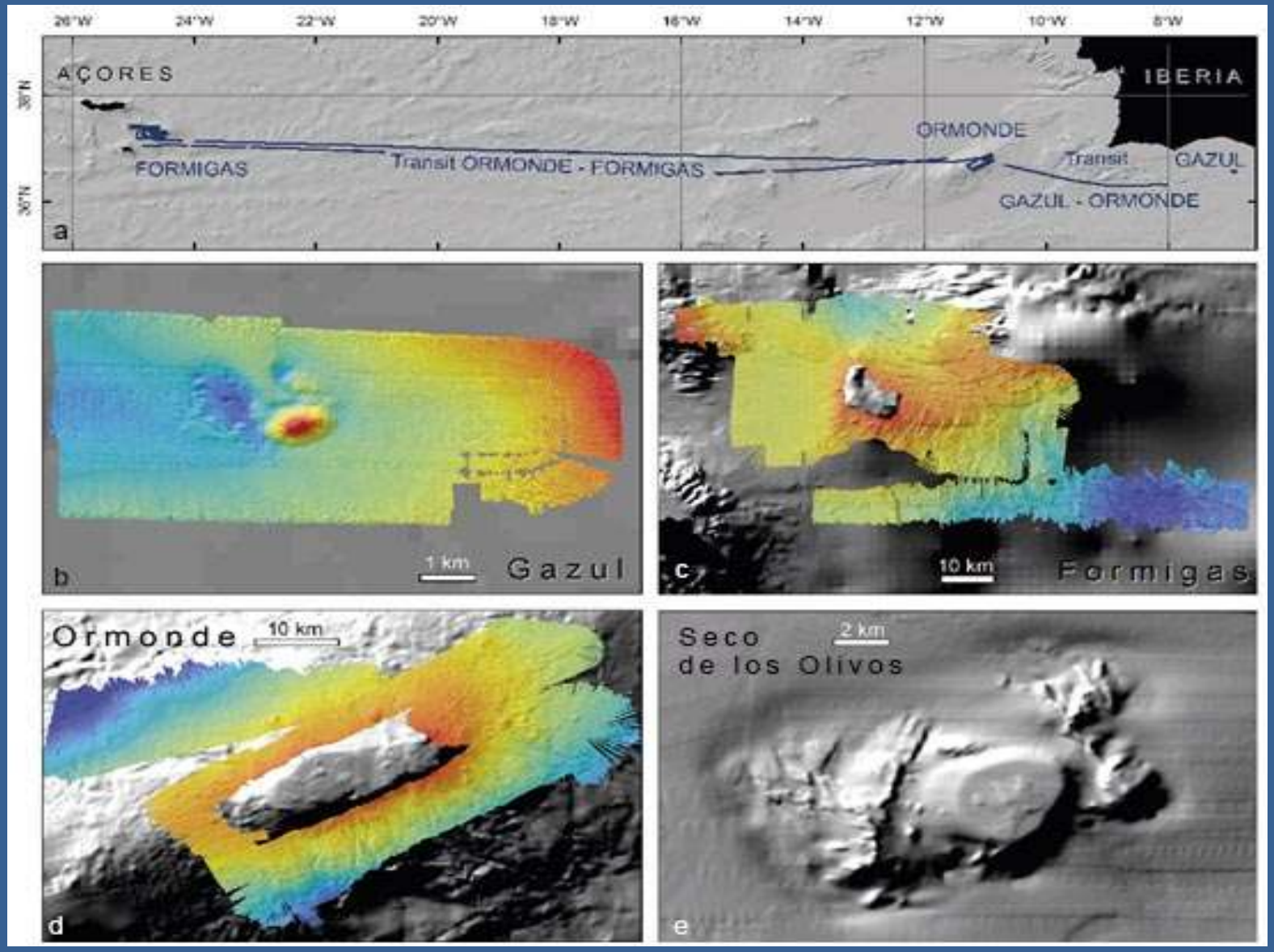
MEDWAVES sampling


Multicore


ROV

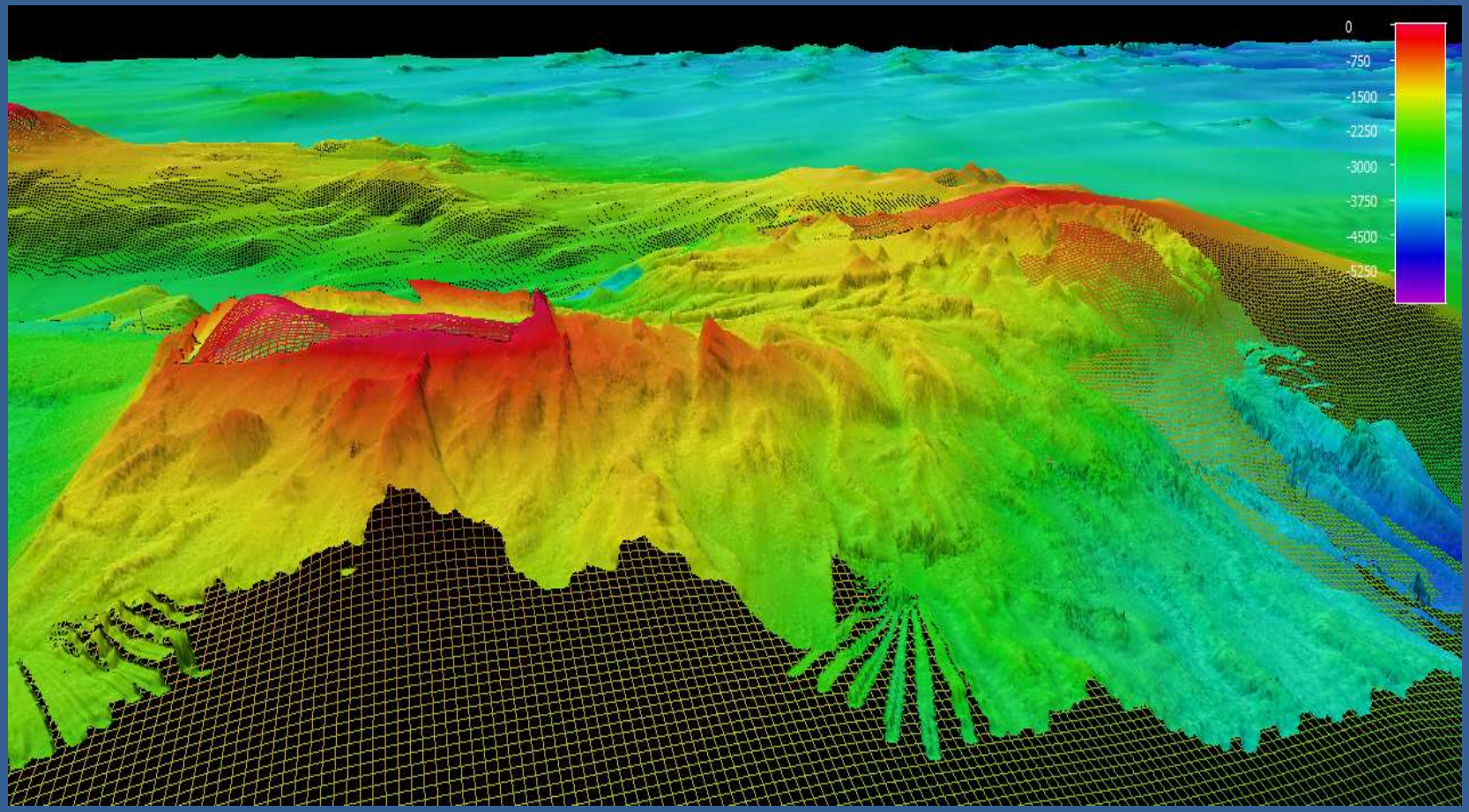
Rov survey team,
Benthic team.
Evolutionary biology

MEDWAVES Geomorphology



Geomorphology & Habitat mapping team_MEDWAVES

MEDWAVES Geomorphology

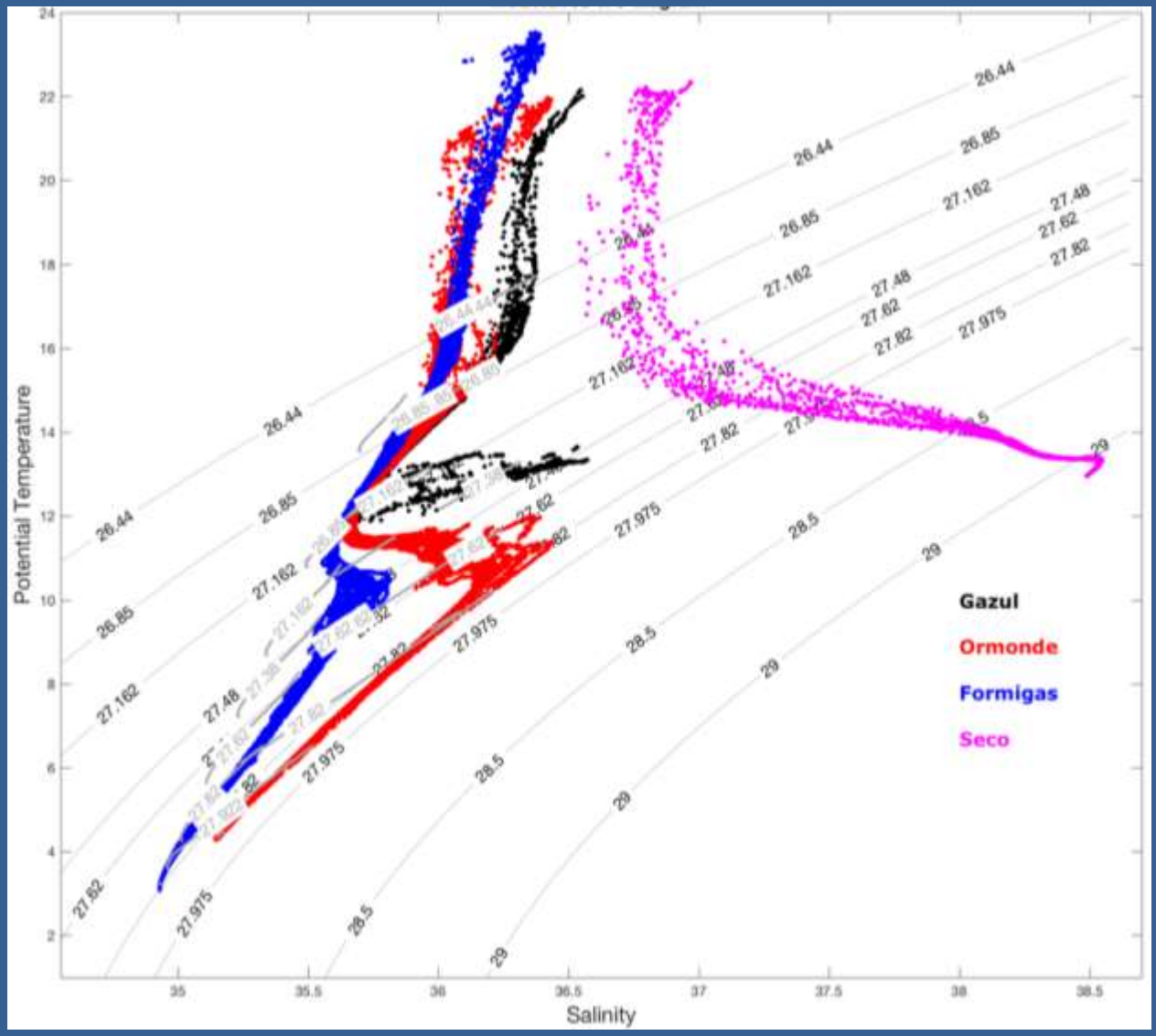


3D view of submarine landscape around Formigas Bank. The mesh is the previous available bathymetry from EDMONET and the solid model show swath bathymetry from MEDWAVES cruise.

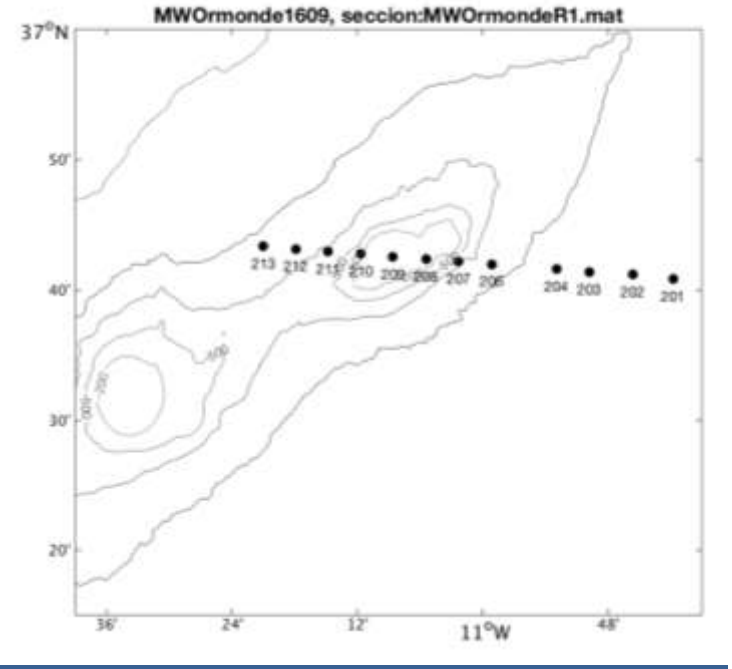
MEDWAVES Physical Oceanography

Decrease in salinity that characterizes the propagation of the MOW into the Atlantic.

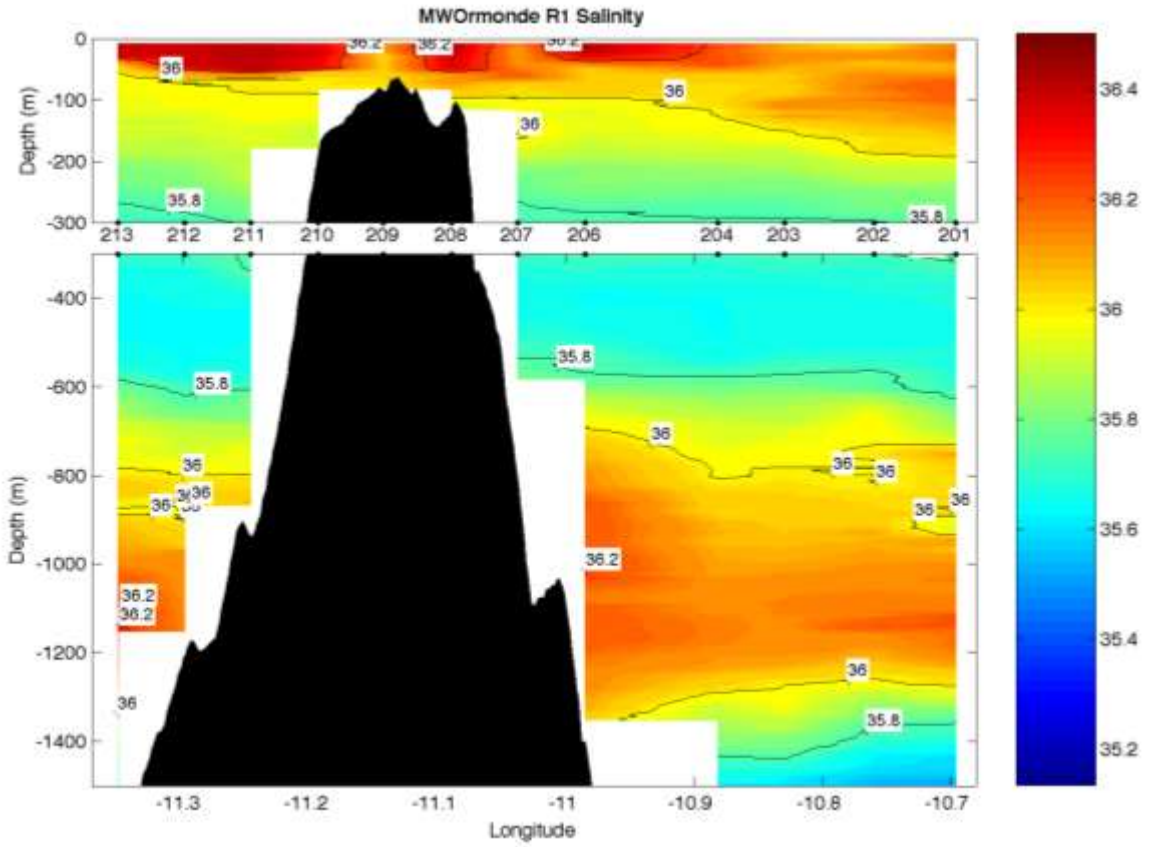
From the 38.5 find in the Seco seamount to the relative maximum of 35.50 found in the Formigas sea mount



MEDWAVES Physical Oceanography

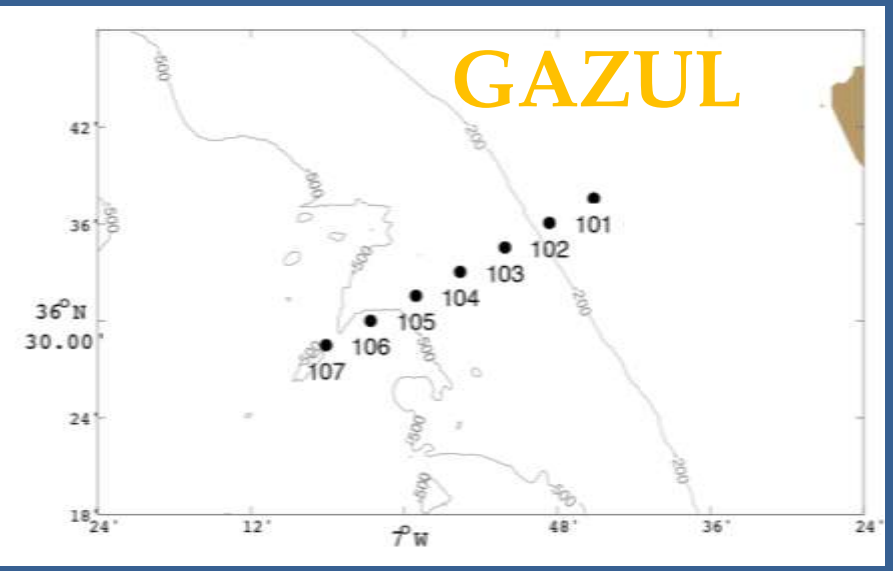


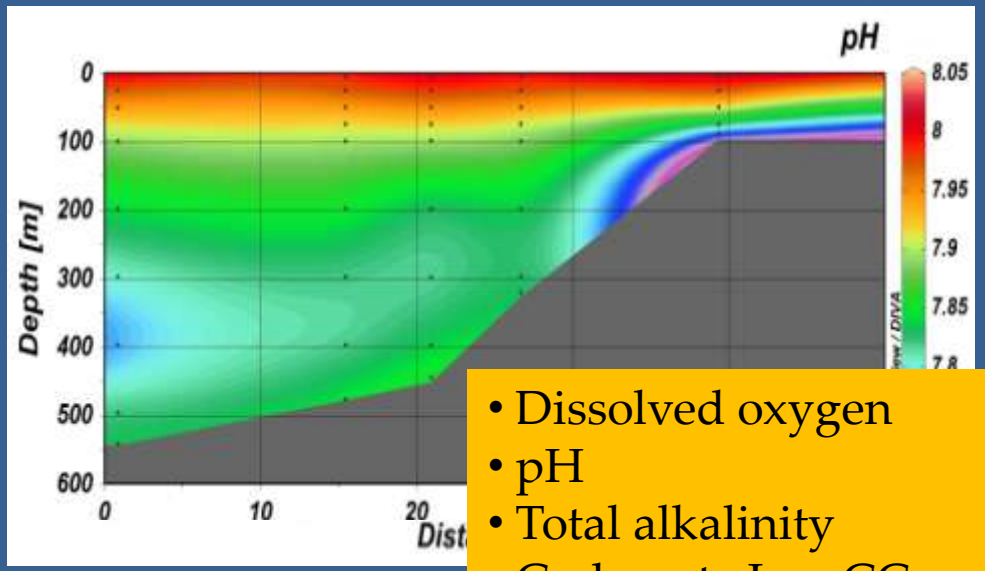
ORMONDE



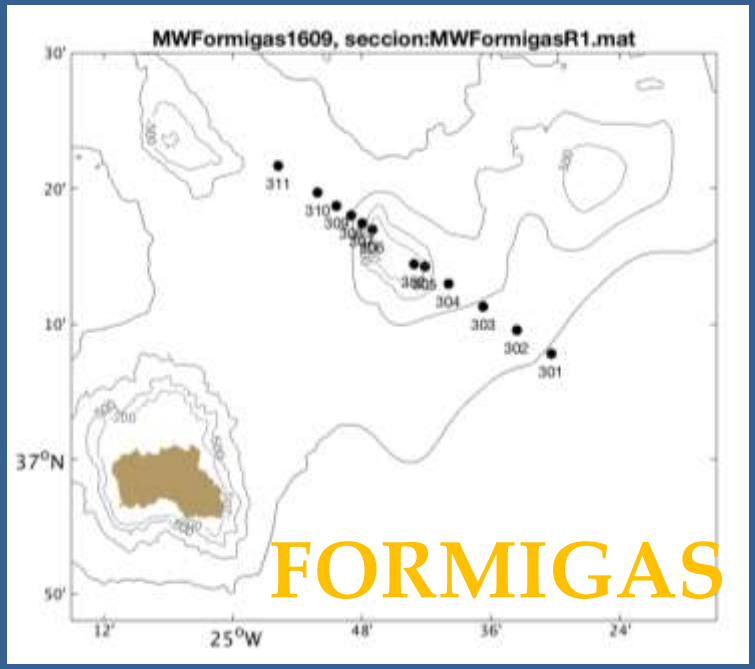
Oceanography
team_MEDWAVES

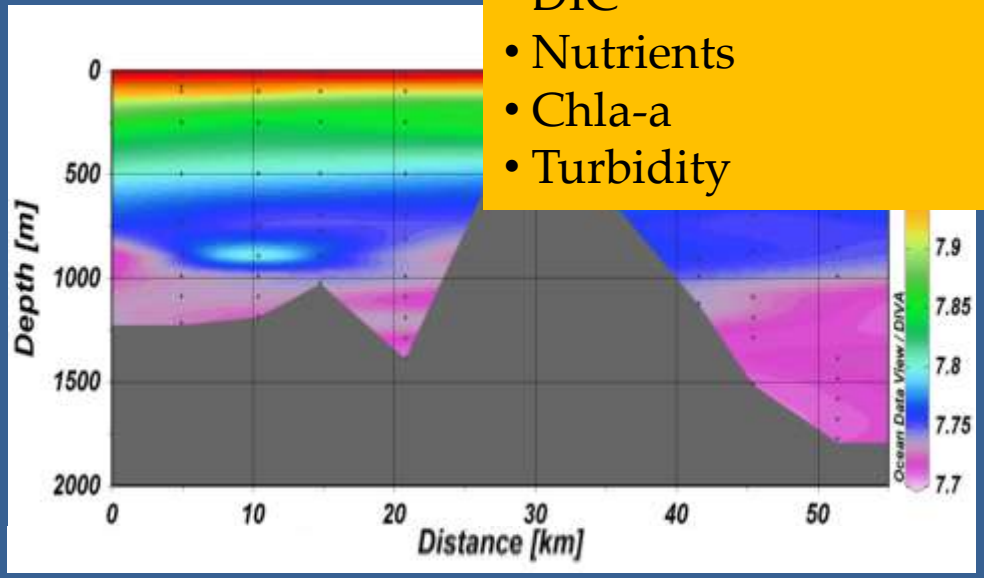
MEDWAVES Biogeochemical Oceanog.





- Dissolved oxygen
- pH
- Total alkalinity
- Carbonate Ion CC
- DIC
- Nutrients
- Chla-a
- Turbidity





MEDWAVES Benthic ecology

Soft sediment samples

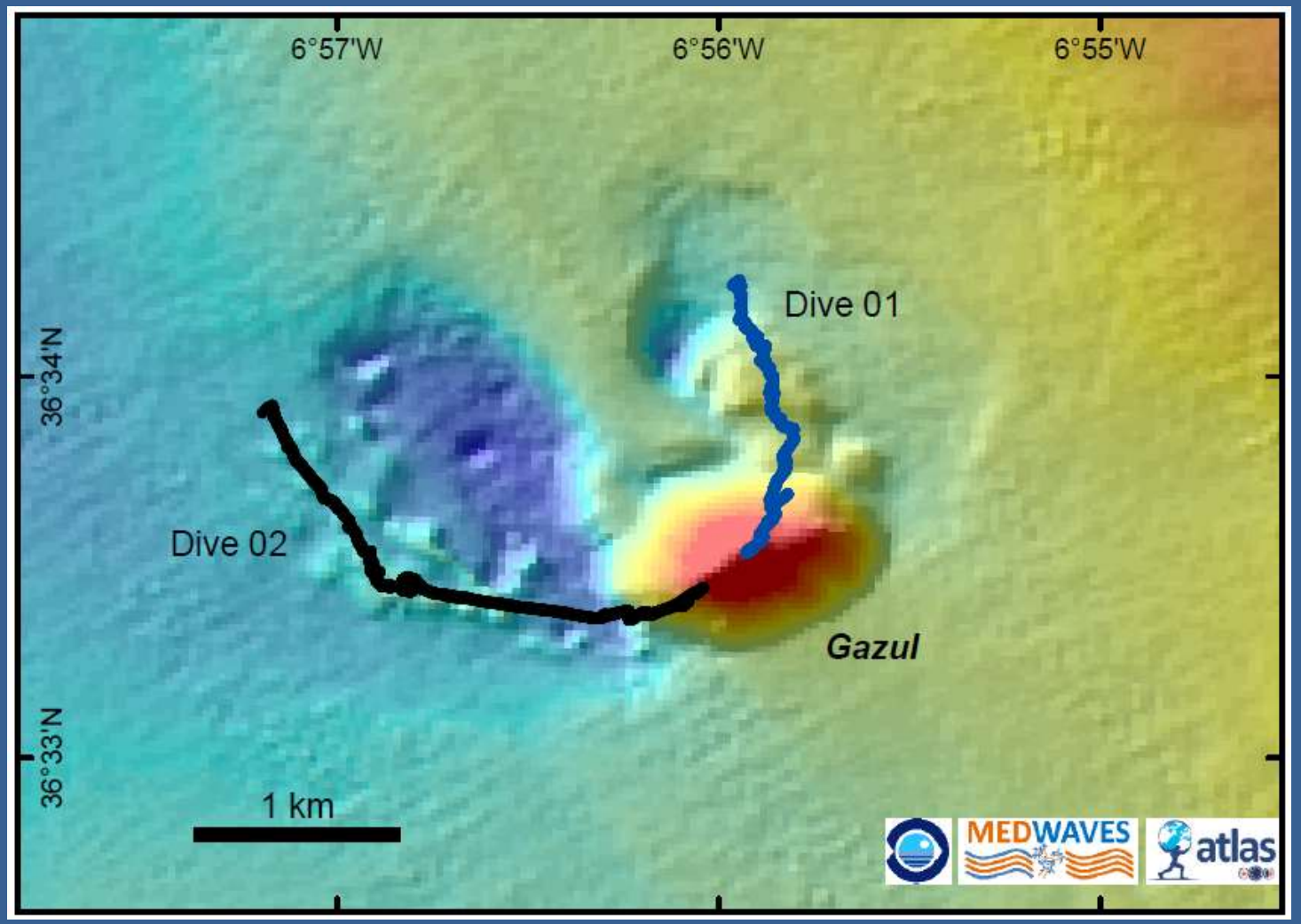
Mini-corer for sediment analyses at the home lab

Surficial hemipelagic sediment collected in Ormonde displaying large numbers of foraminifera (dominating *Orbulina universa)*

Shells of pteropods (mainly *Cavolinia* and *Clio*) after sieving a sediment sample collected in Formigas

Benthic team_MEDWAVES

MEDWAVES Benthic ecology



Geomorphology team & Habitat mapping_MEDWAVES

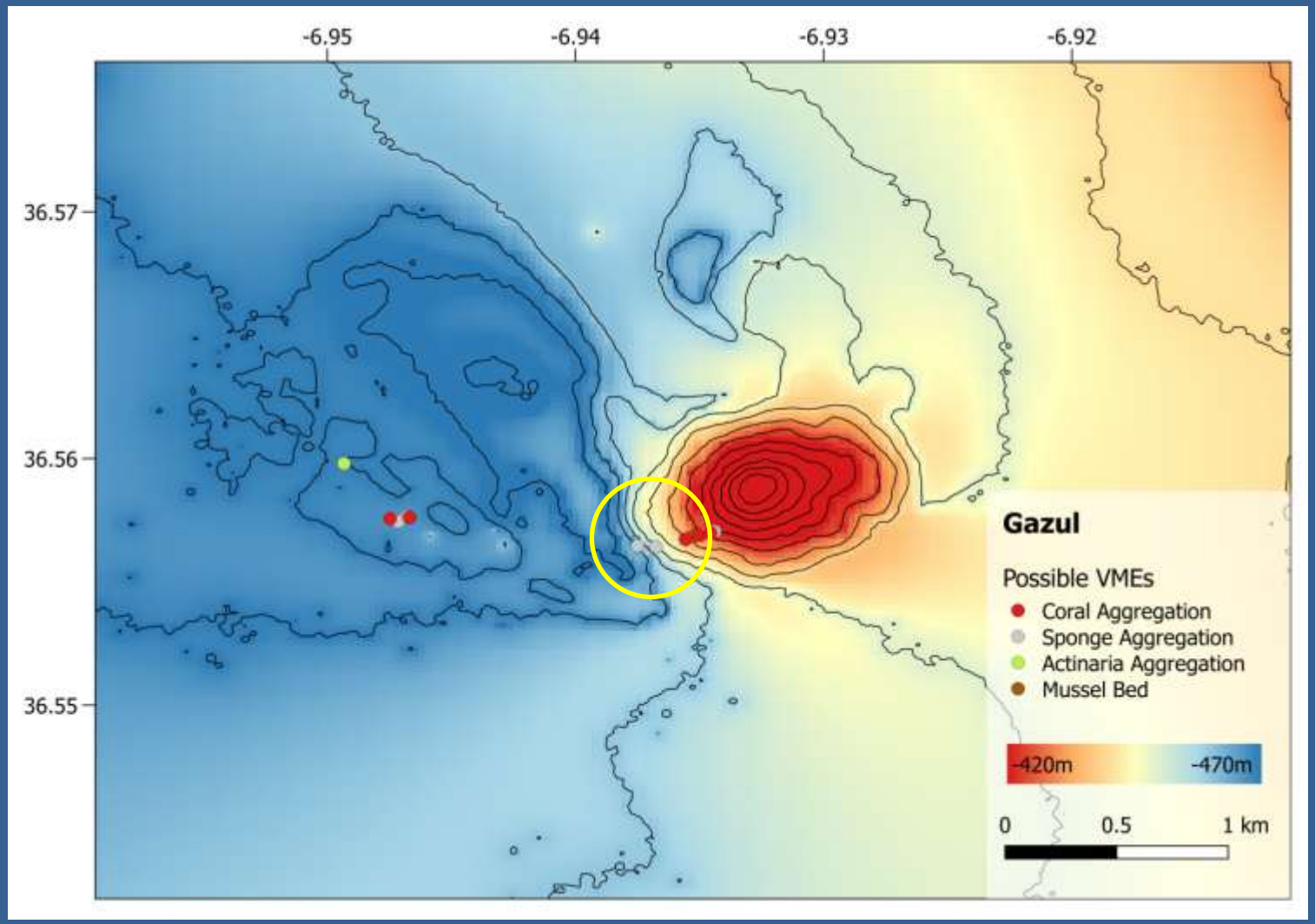
GAZUL

MEDWAVES Benthic ecology

GAZUL

MEDWAVES Benthic ecology

Vulnerable Marine Ecosystems (VMEs)

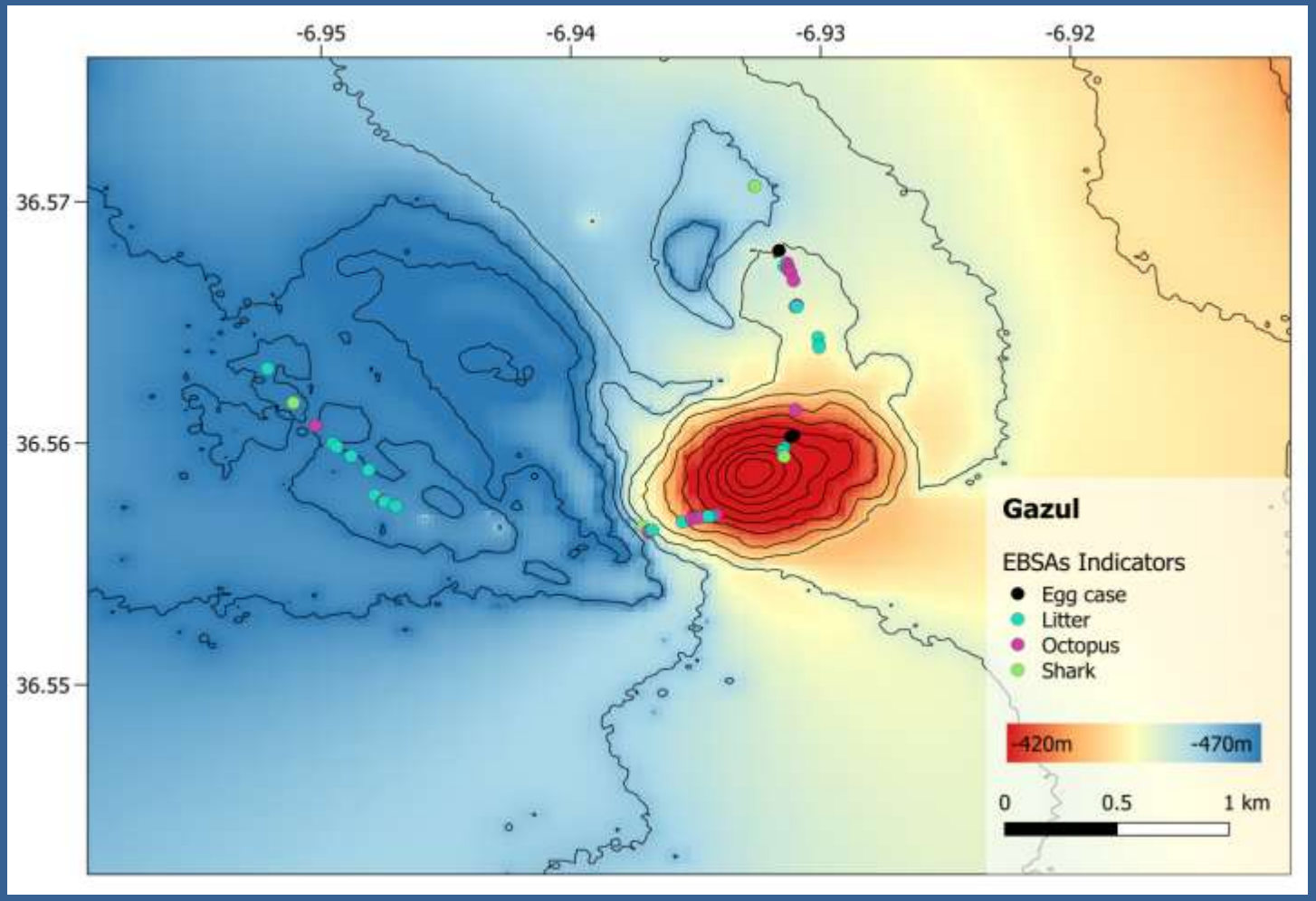


GAZUL

Benthic team_MEDWAVES

MEDWAVES Benthic ecology

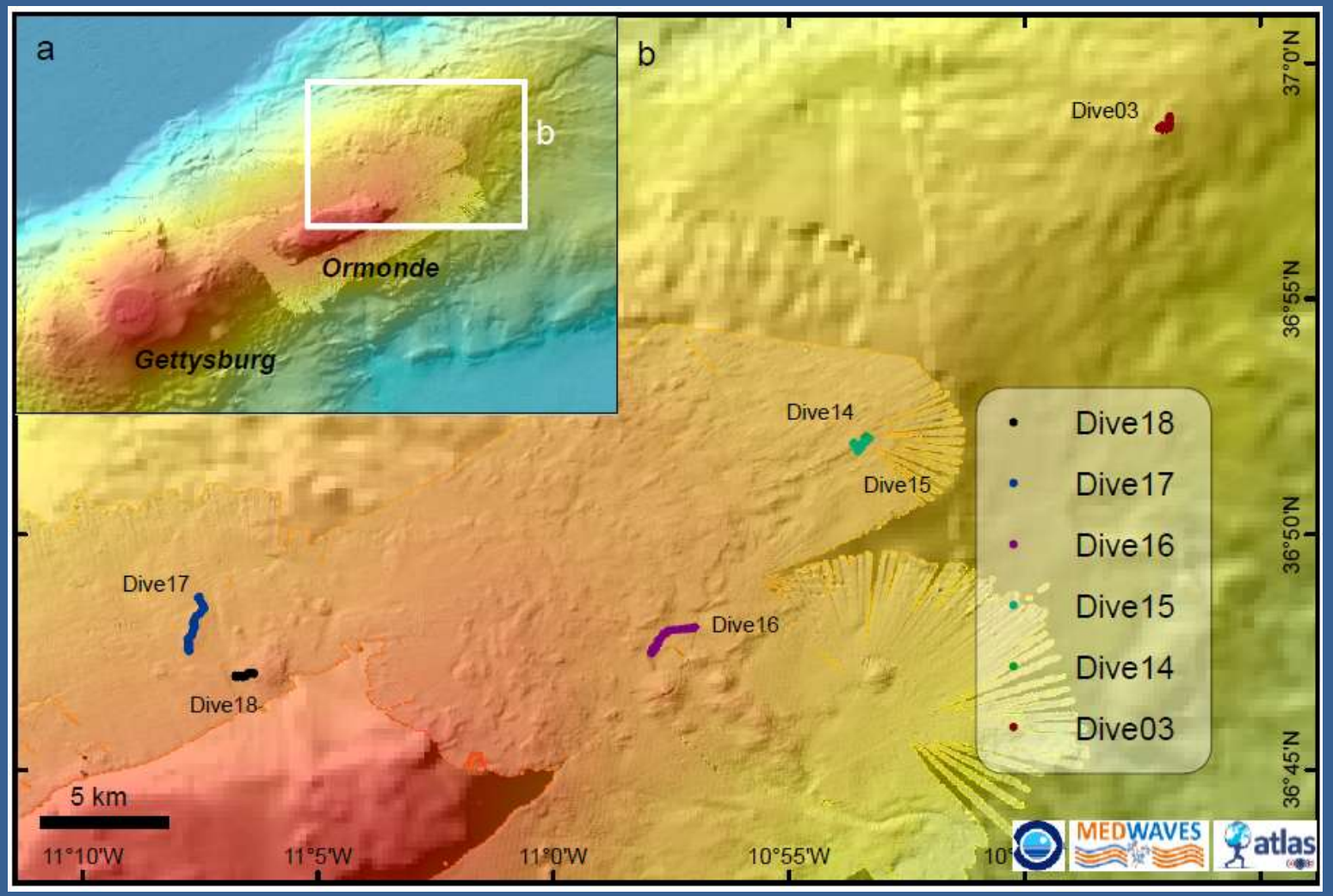
Ecologically or Biologically Significant Marine Areas
EBSAs



GAZUL

Benthic team_MEDWAVES

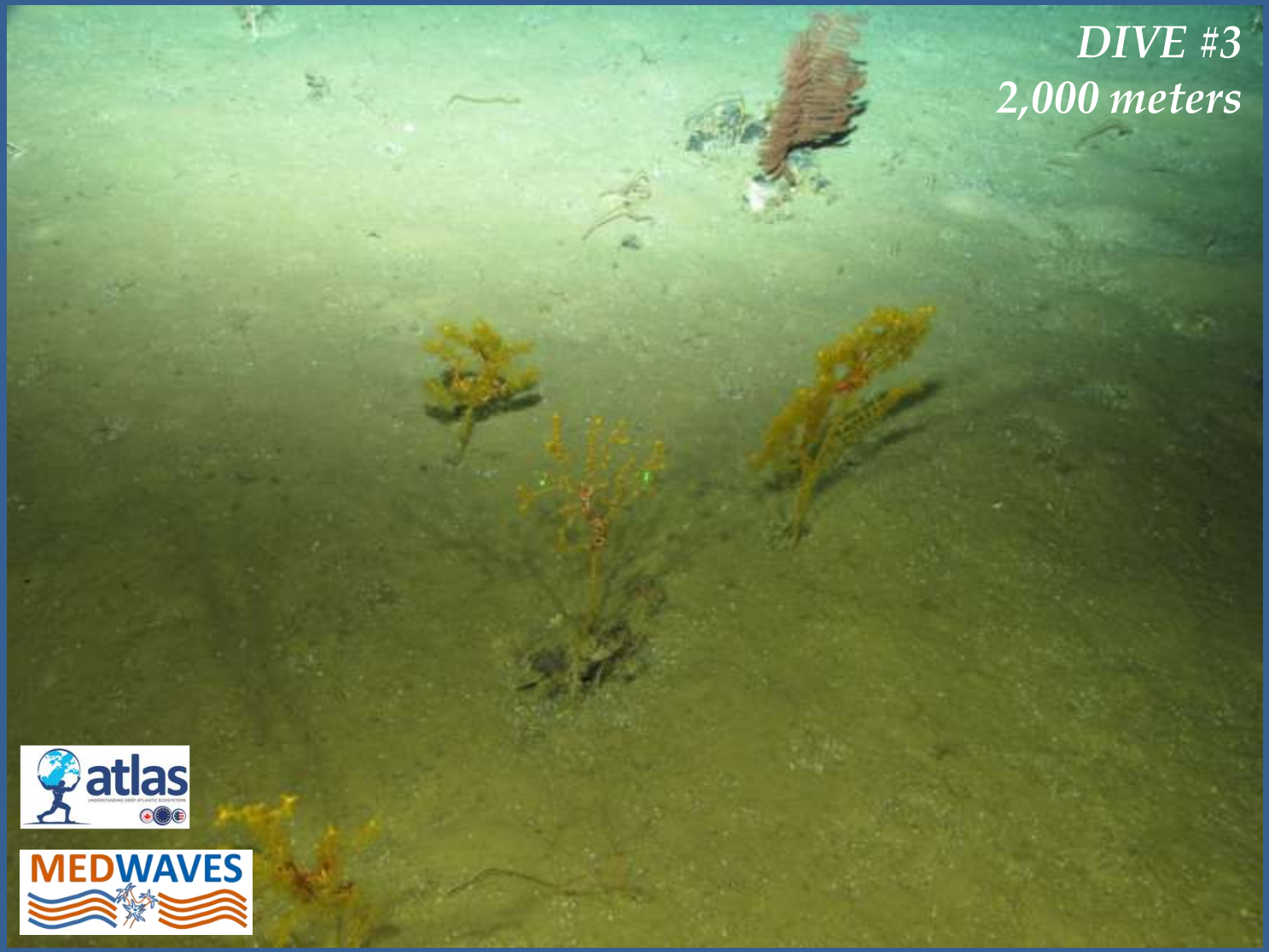
MEDWAVES Benthic ecology



Geomorphology team & Habitat mapping_MEDWAVES

ORMONDE

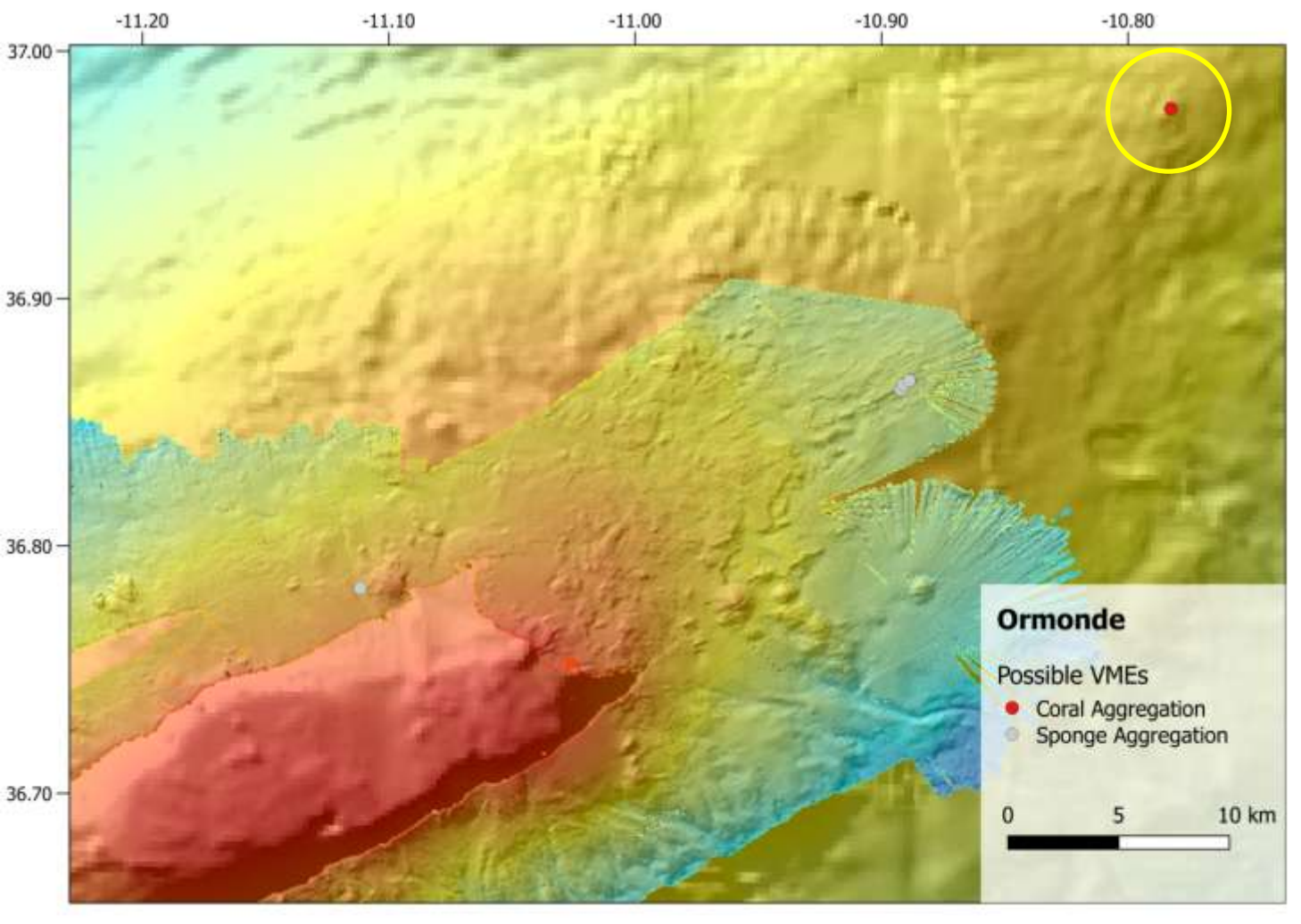
MEDWAVES Benthic ecology



ORMONDE

MEDWAVES Benthic ecology

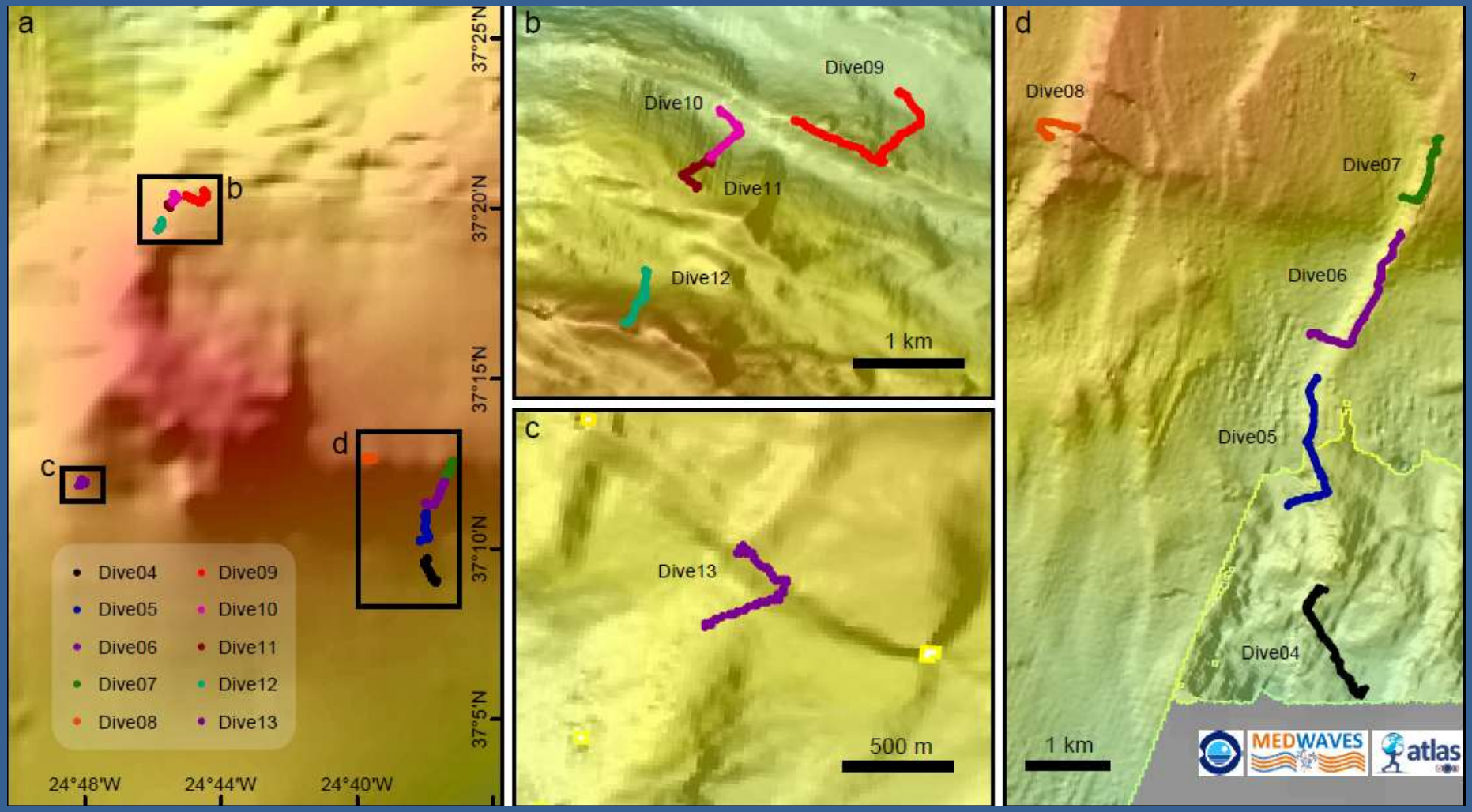
Vulnerable Marine Ecosystems (VMEs)



ORMONDE

Benthic team_MEDWAVES

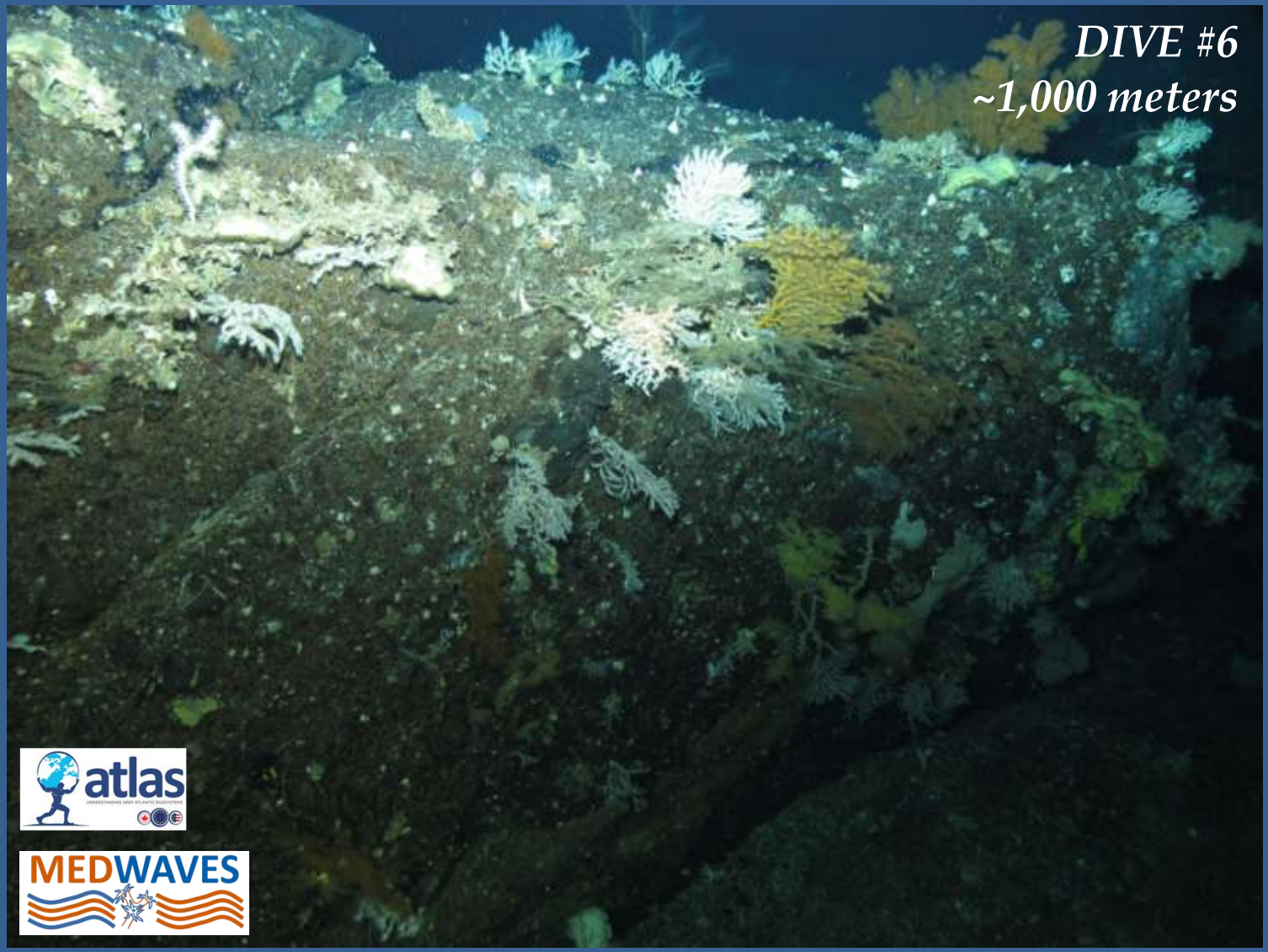
MEDWAVES Benthic ecology



Geomorphology team & Habitat mapping_MEDWAVES

FORMIGAS

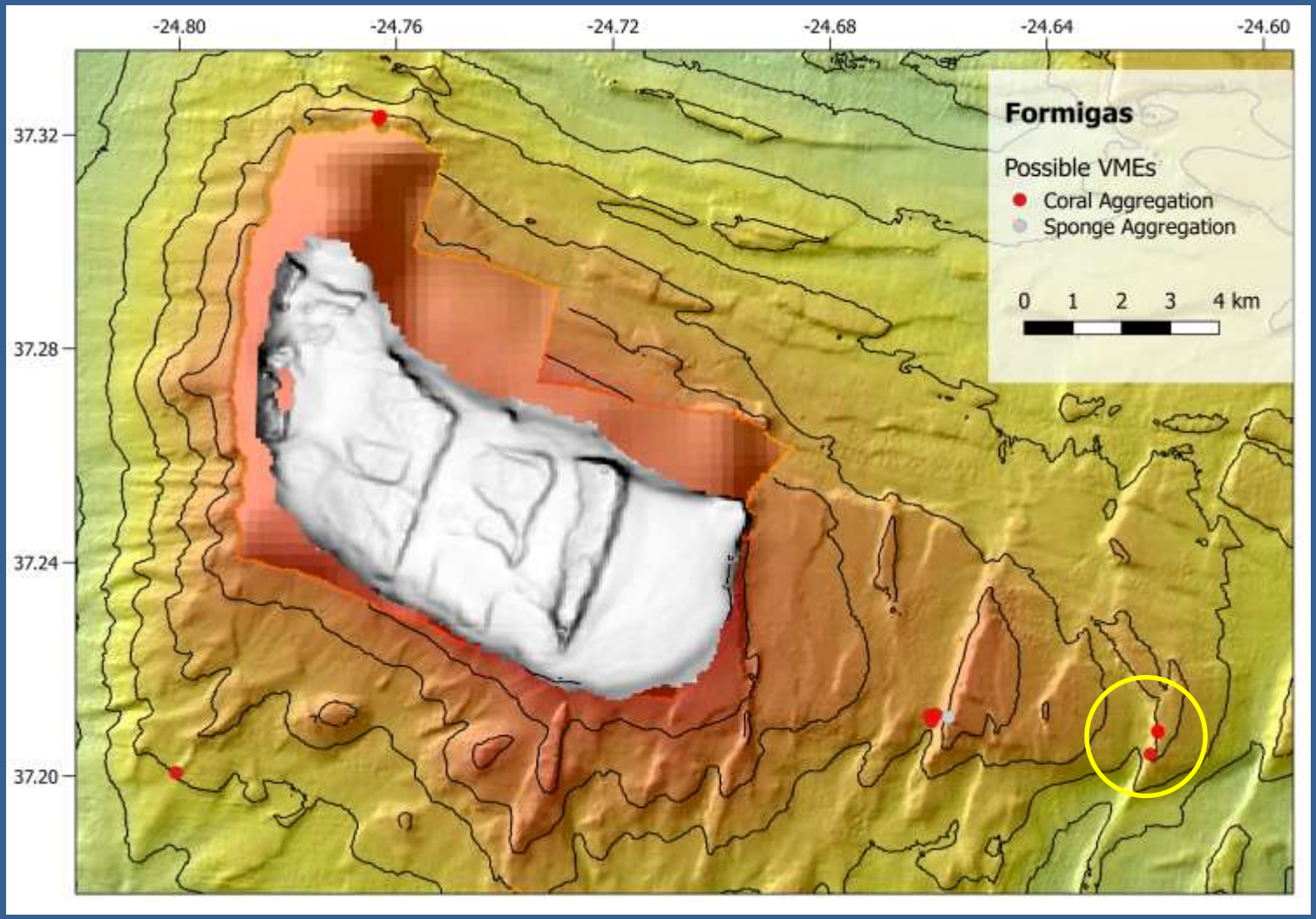
MEDWAVES Benthic ecology



FORMIGAS

MEDWAVES Benthic ecology

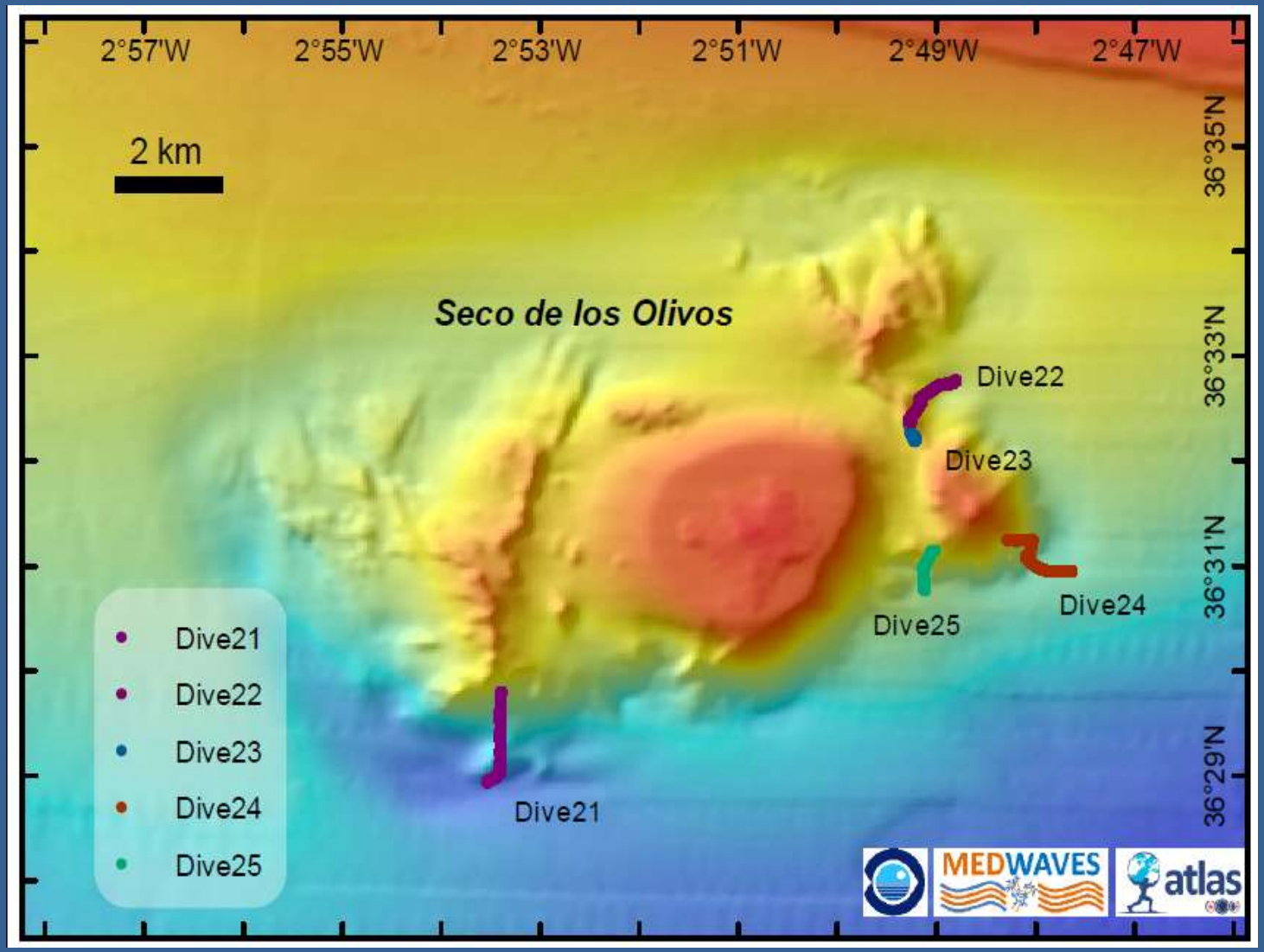
Vulnerable Marine Ecosystems (VMEs)



FORMIGAS

Benthic team_MEDWAVES

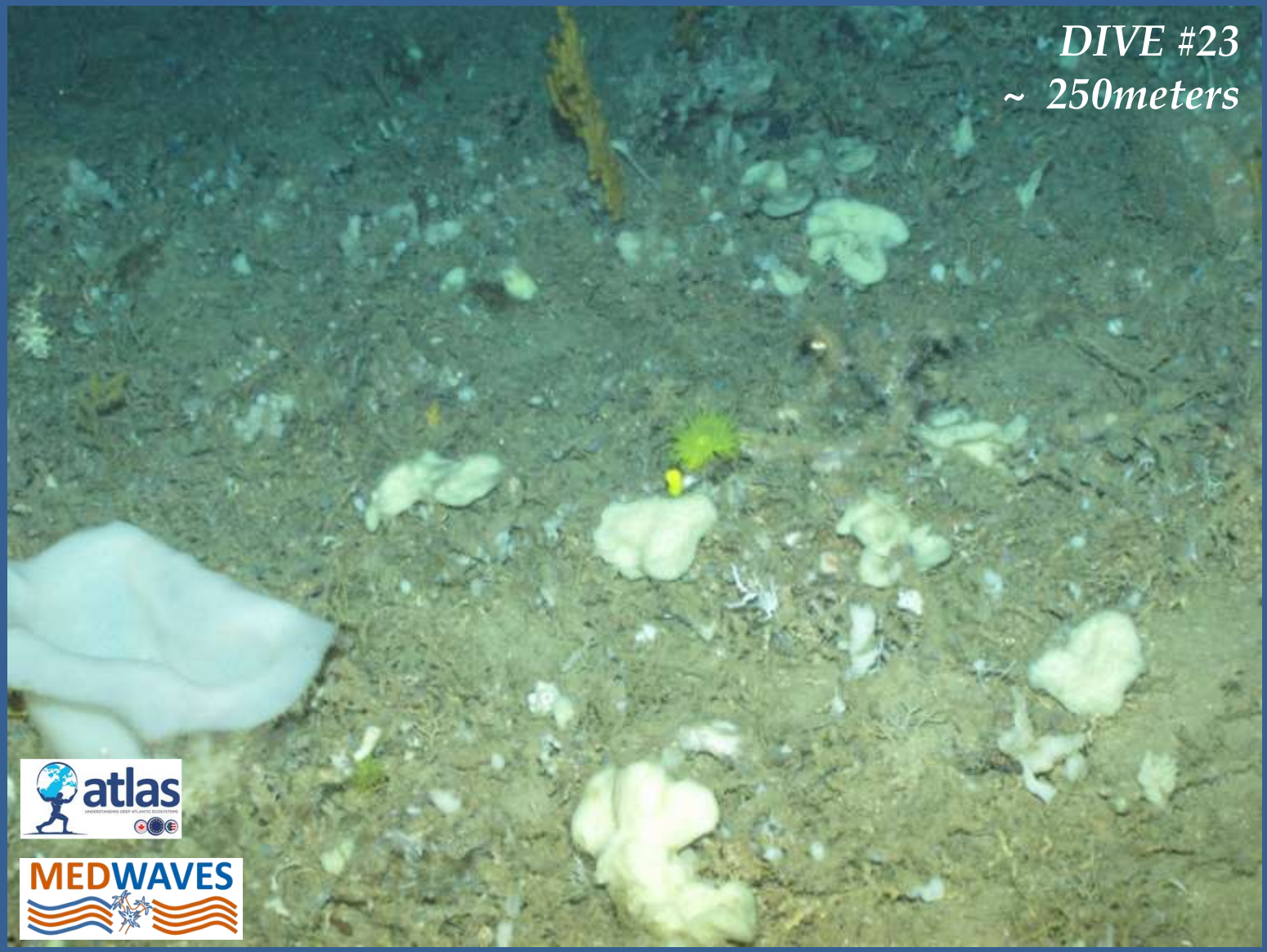
MEDWAVES Benthic ecology



SECO DE LOS OLIVOS

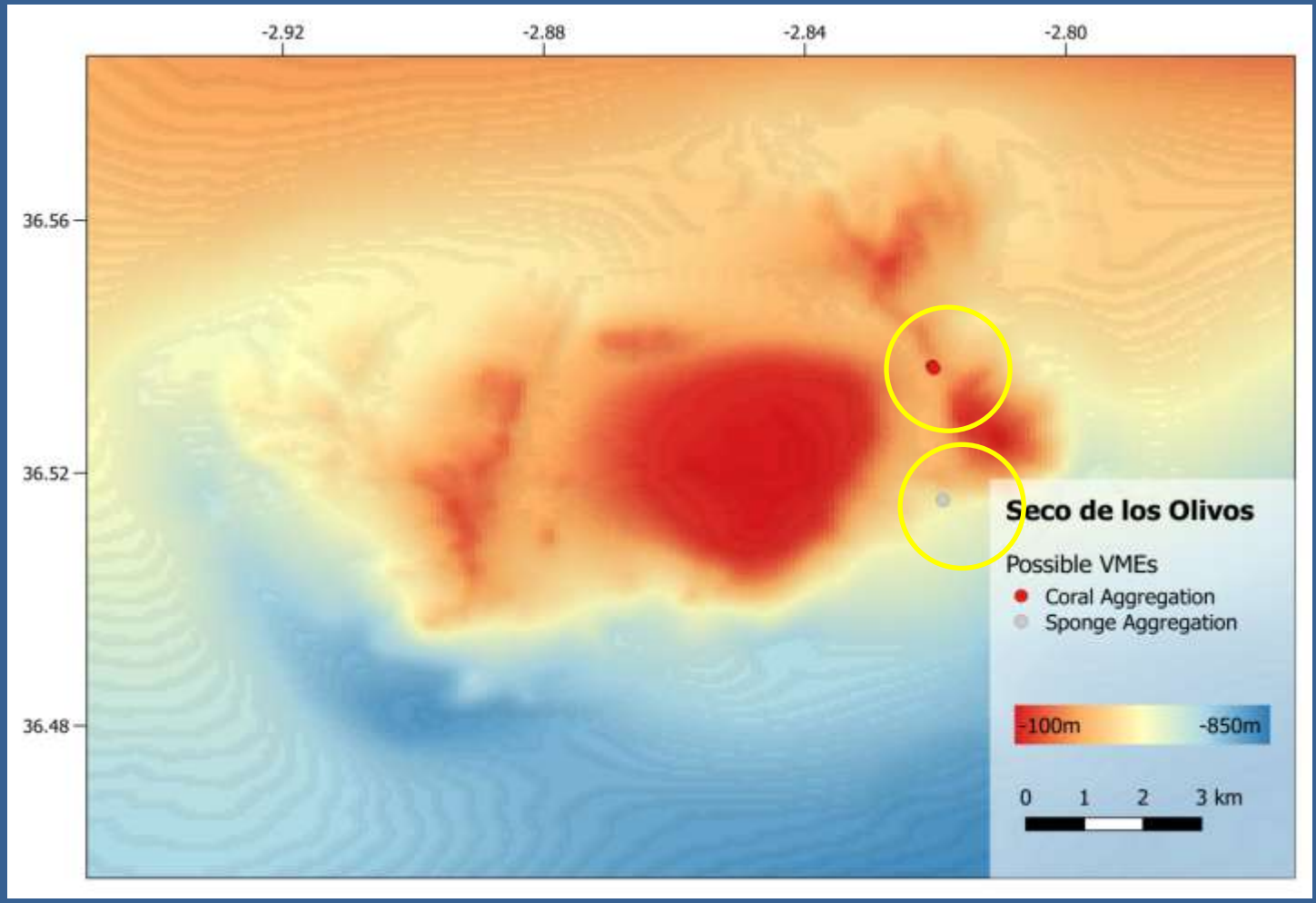
Geomorphology team & Habitat mapping_MEDWAVES

MEDWAVES Benthic ecology



SECO DE LOS OLIVOS

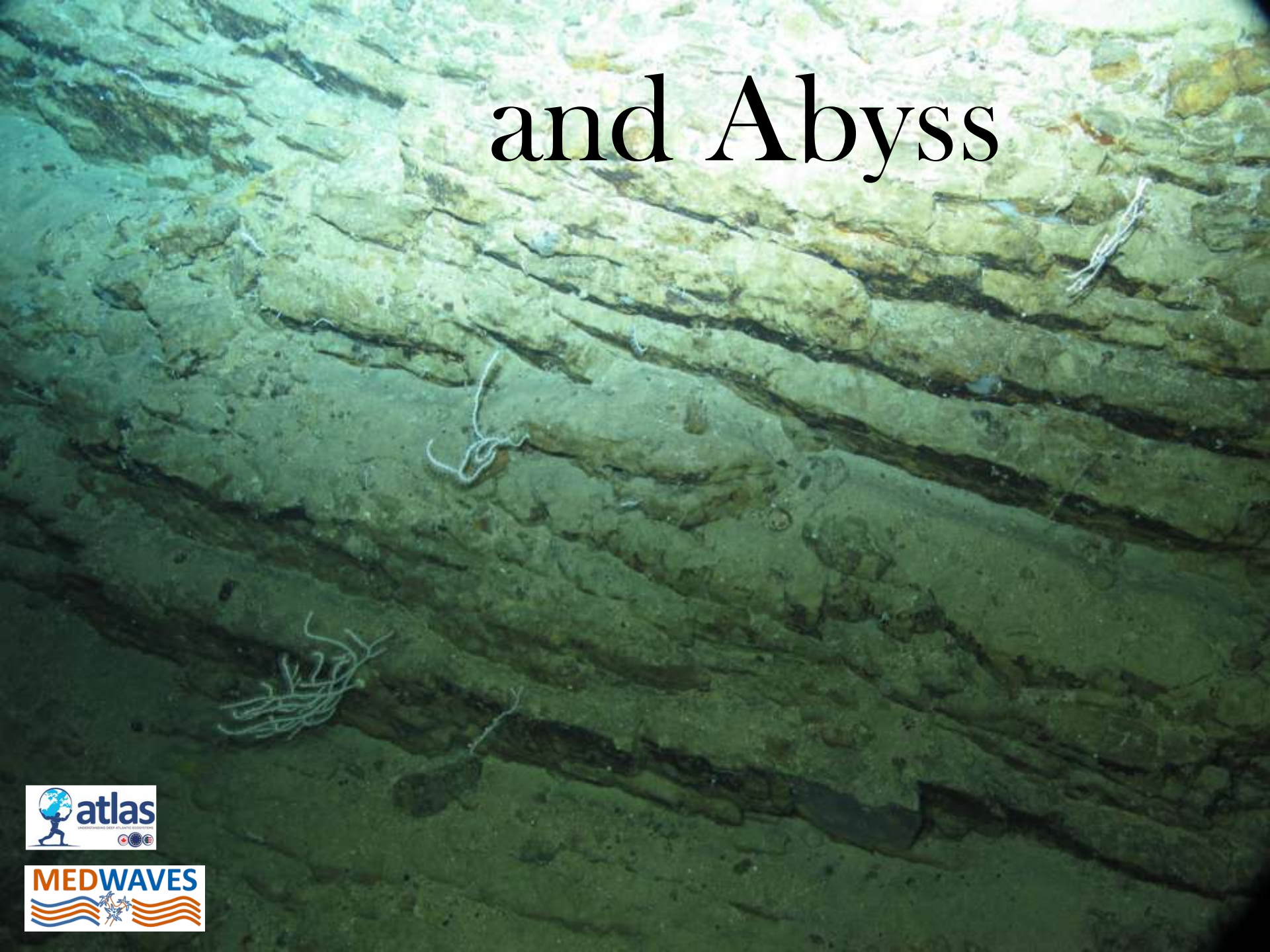
Vulnerable Marine Ecosystems (VMEs)



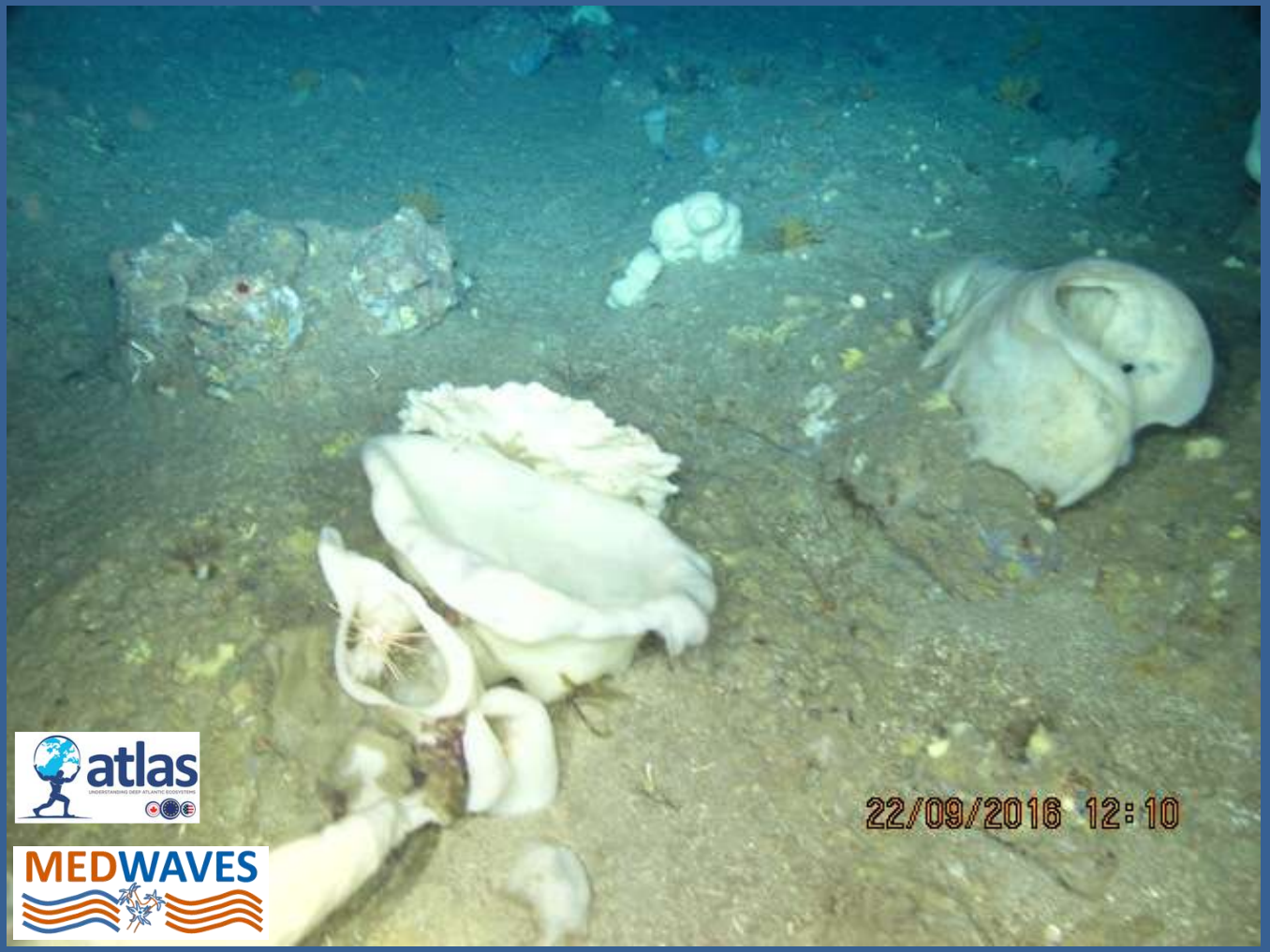
SECO DE LOS OLIVOS


Plains

and Abyss



Sponge grounds in Gazul



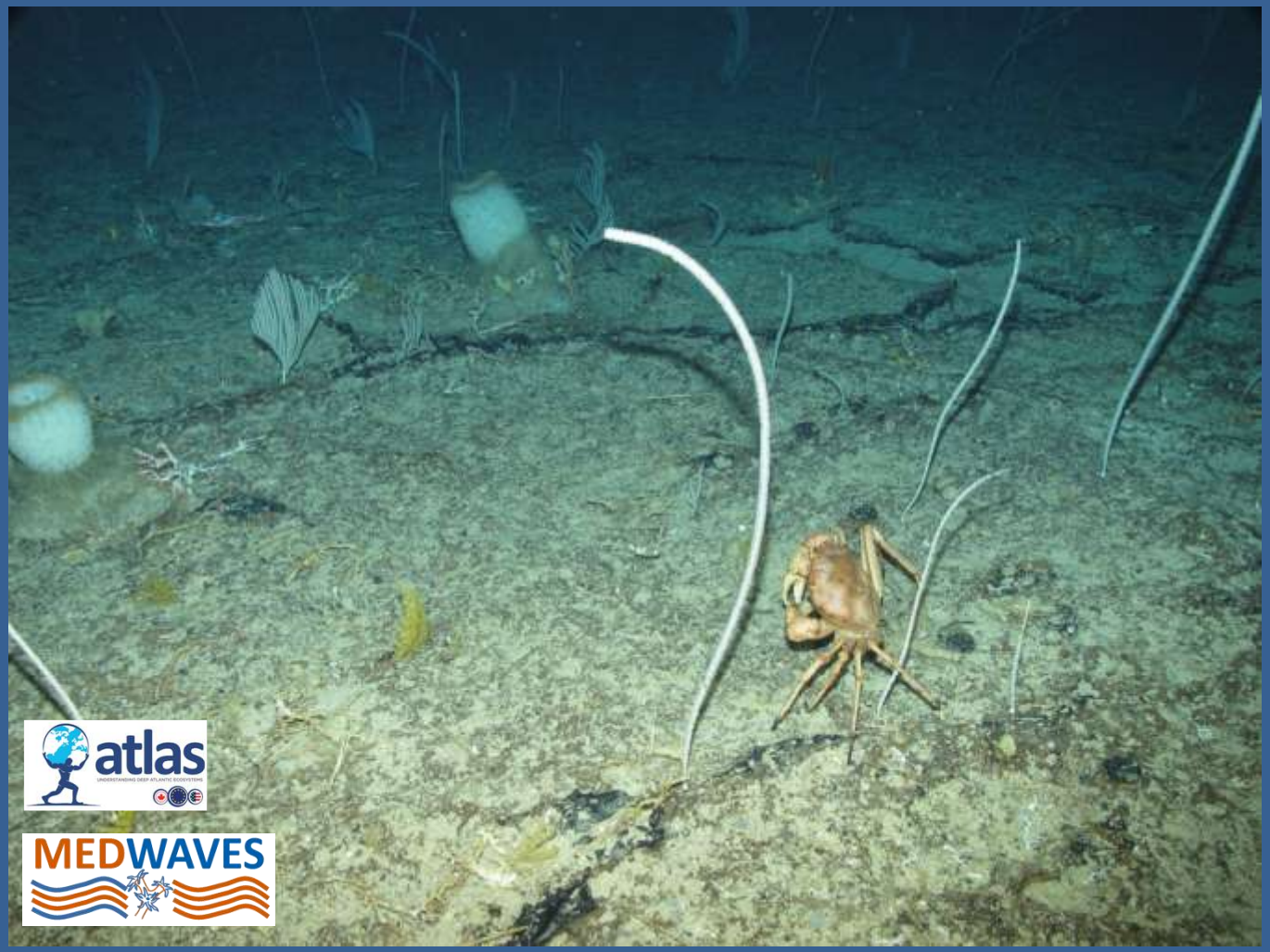
High diverse deep sea communities in Ormonde

Dense and abundant *Acanella* forests

Complex geomorphology in Formigas

Steep slopes

Dense and diverse coral gardens



Coral gardens

MEDWAVES going on work

MEDWAVES Cruise report to be submitted in the coming weeks

MEDWAVES going on work

- Oceanographic and biogeochemical data → ATLAS 2nd Gral Assembly

  WP1 WP3

- Geomorphology → ATLAS 2nd Gral Assembly

  WP3 WP6 WP7

  • Formigas manuscript in progress lead by R. Quartau (Instituto hidrografico Portugal), Universidad de Lisboa, MARE, IMAR (Portugal), IEO (Spain)

- Sediment analyses → In progress…

  WP2 WP3

- Soft bottom fauna analyses → ATLAS 2nd Gral Assembly

  WP3 WP6 WP7

MEDWAVES going on work

- Video analyses

ATLAS 2nd Gral Assembly

WP3 WP6 WP7

- VMEs identification in all areas
- EBSAs identification: Gazul mobile fauna, currently work with the rest of video material
- Quantitative video analyses Formigas seamount (PhD, IEO Palma)
- Biodiversity analyses Formigas and Ormonde (IMAR), Gazul and Seco de los Olivos (IEO, Málaga)
- Video analyses to develop indicators for deep-sea GES

MEDWAVES is grateful to....

- Master and crew of the Research vessel Sarmiento de Gamboa (SdG)
- Marine Technology Unit UTM (CSIC)
- Jose Ignacio Díaz (IEO) for the logistic coordination
- ACSM - ROV team
- Portuguese authorities
- M. Carreiro-Silva, T. Morato, F. Tempera, F. Porteiro and many colleagues from IMA R for their support before, during and after the cruise
- P. Madureira (EMEPC) for providing Formigas and Ormonde bathymetry
- LM. Fernández (IEO) for allowing the use of Gazul batymetry to plan the ROV dives
- MEDWAVES scientific party
- The ATLAS coordinator Prof. Dr. Murray Roberts and Dr. Katherine Simpson from the coordination office in Edinburgh

GOBIERNO DE ESPAÑA MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD

The Spanish Ministry for Economy and Competitivity

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atlas
UNDERSTANDING DEEP ATLANTIC ECOSYSTEMS


MEDWAVES