Proposal for an ASPIRE mission to the FAMOUS segment and Sarda seamount on the Mid-Atlantic Ridge

Contact Information

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Willing to attend the workshop?

Possibly/yes (Ana Colaço)

Target name(s)

Main Feature(s)/Area(s) of Interest: Mid-Atlantic-Ridge (MAR); benthic habitats such as hydrothermal vents (active and inactive) and mid ocean ridge (non vent), with corals, sponges and other structure-forming biota linked to seamounts and ridges

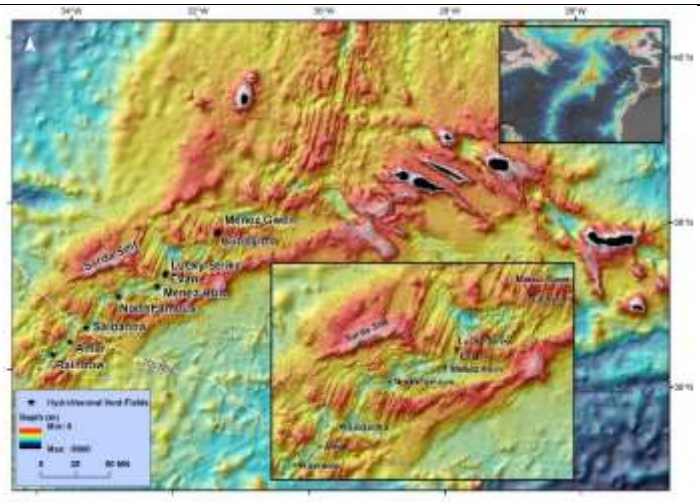
Geographic areas of interest within the North Atlantic Ocean

North Central

Relevant subject area(s)

Biology, Geology, Chemistry, Physical Oceanography, Ecosystem-based observation and management

Description of topic or region recommended for exploration



Bathymetry:
Amante, C., & B.W. Eakins, 2008. Escartin, J., et al., 2001. Lourenço, N., et al 1998. Morpho-tectonic analysis of the Azores volcanic plateau from a new bathymetric compilation of the area. Marine Geophysical Researches, 20: 141-156.

Figure 1 - Seafloor morphology of the southern part of the Azores region, with close up of the Interested region. The first goal is the area from the Lucky Strike segment at the periphery of the vent field to the Sarda seamount, and the second goal is on the Famous segment, from North Famous to the Saldanha mound. R.Medeiros © *Imag*DOP

We propose missions to the FAMOUS segment and Sarda seamount on the Mid-Atlantic Ridge to address several specific science goals, and that will have repercussions on a Deep Ocean Observing Strategy (DOOS). (1) This first goal is to assess if the biotopes that exist in the large periphery of Atlantic active vents are similar to those on nearby inactive vents and seamounts slopes. Active hydrothermal vents in this region have been the subject of many studies in the past decades. Therefore, hydrothermal mega- and macrofaunal invertebrate communities are relatively well known (for the surveyed vent fields, e.g. Lucky Strike). The energy that fuels these hydrothermal systems is known to come from different types of microorganisms (either symbionts or free living) with different energy sources and chemical electron donors. When the hydrothermal activity ceases, chimneys become inactive, and may provide hard substrate for species that do not tolerate the harsh vent environments. Nevertheless, the ecology of the animals living on inactive vents remains poorly understood. What is known is that the non-vent suspension feeders that live close to the vents can benefit from the large number of suspended particles derived from the active vents (Eriksson et al 2009). However, the distribution patterns of the faunal assemblages colonising inactive vent sites close by or further away from active venting have not yet been studied. The degree to which fauna and nutritional resources are shared among inactive vents and seamounts remains unknown as well. To date, some work has been done on seamounts hosting vents (Boschen et al, 2015), but not on seamounts or inactive sites out of the influence of active vent fields. The first study area proposed is an east-to-west transect from the ridge valley where the well-known Lucky Strike Hydrothermal vent field ecosystem is present (and EMSO-observatory is in place, maintained by EMSO –France) towards Sarda seamount, placed at the west side of the ridge.

(2) The second area will be the exploration of the Famous segment from the North Famous inferred vent field location towards Saldanha vent (south of the Lucky Strike segment), in order to locate and characterise possible new vent field. This will take into account the previously inferred vent fields and the new hypothesis/knowledge on the 50-km larval dispersal potential limit for mussel larvae, which should mean that theoretically there should be an active vent field in that region.

The hypothesis that vent mussel larvae along the Mid-Atlantic Ridge cannot travel more than 50 km as stated by Breusing et al. (2016) will be tested. Within the scope of the MIDAS project (EU-FP7-603418), Colaço et al. (in prep) modelled the dispersal of Atlantic vent mussel larvae, showing that the origin of the larvae able to settle in Lucky Strike and Rainbow vent fields must be originated on the Famous segment. Hence, there are strong indications for the existence of intermediate vent fields facilitating dispersal. Up to now, two hydrothermal vent fields were discovered south of Lucky Strike and north of Rainbow. One of them is Saldanha (South of Famous segment), a low temperature vent field with no chimneys or endemic fauna, just diffusion and another site has been inferred at North Famous. Therefore, using the new technology available today, we would like to use it to explore the Famous segment in order to locate these and possibly other new vent fields, which could shed a new light on dispersal abilities of vent fauna.

Relevant partnerships

This campaign would benefit from (and leverage) the work in progress in scope of the H2020-SponGES project, Atlas and Merces, as also the recent submitted projects Azores fun and the DOOS initiative

The questions in this proposal align with DOOS objectives to integrate physical, biogeochemical, and biological/ecosystem-based investigations. Understanding the connectivity of species (bathymodiolin mussels) and of habitats (e.g., inactive vents and seamounts) in the North Atlantic requires combined knowledge of physical transport (current velocities), habitat suitability (heat fluxes from below, and biogeochemical conditions (oxygen, H2S and, POC fluxes) required for microbial and faunal support. With an end –to-end approach the data would become open access and syntheses would be available to the Portuguese governments, OSPAR; BBNJ; CBD to monitor and designate protected areas, design-mining regulations, develop EIS requirements, as examples.