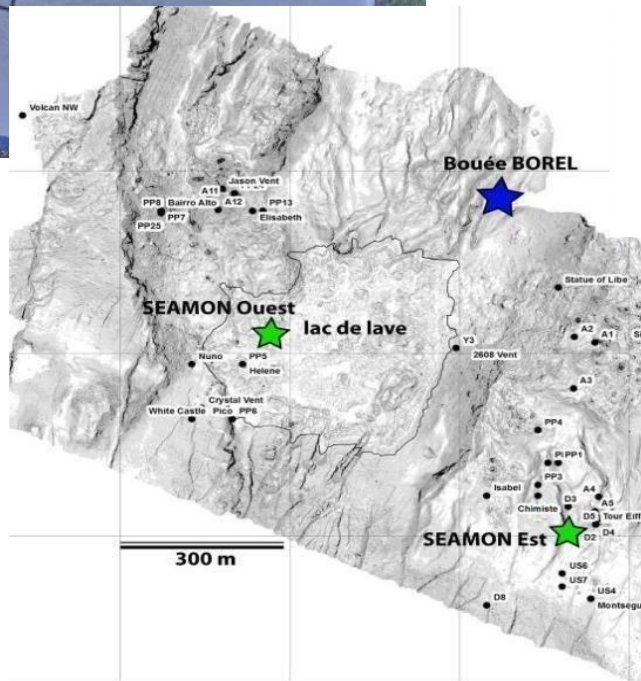


Temporal dynamics of the Lucky Strike hydrothermal vent field – the EMSO Azores observatory



EMSO Azores Deep sea Observatory

Understand the links between geological, physical and chemical processes and their effects on the dynamics of the hydrothermal fauna at different spatial and temporal scales at the Lucky Strike vent field



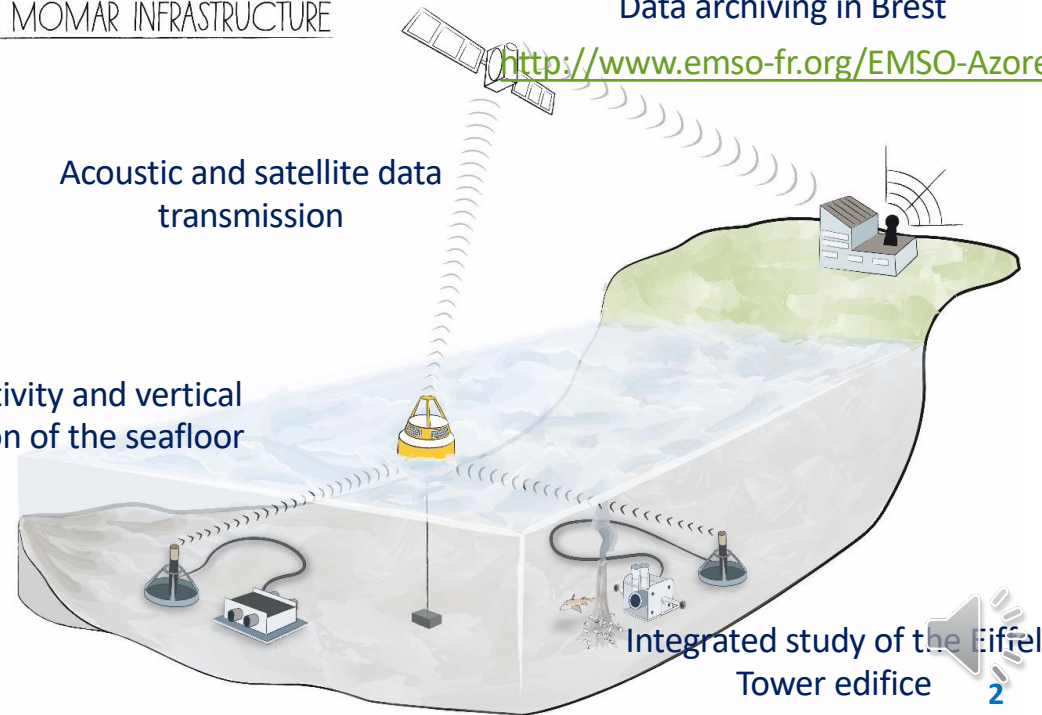
THE MOMAR INFRASTRUCTURE

Data archiving in Brest

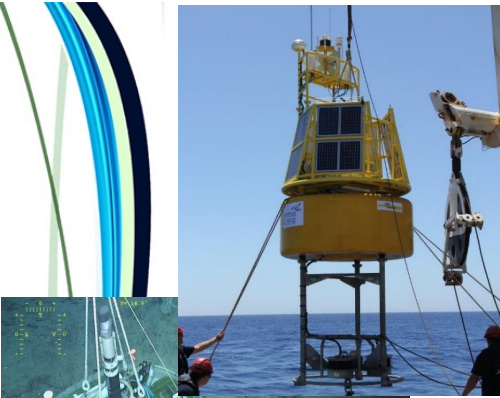
<http://www.emso-fr.org/EMSO-Azores>

Acoustic and satellite data transmission

Seismic activity and vertical deformation of the seafloor



Integrated study of the Eiffel Tower edifice



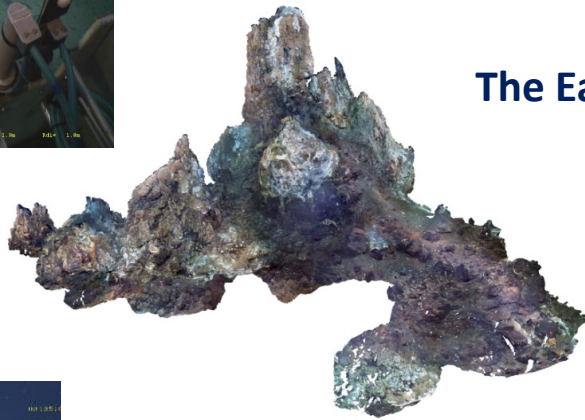
The BOREL buoy : Acoustic and satellite communication, Weather station, Automatic Identification System, COSTOF 2 and WIFI20 solar panels



The West Node : 1 connected OBS, 2 pressure gauges, GPS on the buoy,

- TEMPO HD camera, CHEMINI and O₂ optode
- CISICS : instrumented microbial colonisation device
- Turbidity sensor and O₂ optode
- BARS chlorinity sensor
- Thermistor string
- Hydroctopus hydrophone array
- Fluid sampler DEAFS
- EGIM- EMSO Generic Instrumentation Module

The East Node

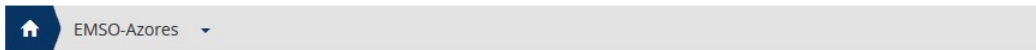
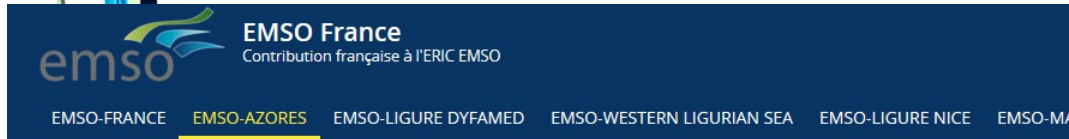


An Integrated Study Site

- Autonomous OBS array
- Autonomous pressure gauge
- Temperature probe arrays
- Physical oceanography mooring and modelisation
- Colonization substrata (ecology/microbiology)
- Autonomous currentmeters
- Sampling strategy



Data management



EMSO-Azores



EMSO-Azores is a non cabled multidisciplinary observatory devoted to the long term integrated study of mid-ocean ridge processes, from the subsea floor to the water column.

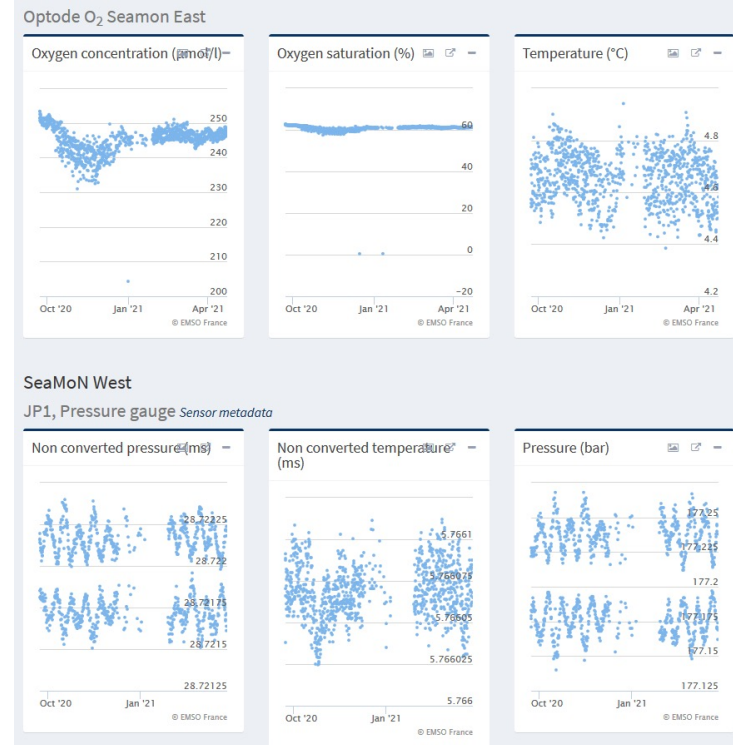
EMSO-Azores was deployed in 2010.

EMSO-Azores seafloor observatory is supported by France and Portugal as their contributions to EMSO. The site is open to new collaborations, connected instruments for near real time data transmission or autonomous sensors.

Scientific objectives	Infrastructure (2017-2018)
Real time data plot	Data download
Maintenance cruises	Ground breaking results
Instruments	



<http://www.emso-fr.org/EMSO-Azores>



Cannat Mathilde, Sarradin Pierre-Marie, Blandin Jérôme, Ballu Valérie, Daniel Romuald, Legrand Julien, Laës-Huon Agathe, Sarrazin Jozée, Colaço Anna, Blin Alexandre, Carval Thierry, Coail Jean-Yves, Courier Christophe, Gabsy Taoufik, Guyader Gérard, Pichavant Pascal, Pot Olivier, Tanguy Virginie (2015). EMSO-Azores observatory real-time data 2011 deployment. <http://doi.org/10.12770/bac2a0e5-58d1-40c9-b0aa-3a106e7ca7eb>

SARRADIN Pierre-Marie, CANNAT Mathilde (2017) MOMARSAT 2017 cruise, RV Pourquoi pas ? <http://dx.doi.org/10.17600/17000500>

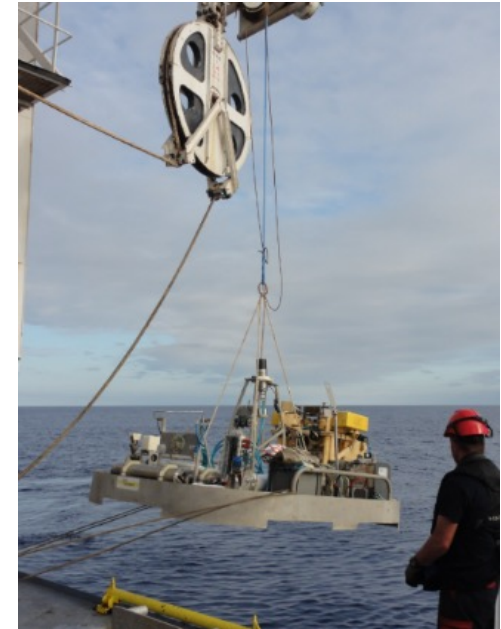


A Technological development platform for environmental monitoring

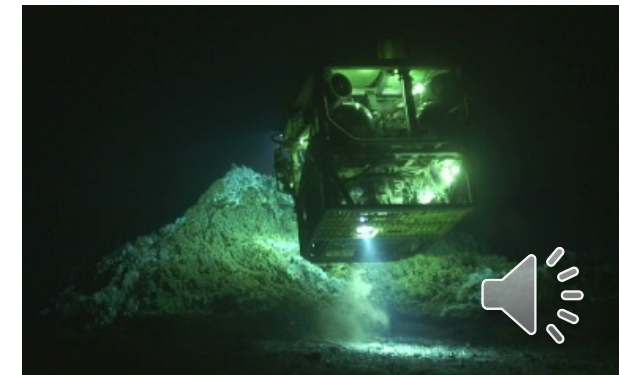
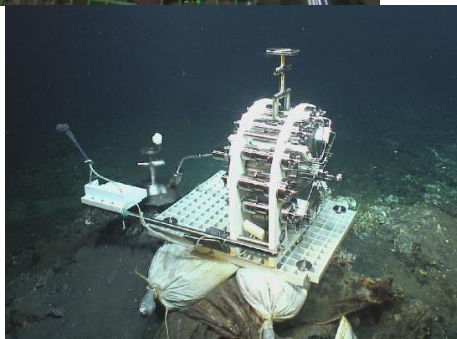


- 10 years of operations
- Near real time data
- From the sensor to the Data management centre
- <http://www.emso-fr.org/EMSO-Azores>

- Transfer of the Costof to RTSYS
- Trial of the EGIM in 2017
- DEAFS with TOPINDUSTRIE
- Camera SMOVE, antifouling system / Forsea



- Servicing procedure
 - Deployment / recovery with cables
 - 2 submersibles
 - 3 different vessels
 - Decrease the impact
 - Optimize the servicing process



Hydrothermal circulation at Lucky Strike

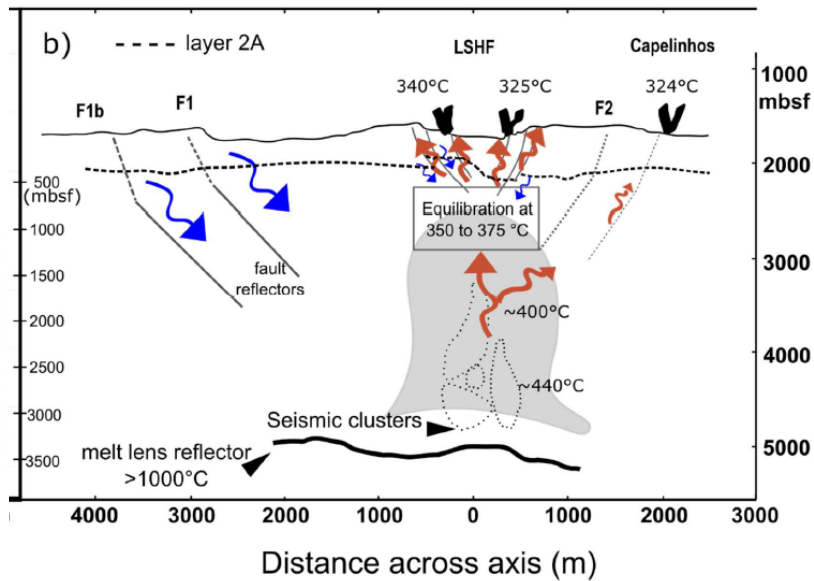
Hydrothermal circulation is constrained by

- Fault reflectors
- Substrate permeability

Fluid chemistry is controlled by

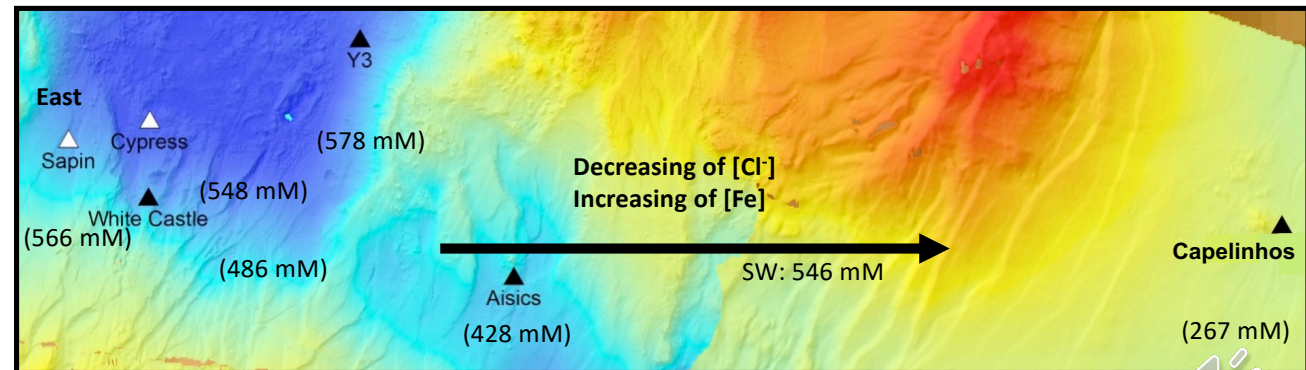
- Fluid circulation (down and upward)
- Depth of the reaction zone
- Phase separation

Conceptual model to explain the spatial variability of the fluid chemistry at Lucky Strike



Disparities among sites for end-members

Leleu (2017): East-west chlorinity and Fe gradient in the end-members



Leleu et al 2017, Crawford et al. 2013, Fontaine et al. 2014,

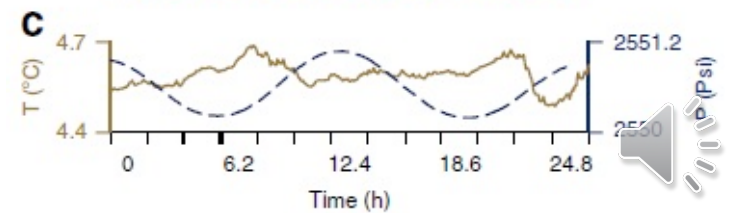
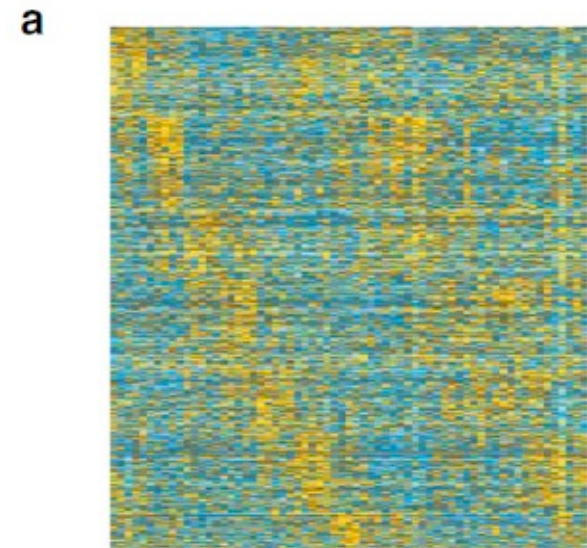
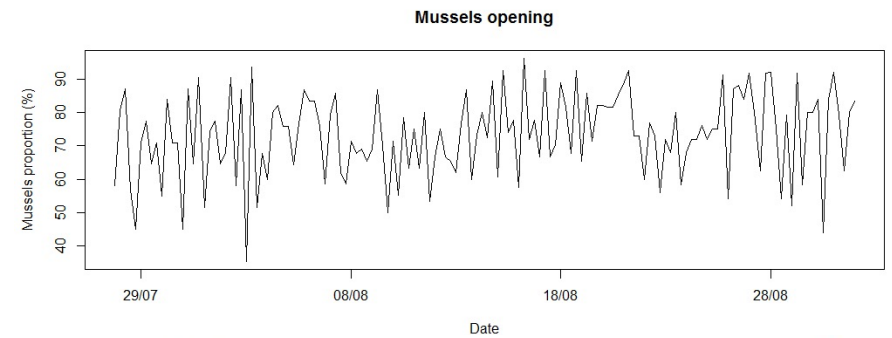
Mussels have rhythm in the shells



Long term observation
New specific sampling strategy

Presence of biological rhythms on a deep-sea species,
both in terms of

- behavior (mussel openings)
- molecular sequencing (transcriptome)



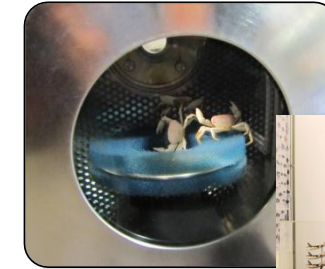
Mat et al. 2020

Public Outreach – Ocean Literacy

Discover, understand to better protect!

Abyss box – A permanent exhibition at Oceanopolis – Brest

Shrimps and crabs from Lucky Strike in a pressurized aquarium.
2012 ...

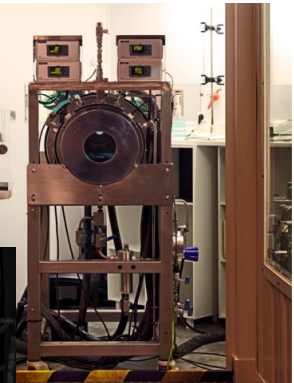
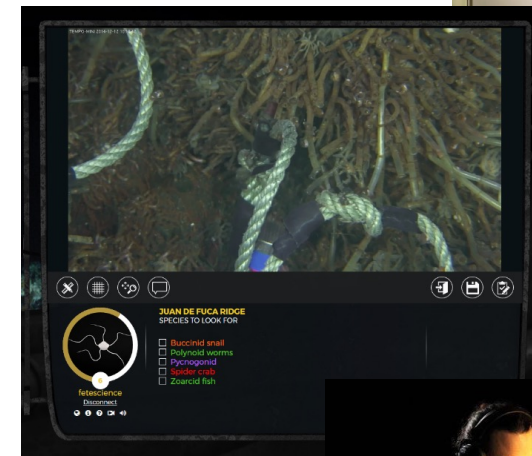


Deep sea spy – A collaborative annotation tool

Citizen science initiative

On line image annotation tool (EMSO-Azores and ONC)

Dedicated scientific website



Donvor, Deep thoughts

Scientific and artistic immersion into the deep-sea

« Radiophonic theater play » > 20 000 spectators



Permanent exhibition « **Under the ocean** »

Paris , Palais des Sciences et de la découverte, M. Cannat



EMSO-Azores – a platform to the deep-sea

From deep-sea observatory to Environmental monitoring and ecosystem management

10 years of successful deployment

- A technological development platform
- From Ecosystem functioning to Marine mineral resources potential impacts
- Leverage effect (MIDAS, FIXO3, ENVRI+, MERCES, PIONEER, Marine Mineral Resources, IAtlantic...)
- Ocean Literacy

Added value of the combined approach
site study / observatory maintenance

New period of 5 years 2021-2024

- Enlarging the scientific community
- Increasing the servicing periodicity
- New clean mooring methods
- Underwater noise
- Data visualisation
- Image analysis, ...

New inputs :

- Ecosystem preservation and resilience
- Efficiency of a marine protected area
- Access to new samples / questions
 - Climate change, pollutants, active molecules ...