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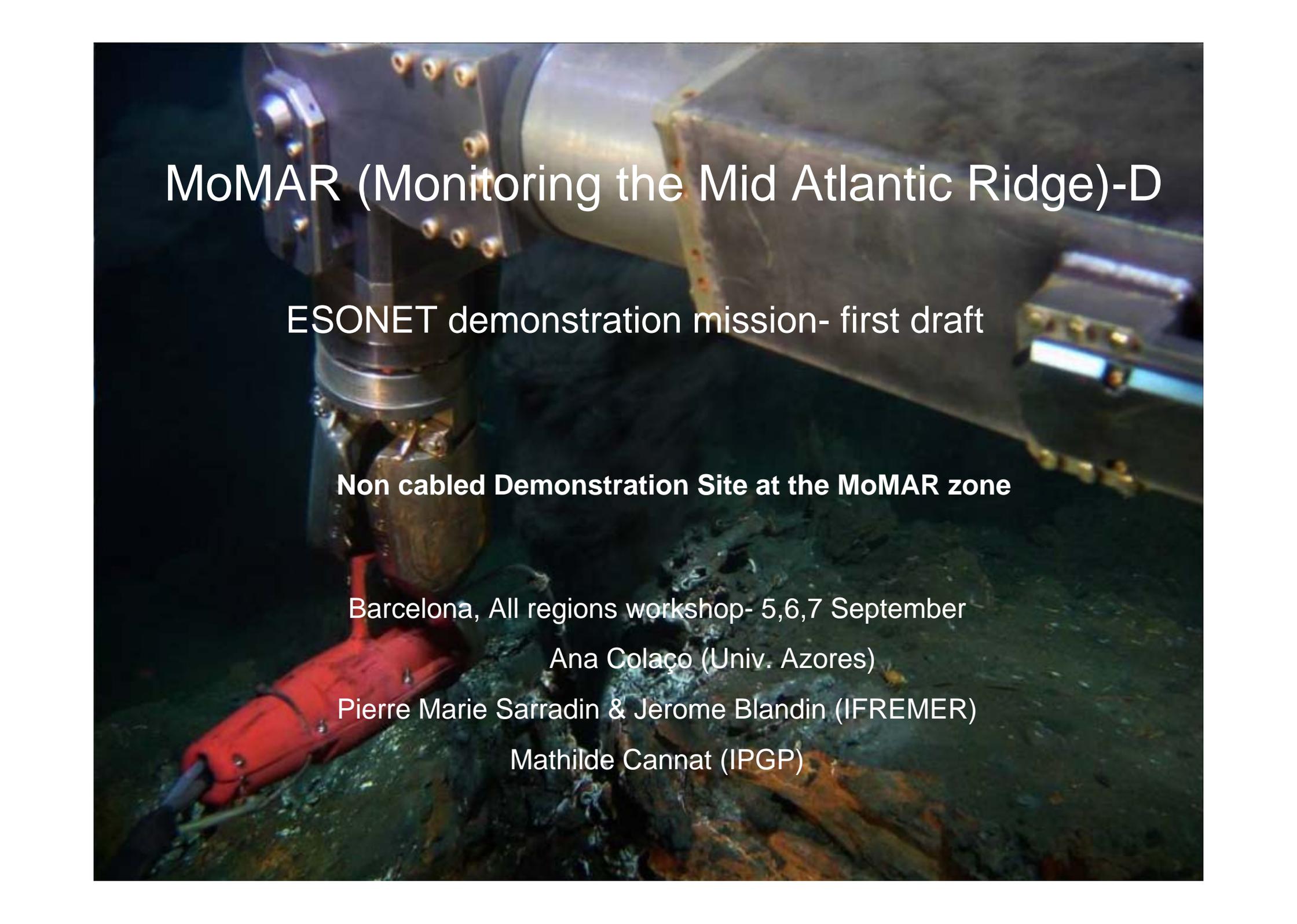
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IFREMER**

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**MoMAR (Monitoring the Mid Atlantic  
Ridge)-D**

**ESONET demonstration mission- first draft  
Non cabled Demonstration Site at the MoMAR zone**

**All Regions Workshop #1, Barcelona 5-7th Sept. 2007**



# MoMAR (Monitoring the Mid Atlantic Ridge)-D

ESONET demonstration mission- first draft

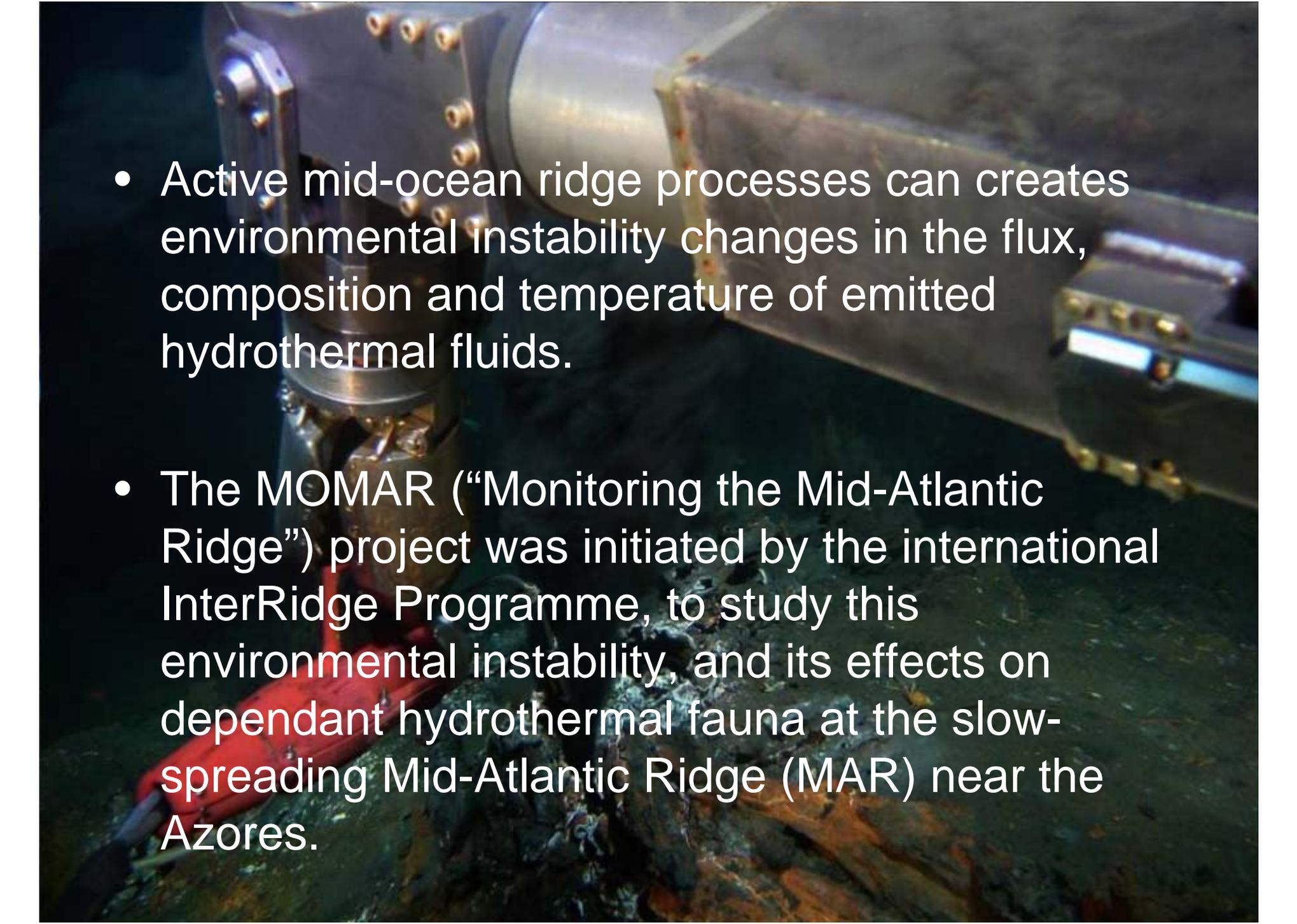
**Non cabled Demonstration Site at the MoMAR zone**

Barcelona, All regions workshop- 5,6,7 September

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Pierre Marie Sarradin & Jerome Blandin (IFREMER)

Mathilde Cannat (IPGP)

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- Active mid-ocean ridge processes can create environmental instability changes in the flux, composition and temperature of emitted hydrothermal fluids.
  - The MOMAR (“Monitoring the Mid-Atlantic Ridge”) project was initiated by the international InterRidge Programme, to study this environmental instability, and its effects on dependant hydrothermal fauna at the slow-spreading Mid-Atlantic Ridge (MAR) near the Azores.

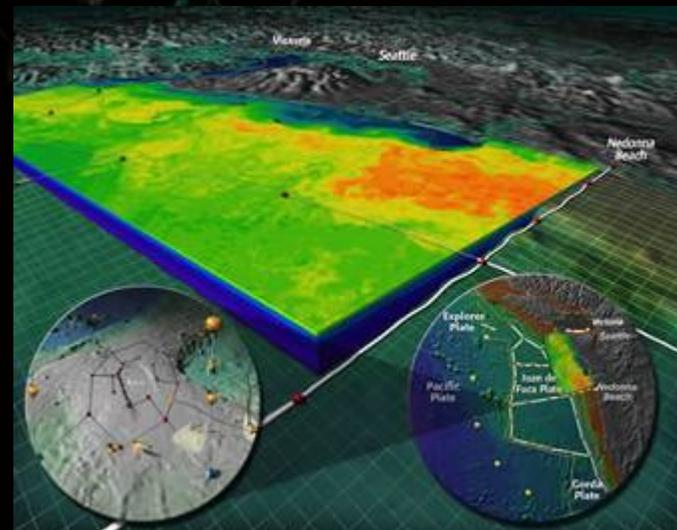
ESONET

MoMAR : Non cabled Demonstration Site  
Demonstration Mission in 2009

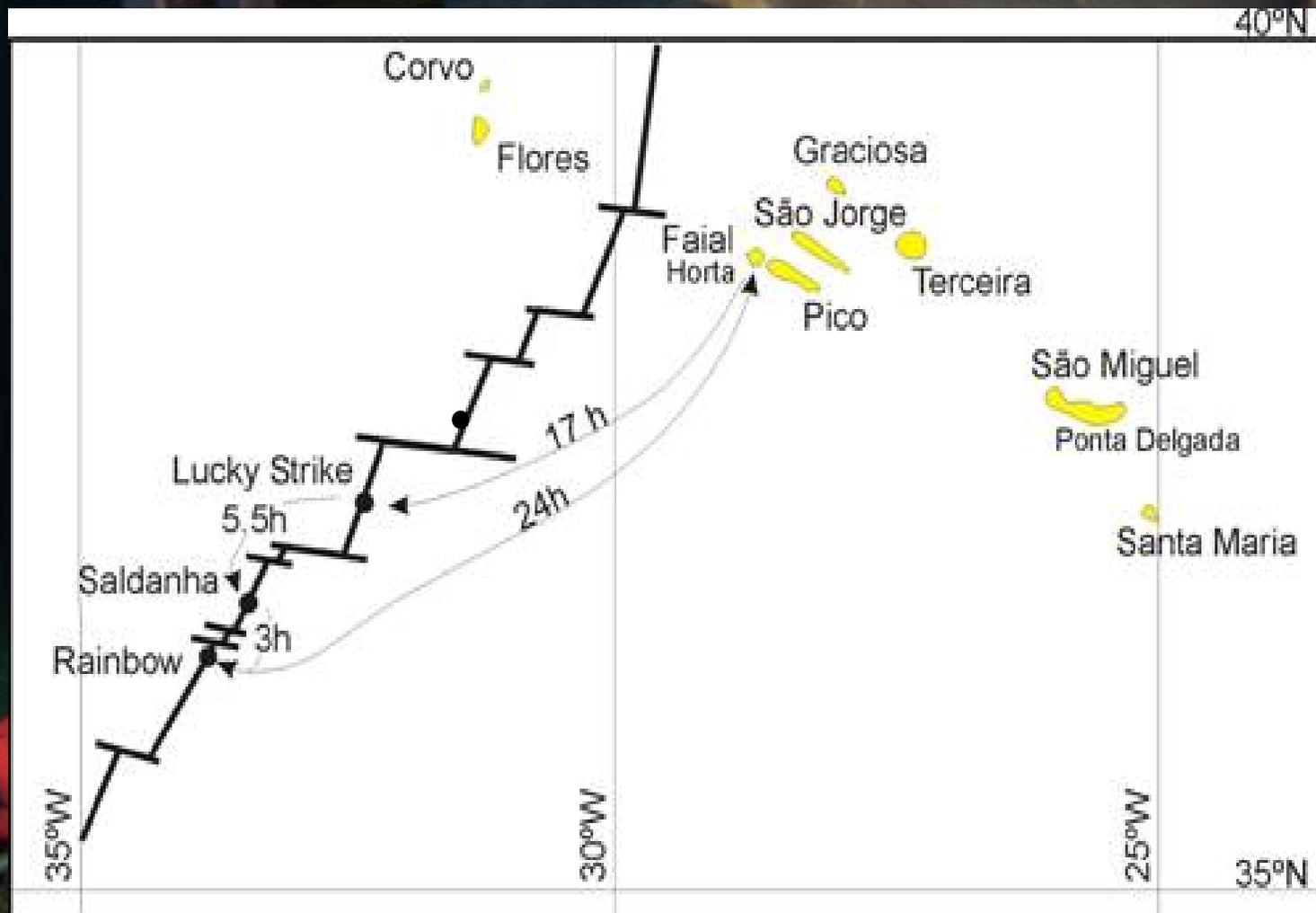
**Collaborations MoMAR**

ORION

NEPTUNE Canada

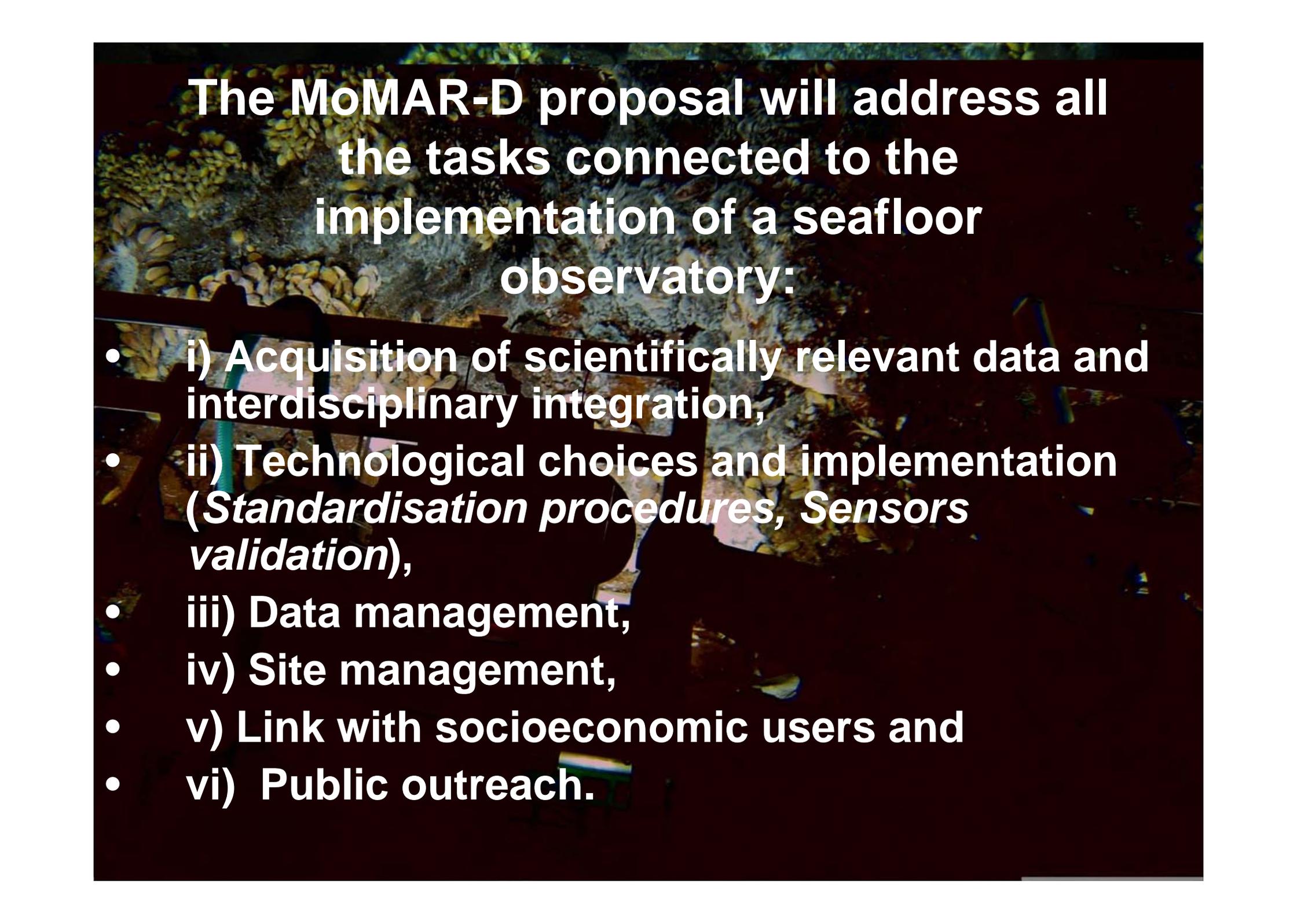


The MAR near the Azores is ideally located for this marine multidisciplinary observatory project: it is near port (Horta on Faial Island), allowing for short transit times for the deployment and retrieval of tools, and making cable connection to shore an option for later stages of implementation of the project.



A land-based laboratory, LabHorta, is installed at DOP-UAç (Colaço et al, 2002), at close proximity to the MoMAR area and the active deep-sea vent sites. LabHorta was conceived in view to keep with live vent animals recovered from acoustically-retrievable cages, developed during VENTOX project, at the deep-vents of the area. LabHorta is currently equipped with resident pressure vessels among other improvements funded through the Portuguese and Azorean research councils.



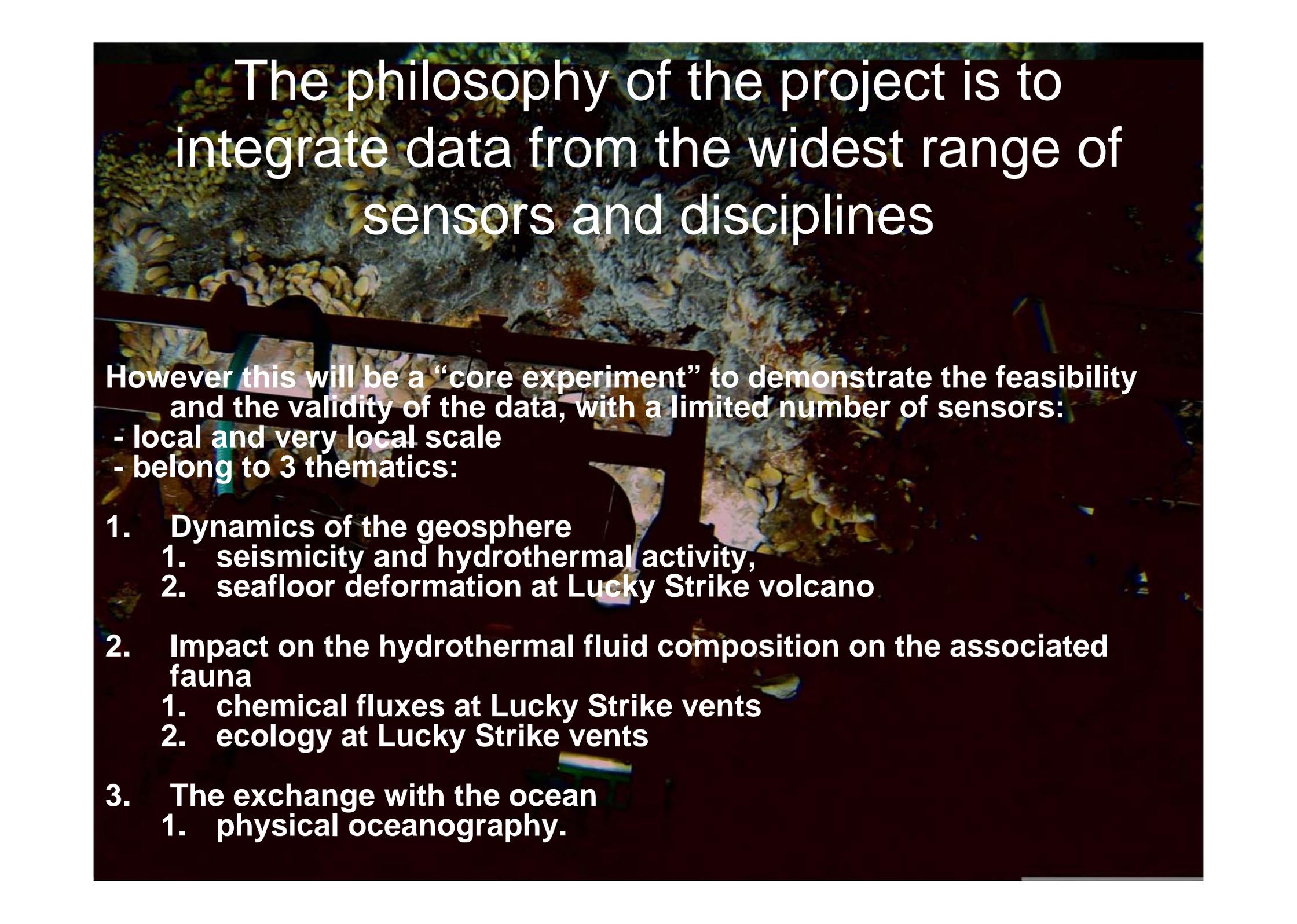


**The MoMAR-D proposal will address all the tasks connected to the implementation of a seafloor observatory:**

- **i) Acquisition of scientifically relevant data and interdisciplinary integration,**
- **ii) Technological choices and implementation (*Standardisation procedures, Sensors validation*),**
- **iii) Data management,**
- **iv) Site management,**
- **v) Link with socioeconomic users and**
- **vi) Public outreach.**

# The scientific and technological objectives of the MoMAR-ESONET proposal are:

- To study the temporal variability of active processes such as hydrothermalism, ecosystem dynamics, volcanism, seismicity and ground deformation, in order to constrain the dynamics of mid-ocean ridge hydrothermal ecosystems.
- To deploy a multidisciplinary acoustically linked observing system, with satellite connection to shore,
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- To integrate the partners' observation means around an existing and proven, non cabled, long term sub sea monitoring infrastructure.
- To demonstrate the overall management of this system during 1 month even if its operation will actually continue during 12 months.

The background of the slide is a dark underwater photograph. It shows a complex metal structure, possibly part of a submersible or a deep-sea instrument, with various pipes and beams. The structure is set against a backdrop of a rocky and mineral-rich seabed, likely a hydrothermal vent field. The lighting is dim, highlighting the textures of the rocks and the metallic surfaces.

# The philosophy of the project is to integrate data from the widest range of sensors and disciplines

However this will be a “core experiment” to demonstrate the feasibility and the validity of the data, with a limited number of sensors:

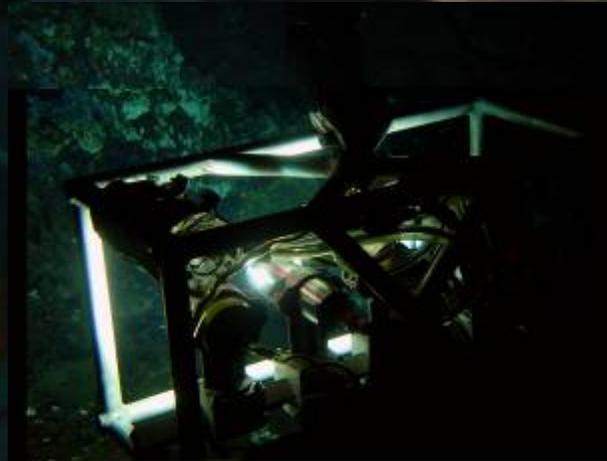
- local and very local scale
- belong to 3 thematics:

1. Dynamics of the geosphere
  1. seismicity and hydrothermal activity,
  2. seafloor deformation at Lucky Strike volcano
2. Impact on the hydrothermal fluid composition on the associated fauna
  1. chemical fluxes at Lucky Strike vents
  2. ecology at Lucky Strike vents
3. The exchange with the ocean
  1. physical oceanography.

# Technological choices



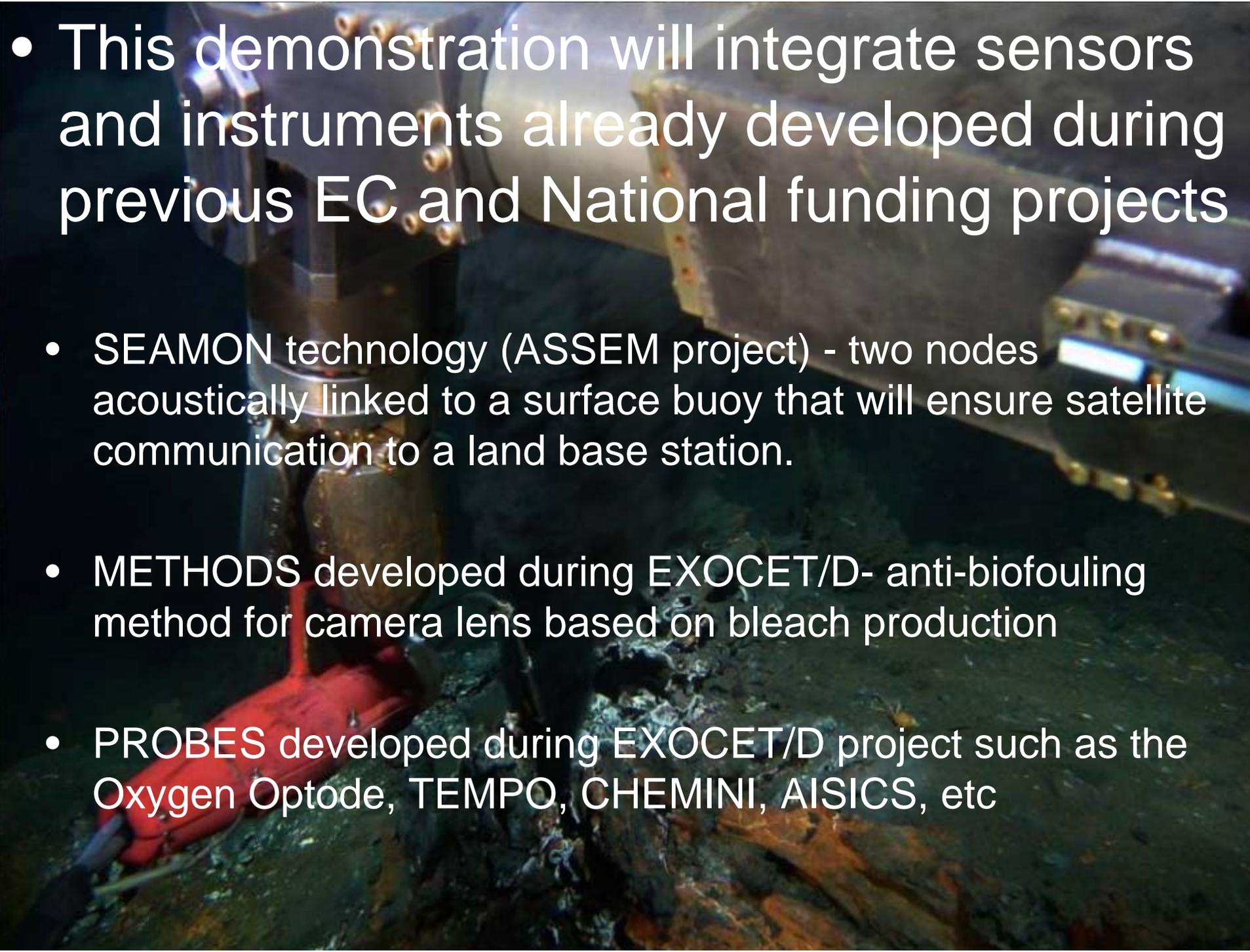
Pressure gauge



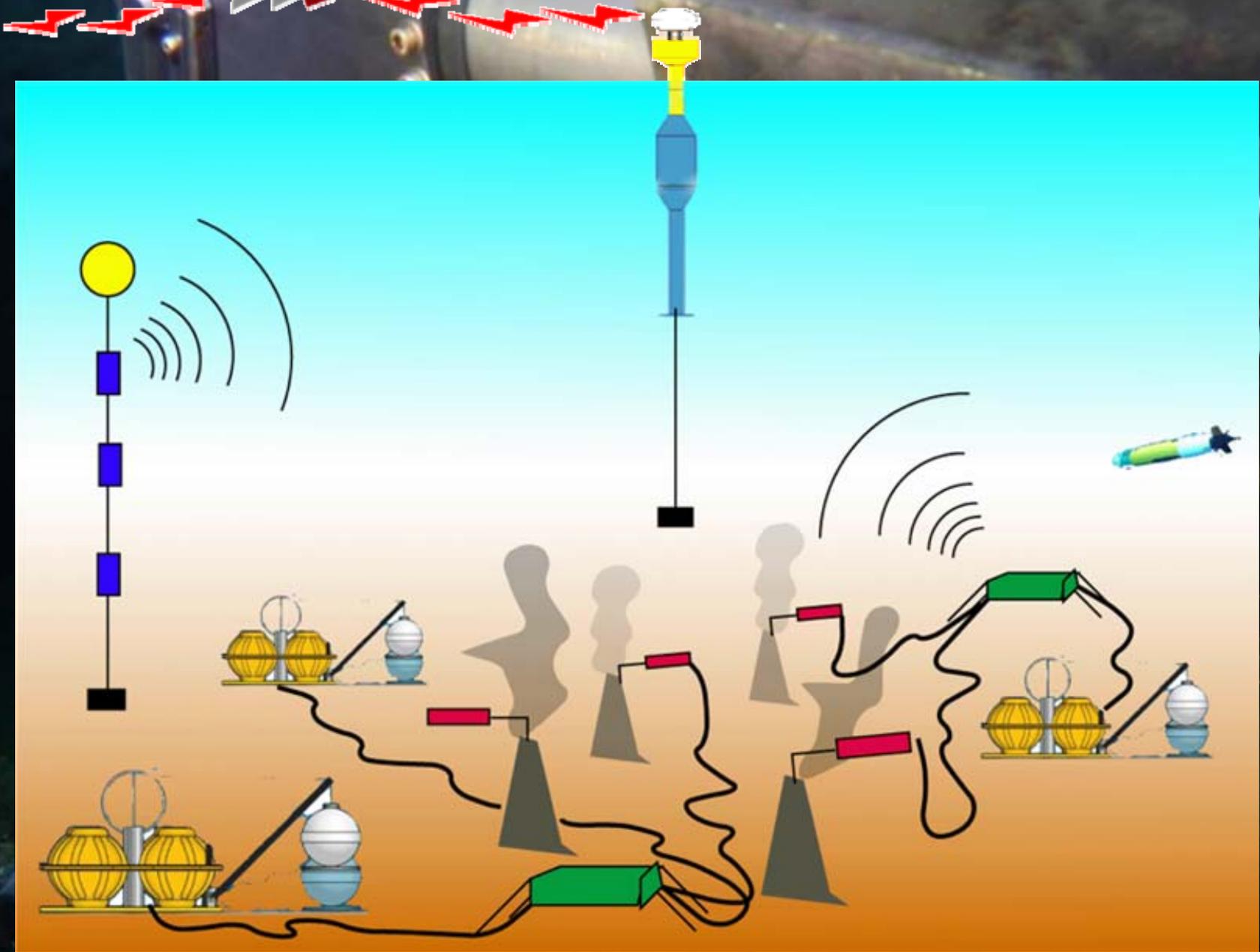
TEMPO

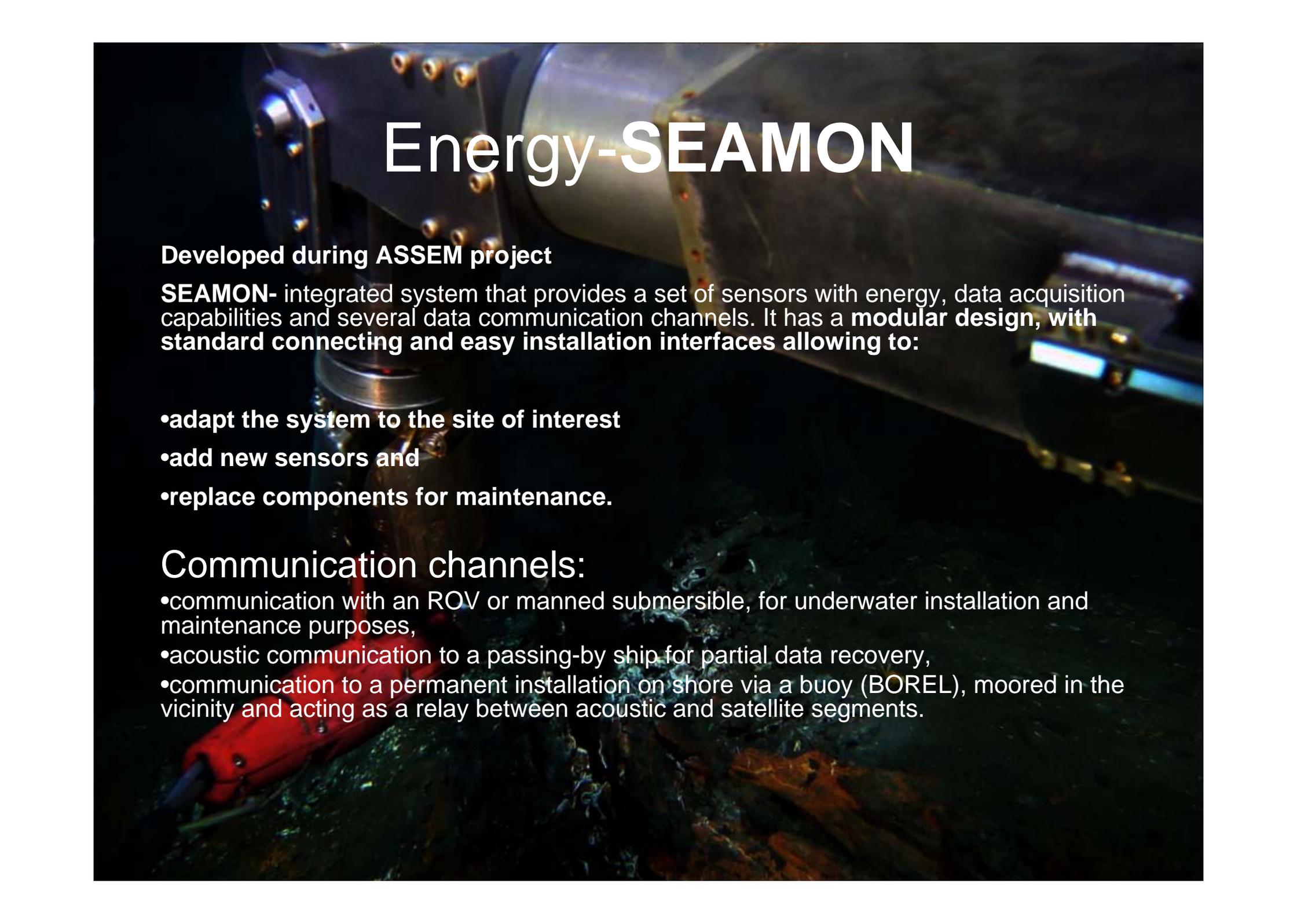


BOREL buoy

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- A close-up photograph of a metallic robotic arm, likely part of an underwater vehicle, positioned over a dark, rocky seabed. The arm is equipped with various sensors and instruments, including a prominent red component. The background is dark and slightly out of focus, showing more of the seabed and some blue light reflections.
- This demonstration will integrate sensors and instruments already developed during previous EC and National funding projects
    - SEAMON technology (ASSEM project) - two nodes acoustically linked to a surface buoy that will ensure satellite communication to a land base station.
    - METHODS developed during EXOCET/D- anti-biofouling method for camera lens based on bleach production
    - PROBES developed during EXOCET/D project such as the Oxygen Optode, TEMPO, CHEMINI, AISICS, etc

# Seafloor observation





# Energy-SEAMON

**Developed during ASSEM project**

**SEAMON-** integrated system that provides a set of sensors with energy, data acquisition capabilities and several data communication channels. It has a **modular design, with standard connecting and easy installation interfaces allowing to:**

- adapt the system to the site of interest
- add new sensors and
- replace components for maintenance.

## Communication channels:

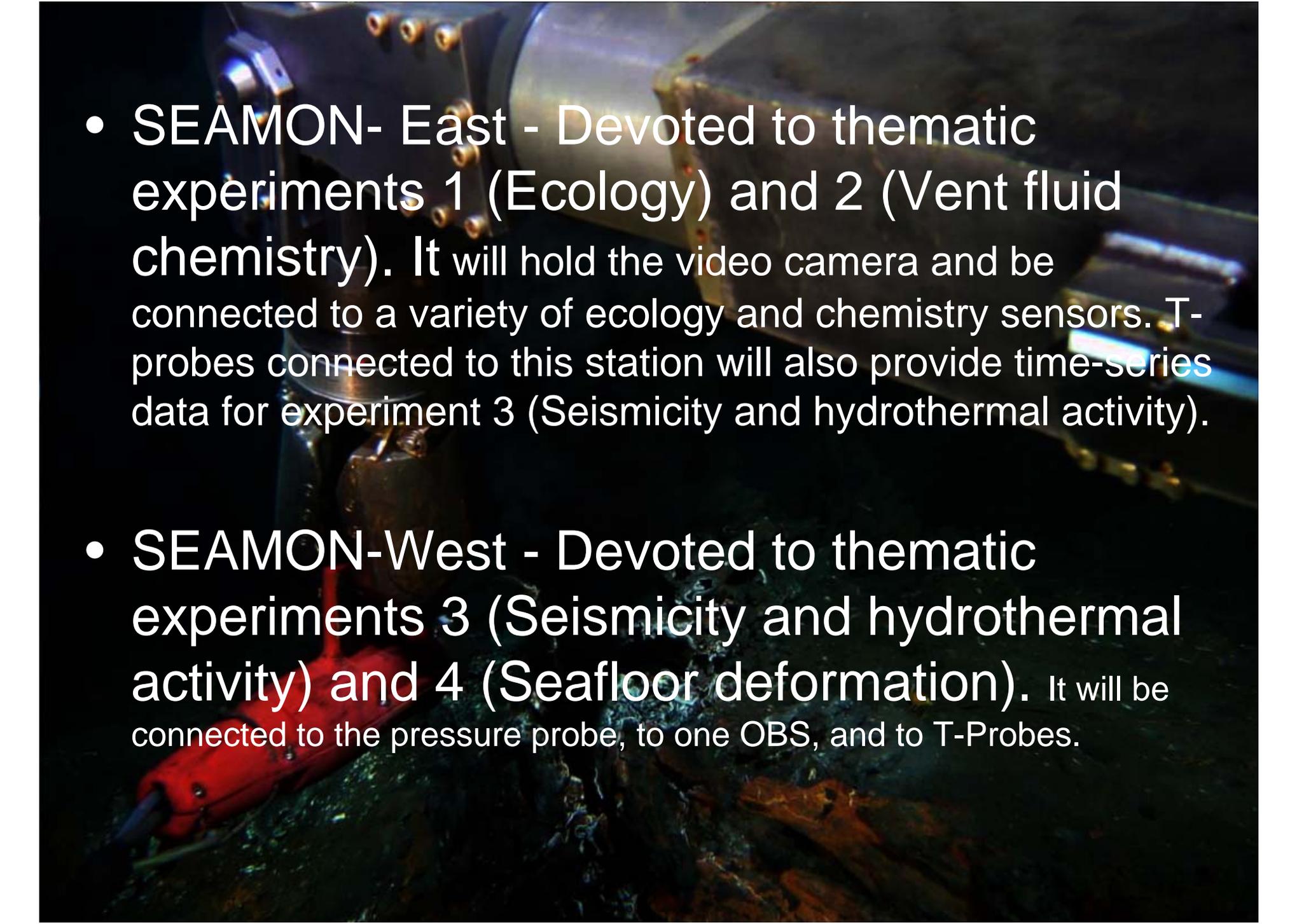
- communication with an ROV or manned submersible, for underwater installation and maintenance purposes,
- acoustic communication to a passing-by ship for partial data recovery,
- communication to a permanent installation on shore via a buoy (BOREL), moored in the vicinity and acting as a relay between acoustic and satellite segments.

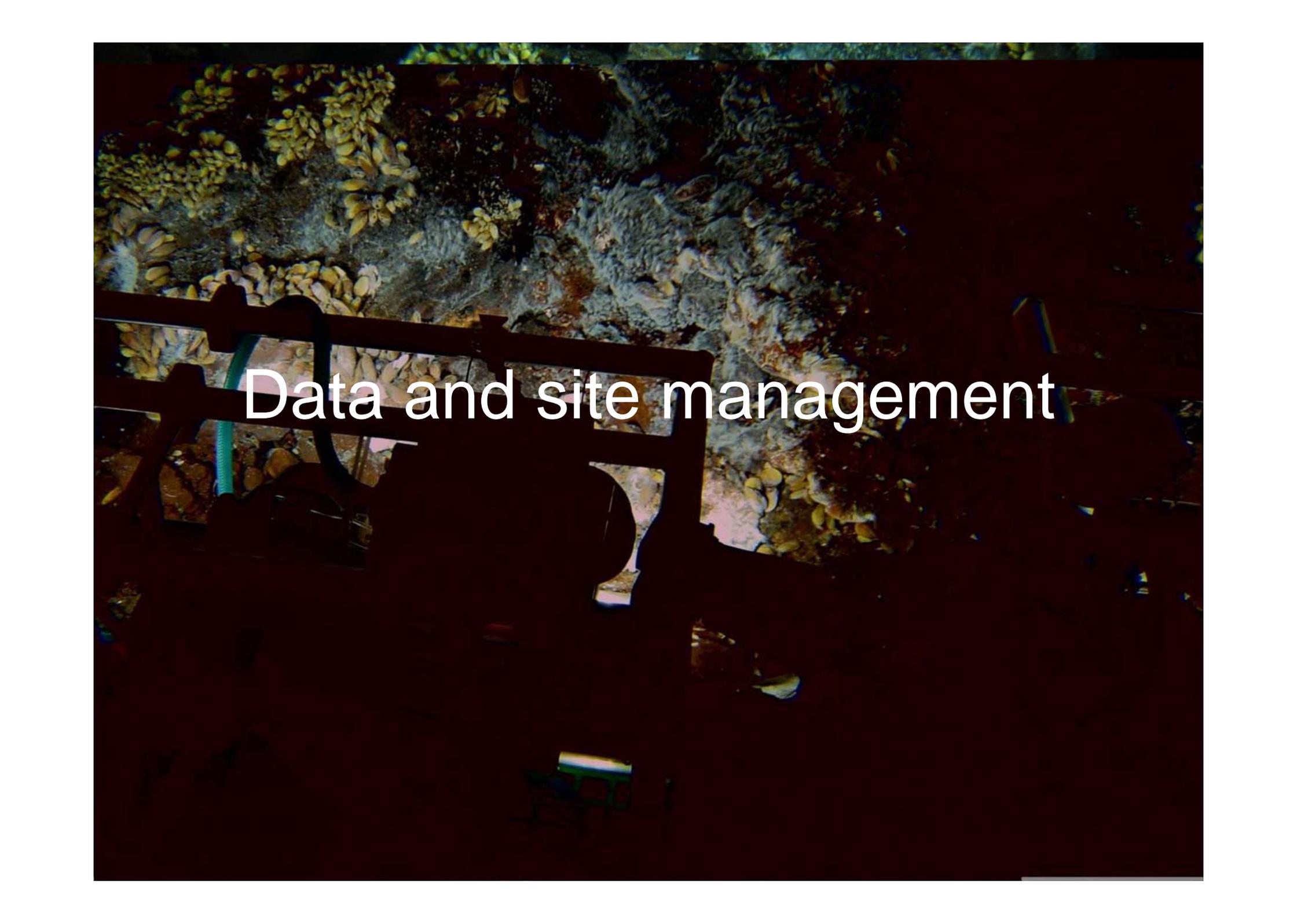
# Data acquisition

- COSTOF- centralize and store the sensors information.
- Each six hours will send information to an acoustic modem, or the data can be discharged by CLSI (contactless serial information)
- It can give orders to the sensors, can synchronize sensors. COSTOF can be intelligent with the probe and change the programmed order of the probe:
- Ex: we detect a phenomena and we order COSTOF to start measuring each 10 minutes instead of each one hour.

# There will be four types of data:

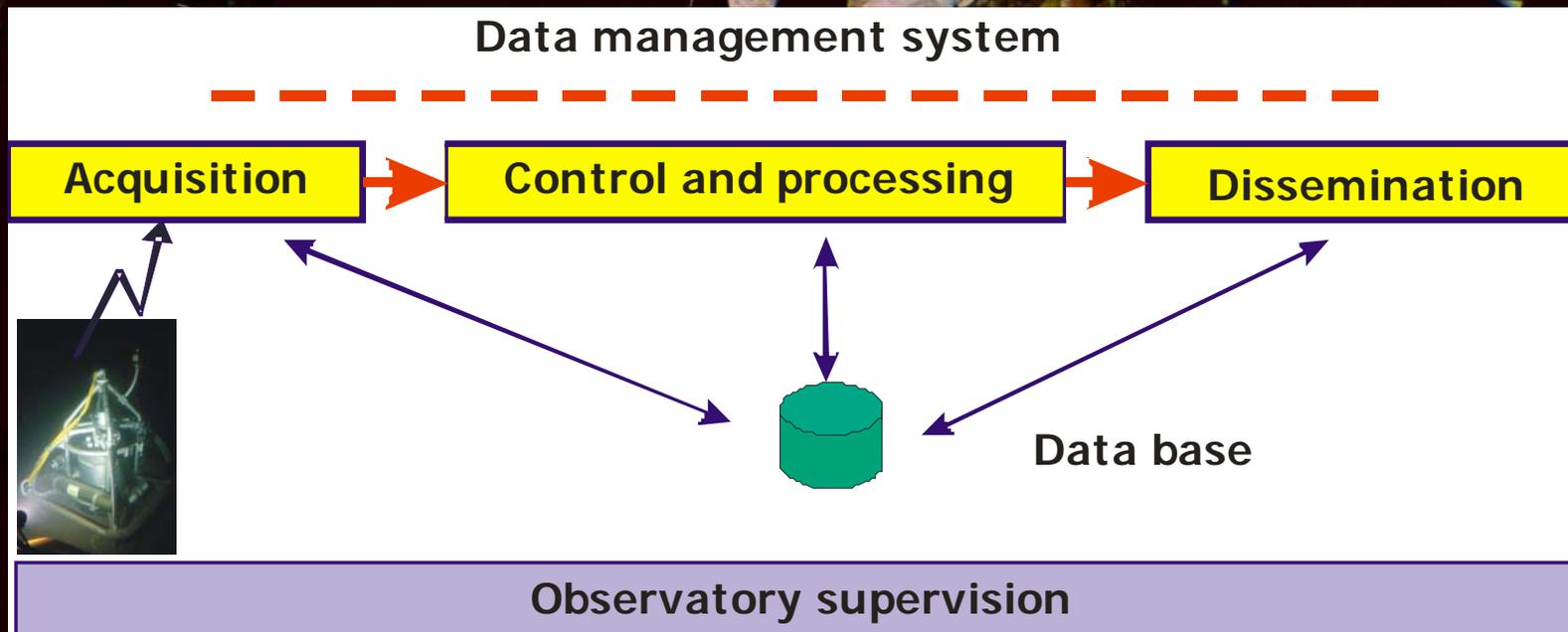
- 1- reduced- the ones that will be transmitted (a sub sampling) by modem and via satellite.
- 2- the raw data- a huge amount which can be recovered by CLSI with a submersible or can be recovered at the end.
- 3- the data acquired by autonomous sensors
- 4- complementary data acquired during the deployment and recovery of the system

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- SEAMON- East - Devoted to thematic experiments 1 (Ecology) and 2 (Vent fluid chemistry). It will hold the video camera and be connected to a variety of ecology and chemistry sensors. T-probes connected to this station will also provide time-series data for experiment 3 (Seismicity and hydrothermal activity).
  - SEAMON-West - Devoted to thematic experiments 3 (Seismicity and hydrothermal activity) and 4 (Seafloor deformation). It will be connected to the pressure probe, to one OBS, and to T-Probes.

An underwater photograph showing a metal frame structure in the foreground, likely part of a scientific instrument or sampling gear. The background is dominated by a large, dense bed of yellowish-brown shells, possibly mussels or barnacles, covering the seabed. The lighting is dim, creating a dark, moody atmosphere. The text "Data and site management" is overlaid in white, centered horizontally across the middle of the image.

# Data and site management

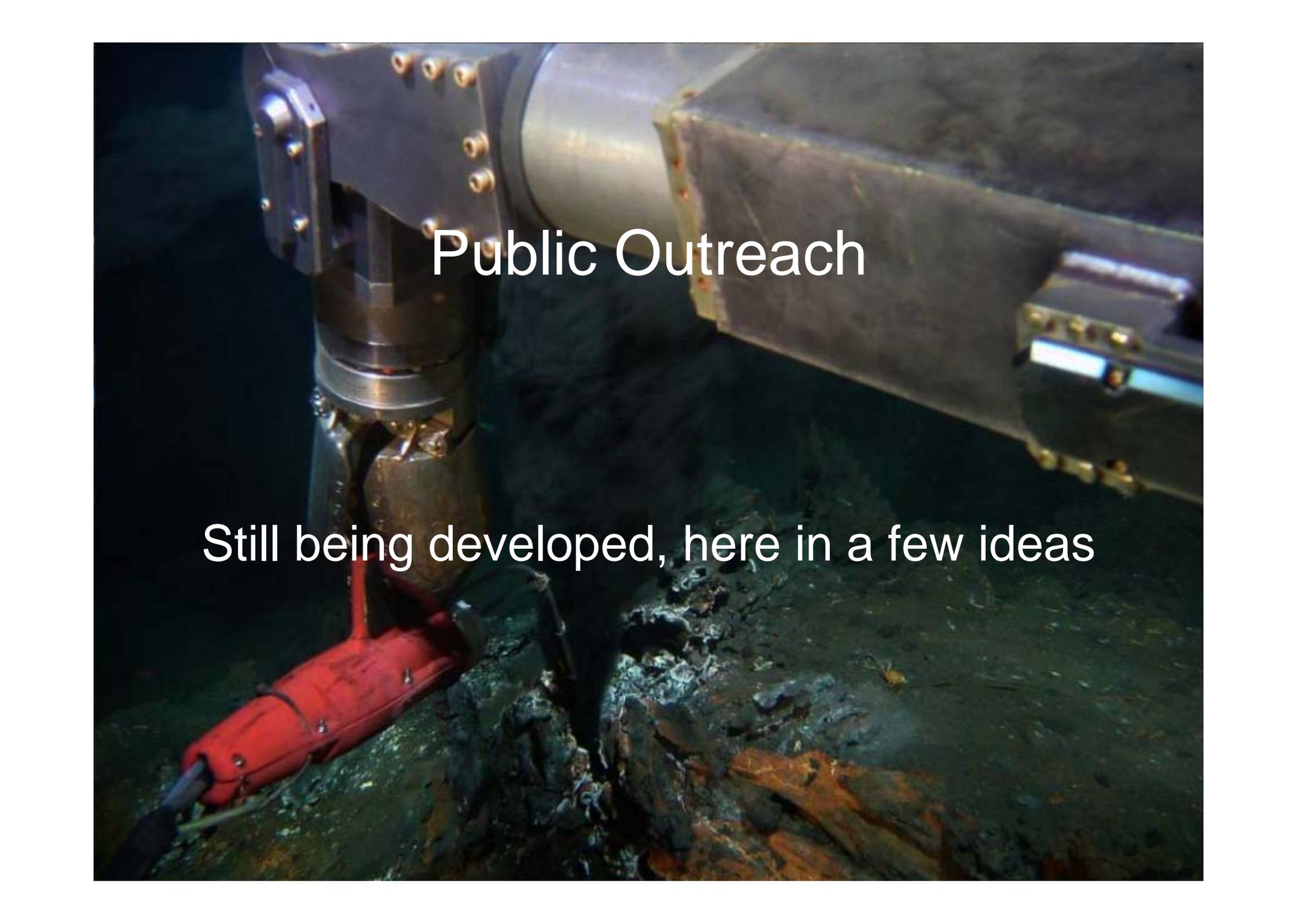
- Data will be made available online according to EsoNet data policy and European directives. Data will also be forwarded to data centres involved in the EsoNet project in order to be permanently archived and distributed.
- Its mandatory and agreement on data management before the start of the project



# MoMAR area is an MPA

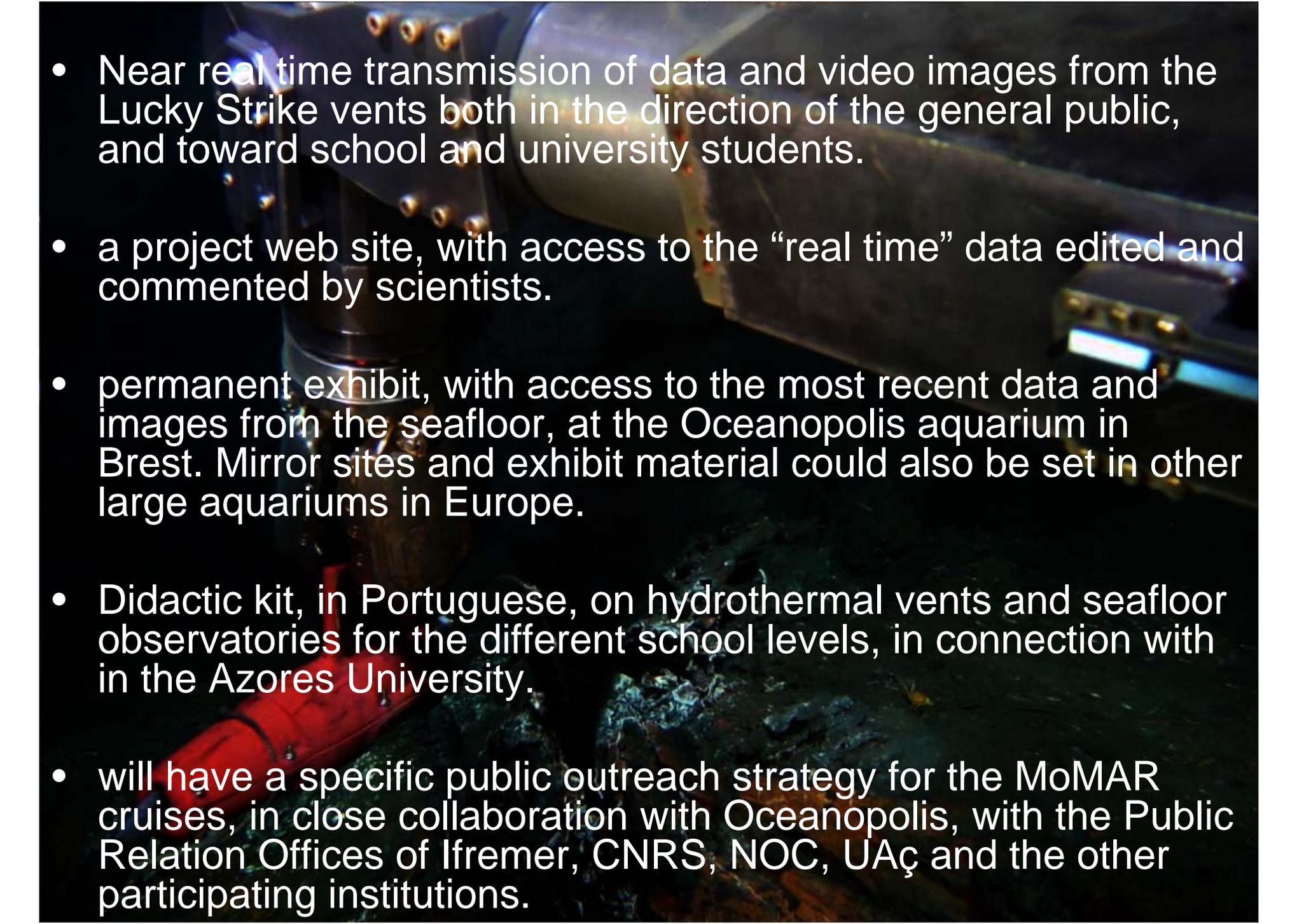
The MoMAR-ESONET demonstration will:

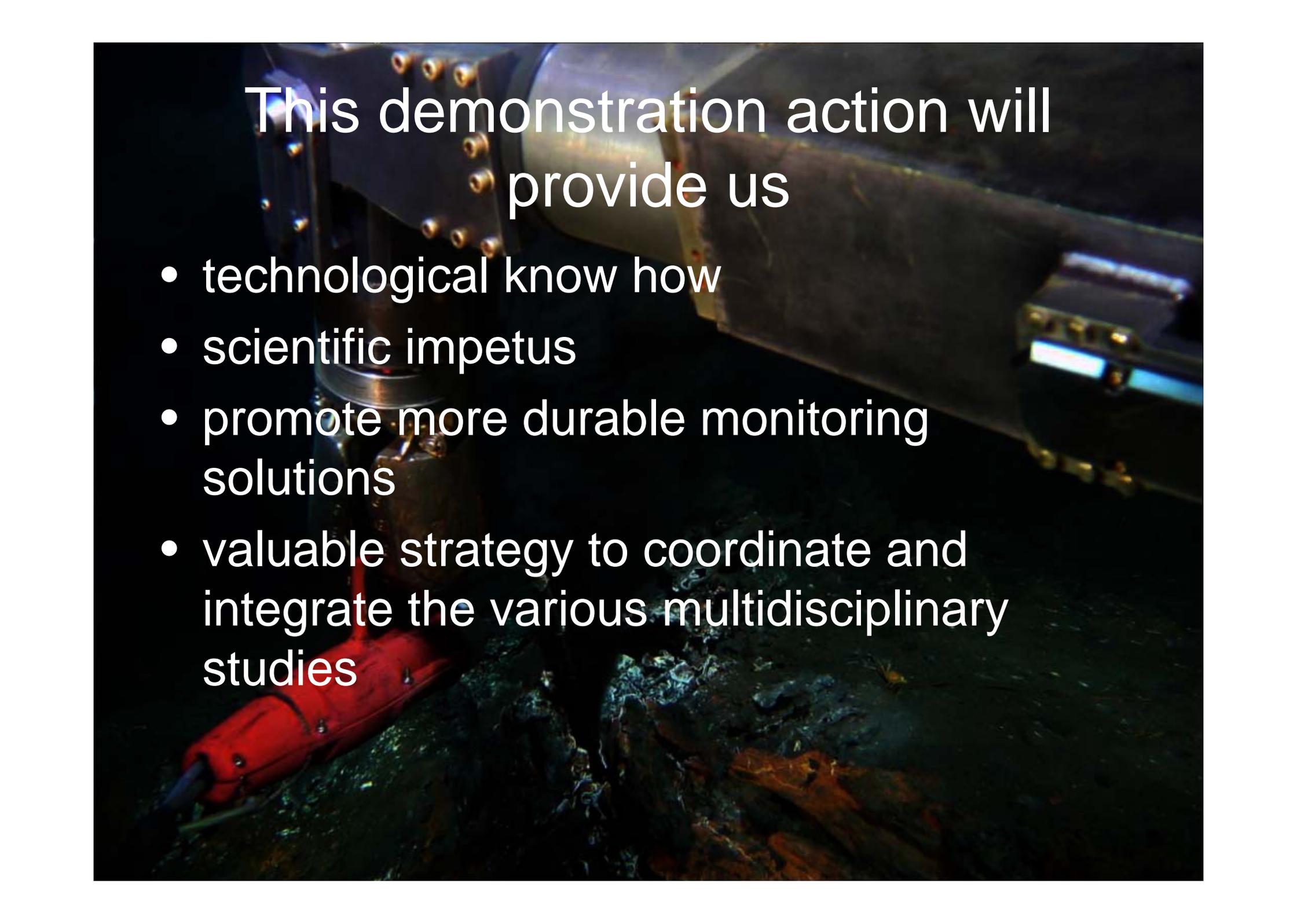
- comply with the MPA rules
- develop a coherent site management plan
  - rules for PI's, based on the MPA code of conduct and on the Interridge code of conduct. These rules will aim at minimizing the impact of research on the environment, and at making sure that the work of one team does not compromise monitoring activities led by other researchers.
- make provision in the MoMAR-ESONET demonstration project for a coordinating MoMAR office.
  - This office will, in coordination with the ESONET data management, and with the Hydrographic Institute of Portugal, keep track of all on-going experiments and insure that they comply with the rules.
- Devote one MoMAR dive to clean the area around the two Lucky Strike SEAMON nodes of the abundant non-native material left there over the years of scientific work (unused ballast and cables, and unfortunately also discarded items thrown overboard the ships).

A close-up photograph of a robotic arm, likely from a space mission, with a red gripper holding a small object over a dark, textured surface. The arm is metallic and has several gold-colored fasteners. The background is dark and appears to be a rocky or metallic surface.

# Public Outreach

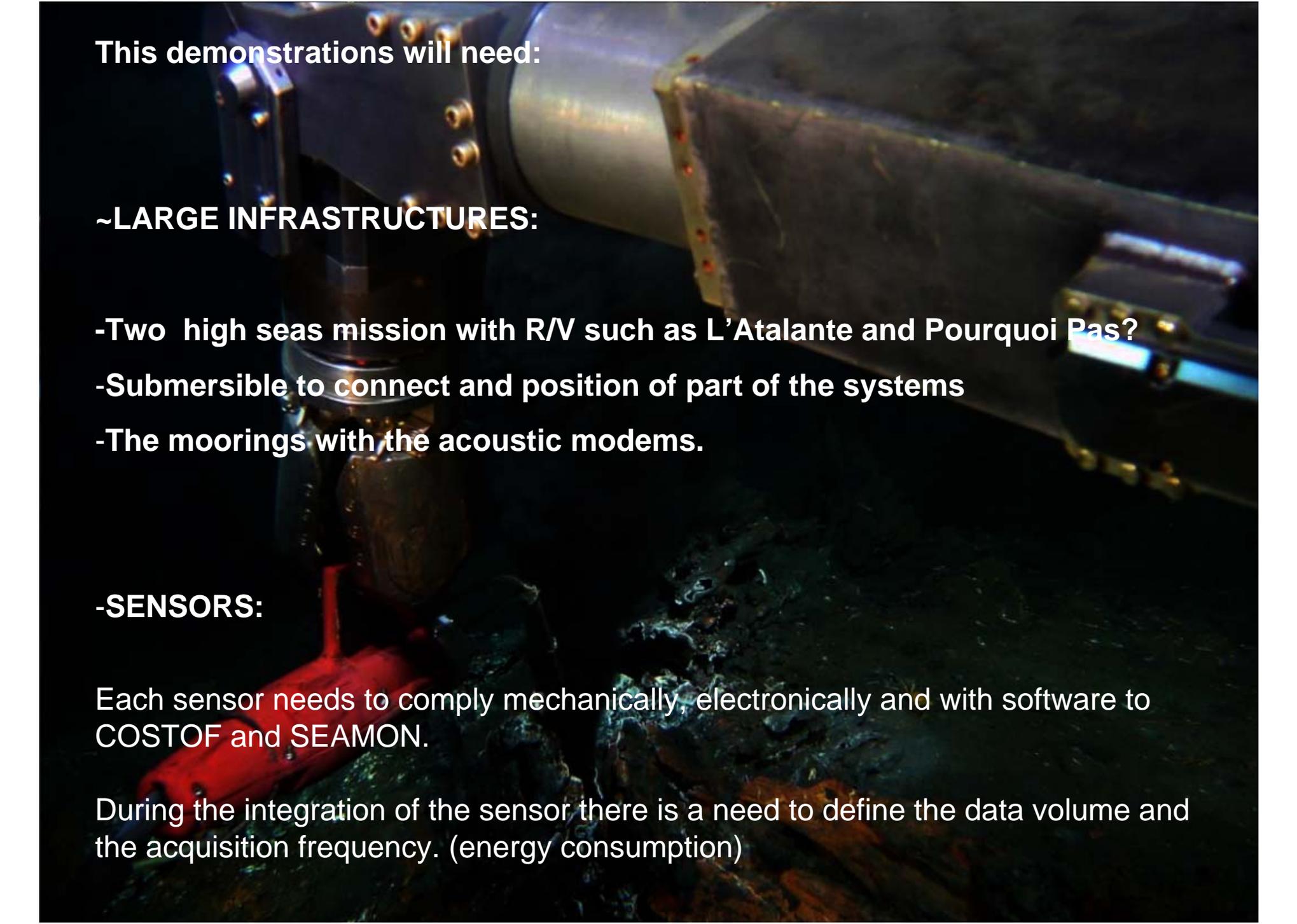
Still being developed, here in a few ideas

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- A photograph of a deep-sea hydrothermal vent, specifically the Lucky Strike field. The scene is dark, illuminated by artificial lights. In the foreground, a red robotic arm or ROV component is visible. The background shows the dark, rocky seafloor with some mineral structures.
- Near real time transmission of data and video images from the Lucky Strike vents both in the direction of the general public, and toward school and university students.
  - a project web site, with access to the “real time” data edited and commented by scientists.
  - permanent exhibit, with access to the most recent data and images from the seafloor, at the Oceanopolis aquarium in Brest. Mirror sites and exhibit material could also be set in other large aquariums in Europe.
  - Didactic kit, in Portuguese, on hydrothermal vents and seafloor observatories for the different school levels, in connection with in the Azores University.
  - will have a specific public outreach strategy for the MoMAR cruises, in close collaboration with Oceanopolis, with the Public Relation Offices of Ifremer, CNRS, NOC, UAç and the other participating institutions.



This demonstration action will  
provide us

- technological know how
- scientific impetus
- promote more durable monitoring solutions
- valuable strategy to coordinate and integrate the various multidisciplinary studies



**This demonstrations will need:**

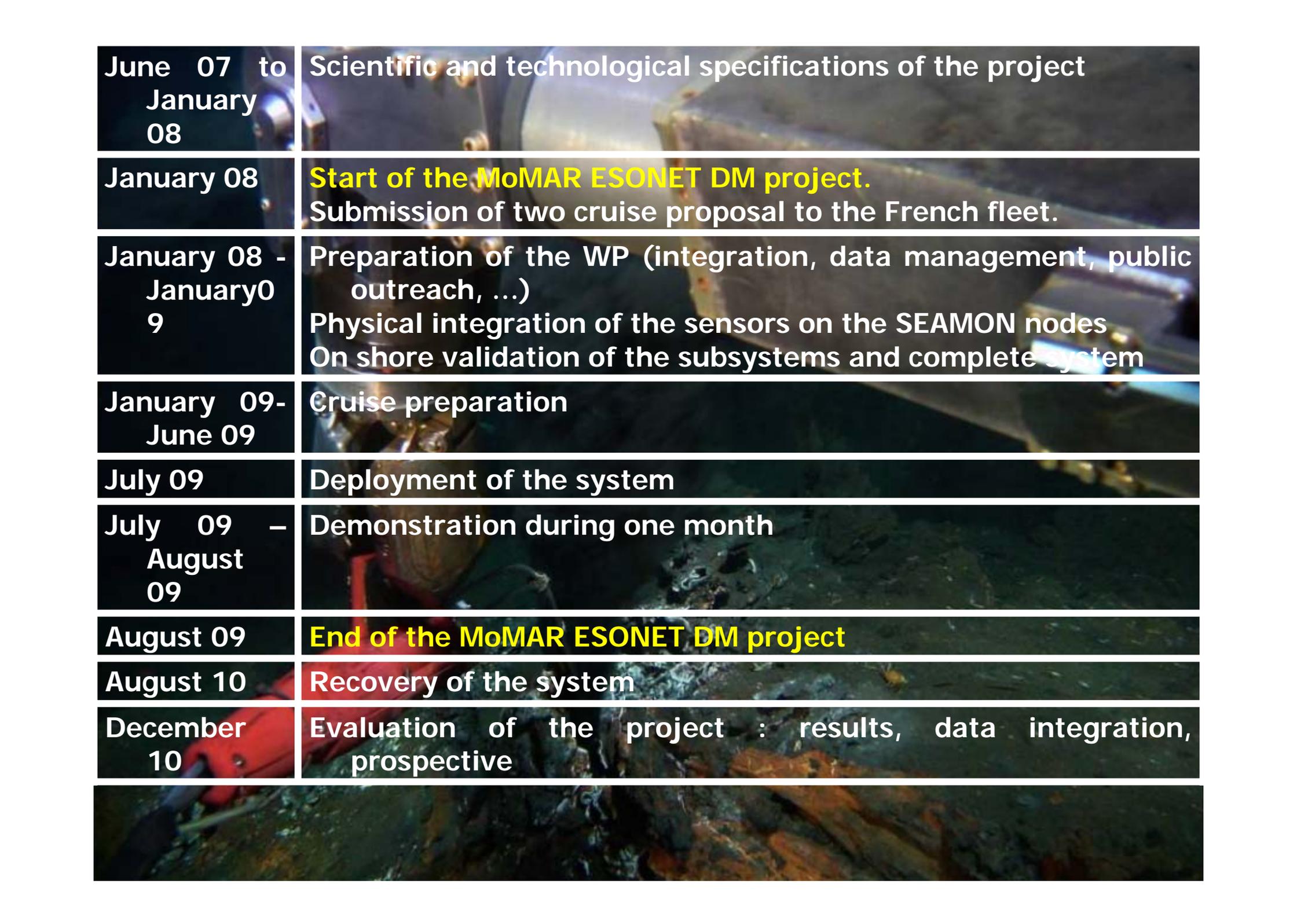
**~LARGE INFRASTRUCTURES:**

- Two high seas mission with R/V such as L'Atalante and Pourquoi Pas?
- Submersible to connect and position of part of the systems
- The moorings with the acoustic modems.

**-SENSORS:**

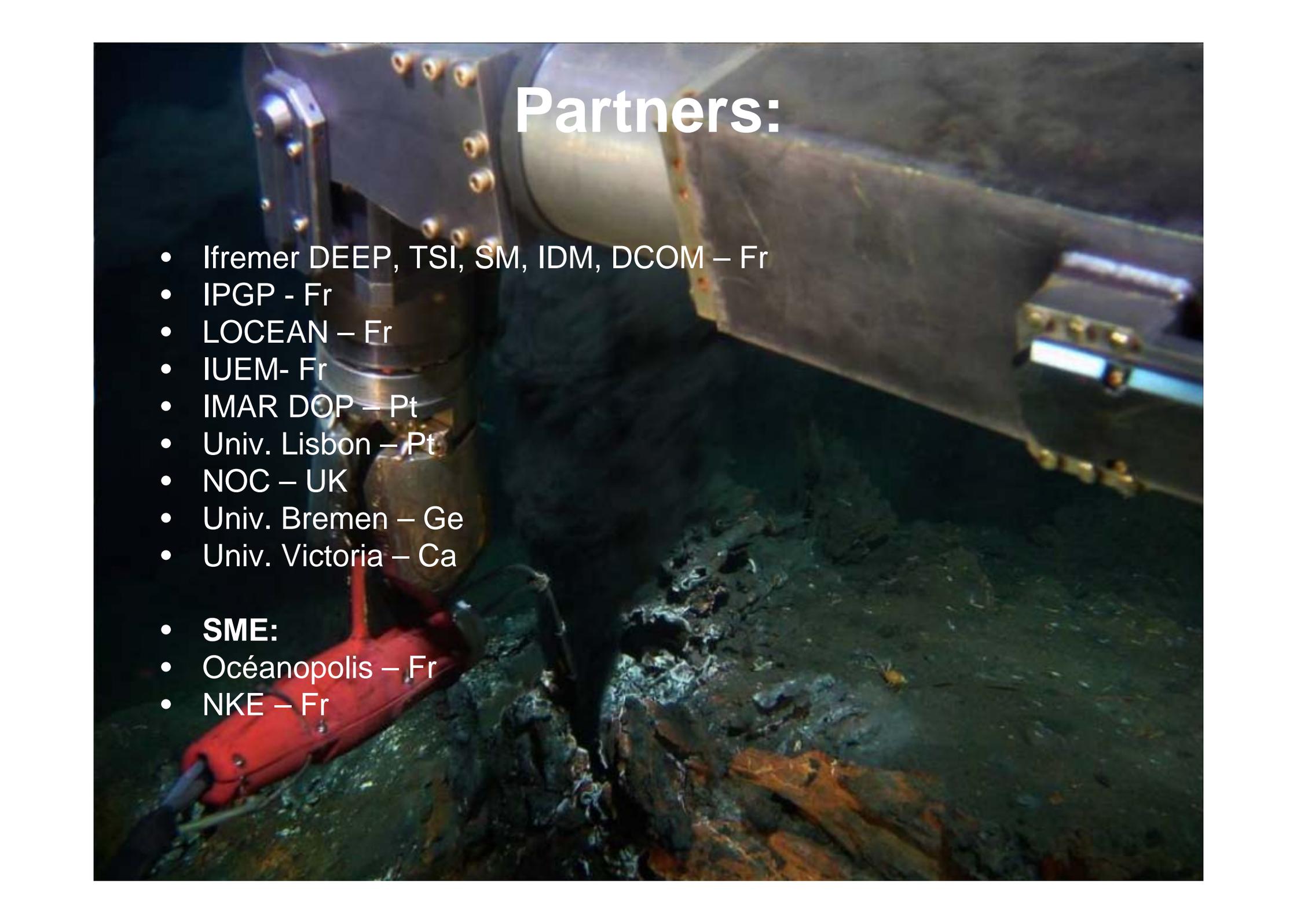
Each sensor needs to comply mechanically, electronically and with software to COSTOF and SEAMON.

During the integration of the sensor there is a need to define the data volume and the acquisition frequency. (energy consumption)



June 07 to January 08	Scientific and technological specifications of the project
January 08	<b>Start of the MoMAR ESONET DM project.</b> Submission of two cruise proposal to the French fleet.
January 08 - January 09	Preparation of the WP (integration, data management, public outreach, ...) Physical integration of the sensors on the SEAMON nodes On shore validation of the subsystems and complete system
January 09- June 09	Cruise preparation
July 09	Deployment of the system
July 09 – August 09	Demonstration during one month
August 09	<b>End of the MoMAR ESONET DM project</b>
August 10	Recovery of the system
December 10	Evaluation of the project : results, data integration, prospective





# Partners:

- Ifremer DEEP, TSI, SM, IDM, DCOM – Fr
- IPGP - Fr
- LOCEAN – Fr
- IUEM- Fr
- IMAR DOP – Pt
- Univ. Lisbon – Pt
- NOC – UK
- Univ. Bremen – Ge
- Univ. Victoria – Ca
  
- **SME:**
- Océanopolis – Fr
- NKE – Fr