# Kick-off Meeting DeepCMED

**16th of October, 2025**

*Online*

# Deep Oceanic Observation to investigate the impact and Prediction of Climate hazards on the resilience of marine ecosystem in Mediterranean Sea

# DeePCMED


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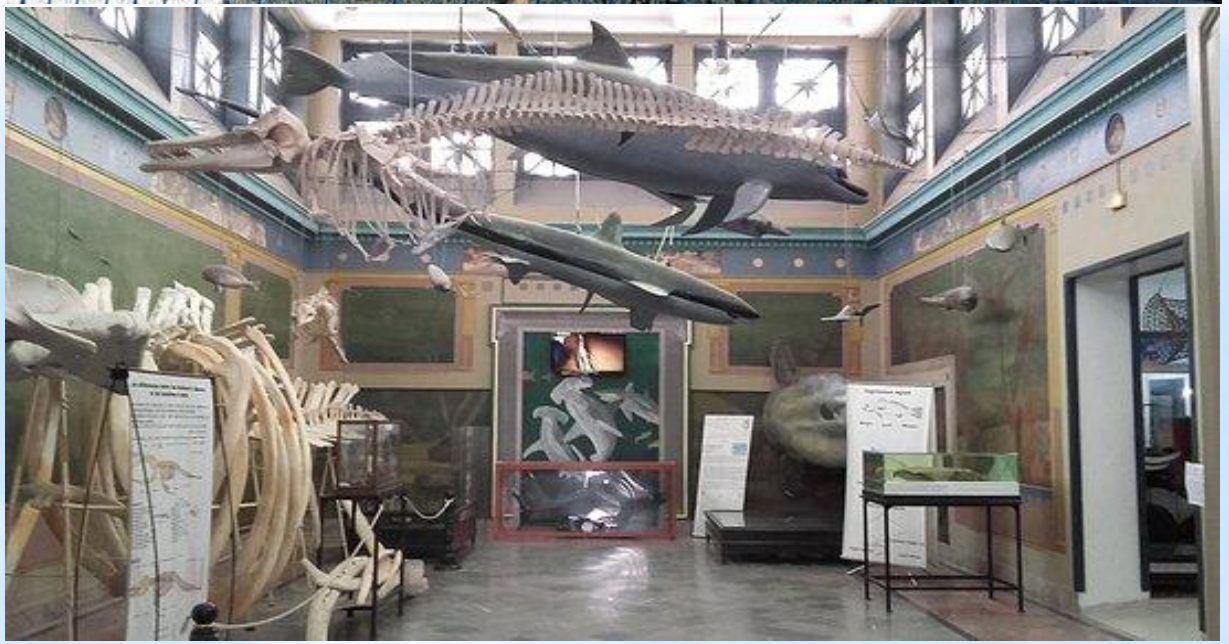
*DIGITAL DEEP-SEA TYPICAL HABITATS (Digital DEPTH) WOKSHOP, XIAMEN 6th November 2024*

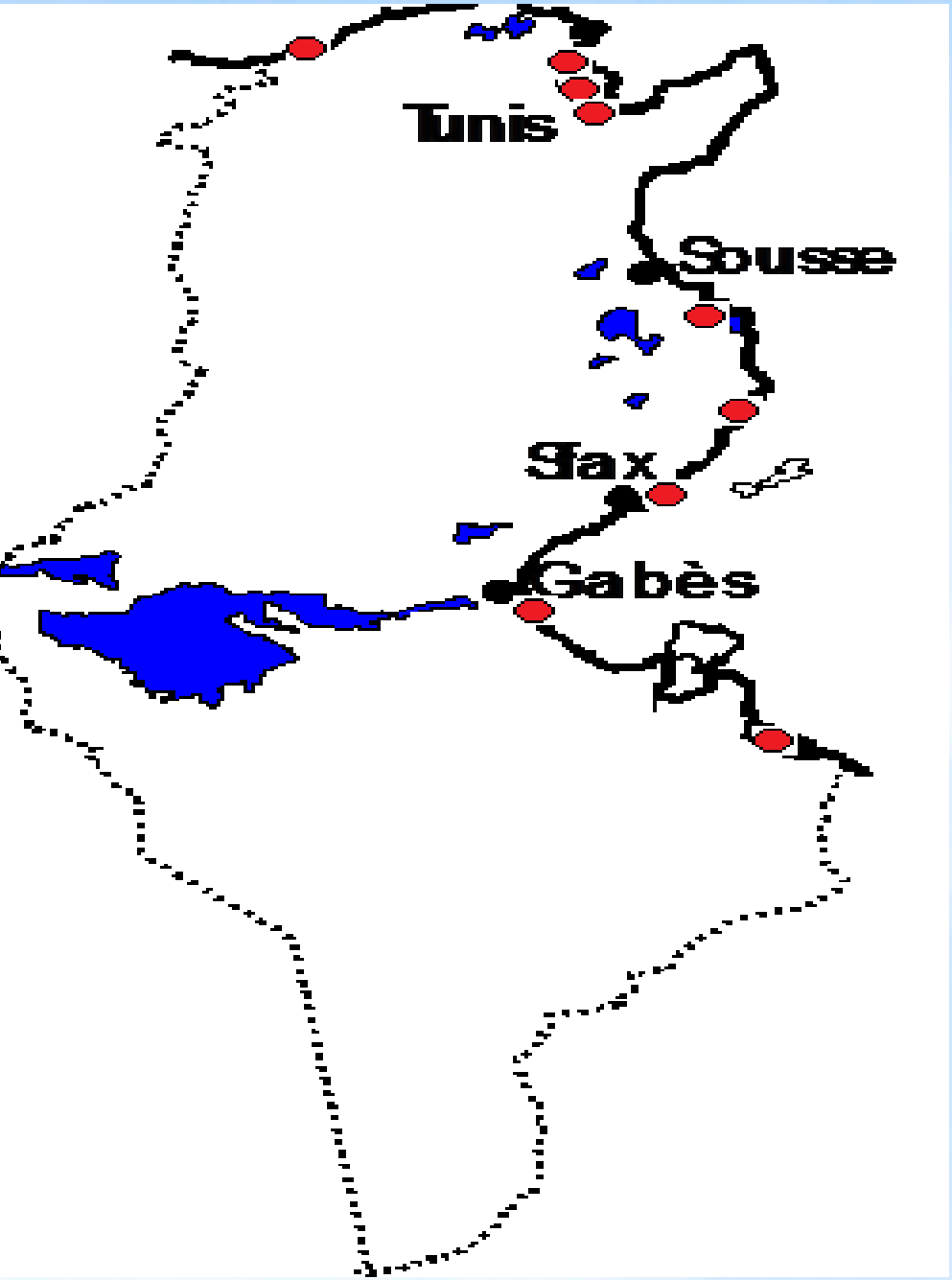

unesco
Intergovernmental Oceanographic Commission

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

# INSTM

INSTM is one of the largest and widespread research center in Tunisia, founded in 1924 for the marine research and technologies.




- ✓ **Supervision**: Ministry of Agriculture, Hydraulic Resources and Fisheries
- ✓ **Structure** : EPA (public administrative establishment)

- ✓ **8 regional centers:**

Tabarka; La Goulette; Kheireddine, Monastir; Mahdia; Sfax; Gabès; Zarzis.

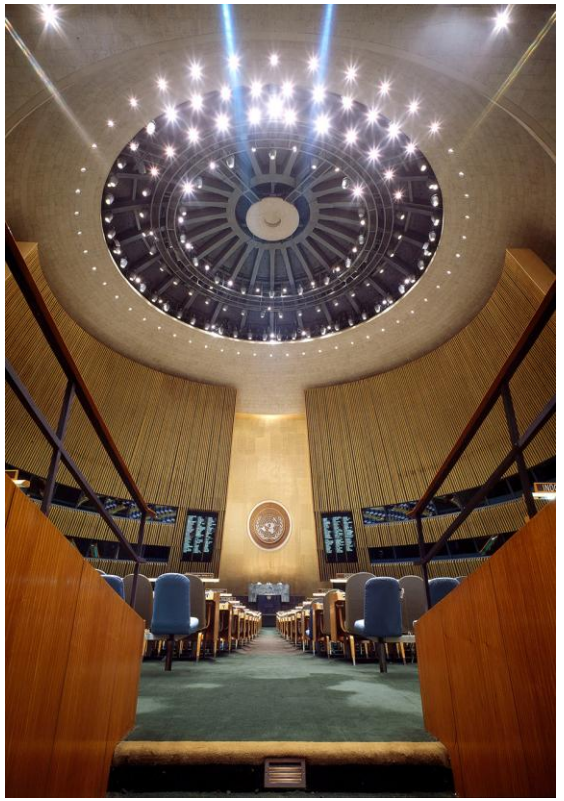
- ✓ **Human Ressources**:
- ✓ 270 employee
- ✓ 100 researchers
- ✓ **Museum Dar EL Hout**

Oceanographic Museum
Dates : **20th century (1924)**
Receives: **65,000 visitors/year**

# UN Ocean Decade Background

In September **2015**, UN Sustainable Development Summit adopted **17 Sustainable Development Goals (SDGs)** to guide global development during 2015-2030.


SUSTAINABLE DEVELOPMENT GOALS



To promote the implementation of UN 2030 Agenda for Sustainable Development, the **72nd** session of the UN General Assembly in December 2017 and the **75th** session of the UN General Assembly in December 2020 adopted resolutions designating 2021-2030 as the "**United Nations Decade of Ocean Science for Sustainable Development**" (referred to as the "**Ocean Decade**").

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# UN Ocean Decade Objectives

"The science we need"

"The ocean we want"

## Objective

1. Identify required knowledge for sustainable development
2. Generate comprehensive knowledge and understanding of the ocean
3. Increase the use of ocean knowledge

"UN Ocean Decade" Action:

- Programme
- Project
- Action
- Donation

## Expected Outcomes

The science we need for the ocean we want

- A clear ocean
- A healthy ocean
- A productive ocean
- A predictive ocean
- A safe ocean
- An accessible ocean
- An inspiring ocean

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# The science we need for the ocean we want

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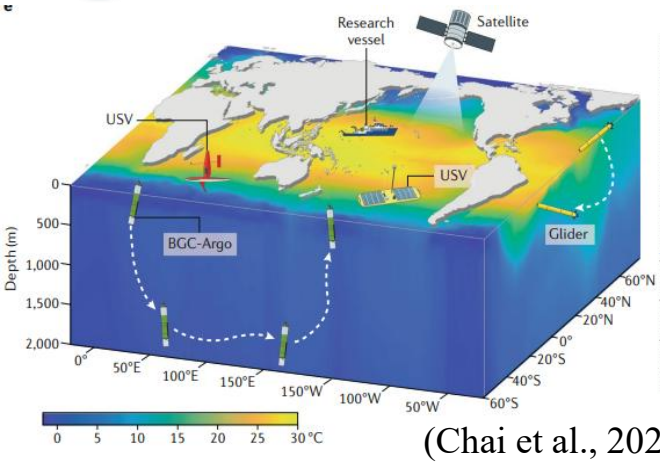
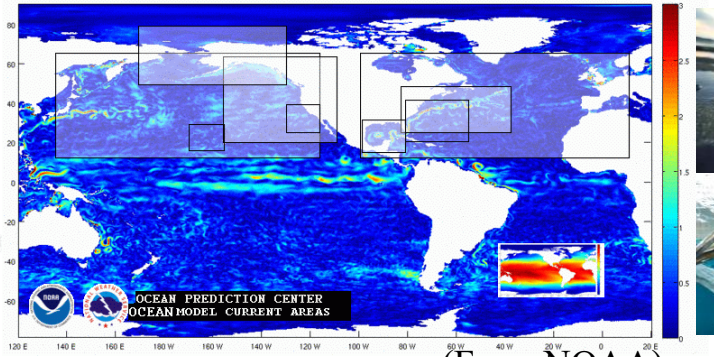
An accessible ocean




(Chai et al., 2021)

A predicted ocean

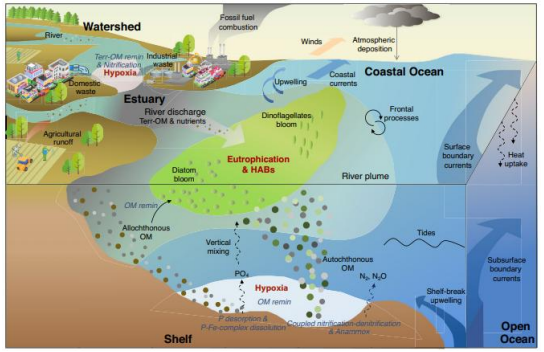



(From NOAA)

A clean ocean

(From internet)

A healthy ocean




(Dai et al., 2023)

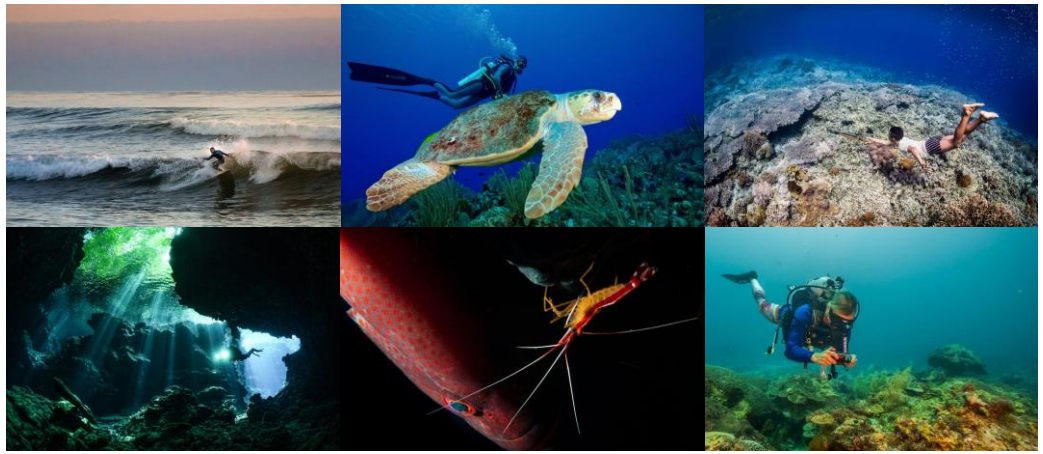
A safe ocean

(From internet)

A productive ocean

(From internet)

An inspiring ocean



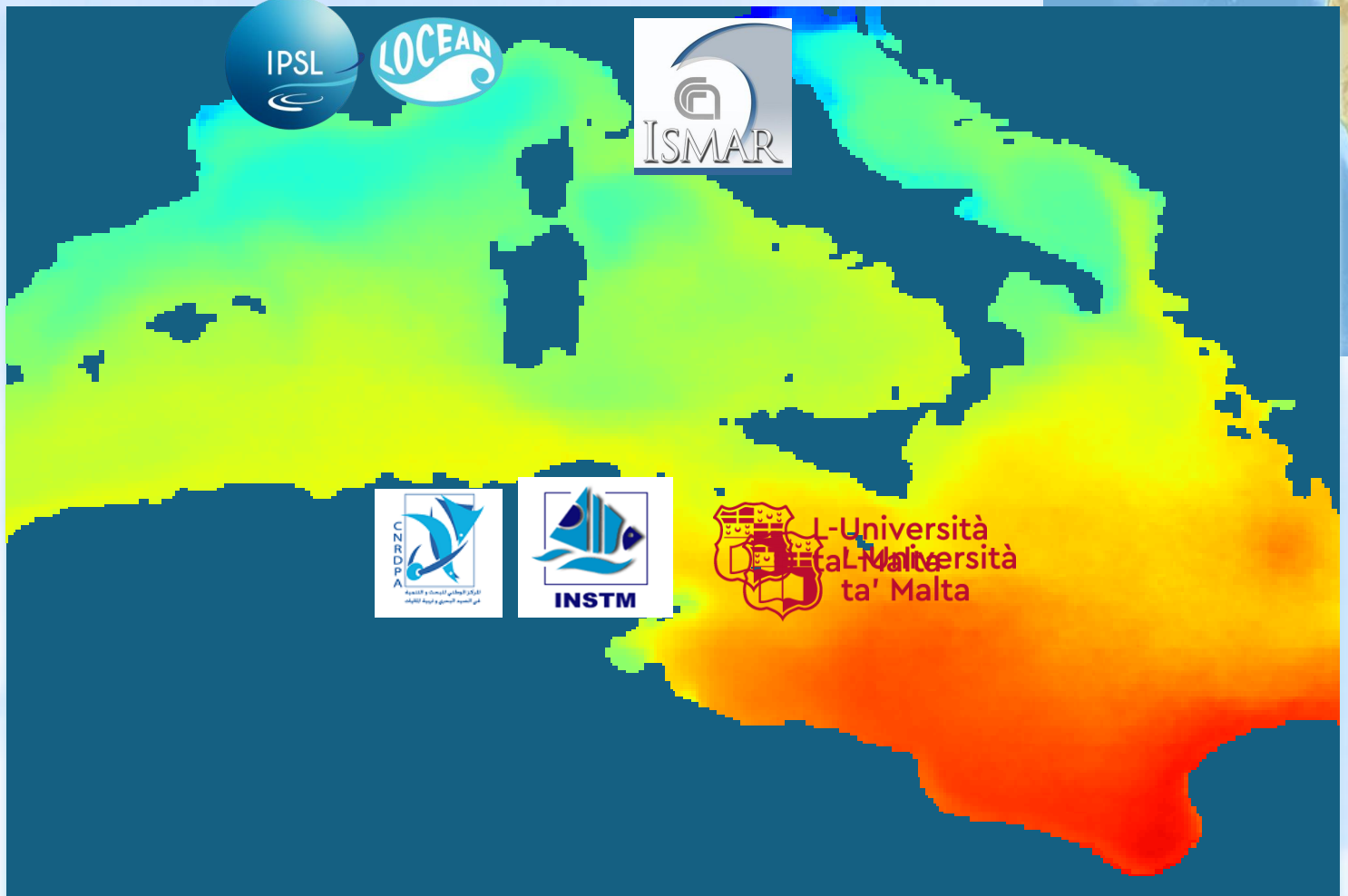
(From internet)

# Deep Ocean Observation to Predict Climate Hazards (DeePCMED)

DeePCMED

- **Oceans play a major role as a modulator of the Earth's global climate system, while holding valuable ecosystems on which we depend. Eulerian observation systems play a key role, since they have unique capabilities to collect samples and make sustained observations where other systems cannot. Within the years some deep moorings locations was not able to be maintained. The major challenge in the deep mooring data observation is to protect and restore ecosystems and biodiversity, to enhence Ocean Observations, and to contribute to the Digital Representation of the Ocean.**

- **DeePCMED focuses strengthen deep-sea research observations in Mediterranean Sea and based on collaboration with partners from marine environmental research institutes to clarify the impact of extreme events in deep habitats in Mediterranean Sea on the stability and resilience of marine ecosystems and to construct a marine ecological environmental prediction system.**





Digital Deep-sea Typical Habitats

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

# DIGITAL DEEP-SEA TYPICAL HABITAT

- **Overall objective :** Digital DEPTH focuses on 4 types of deep-sea habitats: seamounts, mid-ocean ridges, continental slopes and abyssal plains, which are vulnerable to human activities and global changes, and aims at improving our ability to observe, simulate, and map these deep-sea typical habitats, thereby promoting a balance between deep-sea conservation and sustainable development.
- **Overall goals:**

use advanced technology to carry out deep-sea research, build intelligent observation systems, and promote the sharing of data and samples;

develop mapping and numerical simulation techniques to reveal multi-scale cross-habitat connectivity and information transfer processes;

build an “observation-simulation-prediction” digital platform to provide “digital deep-sea habitats atlas” as public products and to update deep-sea area-based management tools;

exchange knowledge and experience in deep-sea science and management with you generation, especially those from SIDS, LDCs, and LLDCs.

2021 2030 United Nations Decade of Ocean Science

# Activities

Three major interrelated scientific efforts are undertaken to elucidate critical processes underlying ecological and environmental changes in the Mediterranean Sea deep sea and coastal region and to establish a high-resolution, accurate coupled dynamical-ecological numerical forecast system. These are

**(i) collecting multi-source dynamical-biogeochemical observations and participate to the international cruise planned by DEPTH programme in 2027**

**(ii) using availble Argo BGC data and constructing the coupled model and forecast system,**

**and**

**(iii) capitalisation of the deep ocean observation and promotion of the application of the model outputs.**

- Produce new data collection by conducting joint oceanographic cruise within DEPTH programme and other partners oceanographic cruise mission planned in Mediterranena to maintain the Hydrochanges deep mooring and extend this intitiavtive to other positions in the Mediterranean Sea
- Analyse dynamic response, recoverability, and critical conditions of marine ecosystems based on in-situ investigations.

# Activities

*a.Accelerates the generation or use of knowledge and understanding of the ocean, with a specific focus on knowledge that will contribute to the achievement of the SDGs and complementary policy frameworks and initiatives.*

DeePCMed will generate new insights into the impact of extreme climate events on marine ecosystems in the Mediterranean Sea. By collecting and analyzing multi-source dynamical-biogeochemical data, the project will enhance our understanding of deep-sea and coastal ecosystem responses to climate hazards. The project aligns with SDG 14 (Life Below Water) by promoting the conservation and sustainable use of oceans, seas, and marine resources. It also supports SDG 13 (Climate Action) by improving our ability to predict and respond to climate-related hazards.

The project will provide scientific evidence to support policy measures aimed at protecting marine biodiversity and enhancing ecosystem resilience (aligning with international frameworks such as the Marine Strategy Framework Directive and the UN Ocean Decade objectives).

**The project will organize training courses, workshops, and academic exchanges to build capacity among marine professionals. This includes mentoring Early-Career Researchers and training specialized technical staff.**

# Activities

Regarding the training, we plan to **conduct them quarterly f**ocusing on advanced marine observation techniques, data analysis, and ecosystem modeling. These trainings will target early-career researchers, technical staff, and graduate students from partner institutions.

For the workshops, we will hold them **biannually.** These sessions will be hands-on, covering the use of observation equipment, data collection methods, and software tools for ecological modeling. The target audience for these workshops includes marine scientists, environmental researchers, and technical personnel.

In terms of academic exchanges, we will organize them annually. **These programs will allow researchers and students to work in partner institutions, facilitating knowledge transfer and collaborative research. The exchanges will focus on fostering North-South collaboration and will be open to researchers and students from participating countries.**

# Activities

*Is co-designed and/or co-delivered by knowledge generators and users, and thus facilitating the uptake of science and ocean knowledge for policy, decision-making, management and/or innovation*.

We will start with **an initial workshop at the beginning of the project**, followed by biannual workshops.

These workshops will include representatives from partner institutions, local communities, and indigenous knowledge holders.
The objective is to identify research priorities, design observation strategies, and ensure that the project addresses the needs and concerns of all stakeholders.

Our collaborative planning approach involves the joint development of research plans and methodologies, incorporating input from all partners. We will use collaborative platforms and regular virtual meetings to facilitate continuous communication and coordination. To ensure effective feedback mechanisms, we will hold regular feedback sessions to review progress, discuss challenges, and adjust plans as needed.

# Mediterranean Sea

## Key region

Exchange heat and salt between the Eastern Mediterranean Basin and the Western Mediterranean Basin

Distinct surface, intermediate & deep water masses circulating between west and east

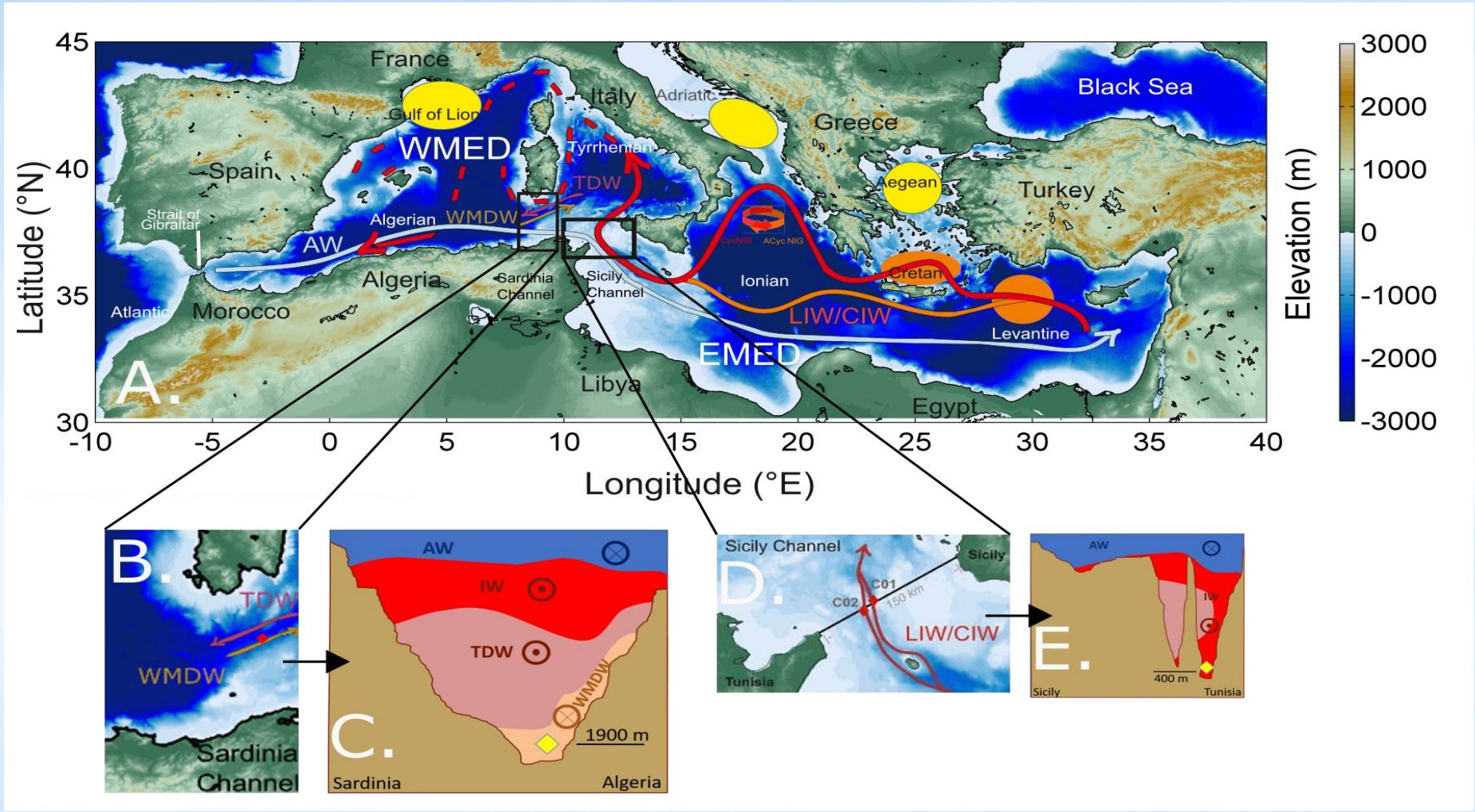
## Useful for climate change studies

define a realistic survey strategy and capitalize existing time series, to understand the time scales of variability and to provide elements of comparison and verification to models.

- documenting changes within it → anticipate similar changes in the global ocean
- understanding the role of key processes involved in climate change → inferences on those processes on the global scale

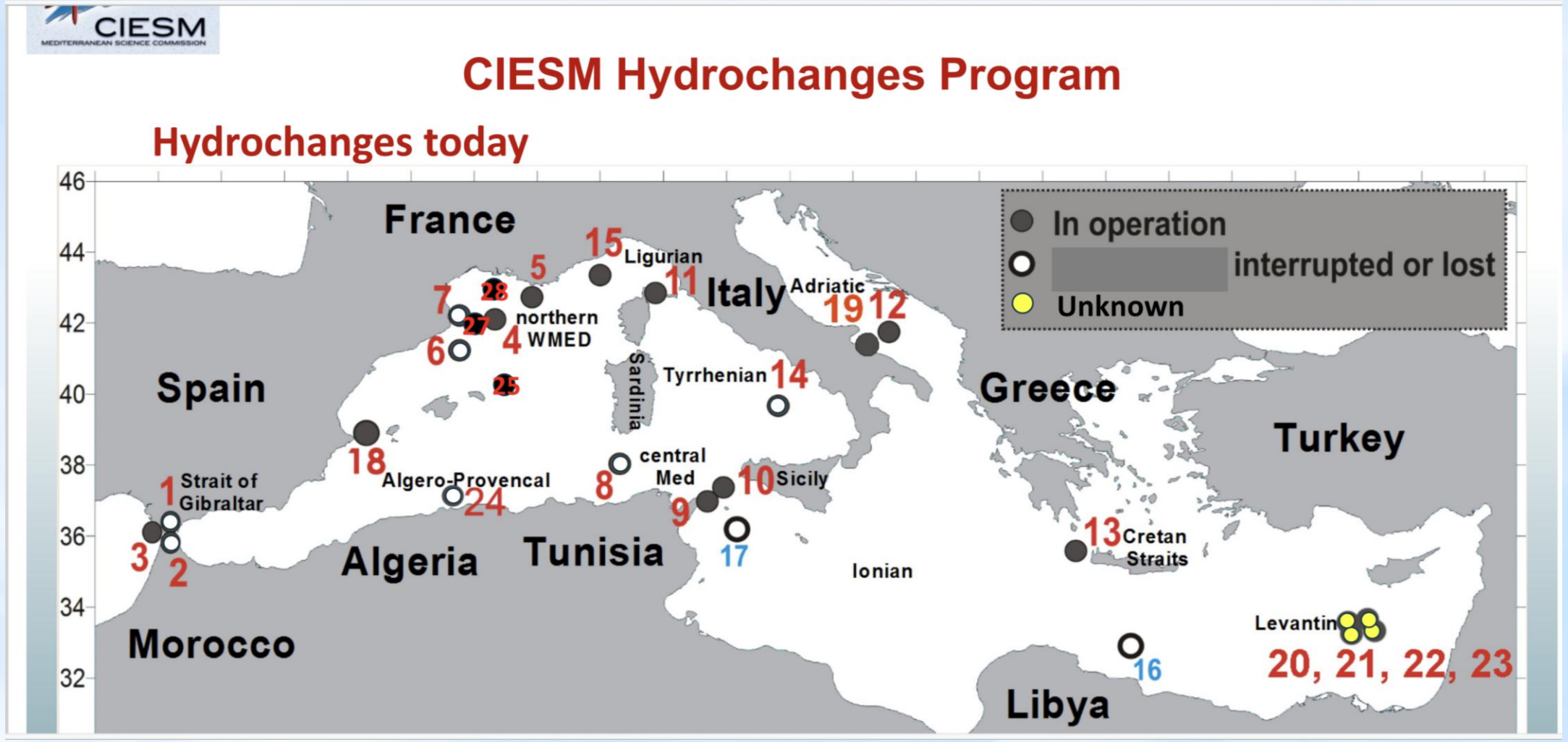
# Monitoring choke points

What we want to do?

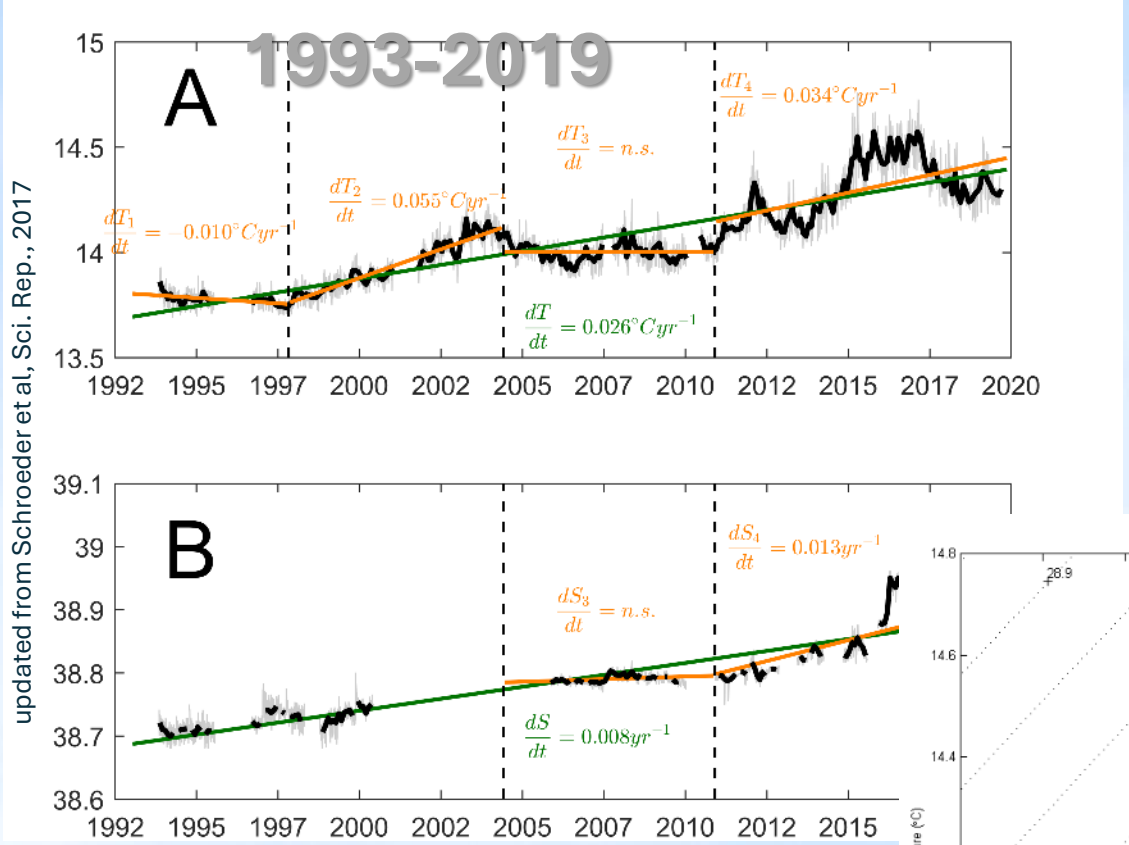



to continue to asses how much **<u>temperature</u>** and **<u>salinity</u>** (and density) have changed over the past decades in the Mediterranena Sea, by monitoring key choke points

# HYDROCHANGE Programme and Med Ship UN decade Action

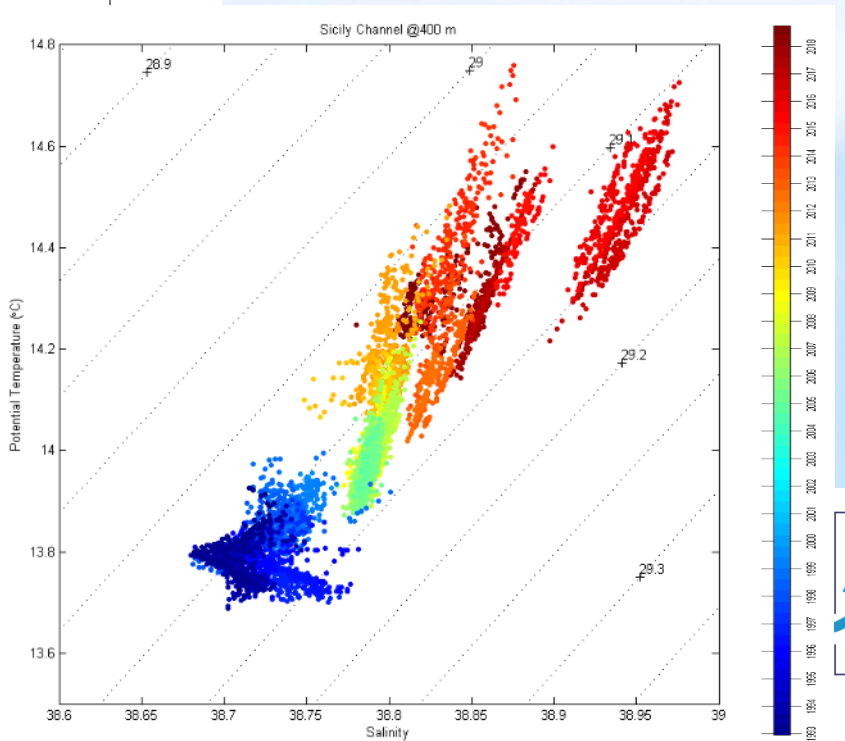


# Intermediate Water: long time series




- T and S co-vary
- trends are subject to changes, slowdowns and accelerations

**➢ ΔT/dt=0.03°C/yr and ΔS/dt=0.008 /yr**




Intermediate Water

1924 - 2024
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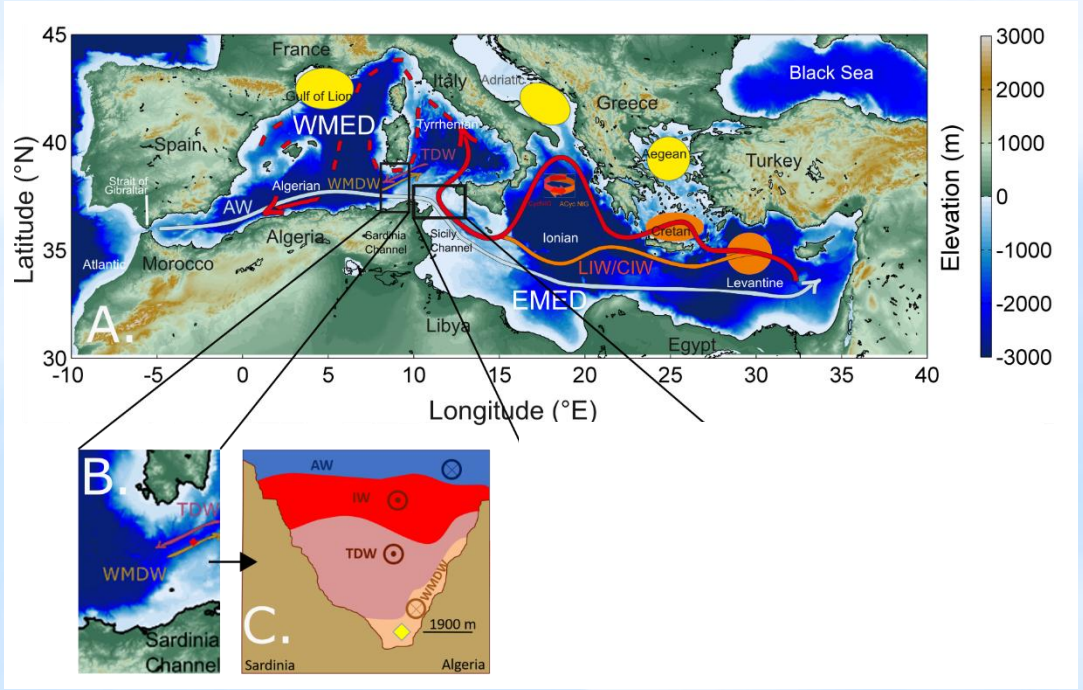
# Monitoring choke points: Sardinia Channel

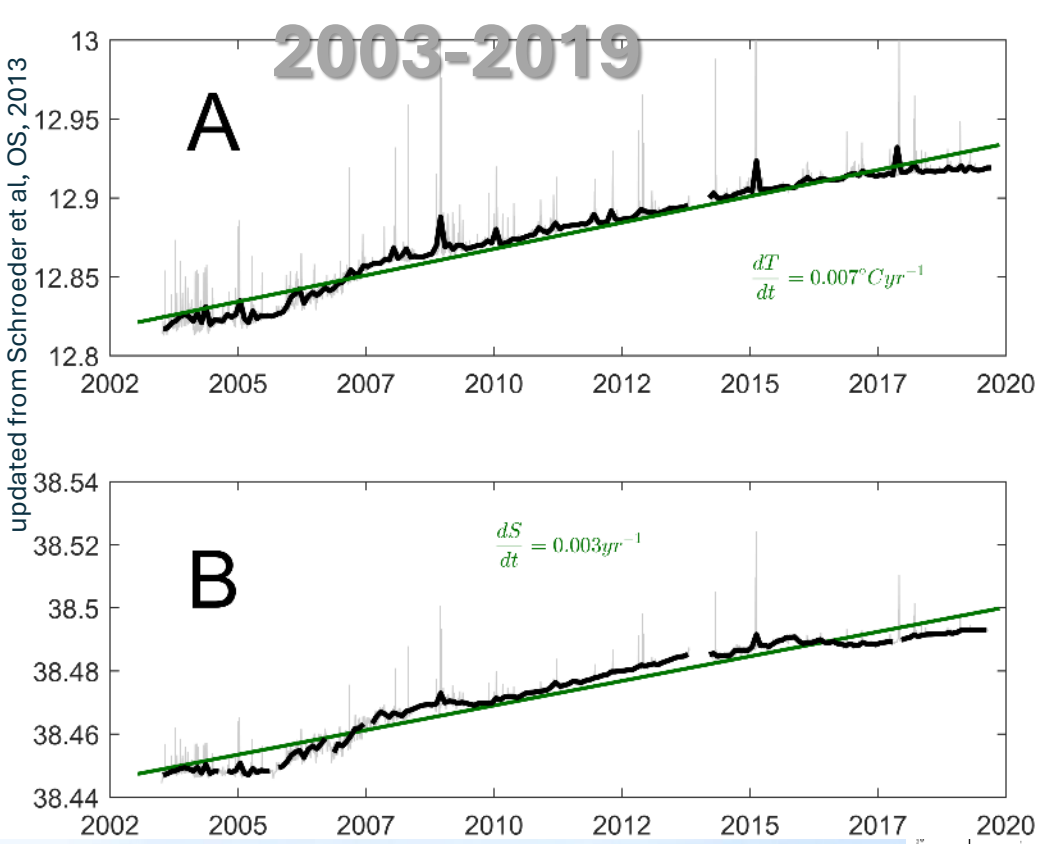
The Sardinia Channel has a sill depth of 1900 m

- It separates the Algerian basin (>2500 m) from the Tyrrhenian basin (>3000 m)
- Monitoring this choke point allows to **intercept all deep water masses** flowing between these two basins
- mooring is mainly located wihthin the WMDW vein, entering the Tyrrhenian, but occasionally it also regsiters outflowing TDW

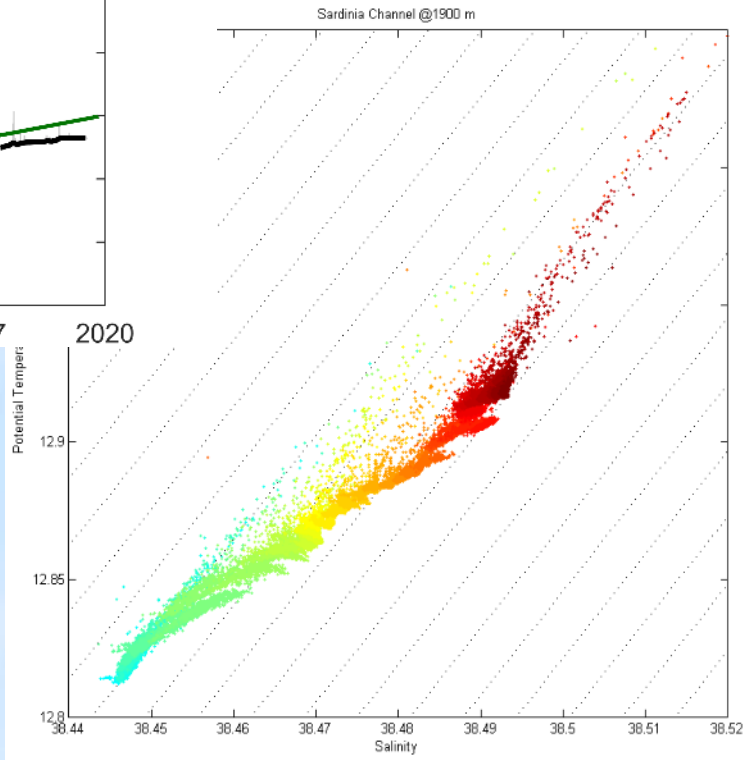
Here it is possible to observe the propagation of the signal of the WMT from the Algerian basin to the Tyrrhenian, that took place since 2010 (5 years after the onset of the WMT) starting to fill up also the deep Tyrrhenian with the deep anomalous water

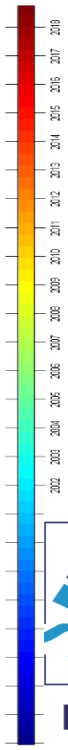


# Deep Water: long time series




➢ alternation of WMDW (lower T and S, 12.81-12.91°C, and 38.45-38.49), flowing east, and TDW ("pulses" of higher T, >12.9-13 °C, and S >38.48-38.5, flowing west



➢TDW pulses are of short duration (1 day-1 week), due to an interface displacement between the two DW masses

➢**ΔT/dt=0.007°C/yr and ΔS/dt=0.003 /yr**

Deep Water

1924 - 2024

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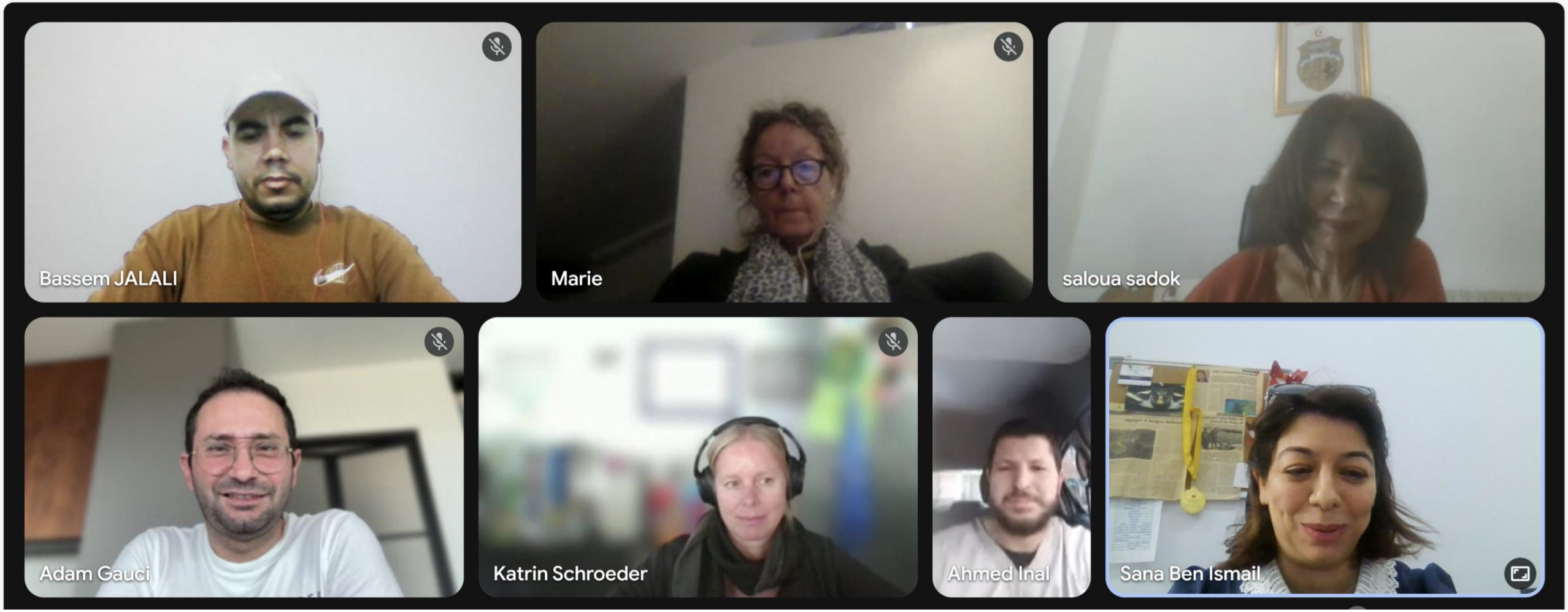
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Marie
saloua sadok
Adam Gauci
Katrin Schroeder
Ahmed Inal
Sana Ben Ismail


Adam Gauci
A
Ahmed Inal
Marie
Katrin Schroeder
Bassem JALALI
Wang Yuntao
Sana Ben Ismail

Look forward to working with you for fostering a deep ocean observation and marine ecosystem habitat through DEEPCMED

# Thank you!

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