

OCEAN OBSERVATORIES

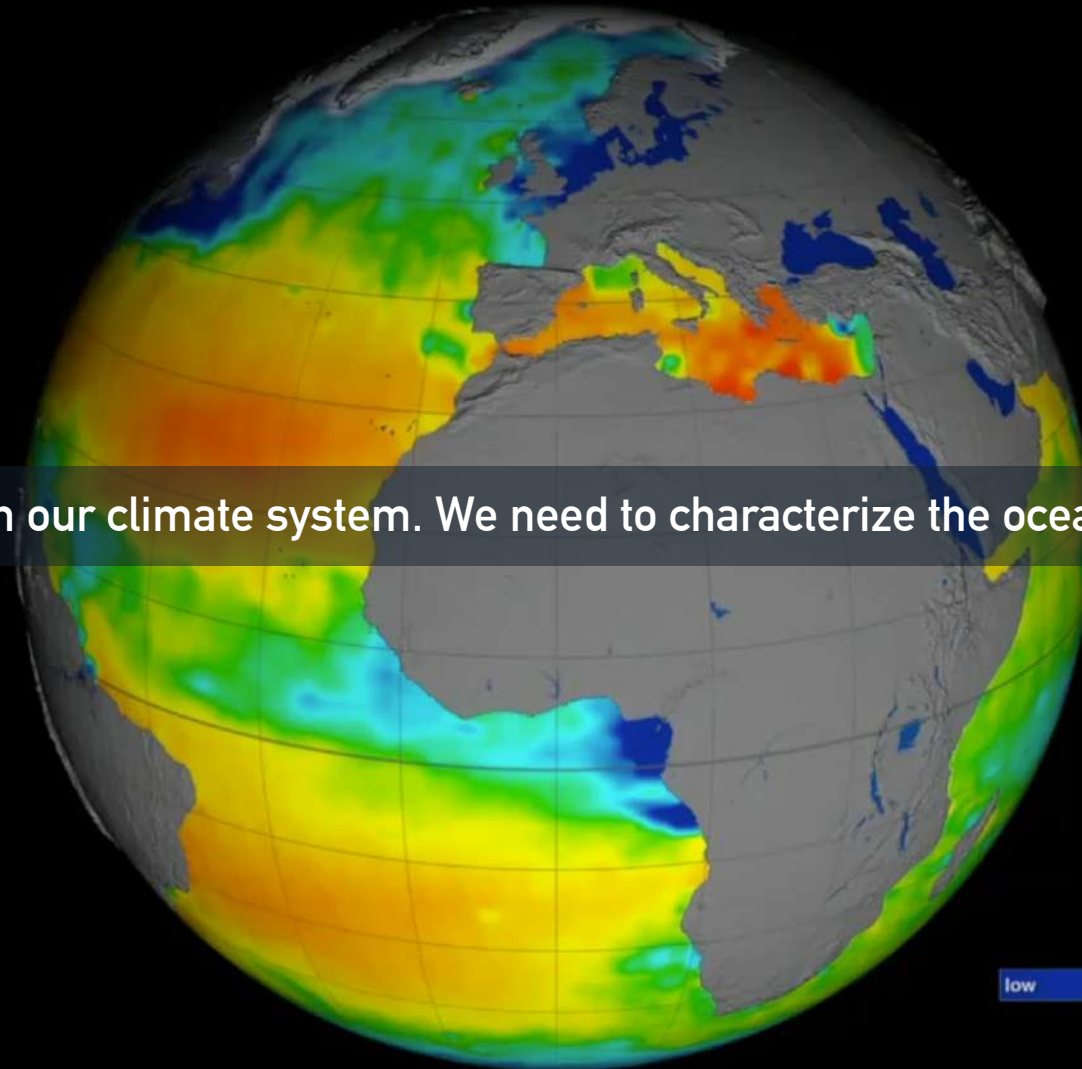
SOCIB: A MULTI-PLATFORM INTEGRATED OCEAN OBSERVING & FORECASTING SYSTEM

Emma Reyes and Joaquín Tintoré
SOCIB & IMEDEA (CSIC-UIB) Teams

OUTLINE

- 01 The complex ocean system
- 02 Why Ocean Observatories?
- 03 Two-fold paradigm shift
- 04 How do we do that?
- 05 SOCIB: Data, Science & Society
- 06 Challenges for the next decade

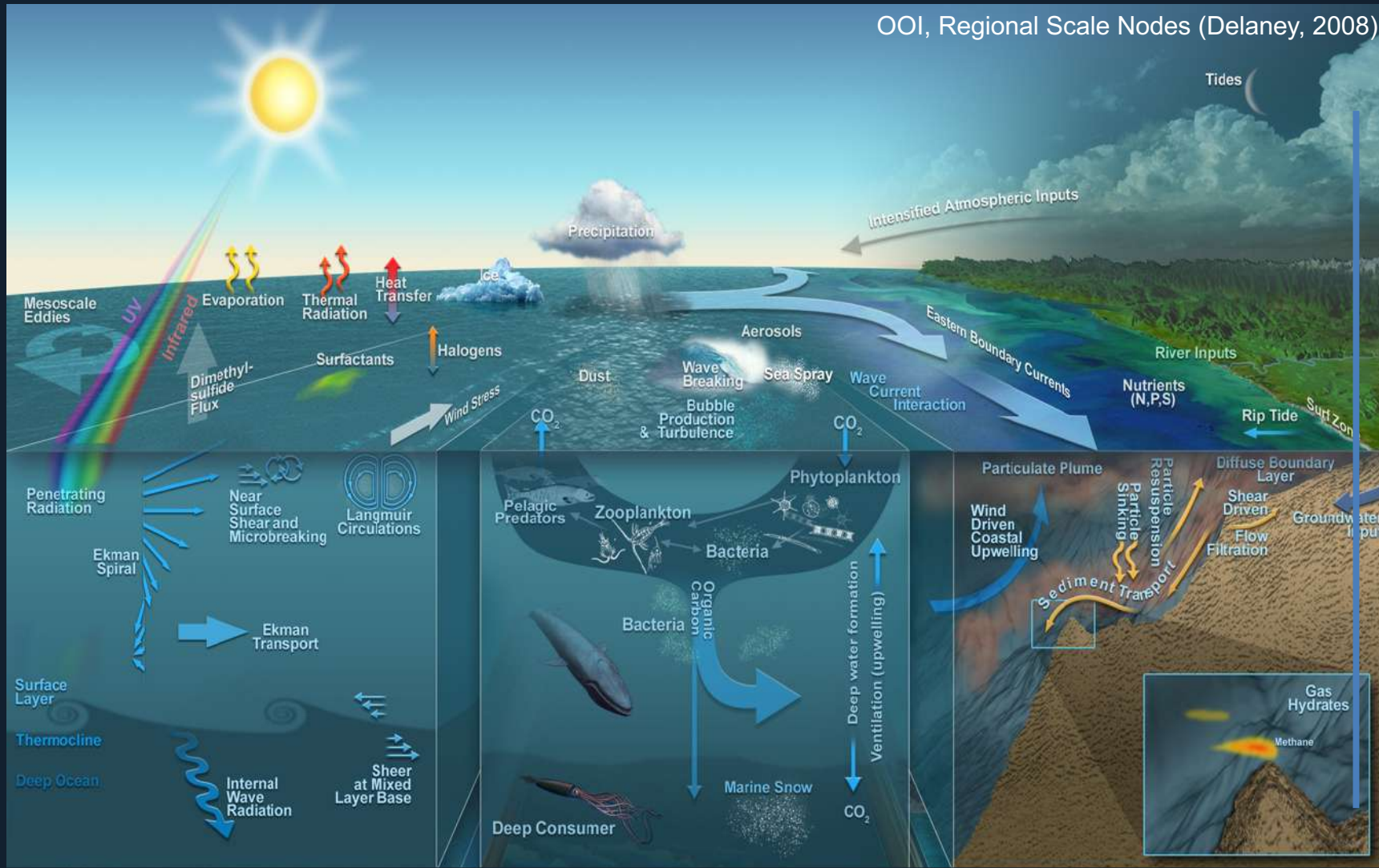
01 THE COMPLEX OCEAN SYSTEM



Plays a critical role in our climate system. We need to characterize the ocean state and variability

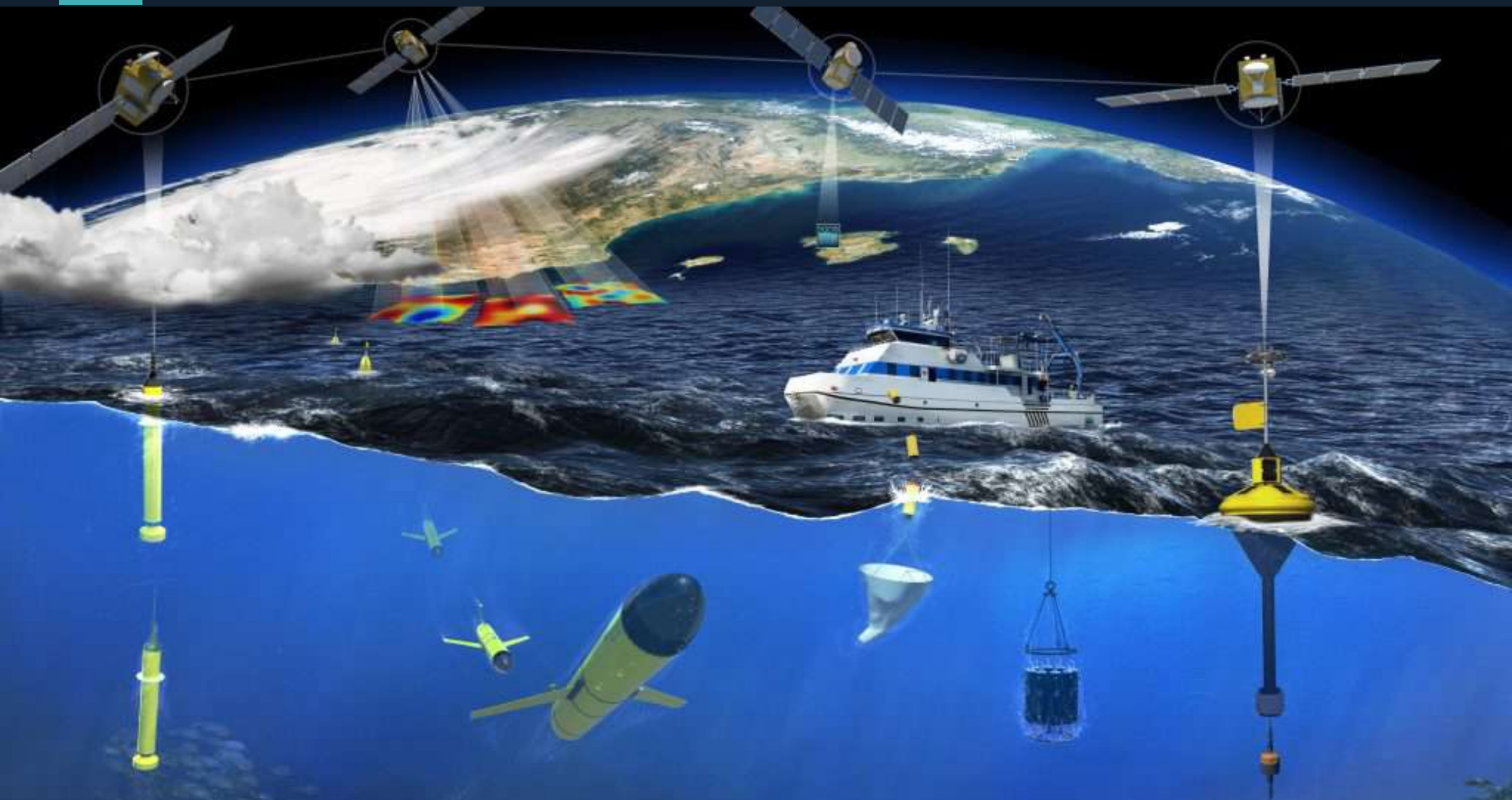
Salinity
low high

01 THE COMPLEX OCEAN SYSTEM



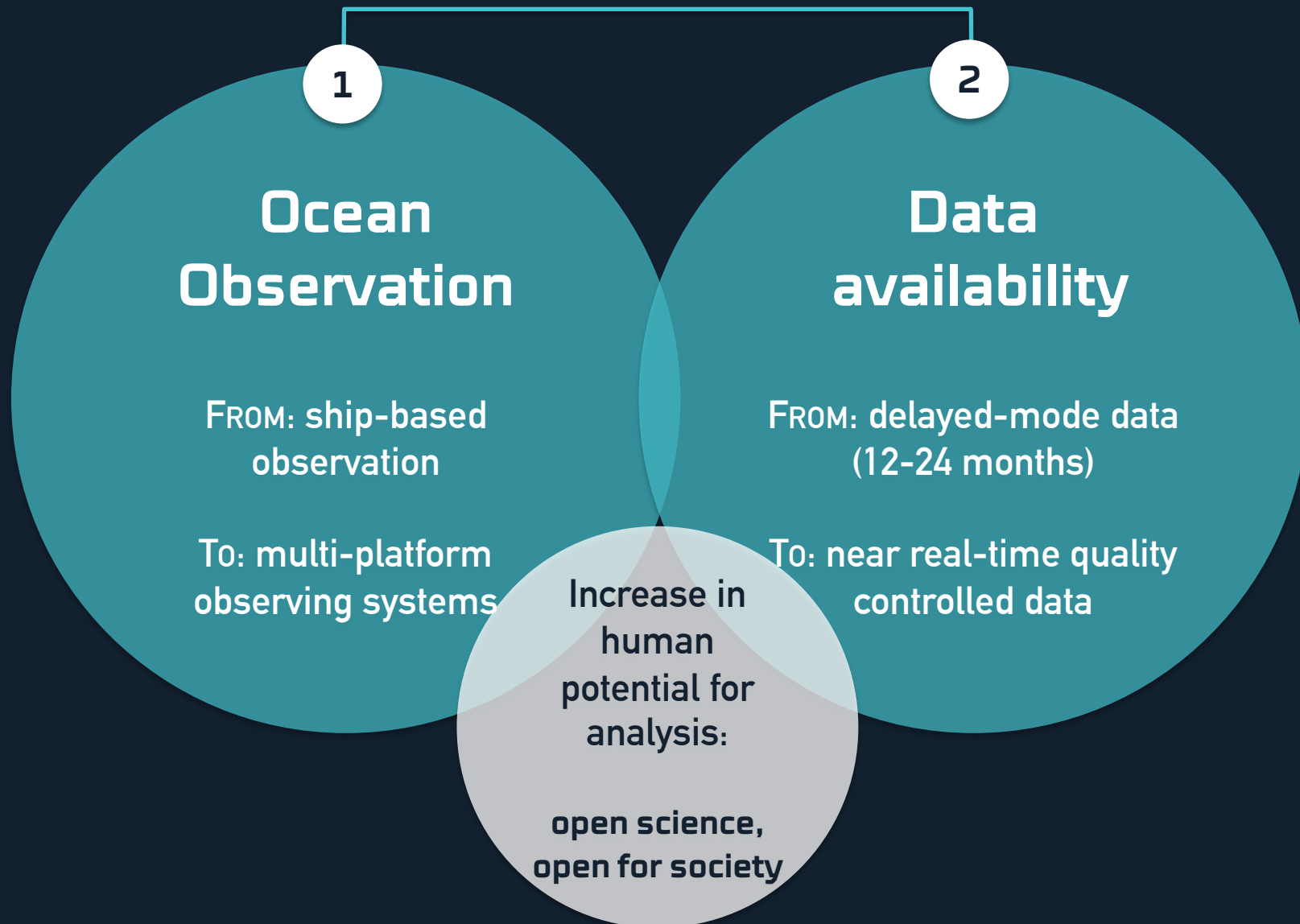
Characterization of state and variability at the 'right' scale

02 WHY OCEAN OBSERVATORIES?



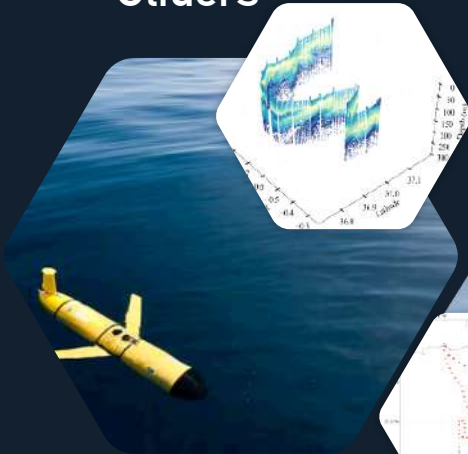
Multiplatform, integrated ocean observation and forecasting
in response to Science & Society needs: from Events to Climate

03 TWO-FOLD PARADIGM SHIFT



04 HOW DO WE DO THAT? multi-platform integrated observing and forecasting systems

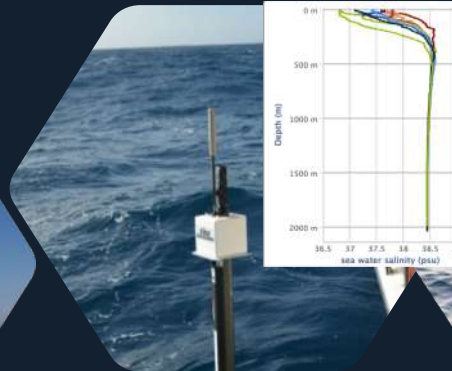
Gliders



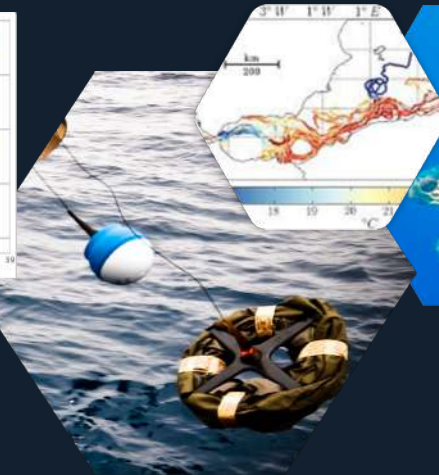
Research and opportunity vessels



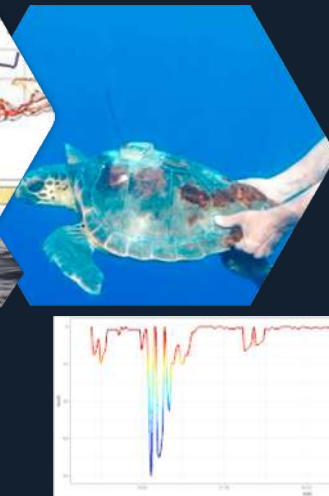
ARGO floats profilers



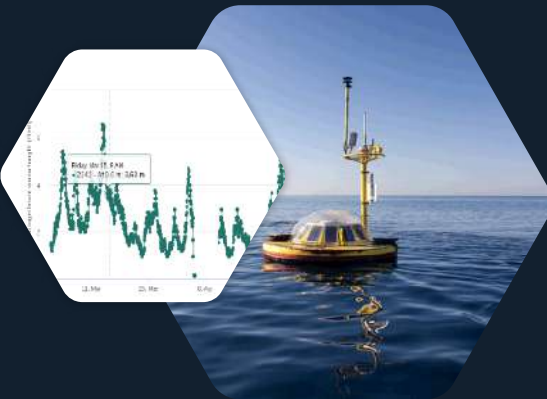
Drifting buoys



Marine animal tracking



Moorings



Tide Gauges



HF radars



Beach Monitoring



05 SOCIB: DATA, SCIENCE & SOCIETY

Integrated ocean observing and forecasting system

❑ 1 mission

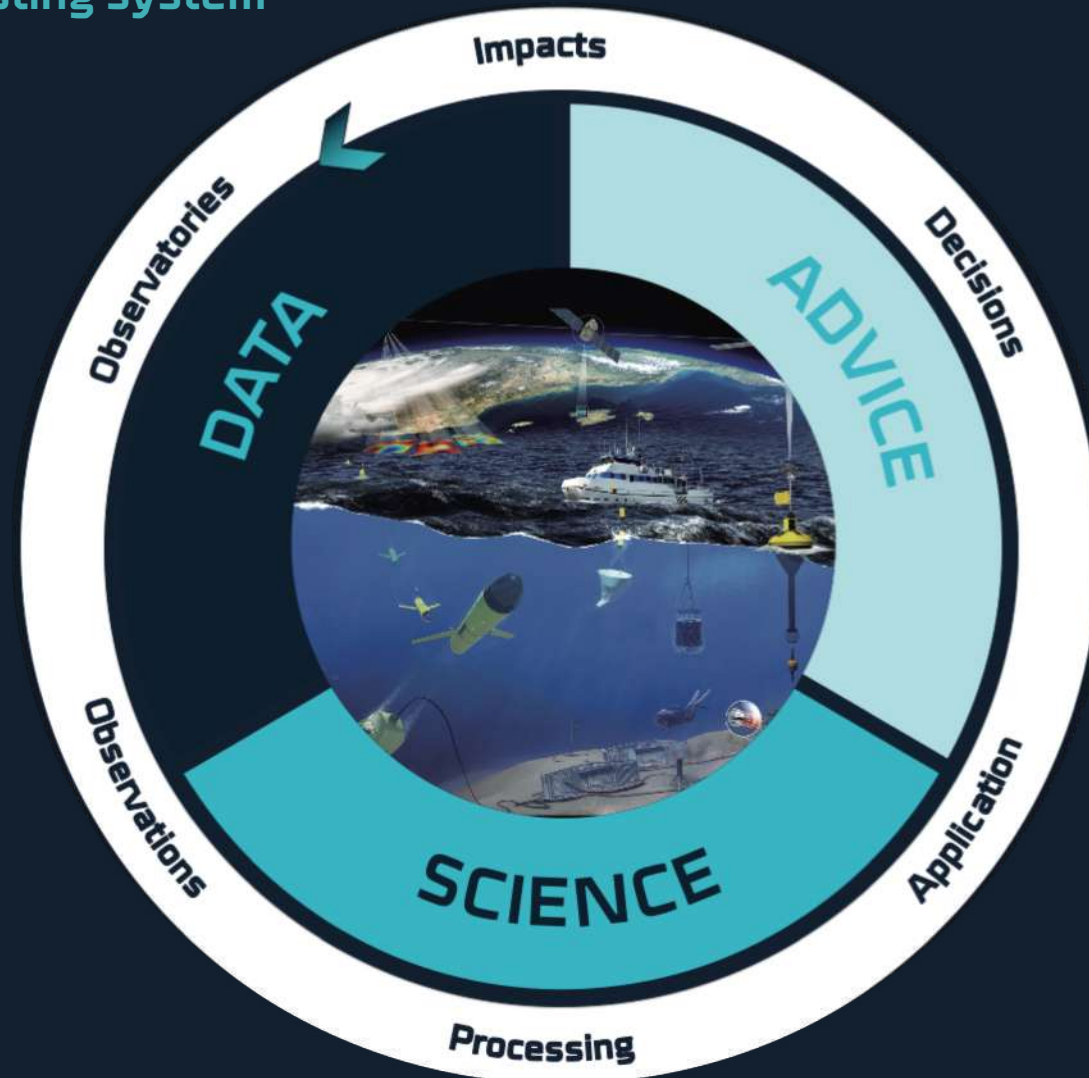
Focus on meso- & sub-mesoscale,
From nearshore to open ocean

❑ 3 drivers

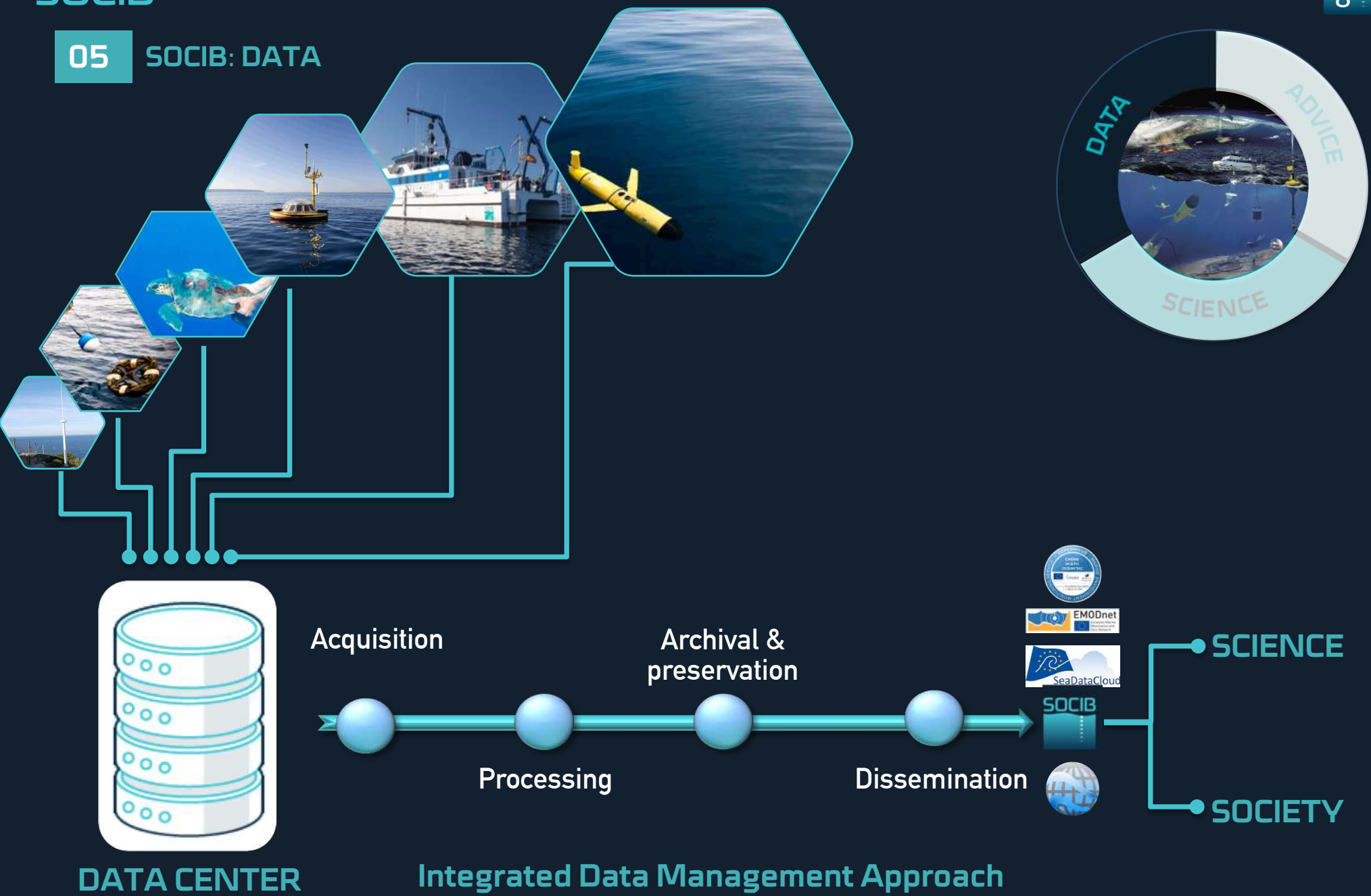
Science priorities
Data & Technology
Society Needs

❑ 3 topics

Operational Oceanography
Ocean Health
Climate



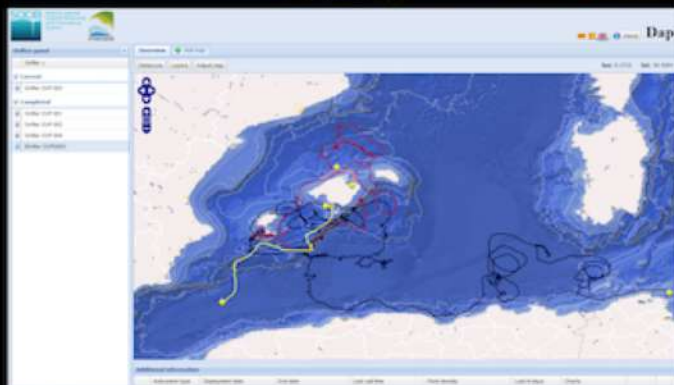
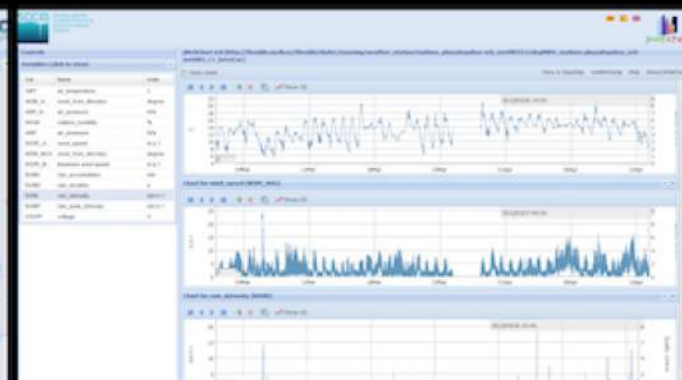
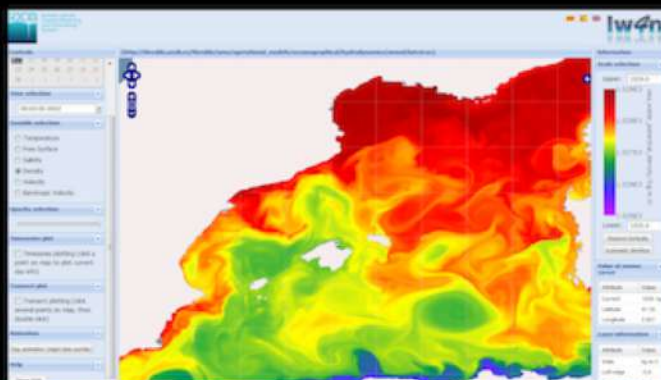
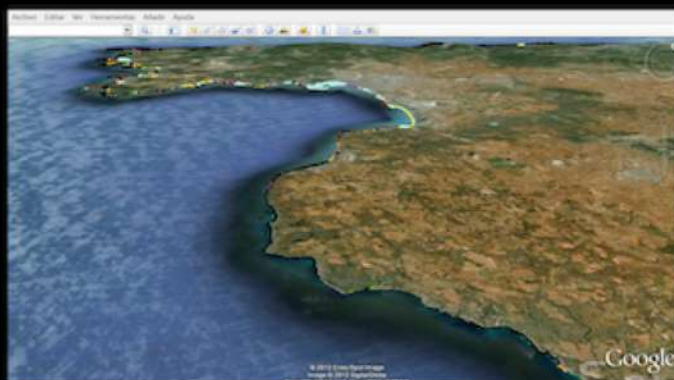
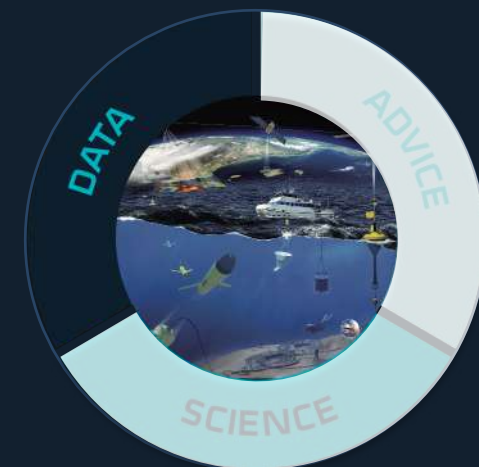
05 SOCIB: DATA



05 SOCIB: DATA

❑ SOCIB Data Centre

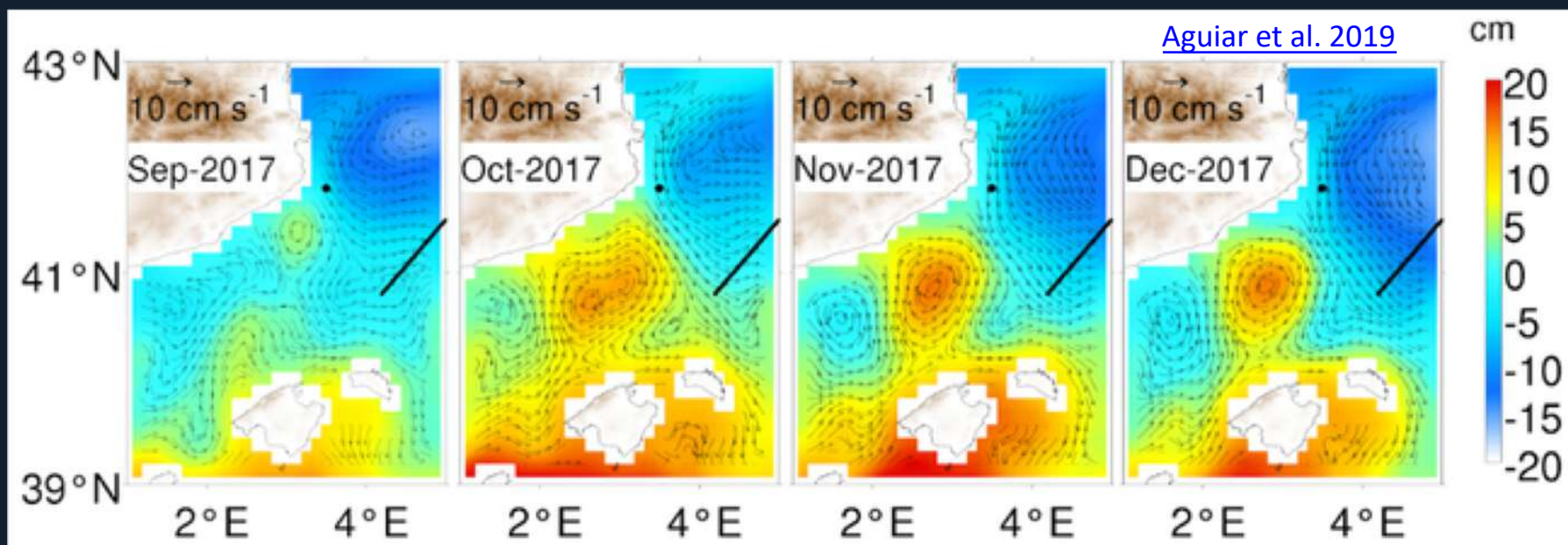
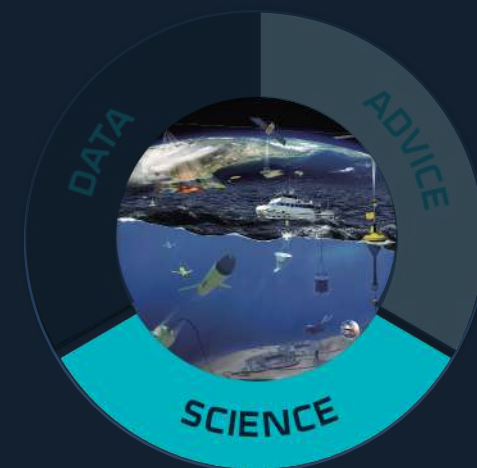
Provides different tools for visualizing, downloading and accessing open and quality-controlled multidisciplinary data



05 SOCIB: SCIENCE

□ Anticyclonic eddy during fall 2017

Its intensification and persistence in time, greater than in previous years, could act as a barrier, diverting the Northern Current.

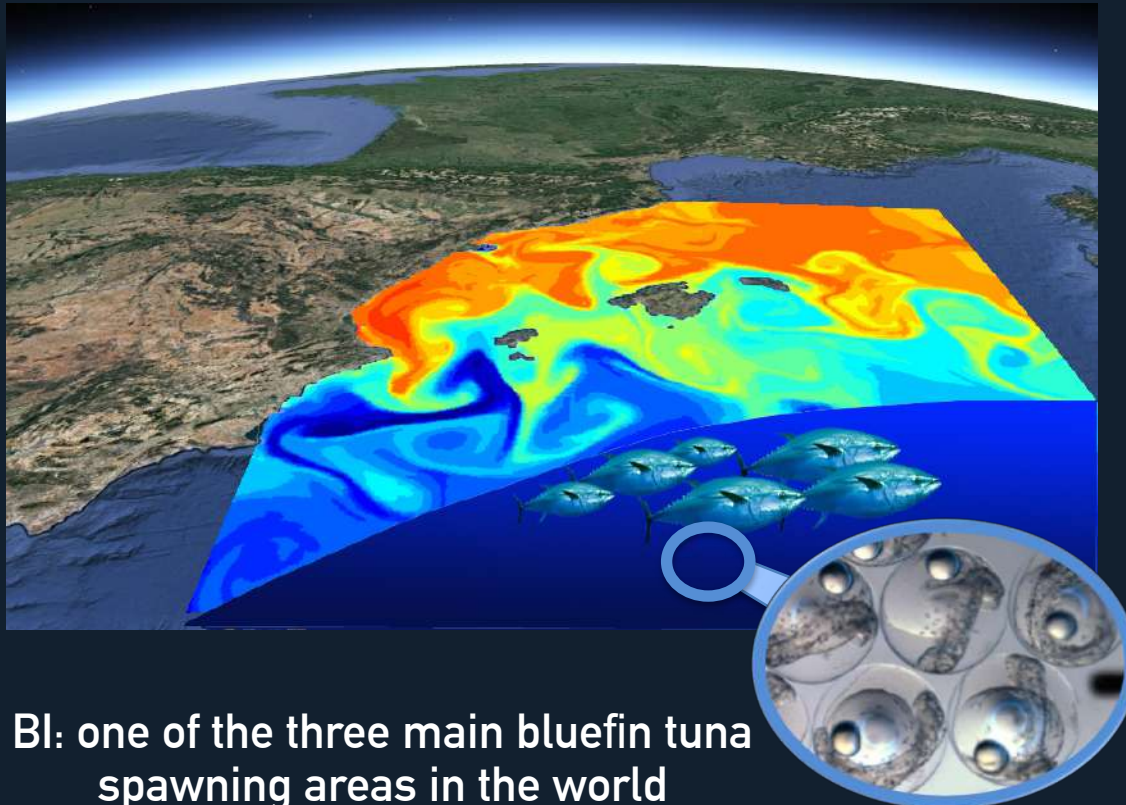
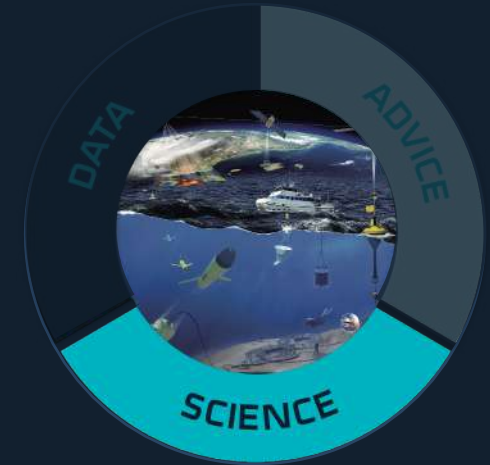


Anticyclonic eddy in the Balearic Sea during fall-winter 2017

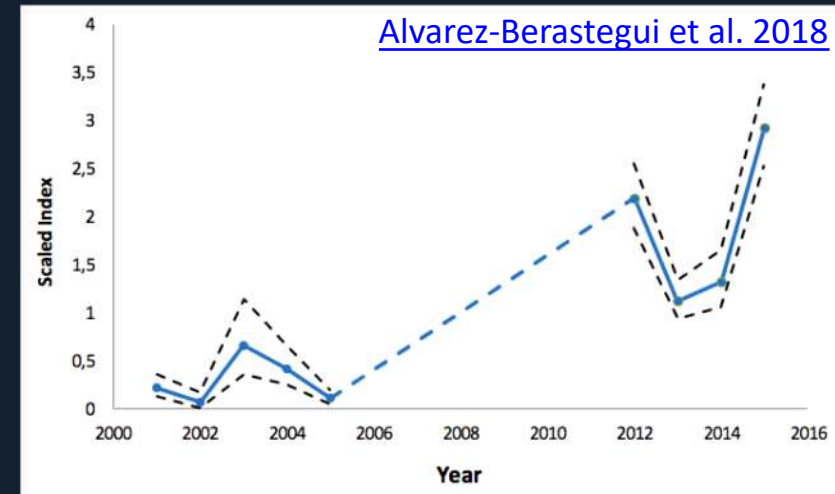
05 SOCIB: SCIENCE

☐ Sustainable fisheries and conservation

Linking ocean variability & species ecology to improve population stock assessment



BI: one of the three main bluefin tuna spawning areas in the world

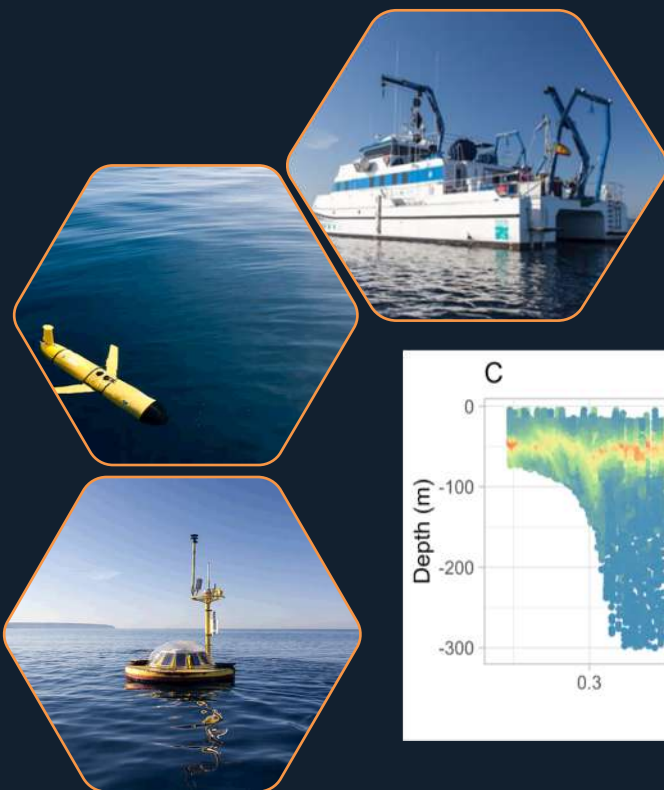
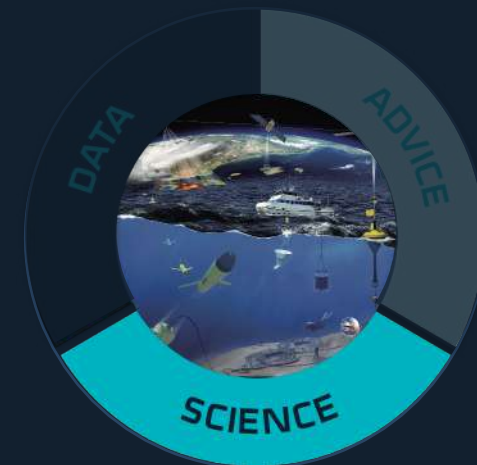


Larval Atlantic bluefin tuna abundances

05 SOCIB: SCIENCE

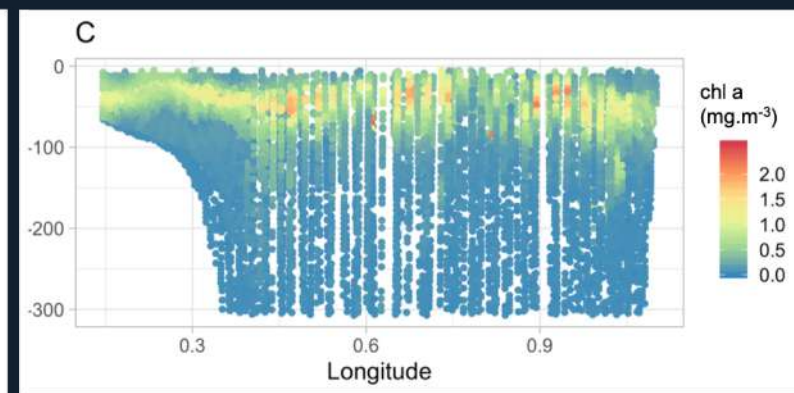
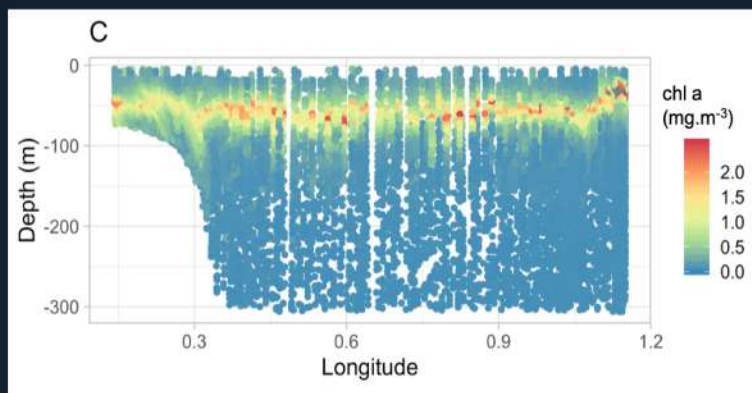
□ Monitoring key biogeochemical parameters

Continuous monitoring of biogeochemical EOVs in the Mallorca and Ibiza Channels



Spring

Winter

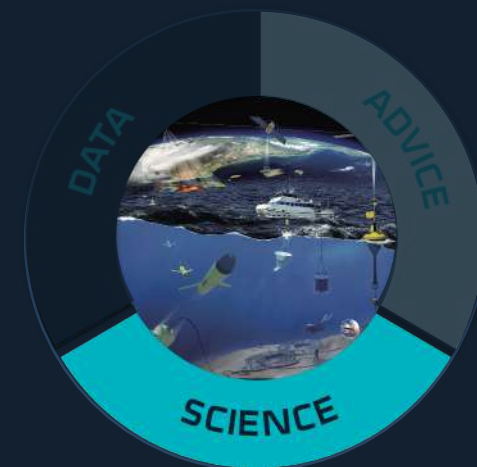


Seasonal variability of chlorophyll-a concentration in the Ibiza Channel

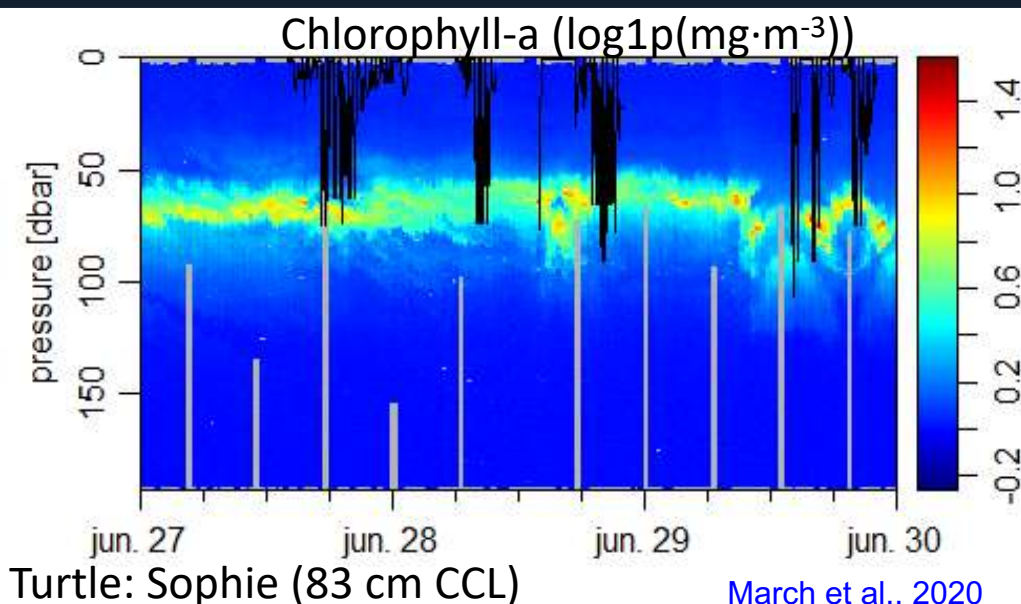
05 SOCIB: SCIENCE

❑ Oceanographic Turtles

Interactions between environmental factors, marine animals and human activities.

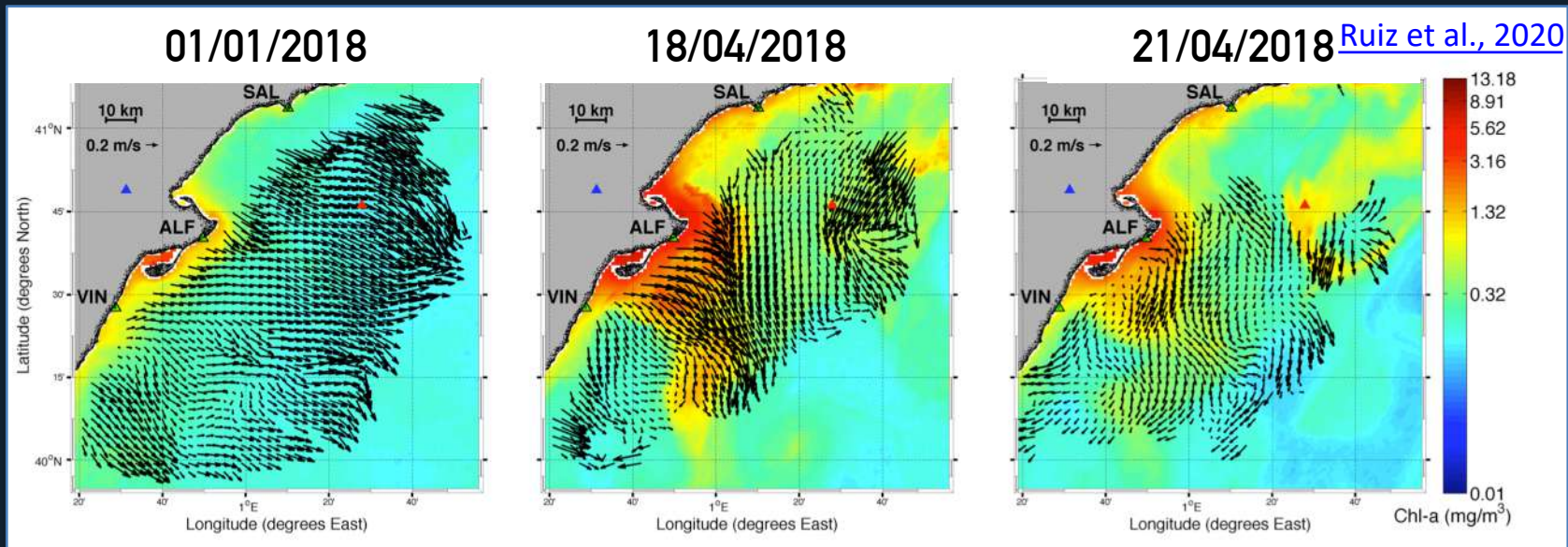
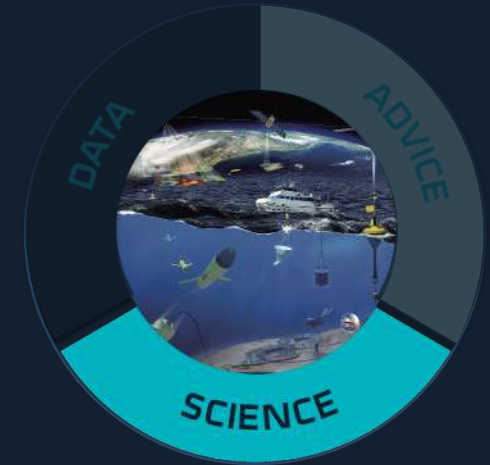


PI: David March



Turtle and glider deployment (left) and turtle dives (black) towards higher productive depths (right)

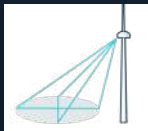
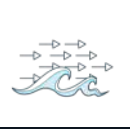
Extreme events monitoring and understanding of impacts on the surface circulation.



Maps of HF radar surface currents and surface Chl-a concentration for reference conditions (left) and extreme discharge events (middle-right)

05 SOCIB: SCIENCE

WMOP model assessment vs.



HF radars



Fixed stations



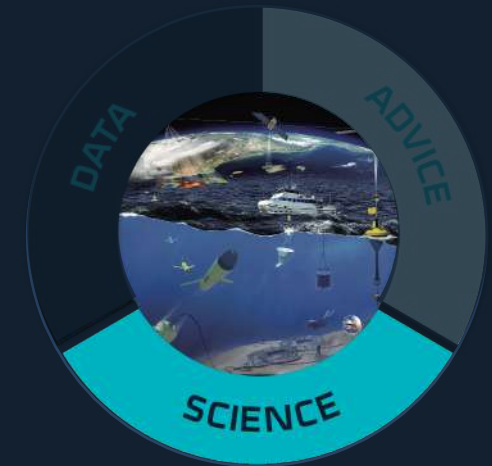
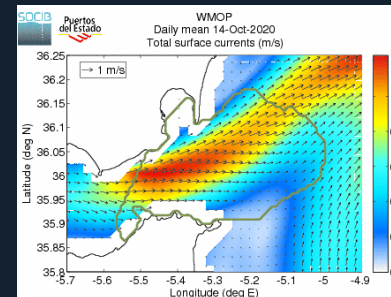
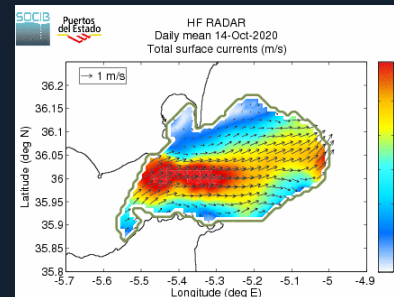
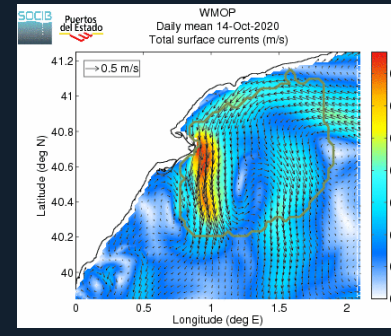
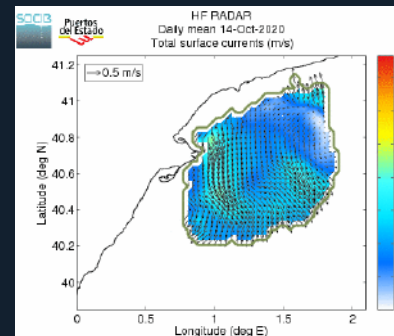
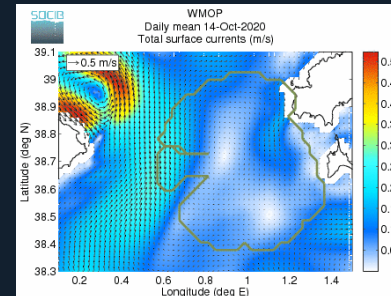
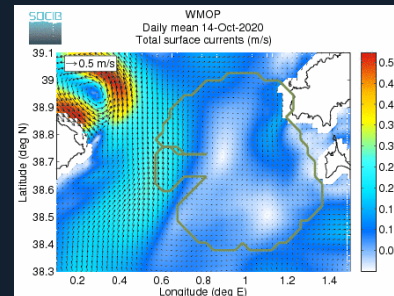
Satellites



Gliders



ARGO profiler



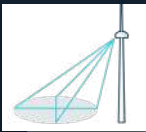
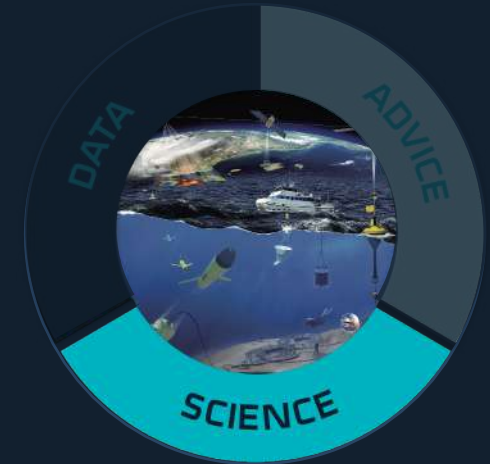
Daily HF radar surface current maps:

Ibiza Channel
Delta Ebro
Gibraltar Strait

[Mourre et al., 2018](#)
[Aguar et al., 2020](#)

05 SOCIB: SCIENCE

WMOP model assessment vs.



HF radars



Fixed stations



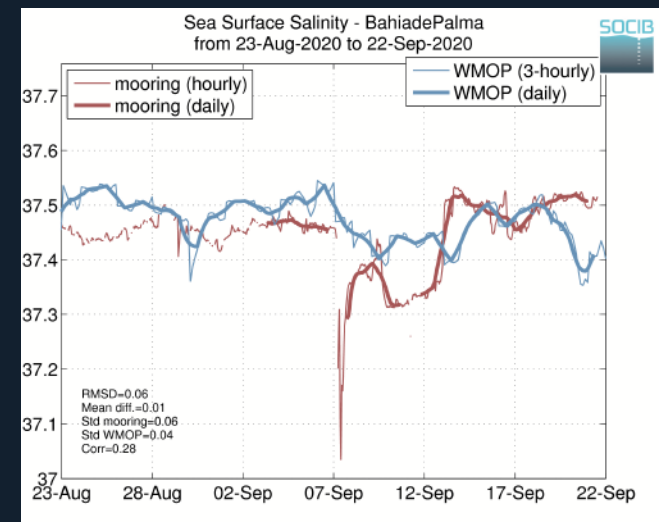
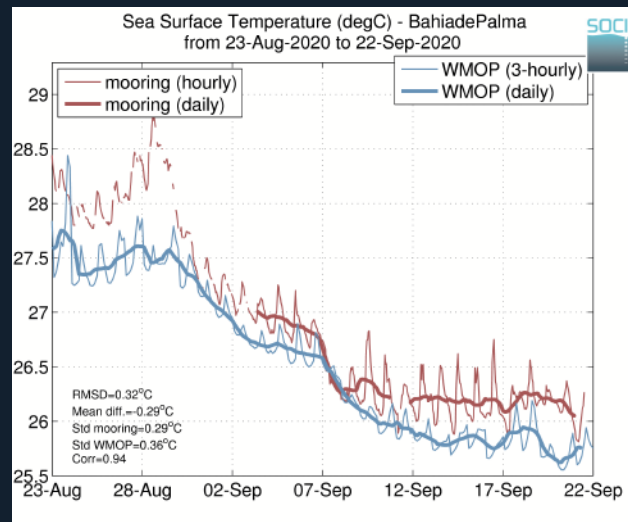
Satellites



Gliders



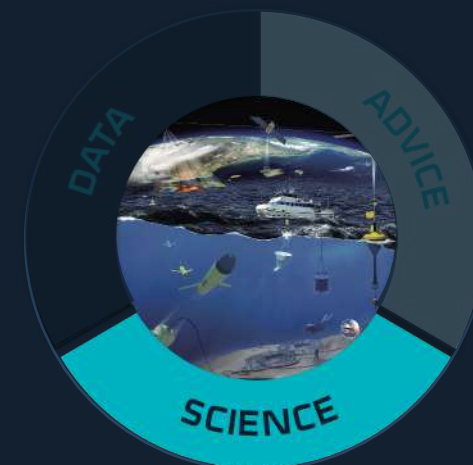
ARGO profiler



Time series of Temperature (left) and Salinity (right) at fixed mooring locations (Palma Bay)

05 SOCIB: SCIENCE

WMOP model assessment vs.



HF radars



Fixed stations



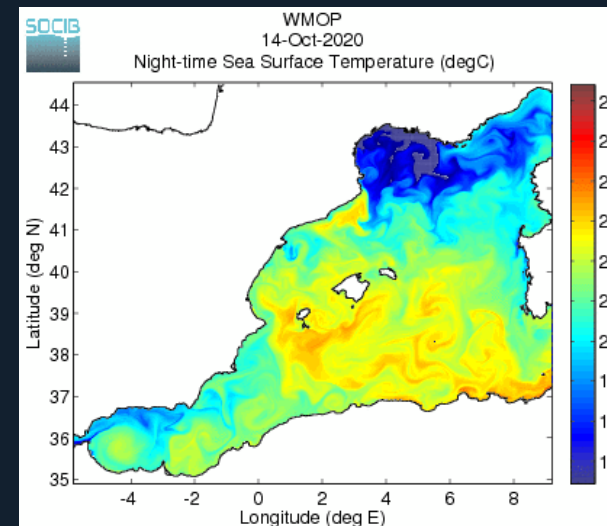
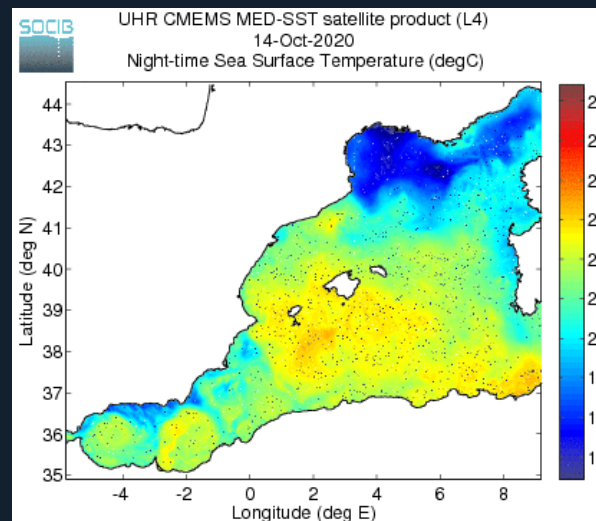
Satellites



Gliders



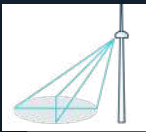
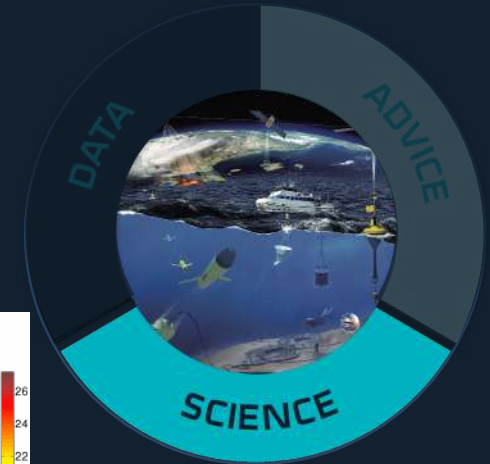
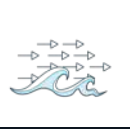
ARGO profiler



Daily Sea Surface Temperature maps from satellite L4 SST product (left) and WMOP model (right)

05 SOCIB: SCIENCE

WMOP model assessment vs.



HF radars



Fixed stations



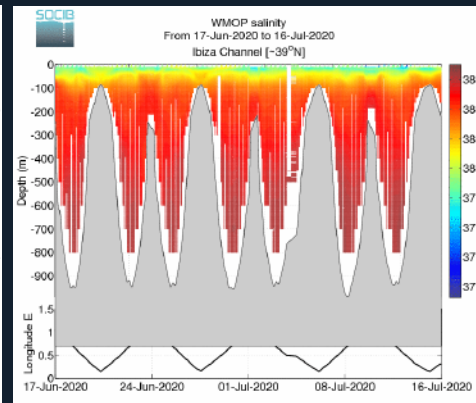
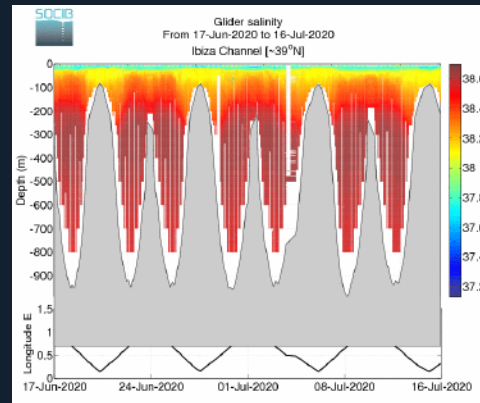
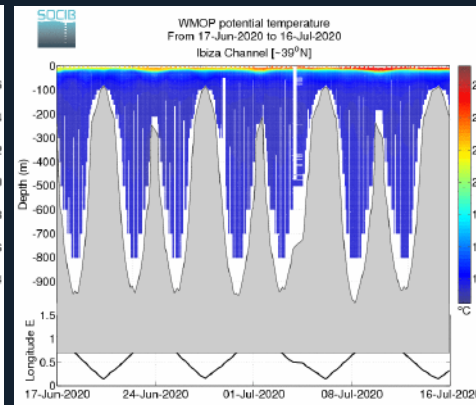
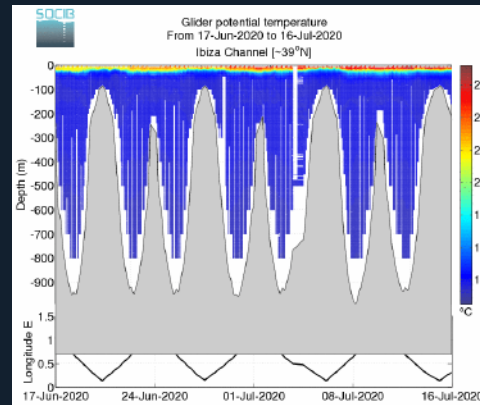
Satellites



Gliders



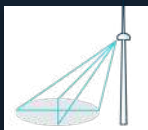
ARGO profiler



Glider temperature and Salinity sections in the
Ibiza Channel

05 SOCIB: SCIENCE

WMOP model assessment vs.



HF radars



Fixed stations



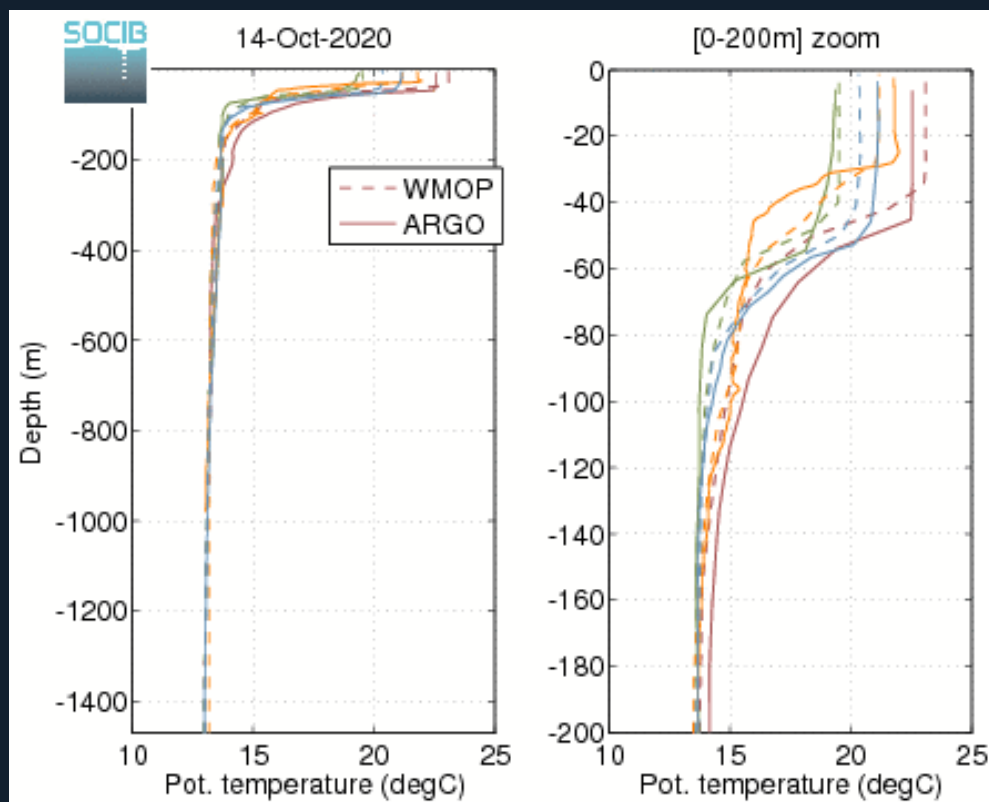
Satellites



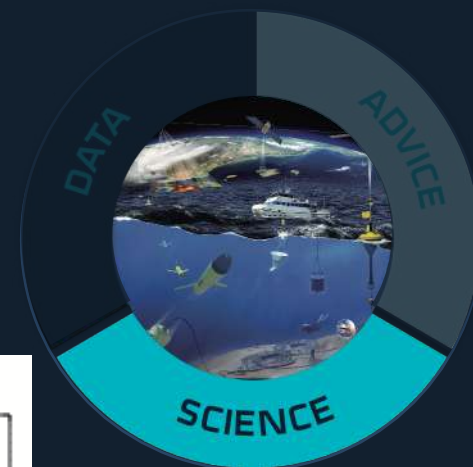
Gliders



ARGO profiler



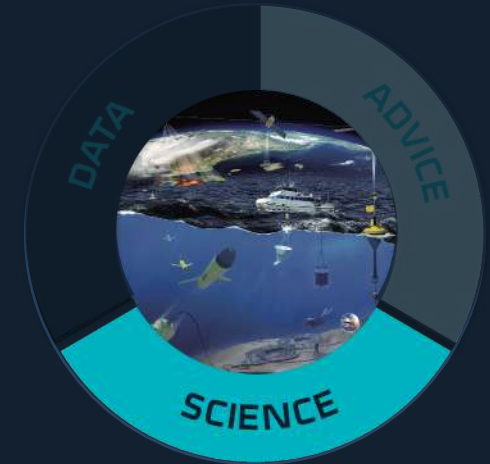
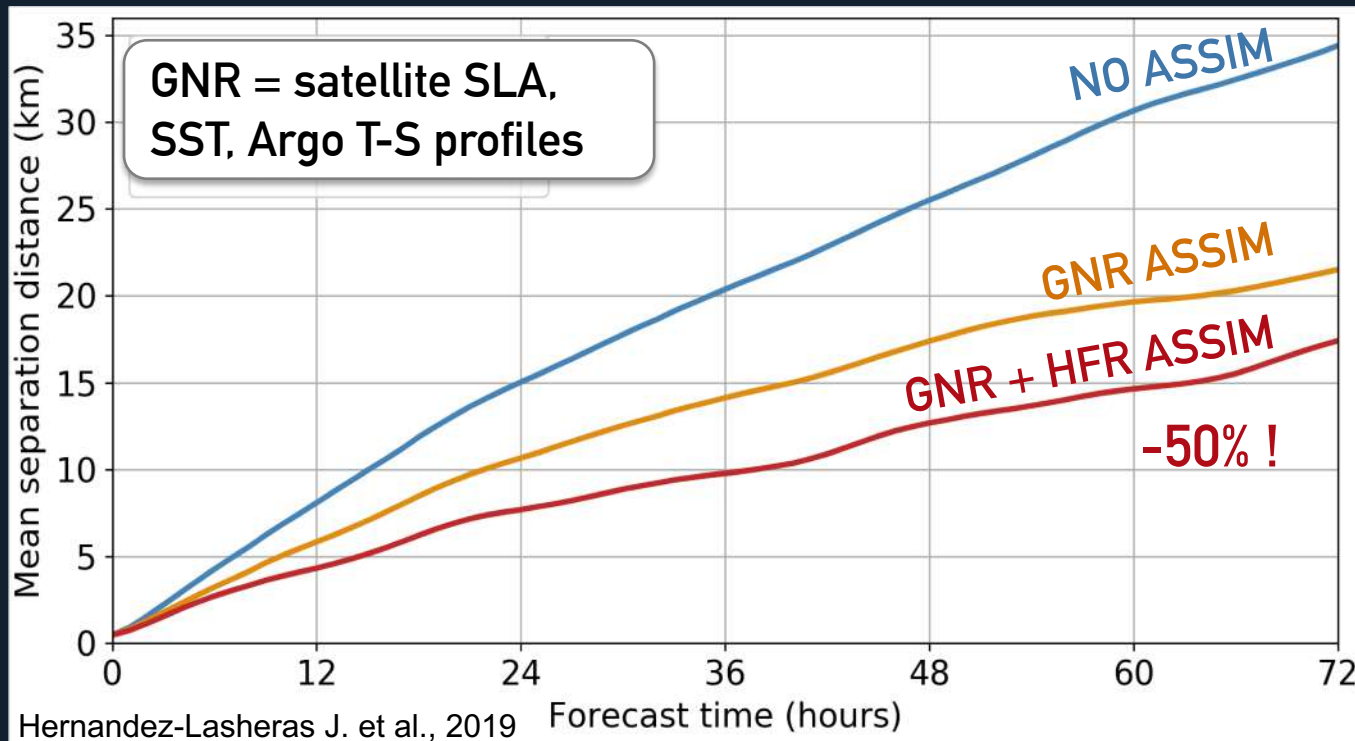
ARGO vertical temperature profiles



05 SOCIB: SCIENCE

WMOP model improvement

HF radar data assimilation improves the prediction of Lagrangian trajectories

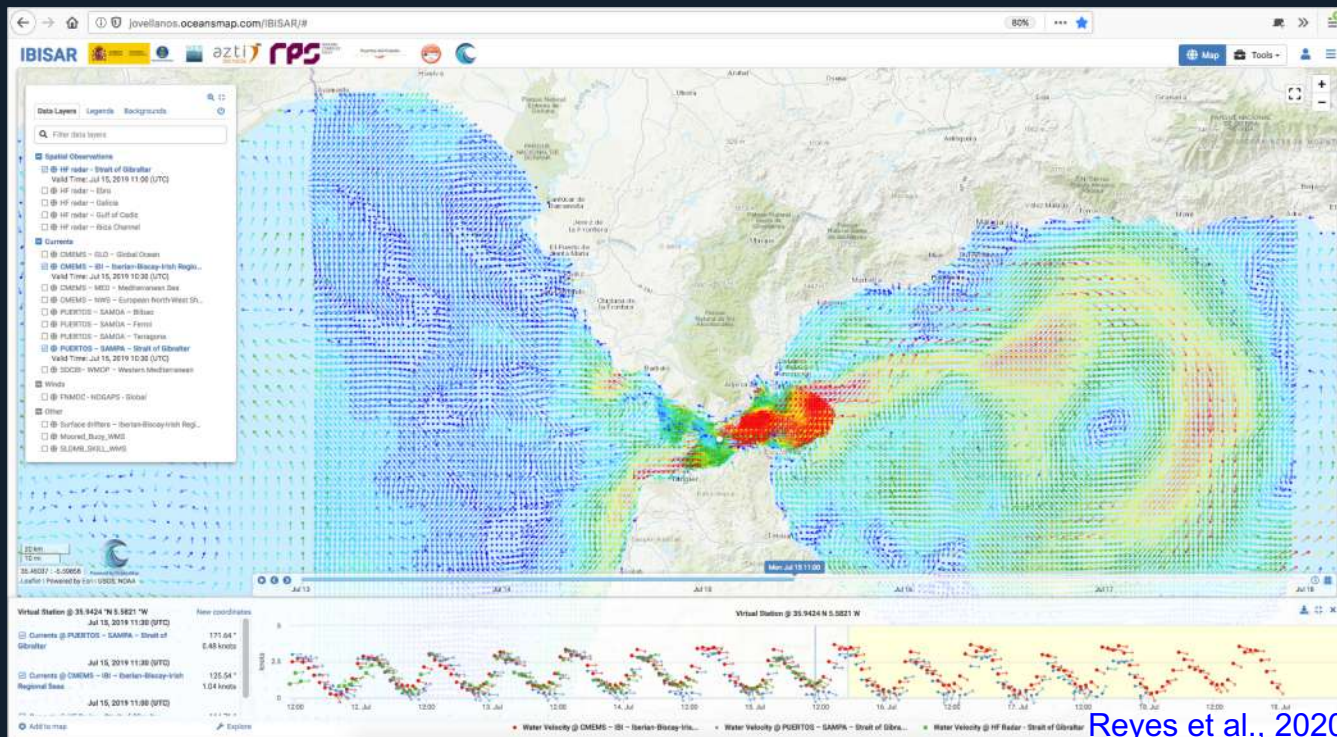
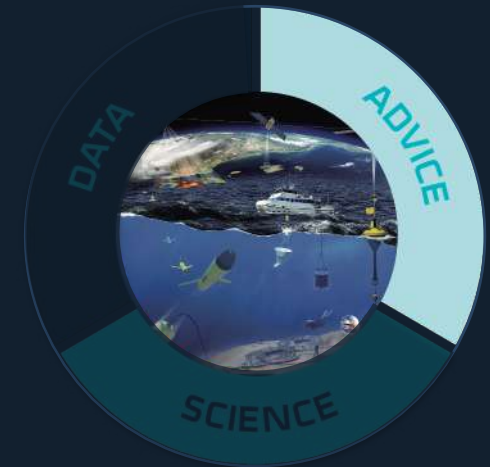


Mean separation distance (km) over the time between real and simulated trajectories for different DA simulations. Validation performed with 14 drifters (10 days)

05 SOCIB: SOCIETY

IBISAR: coastal downstream service

Evaluates the performance of ocean current forecasts available in the Iberian-Biscay-Irish (IBI) regional seas



IBISAR visualization tool allowing data intercomparison

Visit: www.ibisar.es

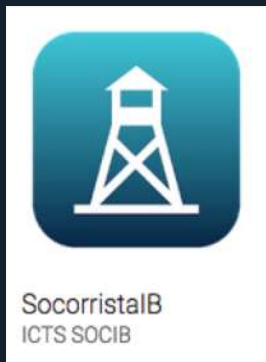


Puertos del Estado



05 SOCIB: SOCIETY

❑ SocorristalB App



- Support tool for lifeguards
- 353 beaches from BI
- Meteo-ocean observation & forecasting
- Alarms & notifications

❑ MEDCLIC Kids App

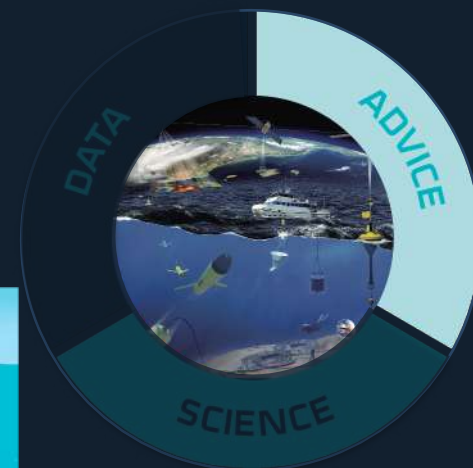


- Educational app for kids
- 3 languages (ES, EN, CA)
- 3 games
 - Puzzle
 - Find it!
 - Memory

❑ Follow the Glider



- Glider – exploring tool for students and teachers



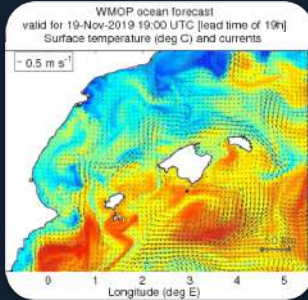
❑ Ocean Literacy

- Broad catalogue of educational resources
- For students, teachers & general public
- SOCIB: founding member of EU4Ocean



06

CHALLENGES FOR THE NEXT DECADE



Sustain and enhance coastal ocean observing systems

- Observations: to monitor the variability at small scales
- Understand and correct model-associated biases
- Enhance model-data integration

[Tintoré et al., 2019](#)



Change in key Science Concepts

- Ecosystems versus ego-systems
- Research excellence redefinition
- Scientific quality
- Long-term goals

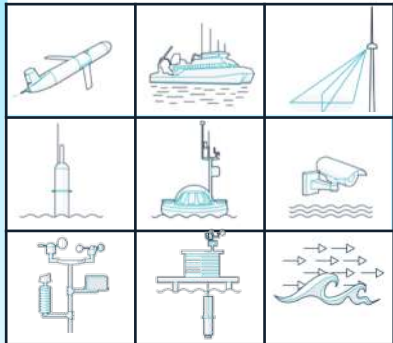


Open Science with and for Society

- 2030 Agenda
- Sustainable Development Goals (SDG 14)
- United Nations Decade of Ocean Science

SOCIB: an integrated ocean observing and forecasting system contributing to a long term sustained EOOS

Infrastructure



Multi-platform

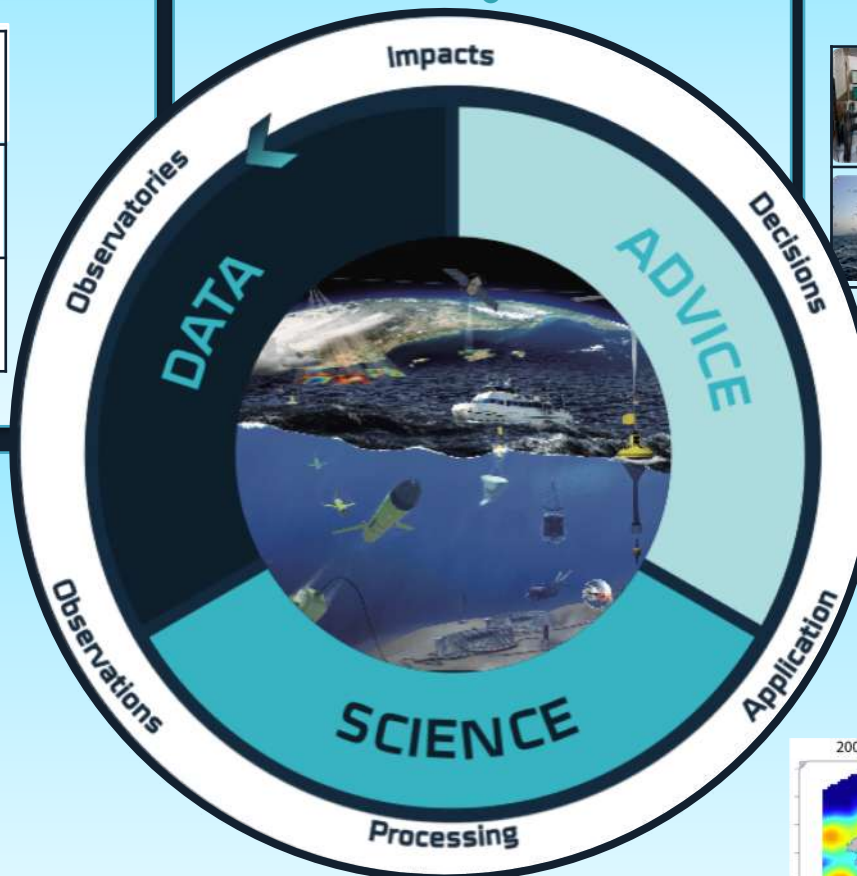
Ocean observing > user-driven

Stakeholders



Innovation strategy
and sectors

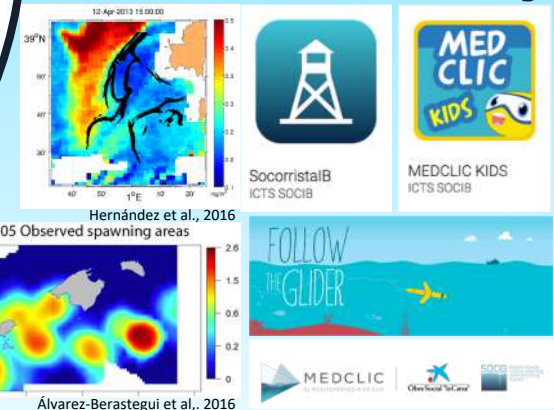
Data Services



Share-data

Meet user-needs

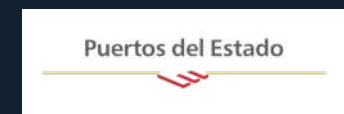
Science for Society



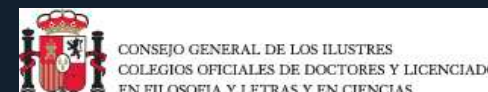


SOCIB

Balearic Islands
Coastal Observing
and Forecasting
System



WE ARE STRONGER TOGETHER



SOCIB Balearic Islands
Coastal Observing
and Forecasting
System

THANKS FOR YOUR ATTENTION