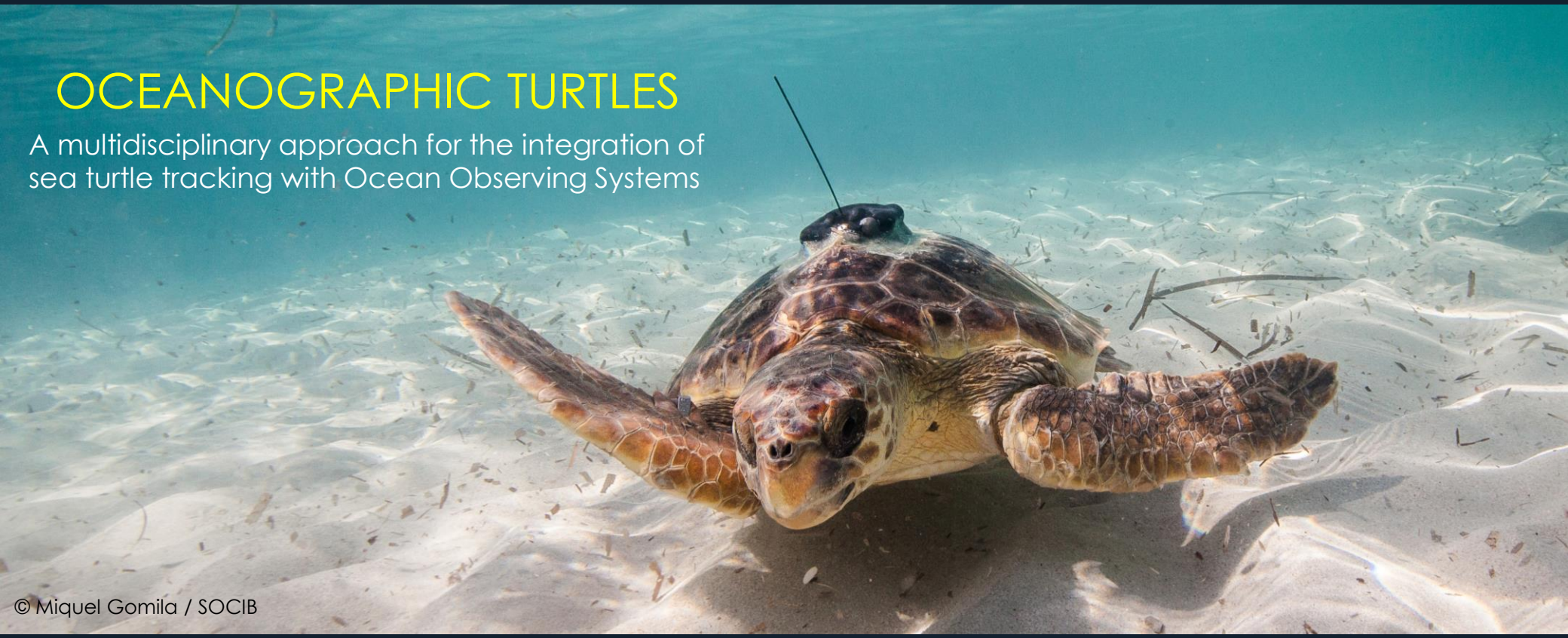
SOCIB Balearic Islands Coastal Observing and Forecasting System

6TH MEDITERRANEAN CONFERENCE ON MARINE TURTLES
PORE Č/CROATIA 2018

OCEANOGRAPHIC TURTLES

A multidisciplinary approach for the integration of sea turtle tracking with Ocean Observing Systems



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David March[1,4*], Ohiana Revuelta[1,2], Diego Álvarez-Berastegui[1], Guillem Félix[3], Gloria Fernández[3], Brendan J Godley[4], Debora Morrison[3], Baptiste Mourre[1], Ananda Pascual[5], Ricardo Sagarminaga[6], Yonat Swimmer[7], Marc Torner[1], Joaquín Tintoré[1,5]

1 Balearic Islands Coastal Observing and Forecasting System (SOCIB, Spain), **2** Universidad de Valencia (Spain), **3** Fundación Palma Aquarium, **4** University of Exeter (UK), **5** Mediterranean Institute for Advanced Studies (IMEDEA-CSIC/UIB, Spain), **6** Alnitak (Spain), **7** Alnitak (Spain
*dmarch@socib.es

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www.socib.es/tortugas

INTEGRATION OF SEA TURTLE TRACKING WITH OCEAN OBSERVING SYSTEMS

1. HOW OCEANOGRAPHIC TURTLES ARE INTEGRATED INTO OOS?

2. HOW CAN OOS CONTRIBUTE TO SEA TURTLE CONSERVATION & MANAGEMENT?

3. HOW CAN SEA TURTLE TRACKING CONTRIBUTE TO OOS?

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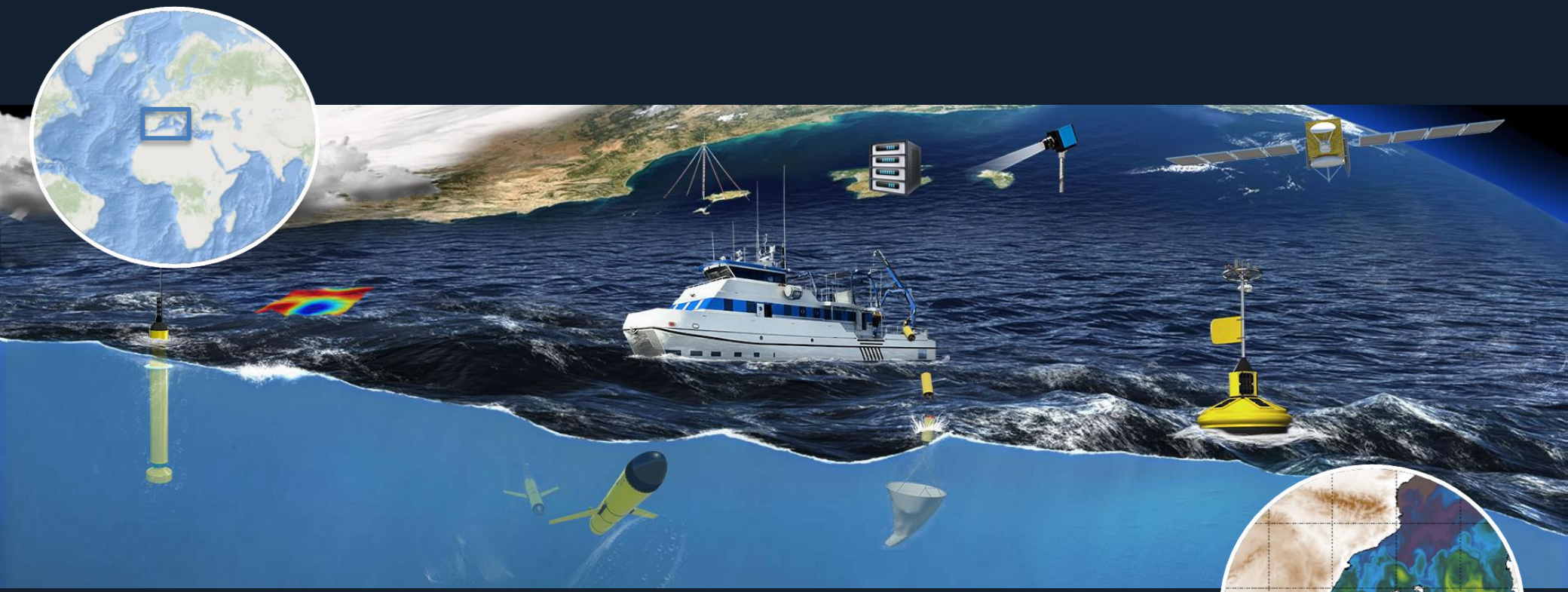
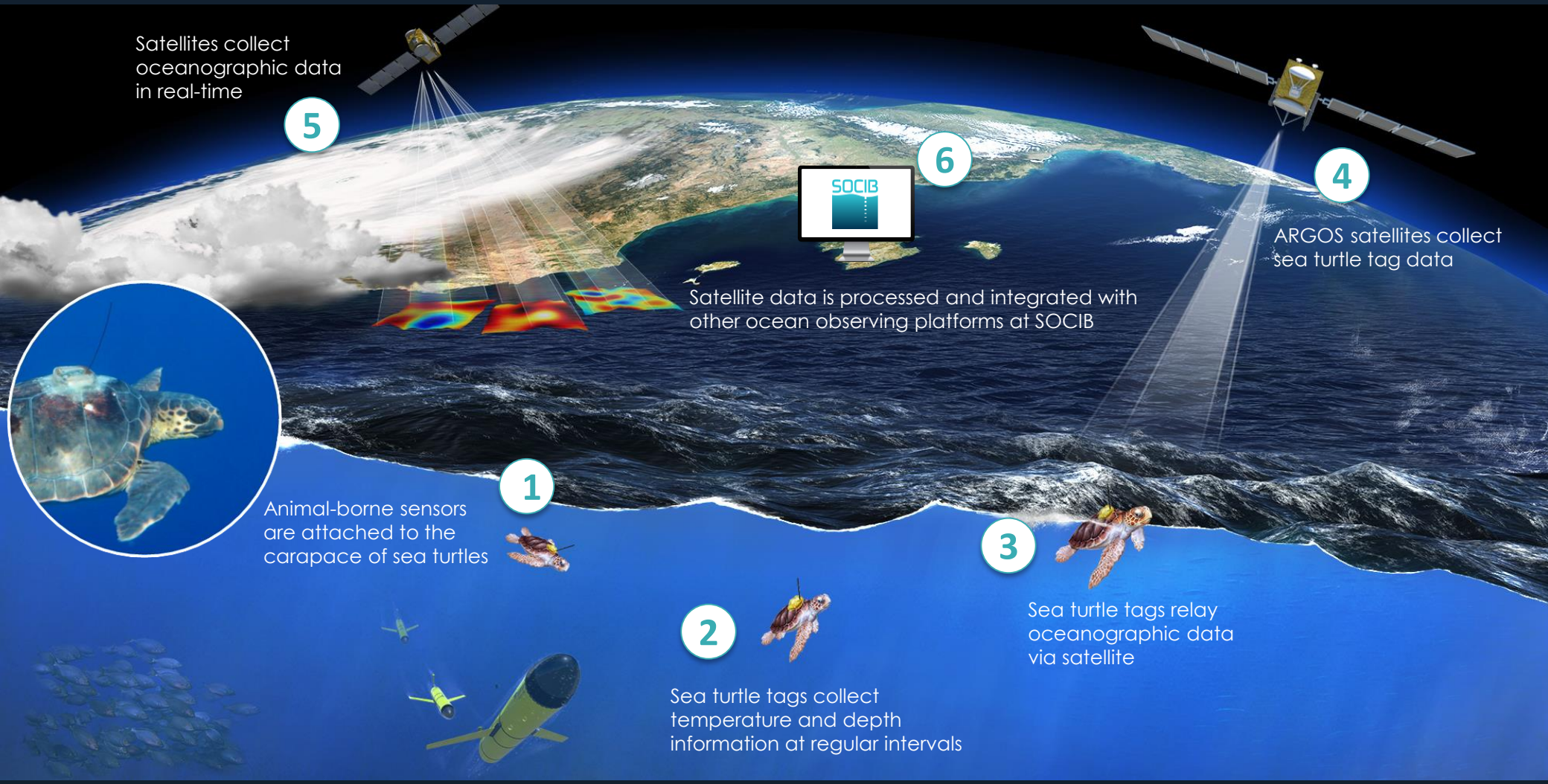
BALEARIC ISLANDS COASTAL OBSERVING AND FORECASTING SYSTEM (SOCIB) AS AN EXAMPLE OF OOS

A Marine Research Infrastructure: a multi-platform observing system, from nearshore to open-ocean



SOCIB provides multi-platform ocean observations -*in stiu* and satellite- and ocean forecasting in near real-time in the Western Mediterranean Sea

ANIMAL-BORNE INSTRUMENTS: A NEW OCEAN OBSERVING PLATFORM



▲

SOCIB is working to integrate satellite tracking of juvenile loggerhead turtles (*Caretta caretta*) with Ocean Observing Systems

INTEGRATION IN NEAR-REAL TIME

Location data from all platforms is currently integrated into SOCIB Deployment Application (DAPP)

http://apps.socib.es/dapp/

- Satellite tracks are integrated into ocean observing systems, providing simultaneous observations of multiple platforms in near real-time troughout a common marine data management system

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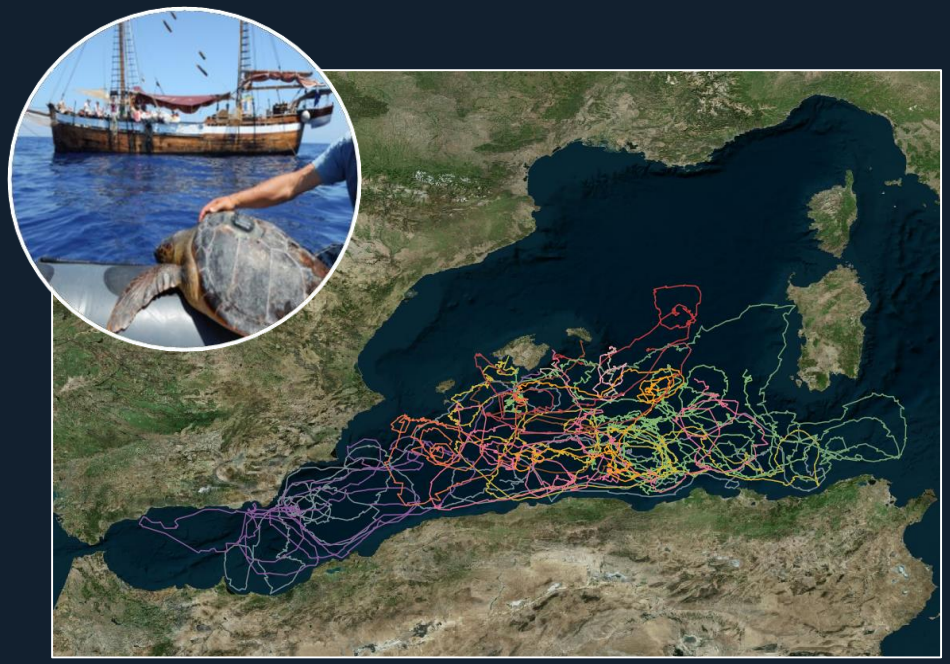
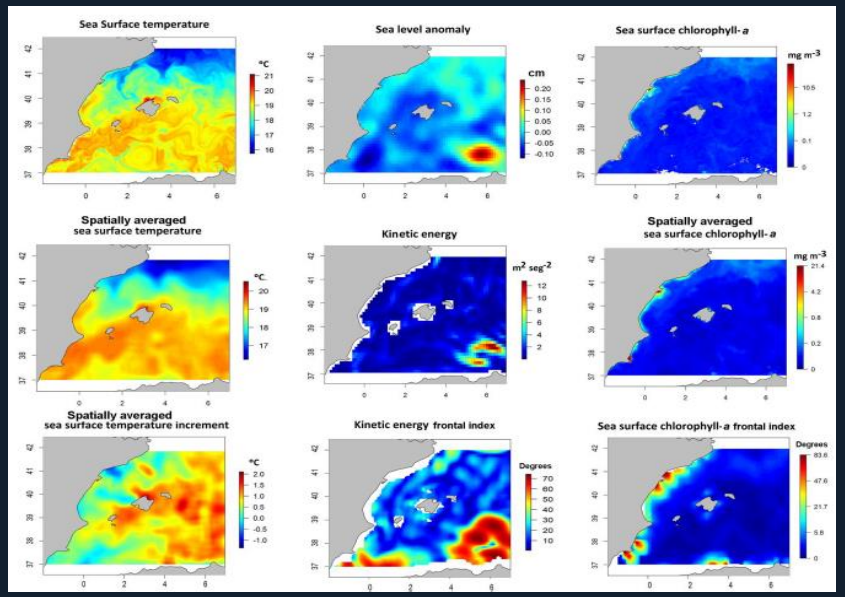
CASE 1: TOWARDS AN OPERATIONAL ENVIRONMENTAL NICHE MODEL

Integration of data-assimilative numerical models and remote sensing observations





(Alvarez-Berastegui et al 2016)

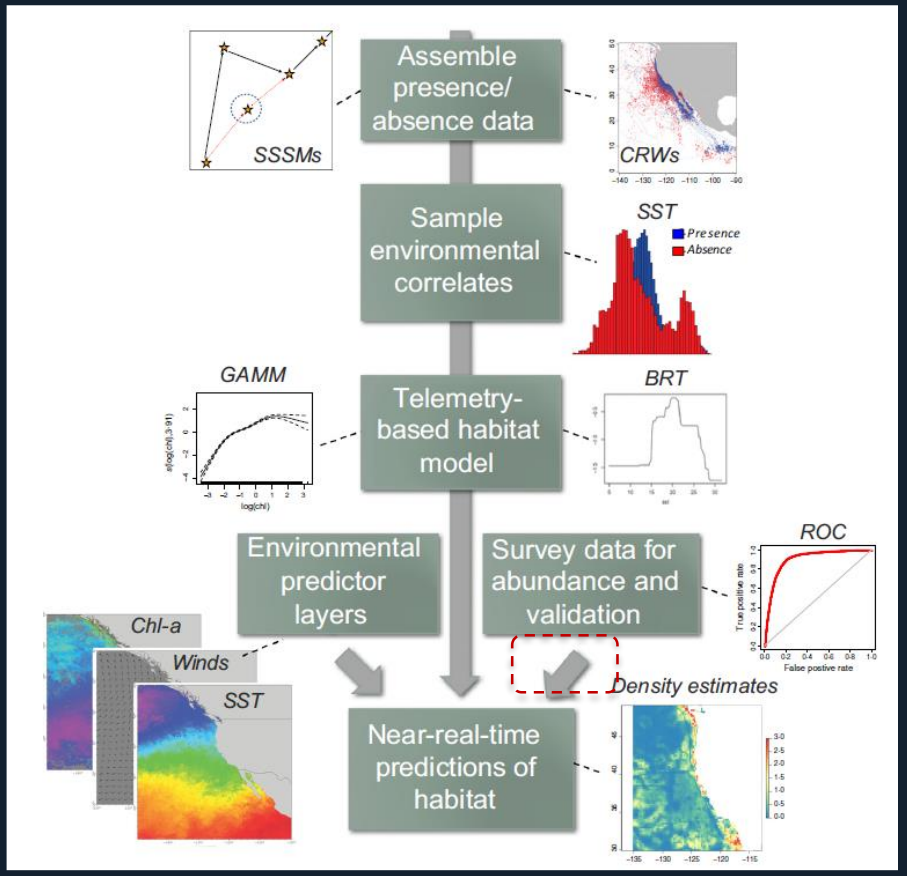
SATELLITE TRACKING DATA (Location only)

- Loggerheads in oceanic phase (28-83 cm CCL)
- Long-term dataset: 2003-2017 (n=51)
- Source: Alnitak (unpubl.), Eckert et al. 2008, Cardona & Hays (2018).

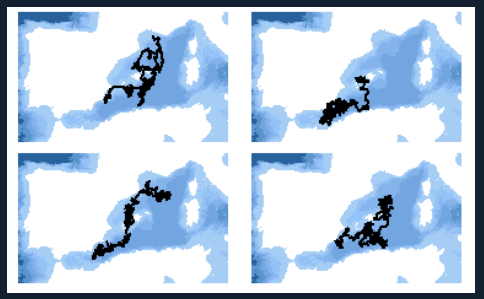
ENVIRONMENTAL DATA

- Numerical models from CMEMS: SST, Salinity, PP, Phytoplankton
- Remote sensning from CMEMS: SLA, EKE, CHLa
- Bathymetry from EMODnet
- Derived products from SOCIB (gradients)

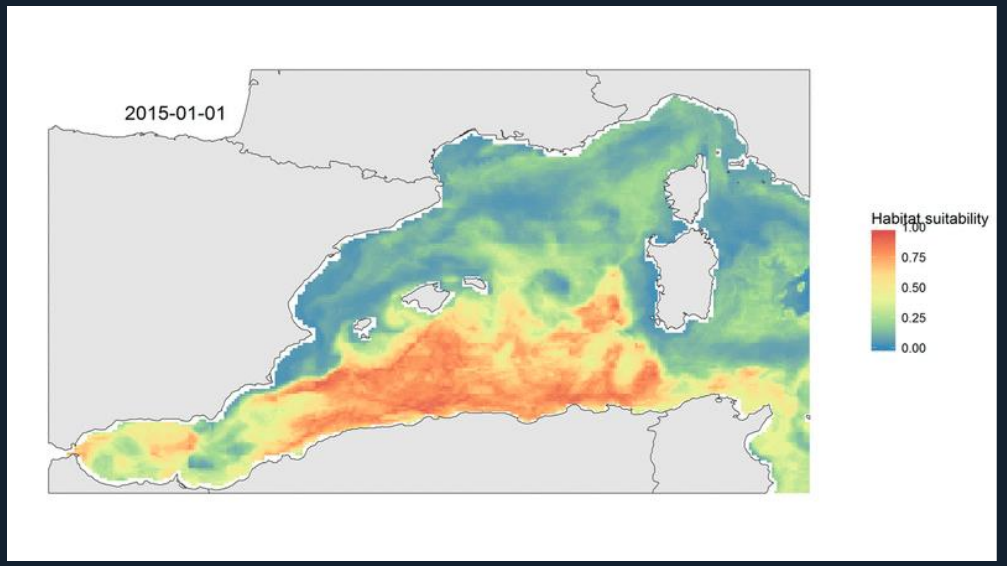
CASE 1: TOWARDS AN OPERATIONAL ENVIRONMENTAL NICHE MODEL



Modelling workflow (adapted from Hazen et al. 2016)



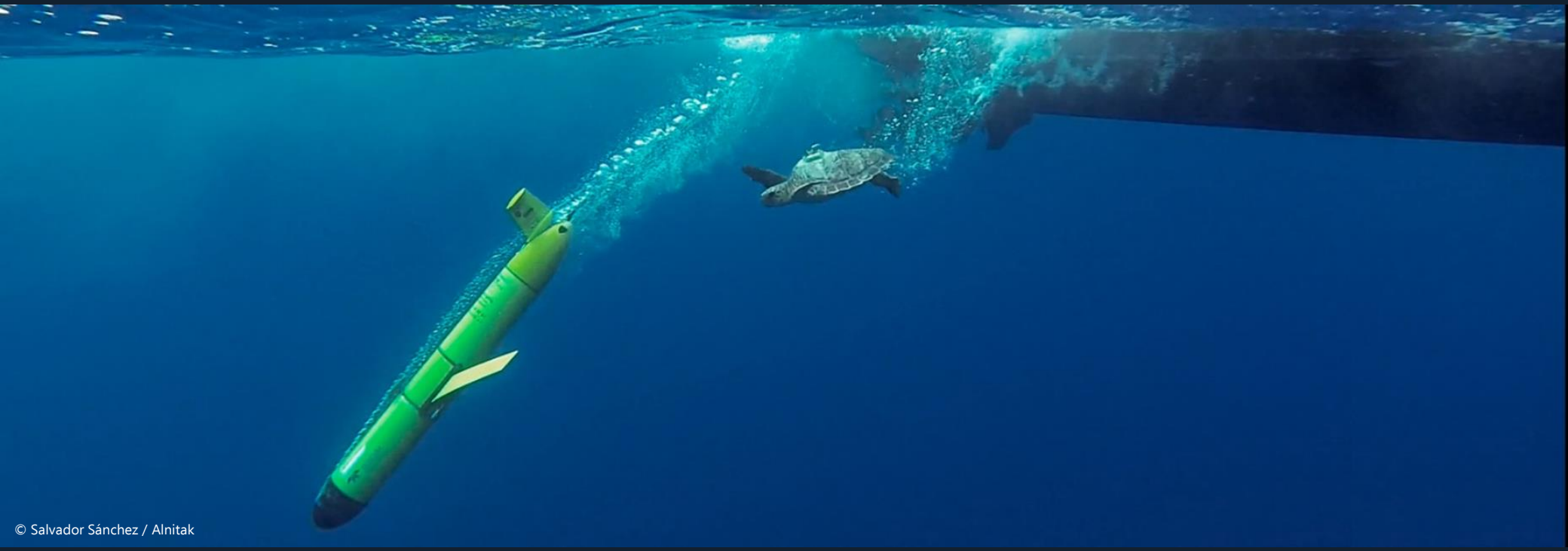
Pseudo-absences
100 CRW simulations per turtle



Daily predictions of the species-niche model (MaxEnt). Salinity, Bathymetry, SST and EKE are the 4 main predictors

CASE 2: MULTIPLATFORM EXPERIMENT

Ocean gliders are used to monitor biophysical paramenters while following the trajectory of sea turtles in real-time



SEA TURTLE

GLIDER

CTD

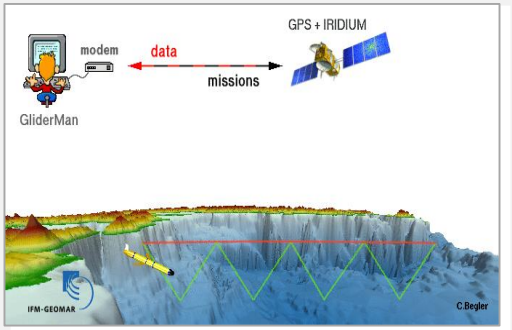
DRIFTING BUOYS

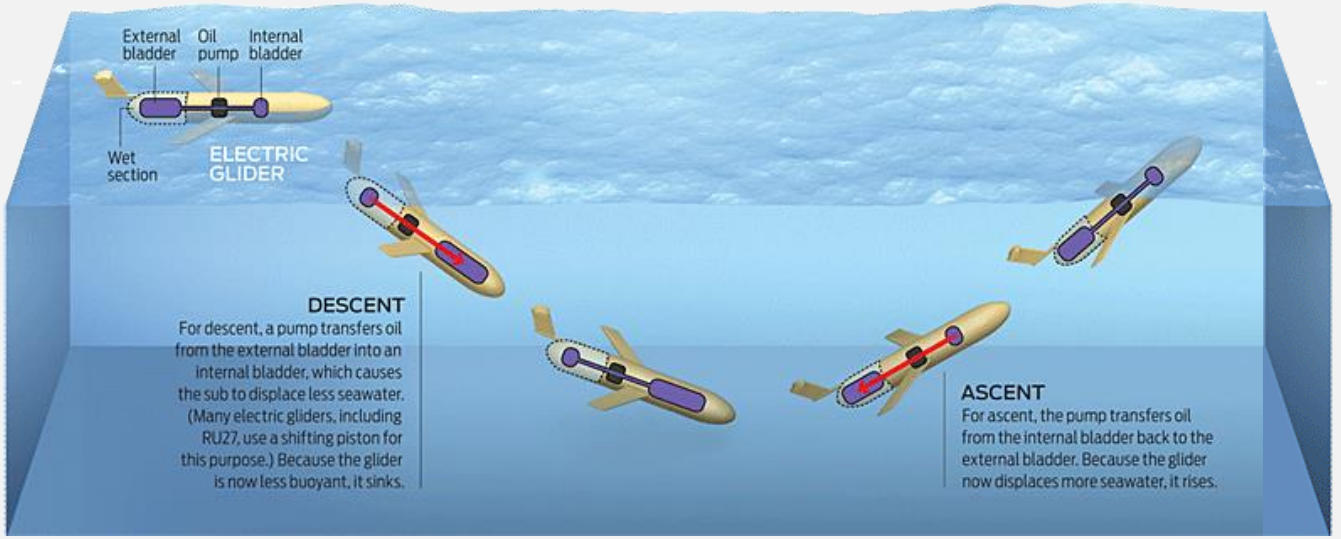
SATELIITE

AIS ANTENNAS

CASE 2: MULTIPLATFORM EXPERIMENT

Underwater drones monitoring the oceans





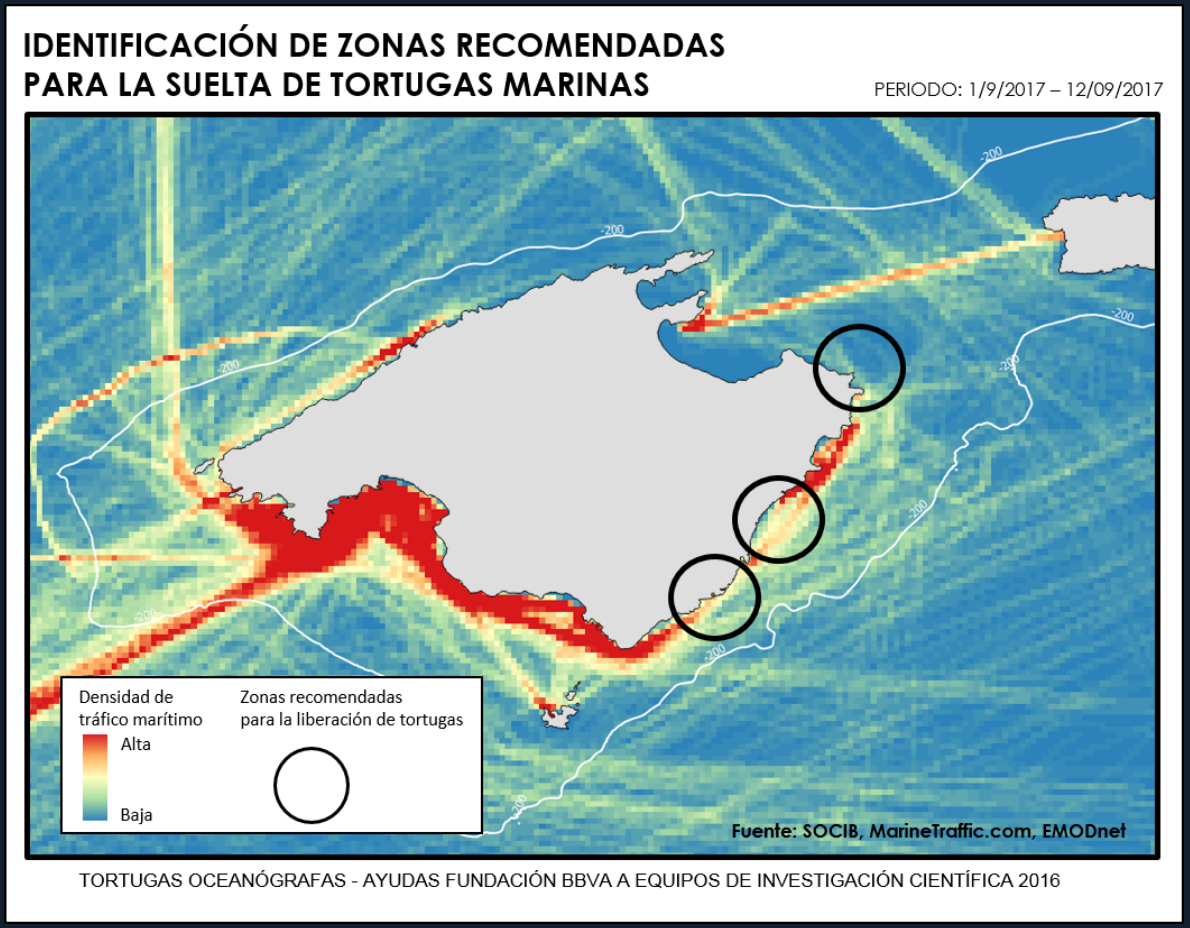
Long-endurance autonomous underwater vehicles (AUV) measure biophysical parameters in a 3D space. Gliders are controlled remotely via satellite communications (Iridium)

CASE 2: MULTIPLATFORM EXPERIMENT

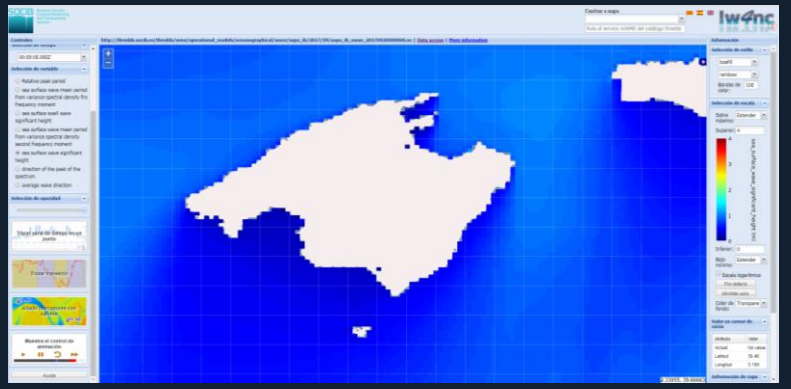
Adaptive piloting: First trial on July 2016 (13 days mission)

We used a shallow Slocum glider to sample the water column along the trajectory of one turtle up to 200 m deep.

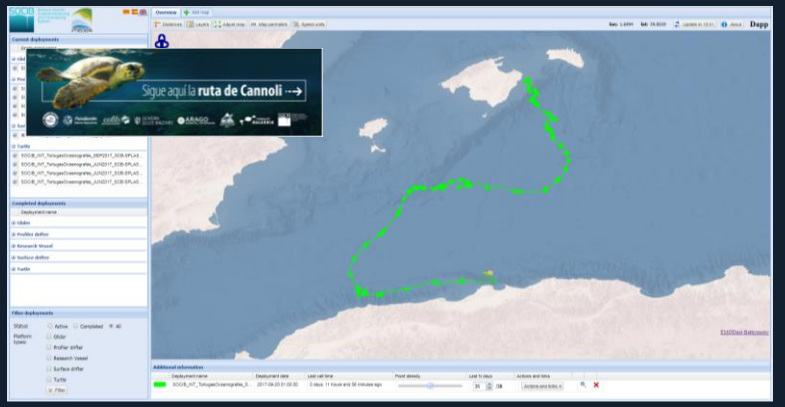
CASE 3: IDENTIFICATION OF OPTIMAL RELEASE LOCATIONS



Marine traffic density map was generated using recent AIS data



SOCIB Wave Forecast for the date of release



Real-time data using SOCIB viewer connected from www.fundacionpalmaaquarium.org

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ANIMAL-BORNE INSTRUMENT

- SPLASH Tags (Wildlife Computers), suitable size for juvenile loggerheads (>45 cm CCL)
- Location data: ARGOS (GPS in few tags as well)
- Depth and Temperature at 5 min intervals relayed through ARGOS satellite (60-80% data recovered)

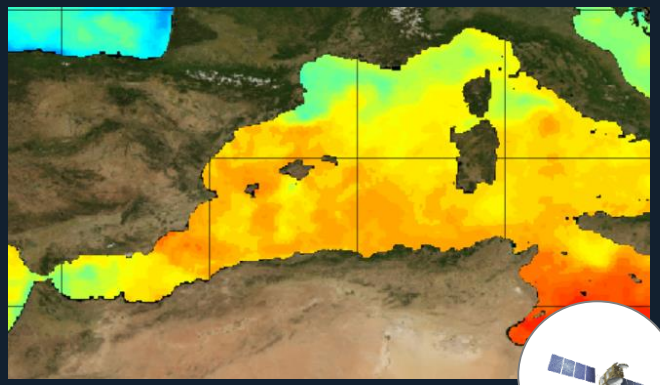
DATA QUALITY CONTROL

- ✓ **Location:** speed & angle filters. Interpolate to 5 min intervals
- ✓ **Pressure sensor**: Zero-offset correction
- ✓ **Temperature**: filter out insolation events

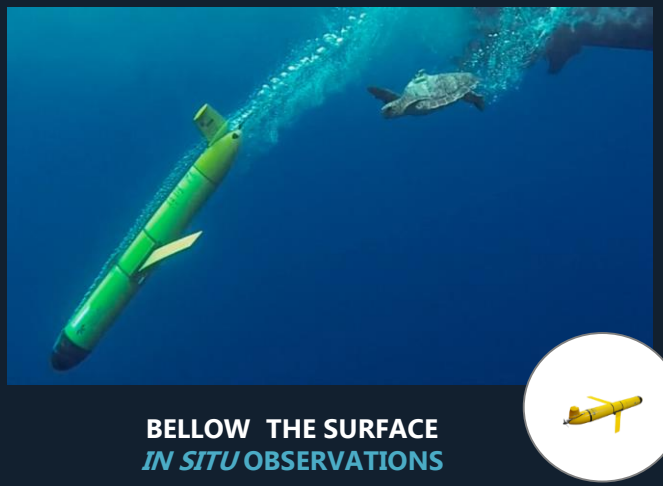
Temperature only Pressure & Temperature Pressure only

DATA VALIDATION

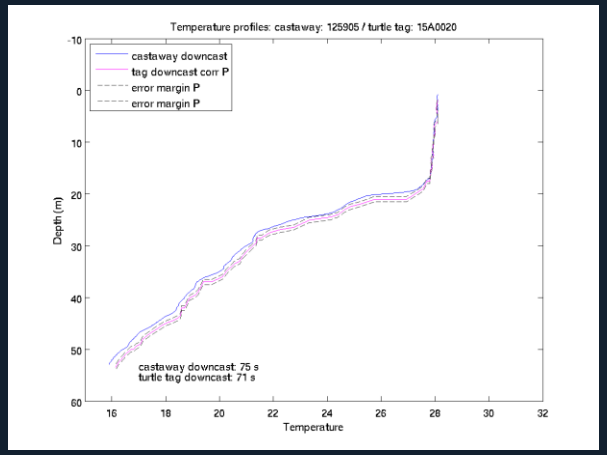
BEFORE DEPLOYMENT
PORTABLE CTD

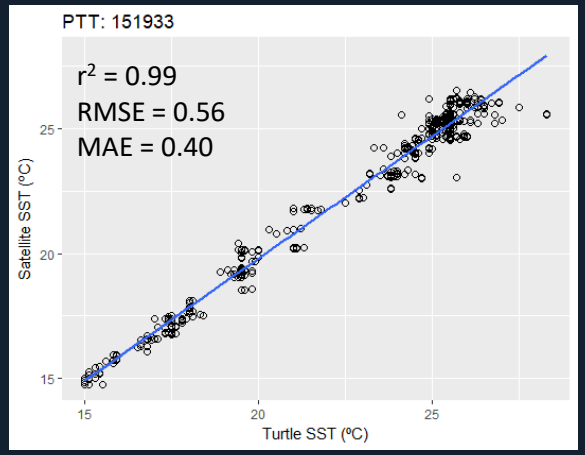


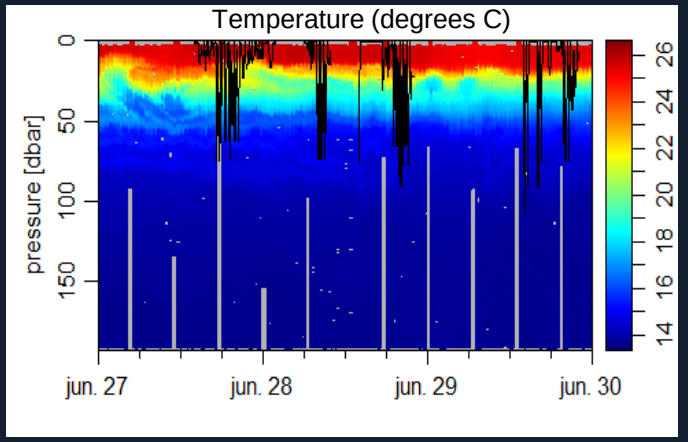
AT THE SURFACE
REMOTE SENSING



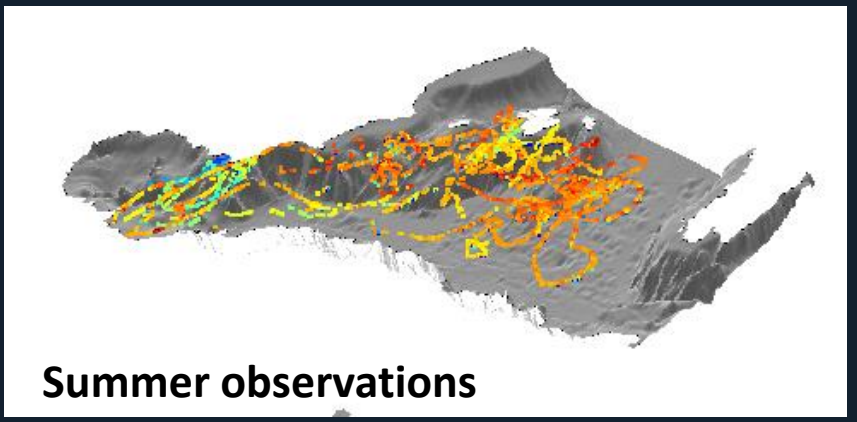
BELLOW THE SURFACE
***IN SITU* OBSERVATIONS**



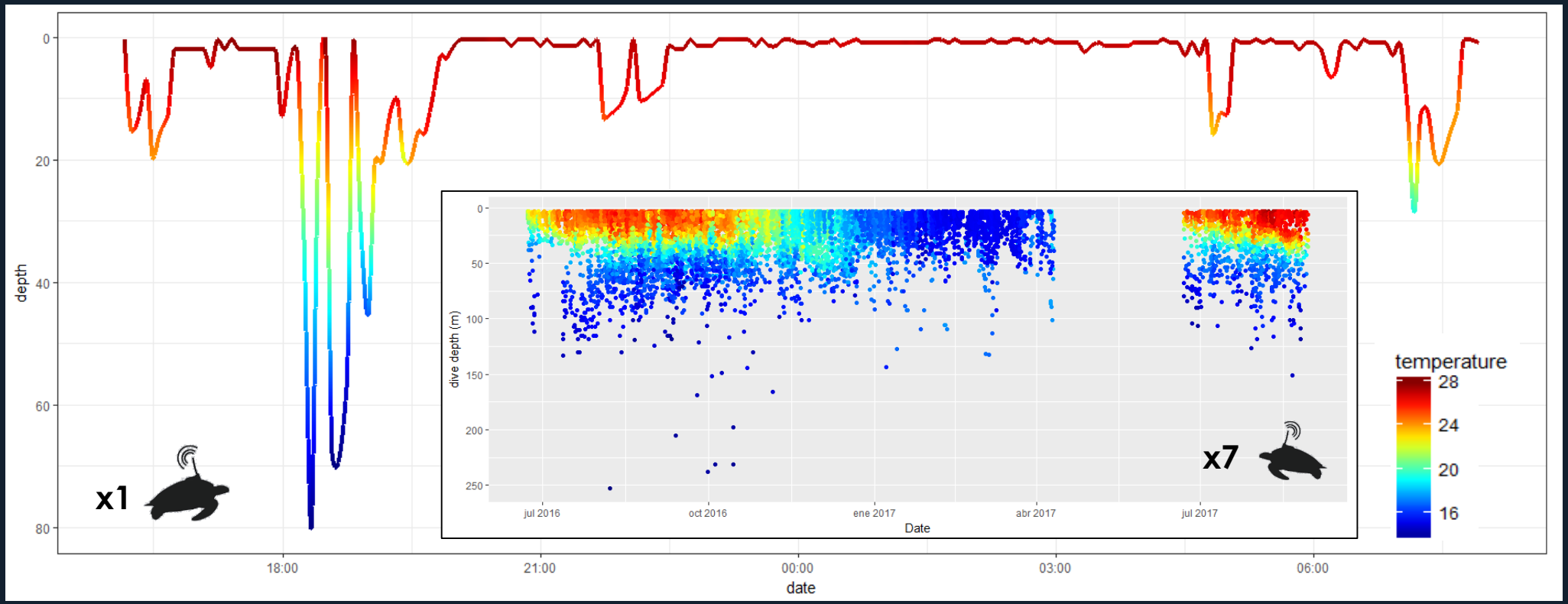




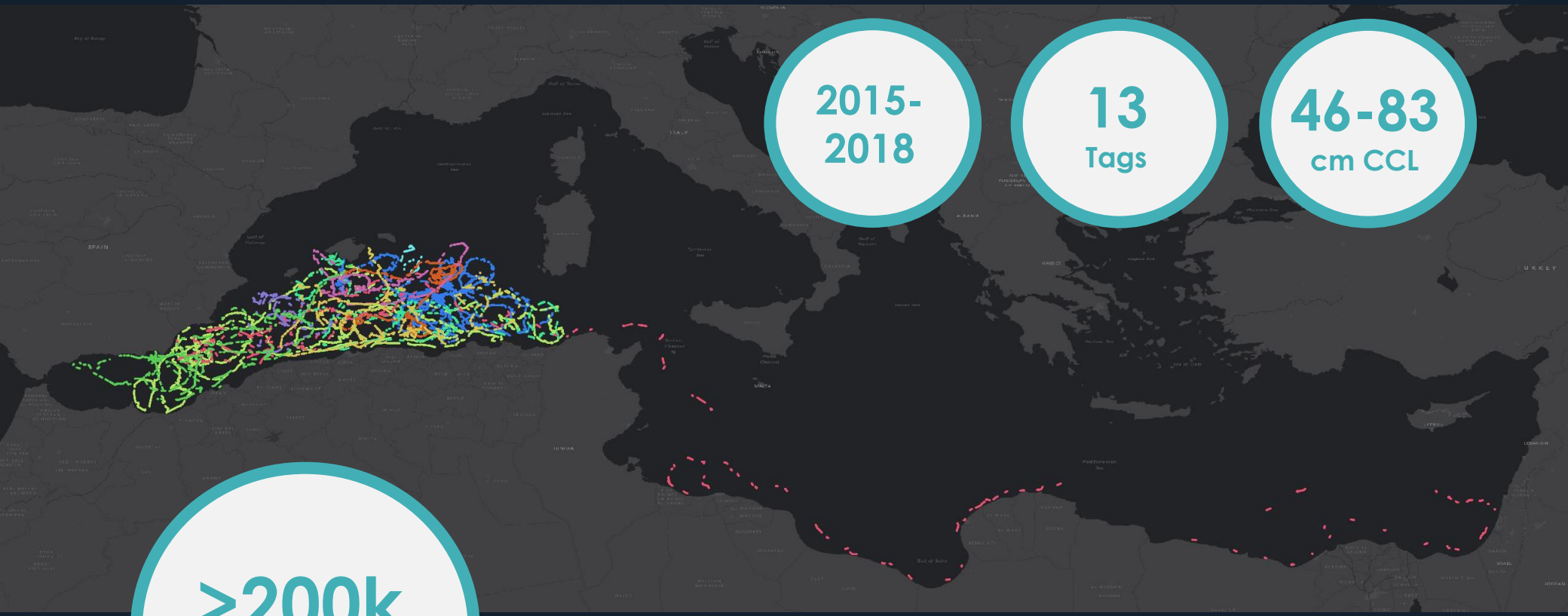
TIME-TEMPERATURE-DEPTH RECORDS



Summer observations



TIME-TEMPERATURE-DEPTH RECORDS



CAN SEA TURTLES CONTRIBUTE TO OOS IN REGIONS OF INTEREST FOR THE OCEANOGRAPHIC COMMUNITY?

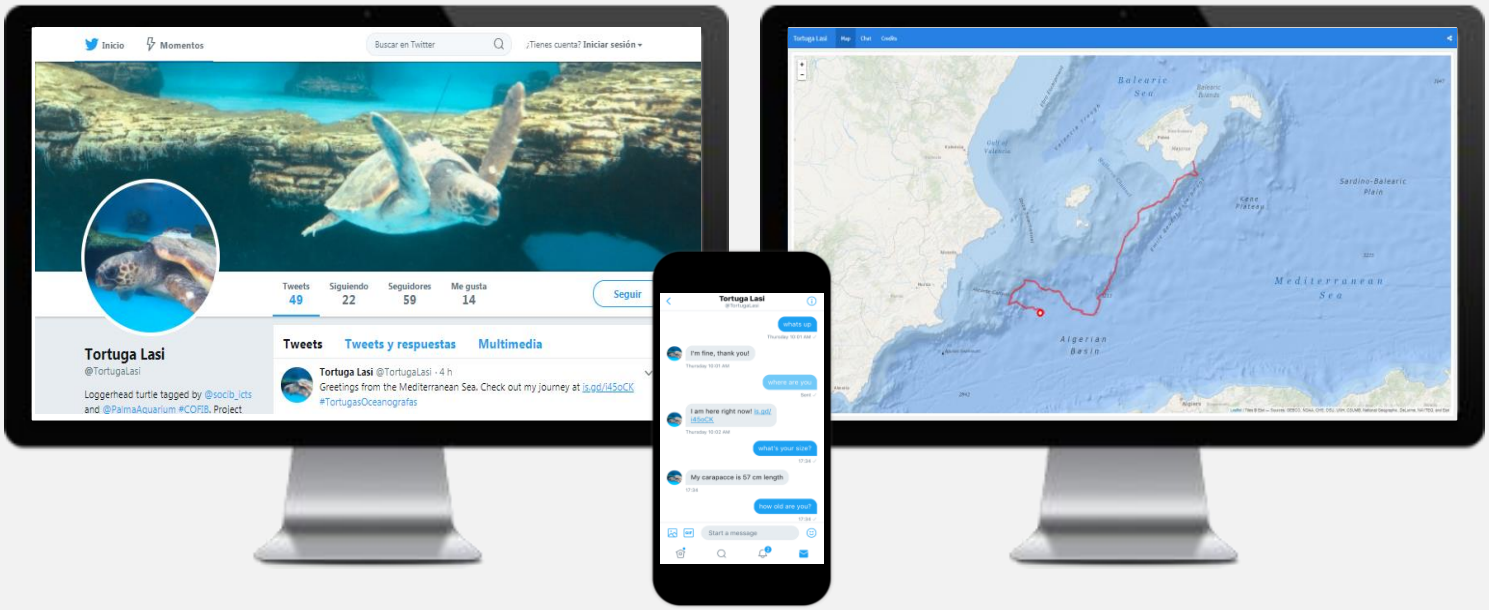
Temperature profiles collected by sea turtles can complement near real-time ocean monitoring systems like numerical models, undersampled regions, and shallow waters across multiple national borders

CONNECT YOUR TAG TO TWITTER!

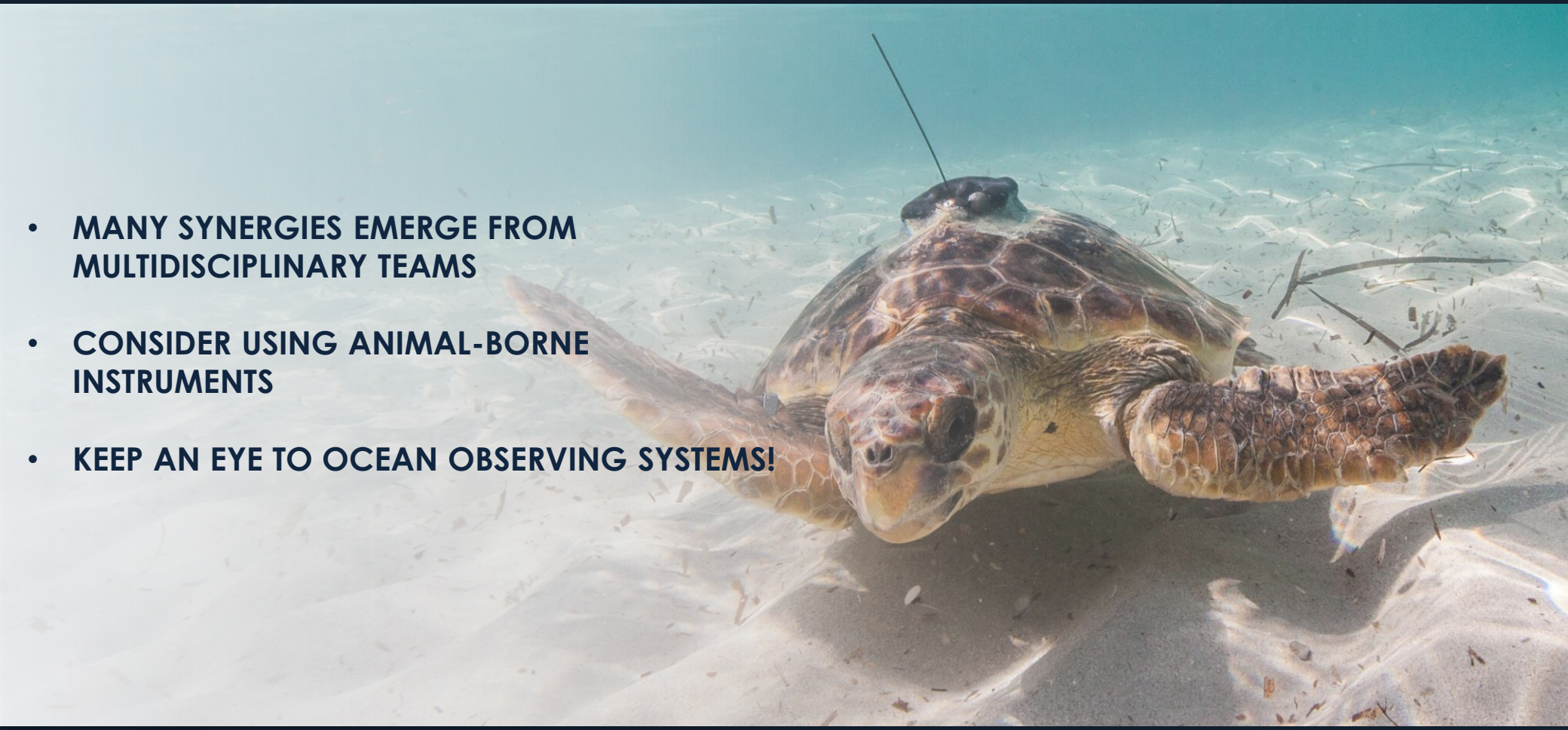
Raise awareness for ocean conservation using real-time animal tracking data and social networks

@TortugaLasi

TWEETING TURTLES



TAKE HOME MESSAGES



- MANY SYNERGIES EMERGE FROM MULTIDISCIPLINARY TEAMS
- CONSIDER USING ANIMAL-BORNE INSTRUMENTS
- KEEP AN EYE TO OCEAN OBSERVING SYSTEMS!

HVALA!

THANK YOU!

¡MUCHAS GRACIAS!

Dr. David March
dmarch@socib.es