Observatories – the new Med observatories

H. Nibani

President of AGIR Association & Moroccan ODYSSEA Observatory Leader.

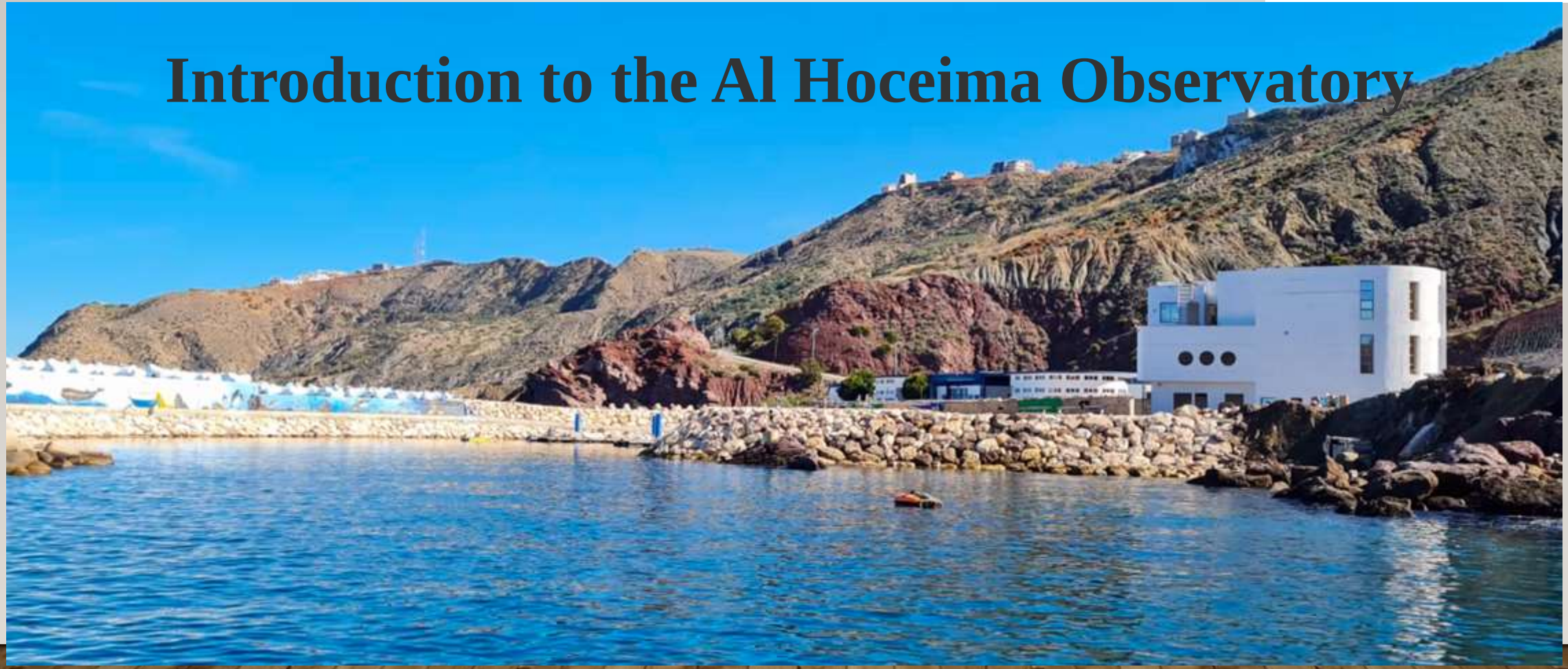
THE OBSERVATORIES

- ✓ Comprise a network of 9 observing and forecasting systems,
- ✓ Cover coastal and shelf zone environments,
- ✓ Cover Ecologically-vulnerable systems (MPAs) / systems with increased human pressure,
- ✓ Combine monitoring and modeling activities,
- ✓ Produce new datasets, store, manipulate, make accessible through the ODYSSEA platform,
- ✓ Data with increased temporal and spatial resolution.

ODYSSEA

AGIR
ASSOCIATION DE GESTION INTEGRÉE DES RESSOURCES

Introduction to the Al Hoceima Observatory



PROJET DE L'OBSERVATOIRE MARIN

DEF/ODYSSEA marine observatory partnership

DEF ; FSTH ; ITPM & AGIR , future partnerships

3 MAIN MISSIONS :

1- Observation, through :

- Acquisition of knowledge on the Moroccan Mediterranean / Al Houceima marine protected area (MPA).
- Characterisation of marine habitats
- Monitoring of biodiversity, particularly the park's emblematic species
- Monitoring the physico-chemical quality of the water and marine sediments
- Cartographic monitoring of heritage areas.

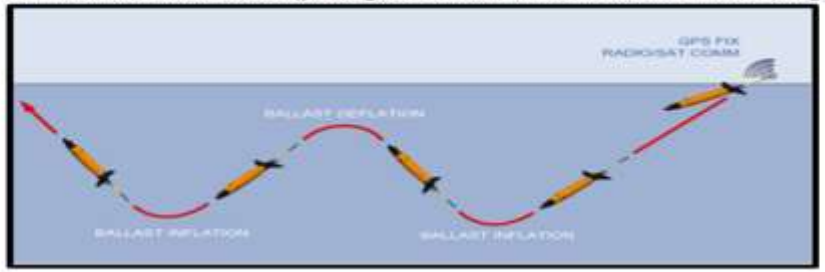
3 MAIN MISSIONS :

2- Information analysis and decision support for MPA monitoring and conservation

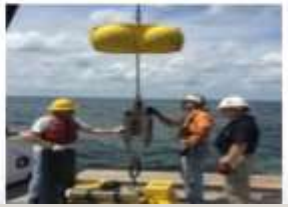
- Edition of monitoring and surveillance dashboards for the MPA by adopting standardised methodologies
standardised methodologies validated by the scientific community
- Publication of research work in partnership with universities and research
research institutes.

EQUIPMENT AND DEPLOYMENT

Glider équipé de différents sensors entre autres de measures hydrologiques, biologique et acoustique ainsi que pour la mesure du microplastique. Infrastructure : Alseamar pilotera le planeur à distance depuis ses locaux, ce qui inclut l'infrastructure de pilotage et les coûts de fonctionnement (pilotage + coûts de communication Iridium/Argos).



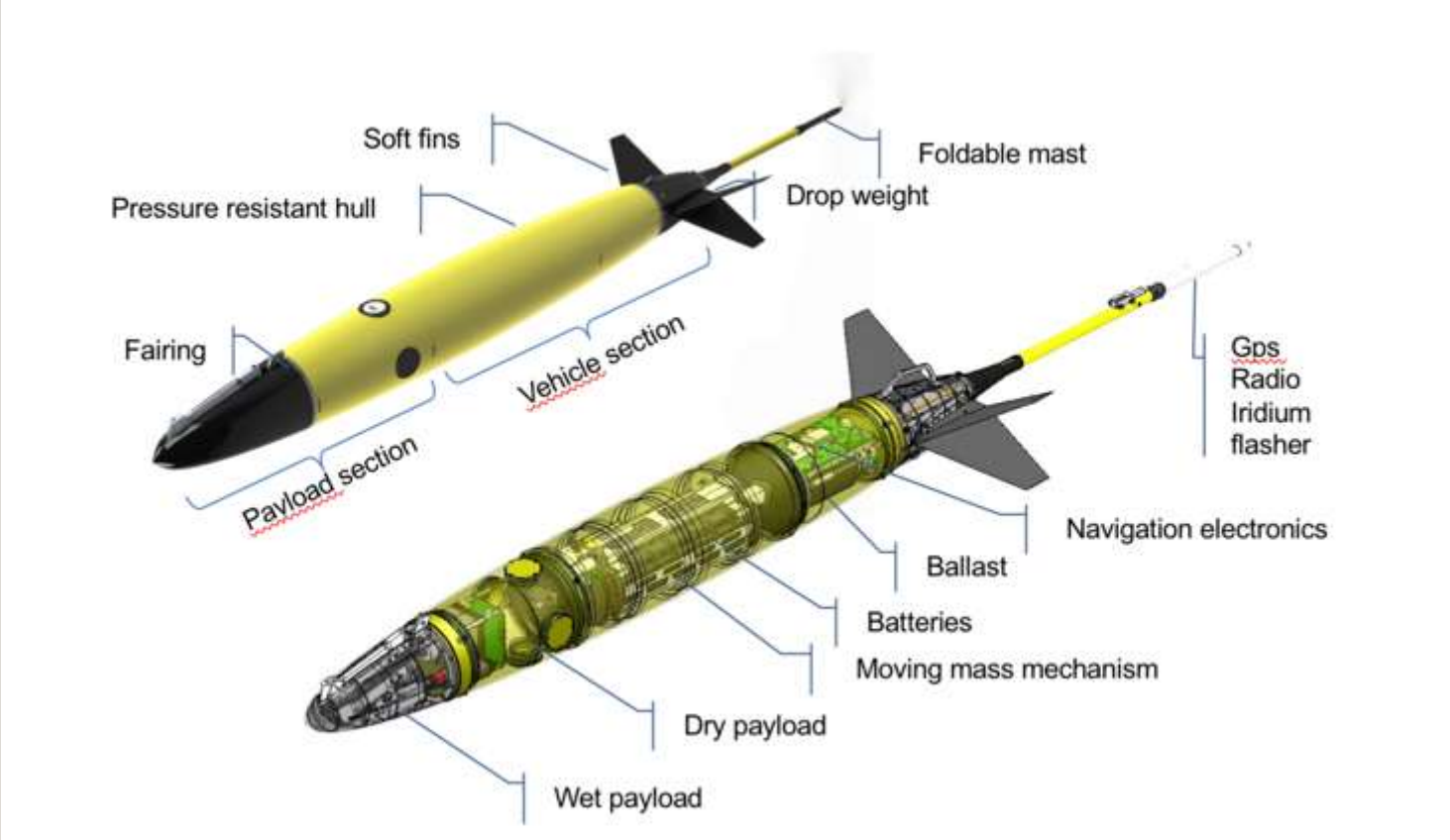
2. D'une station de mesures hydrologiques, biologique et acoustiques fixe au fond ,



DEPTH LANDER DEPLOYMENT MPA/PNAH

SURFACE SYSTEM DEPLOYMENT MPA / PNAH

GLIDER DEPLOYMENT MPA / PNAH



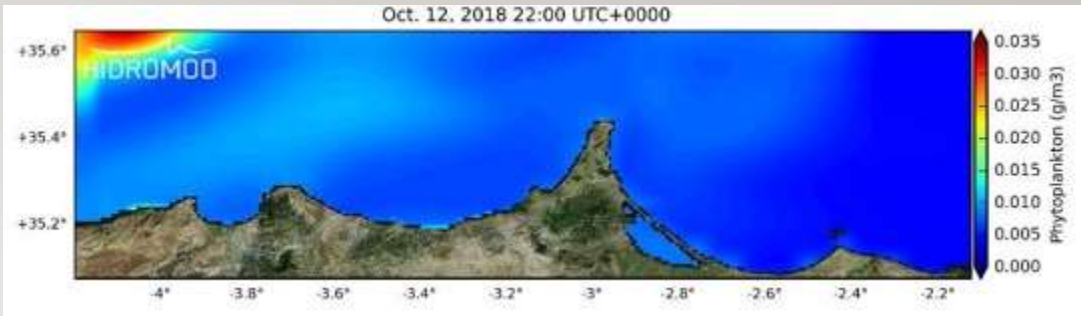
The Models in Al Hoceima Observatory Local Observatories

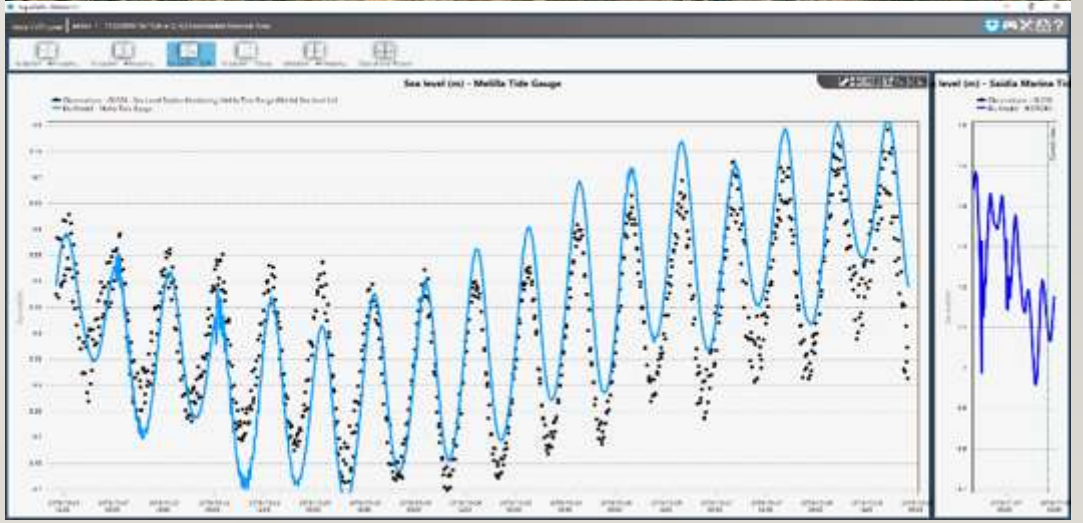
The Models in Local Observatories (Morocco , Algeria & Israel)

- Implementation of local services in three ODYSSEA Observatories: Algeria, Morocco and Israel. In these three Observatories it was set up a local infrastructure section supported by Hidromod's AQUASAFE platform which is capable to take care of a whole service chain acquiring local data, running local high resolution models and upload all the data to ODYSSEA platform.

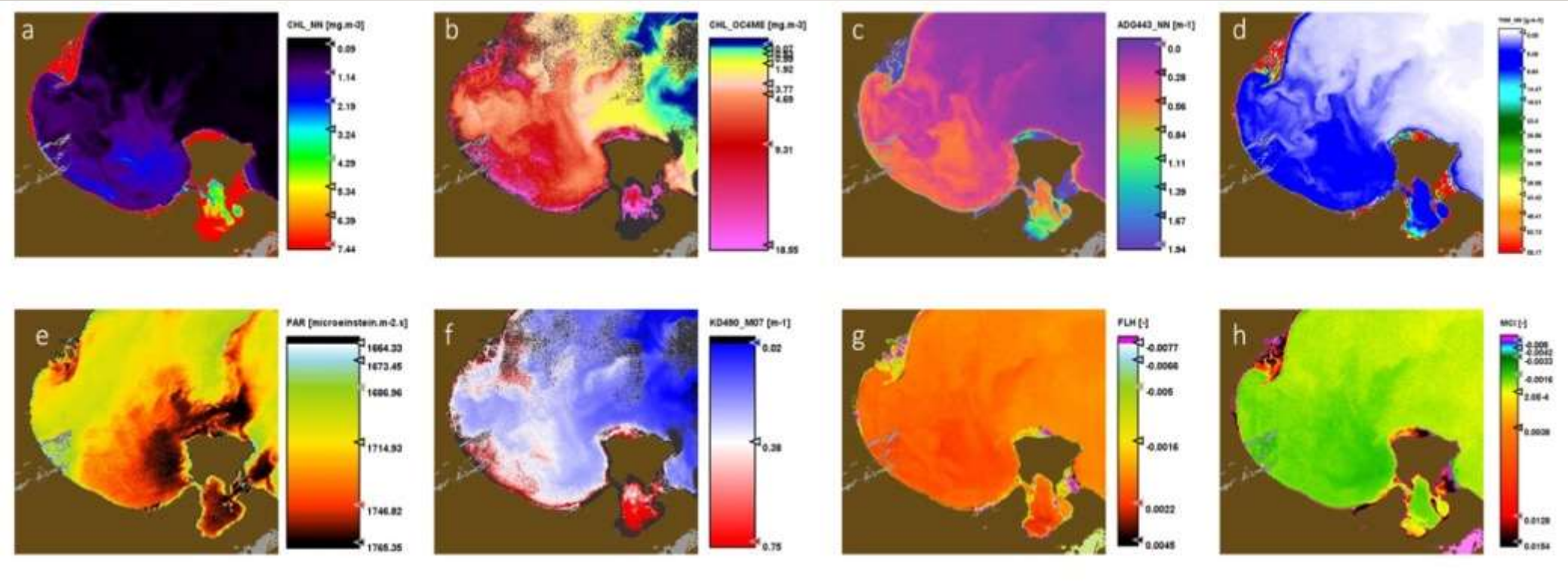
The Models in Al Hoceima Observatory

The Moroccan observatory is split in two regions: Al Hoceima National Park, which covers almost half of the Mediterranean coastline (Figure 3) and the Mohammedia port region in the Atlantic coastline (Figure 4). In the Al Hoceima National Park main local identified issues are related with the ecological assessment, a better understanding of the fisheries nurseries limitations and a better information regarding sea and weather conditions (forecast). In Mohammedia port the main focus is the delivery of meteo-oceanographic forecasts to support port operations. AQUASAFE Morocco. Validation workspace for sea level. Comparison between observations from Gloss (black dots) and numerical model results (blue line).



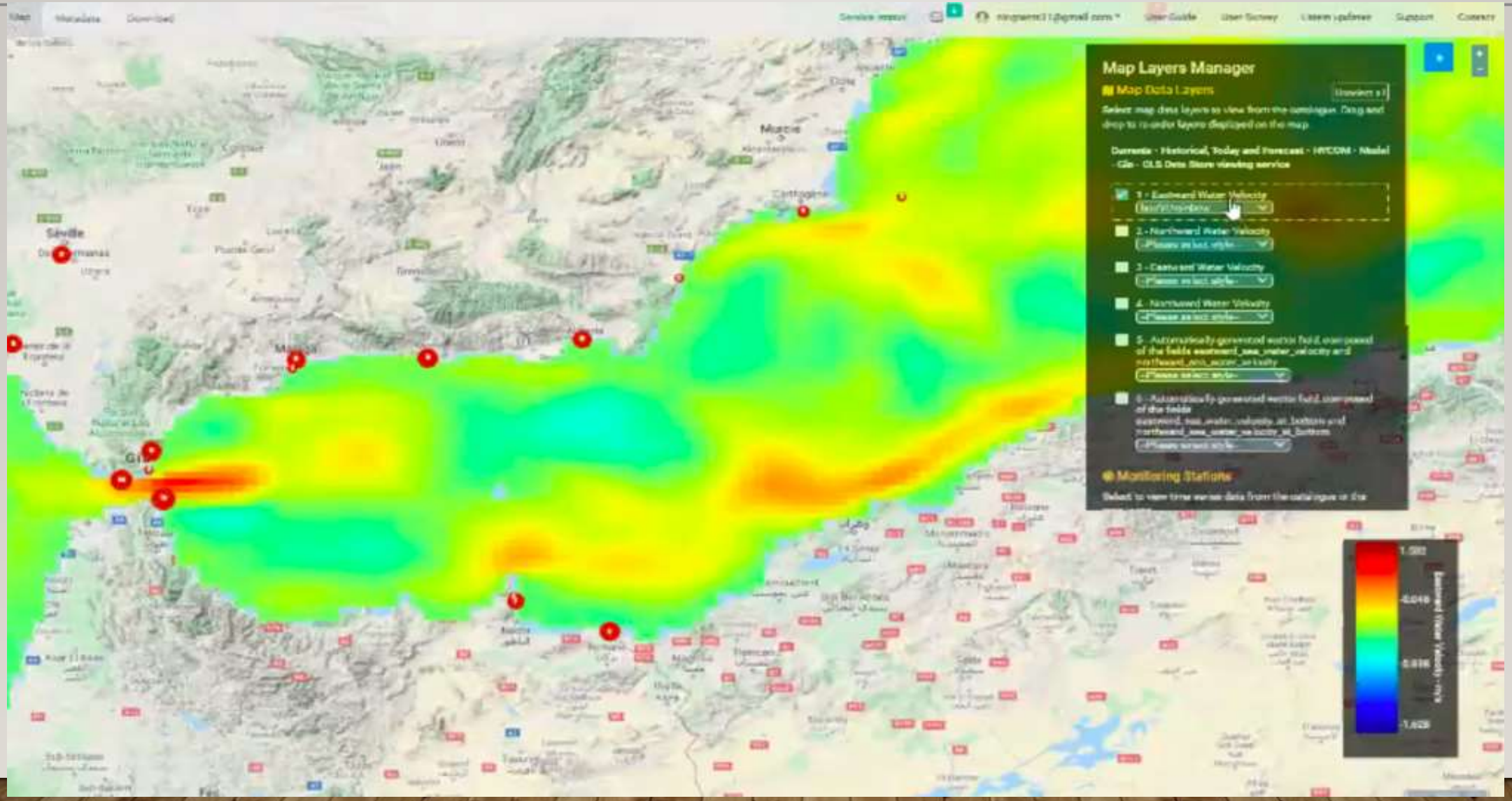


Remote Sensing



Sentinel-3 Level2 spatial distributions of a) chlorophyll-a conc (mg m^{-3}) Oc4me algorithm, b) chlorophyll-a conc (mg m^{-3}) chlnn neural network algorithm, c) absorption of CDOM at 443 nm (m^{-1}), d) TSM concentration (gm^{-3}), e) PAR in the spectral range 400-700 nm (μEinstein m^{-2} s^{-1}), f) diffuse attenuation coefficient at 490 nm (m^{-1}), g) fluorescence line height and h) max chlorophyll index at Gulf of Gabes.

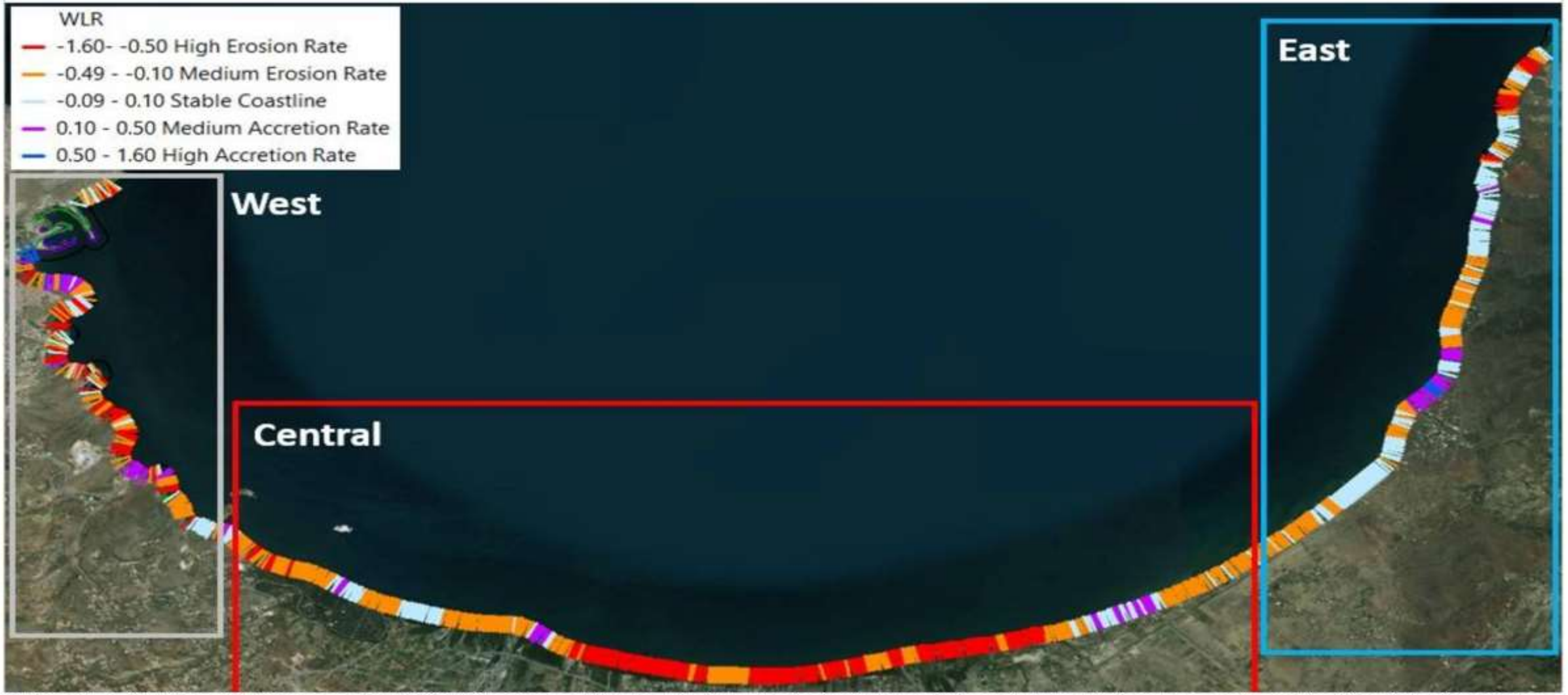
CONTRIBUTION TO PROVIDE DATA



ODYSSEA DATA APPLICATIONS / END USERS

Data for End-Users from Al-Hoceima Observatory

ODYSSEA



Grâce aux données générées par ODYSSEA il est possible de générer des indicateurs précis en temps réel comme cette carte d'érosion des plages de la baie d'Al Hoceima.

AQUACULTURE :

contributes to the adoption of innovative policies and adaptative management that recognise ex situ and in situ knowledge.

Biological assessment

Sample assignment: Marine mammal assessment and detection

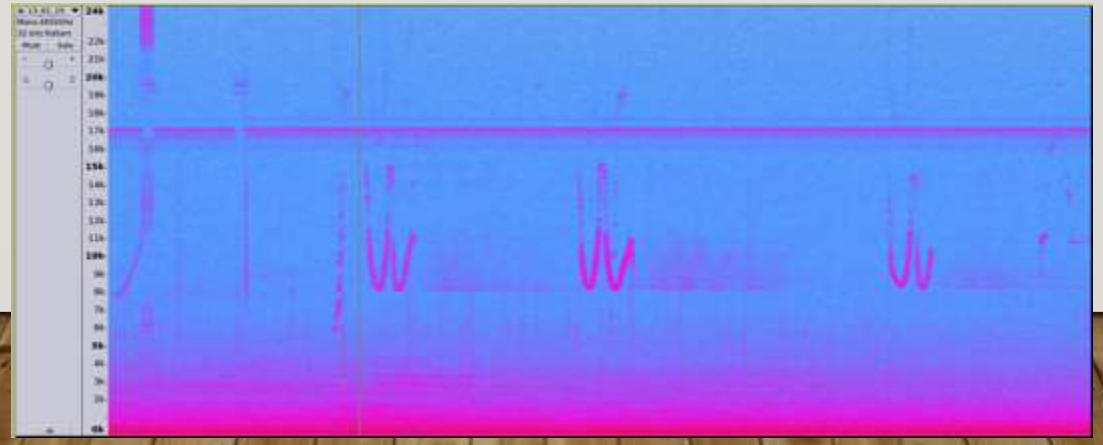
Acoustic size estimation of whales:

The Inter-Pulse Interval (IPI) of the Sperm-Whales vocalisation allows to estimate their size: 11.85m & 13.54m

Source: www.cetaces.org

- Dolphin Chirps:

  (6-9 kHz)



CONVENTION AGIR/DEF/ABDELMALEK ESSAADI UNIVERSITY

The DEF / FSTH / AGIR convention has as an essential objective the implementation of the role of the Al Hoceima Marine Observatory, in order to accomplish its previously described missions, in order to ensure the proper functioning and adaptive management of the Al Hoceima MPA, based on a good scientific knowledge

1- Training of a cohort of marine managers and oceanographers

- Several master's degrees in oceanography have been completed
- Some doctoral students in oceanography are currently completing their theses on several topics of ecosystem conservation and resilience to climate change
- other topics concerning economic aspects, and targeting end-users, topics such as improving the performance of aquaculture projects, integrated port management, or other topics concerning fisheries

FSTH MASTER'S WORKSHOP FOR OCEANOGRAPHY STUDENTS

FSTH Master Oceanography student working on the vehicle

Underwater gliders are autonomous buoyancy-controlled UUVs that move through the water column by changing their density, periodically surfacing to transmit data

WORKSHOP FOR FUTURE SEA-FISHING SKIPPERS AT THE ITPM

workshop for future sea-fishing skippers at the Institute of Maritime Fishing Technology (ITPM) as End Users of the Odyssea marine Observatory

AL HOCEIMA LAUNCHES ITS FIRST FUNCTIONAL MARINE OBSERVATORY IN NORTH AFRICA

AGIR, the Moroccan partner of the EU-funded ODYSSEA project, has successfully deployed SeaExplorer underwater gliders (Alseamar, France) in the southern Alboran Sea.

The first glider mission was mainly dedicated to sampling the Western Alboran Gyre (WAG).

To our knowledge, this pioneering work is among the first oceanographic surveys entirely dedicated to the study of the WAG.

TWO MARINE SURVEY MISSIONS WERE CARRIED OUT

The first mission took place in late autumn, from 10 November to 11 December 2020 (30 days). During this one-month mission, the glider completed a total of 753 cycles.

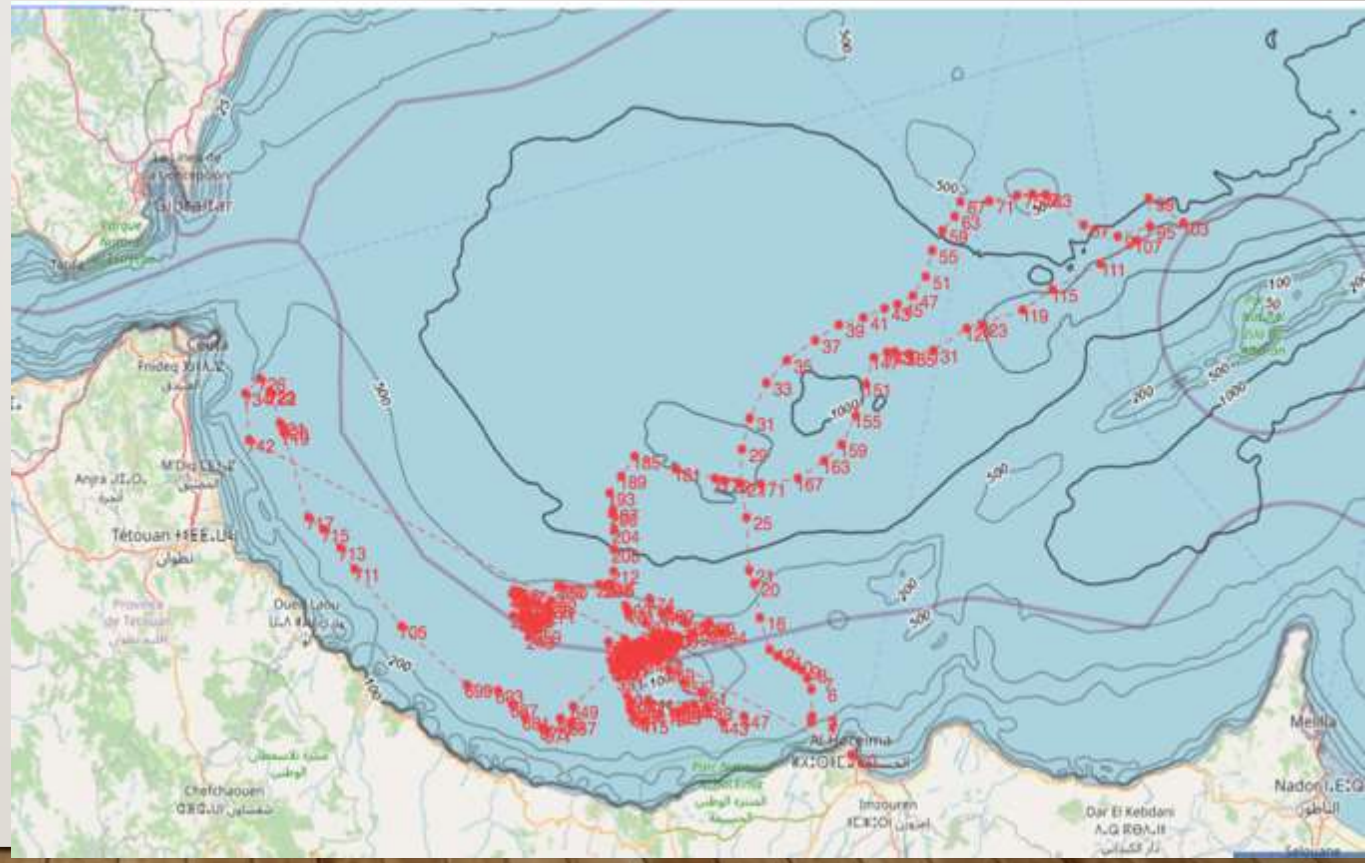


Figure 1. Map showing the route and cycles of the Glider during the first mission.

TWO MARINE SURVEY MISSIONS WERE CARRIED OUT

The second mission took place in late winter and early spring, from 11 February to 23 March 2021 (40 days, 873 cycles).

Figure 1. Map showing the route and cycles of the Glider during the first mission.

MONITORING OF THE ALBORAN WEST GYRE (SST)

- The West Alboran Gyre (WAG) was first monitored using satellite sea surface temperature (SST) maps:
- characterised by warm waters (SST anomaly greater than 1°C in the core of the gyre, at the time of the mission).
- The satellite maps confirmed the presence of the anticyclonic structure, although its size and location varied over time (Figure 2).
- The information was used in real time by the glider pilots. The objective was to cross the GAF, passing approximately through its centre. At the end, two transects were made (Figure 2).

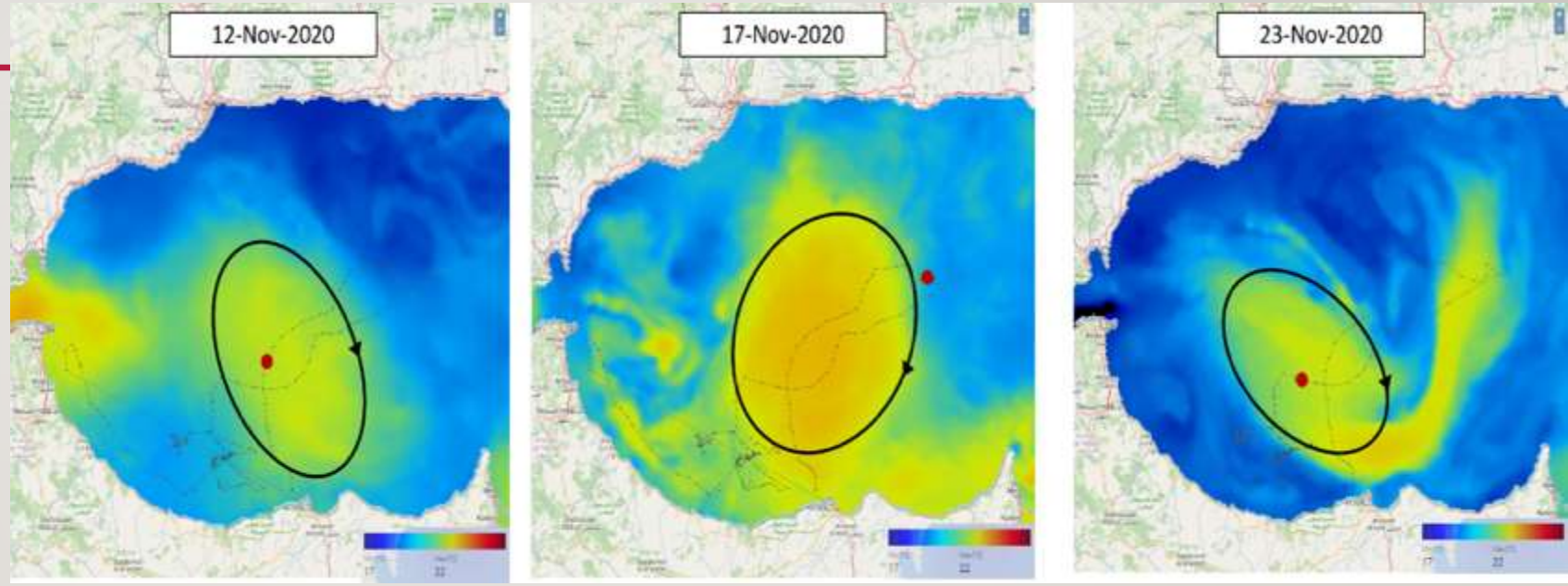


fig 2 : carte de la SST (données téléchargées sur https://marine.copernicus.eu/)et trajectoire du planeur. La position du planeur sur la date de la carte est indiquée par le point rouge.

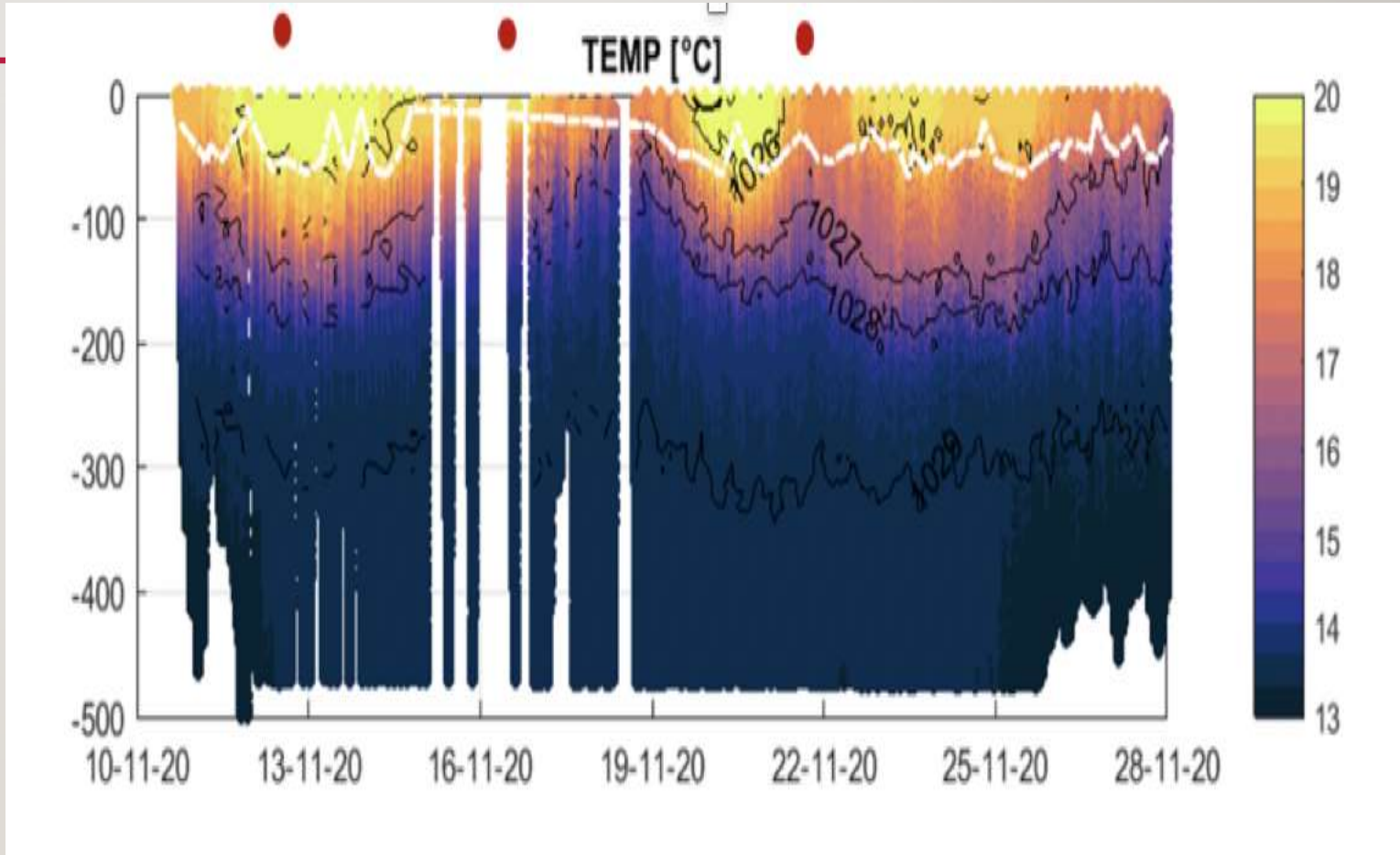
GLIDER RESULTS: GPCTD DATA

Temperature and salinity data acquired during the first part of the mission.

The black lines are the isopycnal levels

the white dotted line is the depth of the mixed layer (density criterion of 0.003 kg.m-3).

The red dots are related to the same profile as in Figure 2.

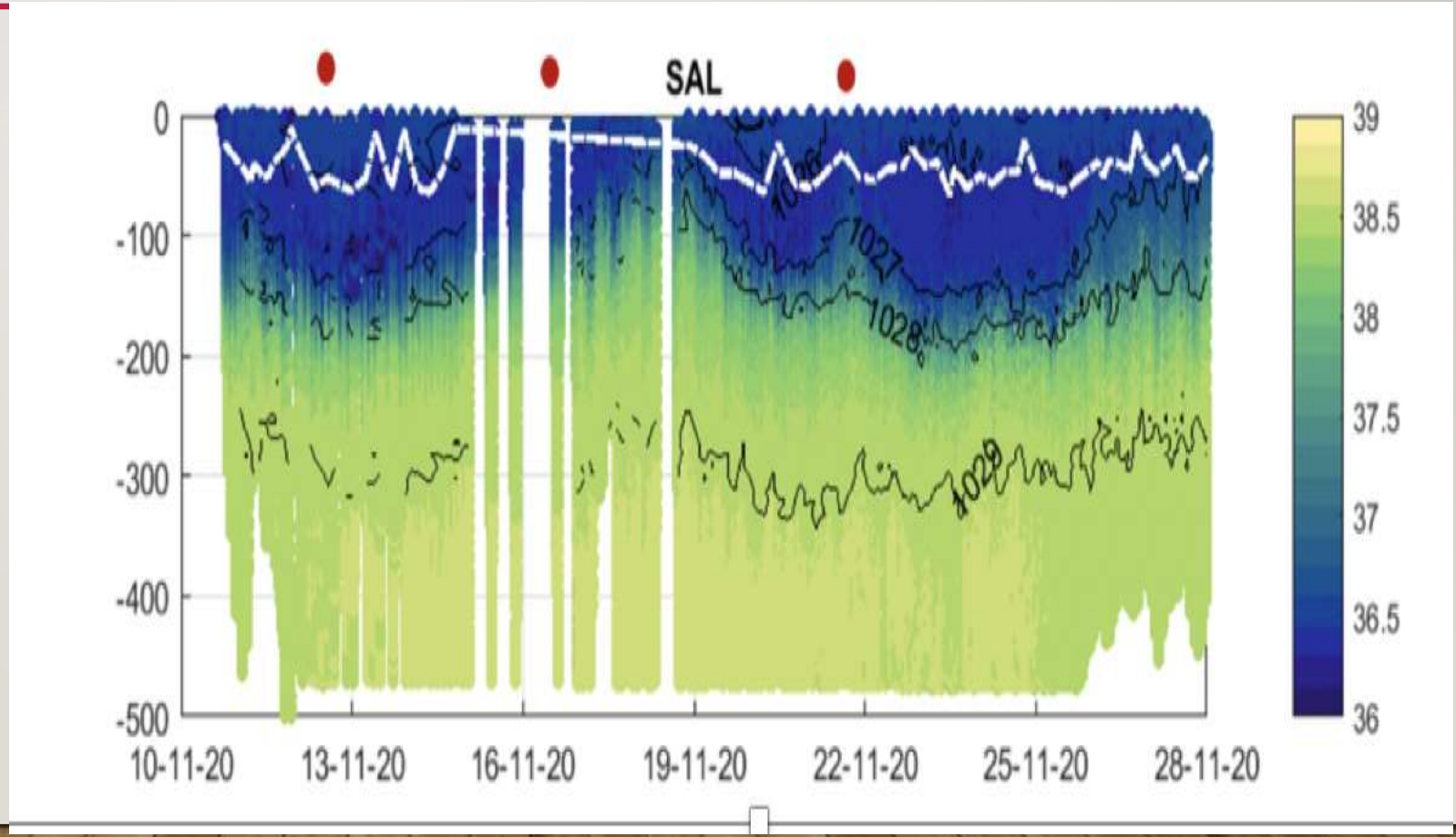


RESULTS OBTAINED WITH THE GLIDER: GPCTD LA VERTICALE DATA

However, the glider data show a great deal of variability, specifically in the first 300m of the water column.

Isopycnic vertical excursions can be observed (black lines in Figure 3) which are directly related to the position of the glider with respect to the GAF.

At the time the glider is located in the GAF, the surface waters are warm (>20°C) and relatively cool (<36.5), down to about 150m depth.



WATER FLOW DATA

- At the surface, the measured velocities are high, even offshore, and can reach up to 1 m.s-1,
- In the subsurface, the average value of the current in the 0-500 m layer is between 0.05 and 0.3 m.s-1, which represents a rather high challenge for glider navigation.
- (These values can be compared with the horizontal speed of the glider ~0.2-0.3 m.s-1).

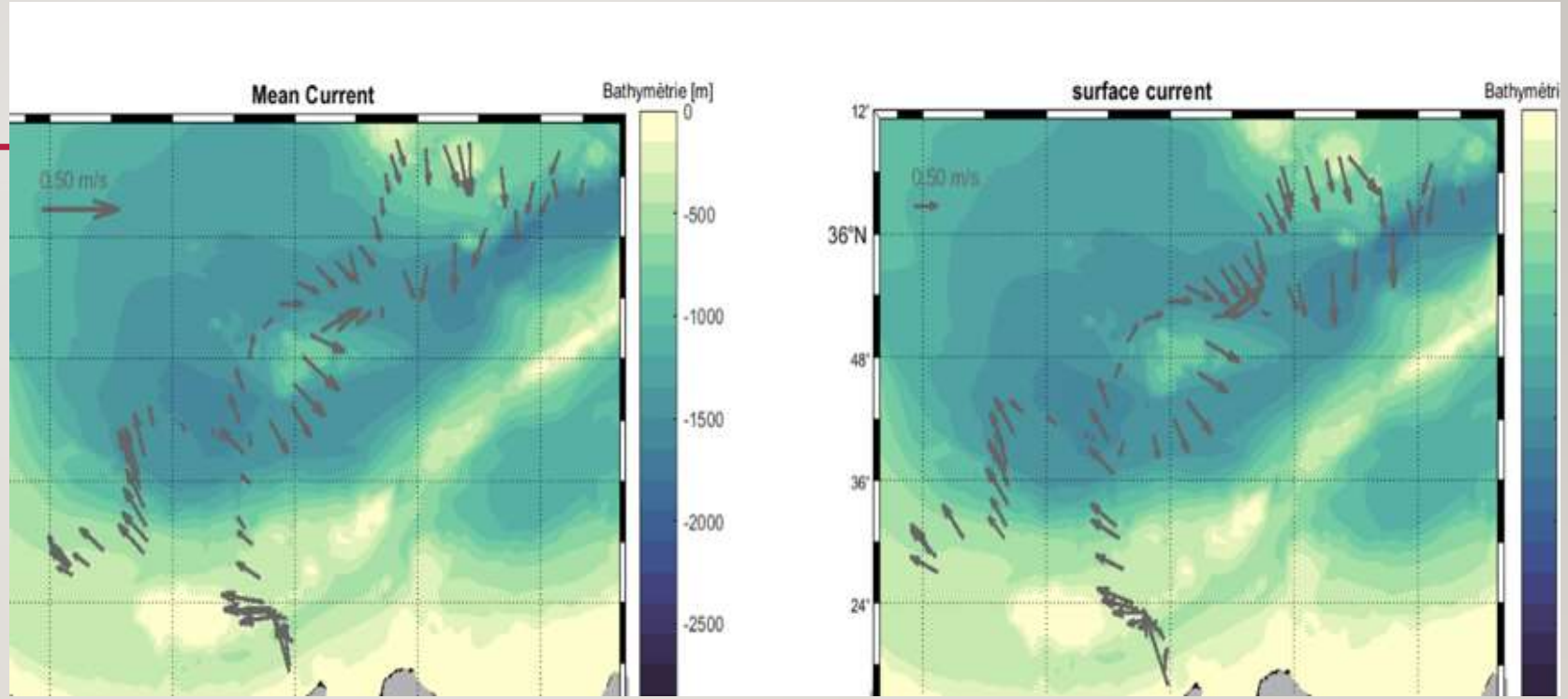


Figure 4: Map (left) of mean current from dead reckoning and (right) of estimated surface current from GPS position. The colour bar indicates the bathymetry (EMODnet).

WATER-CURRENT DATA : CONFIRMATION OF THE PRESENCE OF THE WAG

- The rotating structure of the current again confirms the presence of the WAG.
- The WAG plays a key role in the dynamics of the whole area.
- the strong westward coastal current observed at low bathymetry, when the glider approached the coast.

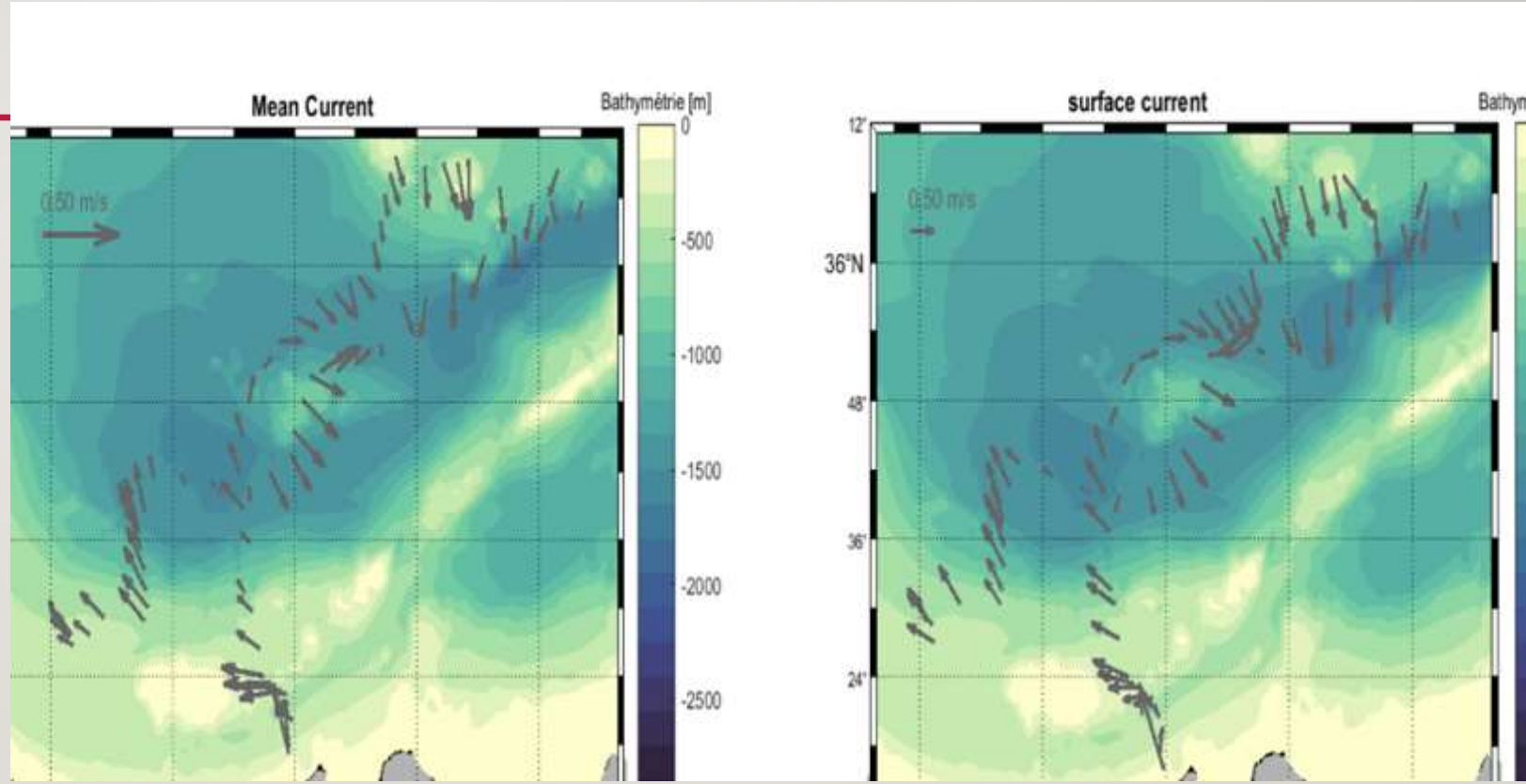


Figure 4. map of (left) average current from dead-reckoned track and (right) surface current estimated from GPS position. The color bar indicates bathymetry (EMODnet).

CONCLUSIONS

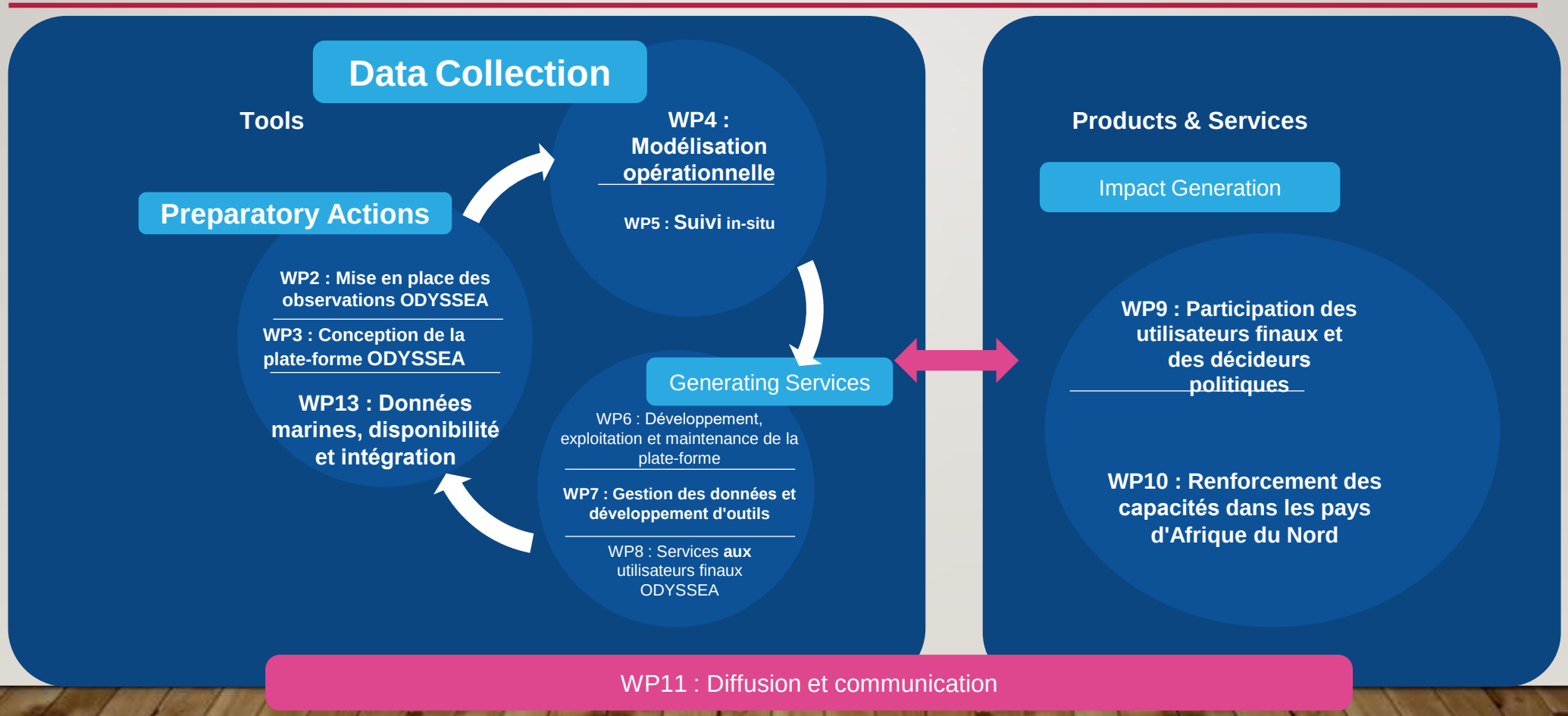
- This glider mission, as such, can be considered of enormous interest given the amount of new data collected and the general scarcity of historical data in the southern Alboran Sea.
- This mission can also be considered as one of the very few works carried out on the GAF using in-situ measurements.
- The glider data provided crucial information that complemented the satellite observations and revealed the vertical structure of the GAF at an unprecedented spatio-temporal resolution.
- These results are a preliminary analysis. Further work is needed to fully investigate the mechanism involved, in order to reveal the suspected role of the WAG in homogenising the freshwater masses of the Atlantic jet with the warmer and saltier water masses of the Mediterranean,
- This mission also shows the great potential of the WAG to increase the resilience of the Alboran marine ecosystem to the effects of climate change.
- This mission also shows the great potential of using gliders in integrated, multi-platform marine observatories.

IMPLEMENTATION OF THE BALLAST WATER CONVENTION UNDER THE BARCELONA CONVENTION UNDER THE BARCELONA CONVENTION

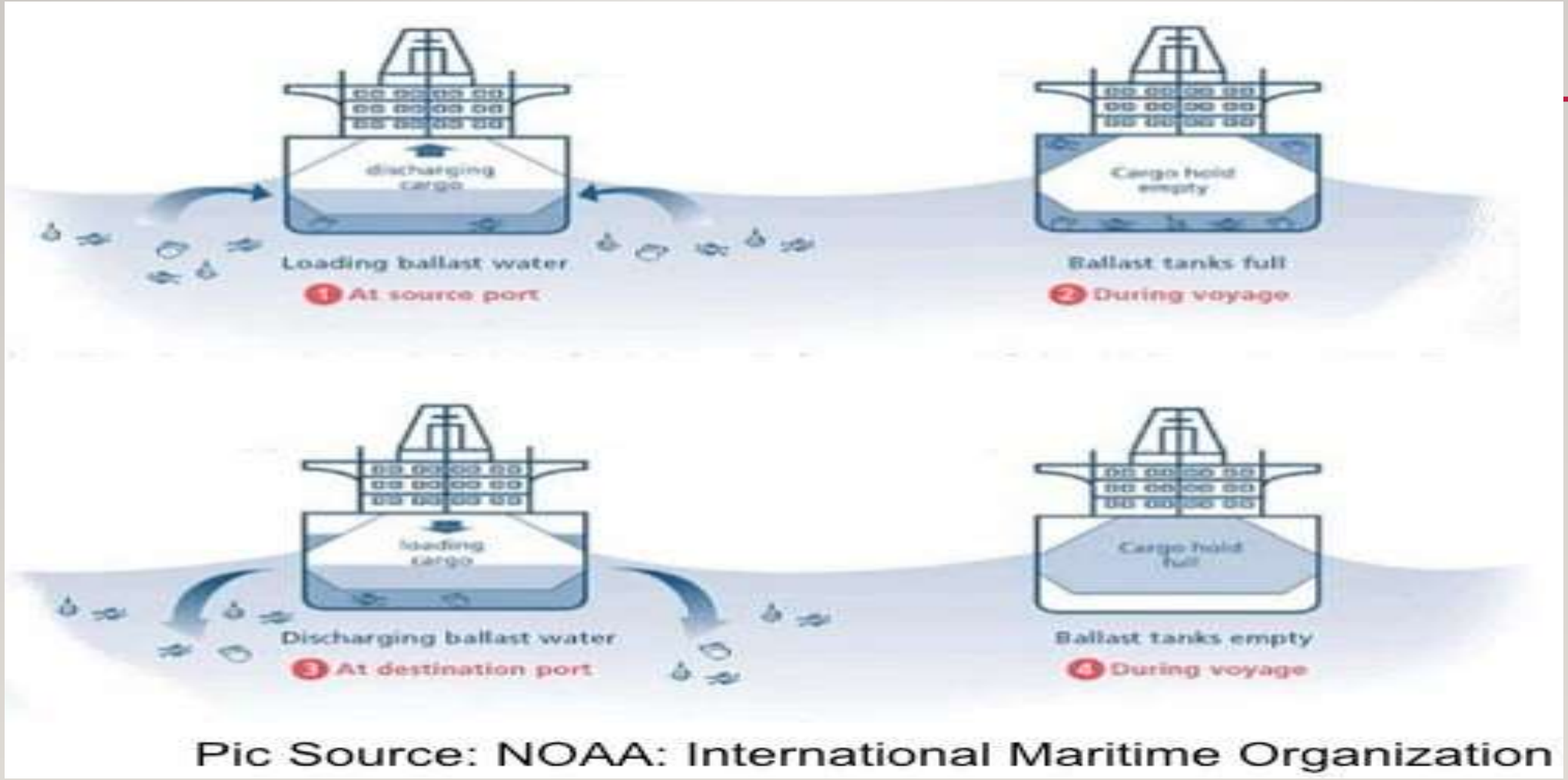
VALENCIA OBSERVATORY EXPERMENT

1. Project definition
2. Project environment
3. Project organisation
4. Programme

THE ODYSSEA PROJECT



BALLAST WATER



Pic Source: NOAA: International Maritime Organization

BALLAST WATER CONVENTION

Where (Regulation B-4) and how (Regulation D-1) exchange ballast water in the Mediterranean Area

- The IMO guidelines (G6) provide specific depth and distance from shore requirements for ballast water exchange (BWE)
- At least 200 nautical miles from the nearest land and 200 metres in depth
- At least 50 nautical miles from the nearest land and 200 metres deep (Regulation B-4).
- Special areas for BWEs could be designated in accordance with IMO guidelines (G14)

Exemptions to ballast water management (Regulation A-4) in the Mediterranean Area

- Under certain low-risk conditions, Regulation A-4 of the BWM Convention allows for exemptions from any requirements of Regulation B-3, ballast water treatment systems
- Or Regulation C-1, on measures complementary to those in Section B of the Convention.

Circumstances when ballast water management do not apply (Regulation A-3)

- Regulation A-3 states that "the discharge of ballast water and sediment from a ship shall be made at the same location from which all such ballast water and sediment originated and provided that no mixing with unmanaged ballast water and sediment from another area has occurred. If mixing has occurred, ballast water from other areas shall be subject to ballast water management in accordance with this Annex. The BWMC does not provide an exact definition of "same location", so this is a matter for regional discussion.

OBJECTIVE

The objective is to provide a tool for monitoring and driving harmonised implementation of the Ballast Water Convention in the Mediterranean basin. The data collected will provide relevant information to researchers and public authorities to assess and monitor the impact of invasive alien species (IAS) in local ecosystems.

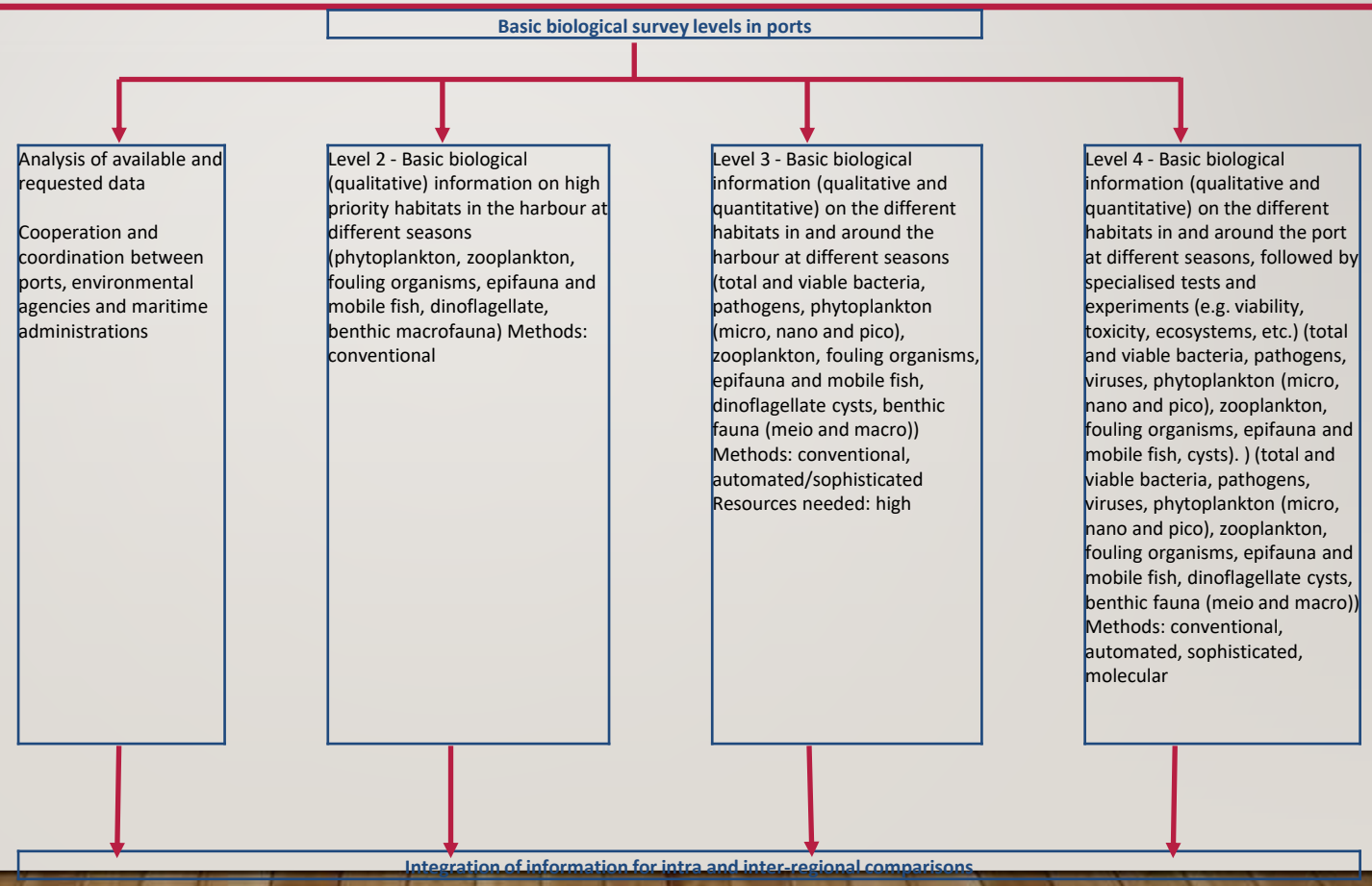
Activities include :

- **Coordination between stakeholders and interested parties for the development of common procedures in the Mediterranean: reaching a common agreement at least between the main Mediterranean ports (Algeciras, TangerMed and Valencia in a first phase. Piraeus in a second phase)**
- **Data collection procedure (administrative and technical): Sampling instruments and methods.**
- **Analysis and storage of data. Risk of transfer of invasive species through ballast water.**
- **Staff training**

BASELINE SURVEY

WP2/9

1. Analysis of available and requested data
2. Cooperation and coordination between ports, environmental agencies and maritime administrations



TESTING AND SAMPLING

WP2/9

1. Analysis of available and requested data
2. Cooperation and coordination between ports, environmental agencies and maritime administrations

ODYSSEA scope includes (at least) sampling of 3 sampling points located inside the port of Valencia.

1. Analysis of organisms in the water column:
   - Pathogenic bacteria: Vibrio cholerae, intestinal enterococci and E.coli.
   - Phytoplankton.
   - Zooplankton.

2. Analysis of benthic organisms (from below) :
   - Infauna (soft substrate organisms).
   - Epifauna (bottom-dwelling organisms).
   - Fouling organisms.

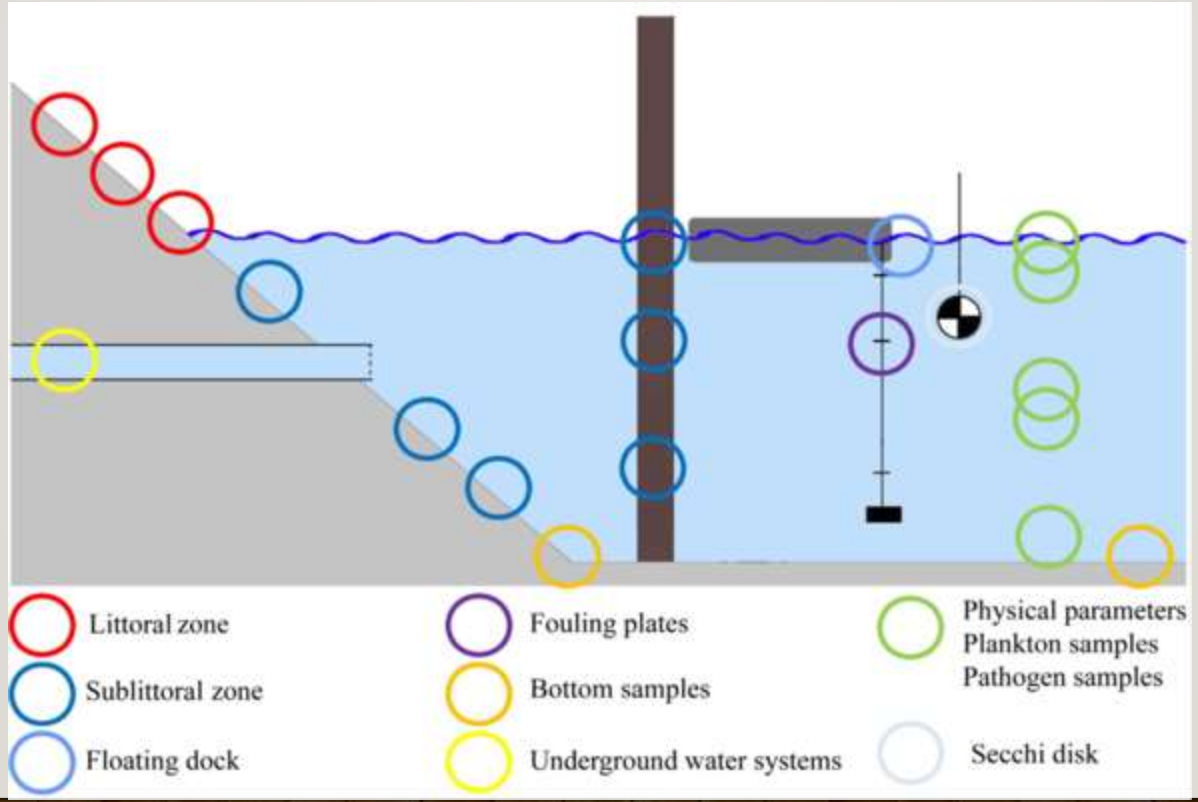
3. Sampling frequency :
   Quarterly for water.
   Annually for benthic organisms.

NOTE: Water quality data will be provided by the Port Authority of Valencia

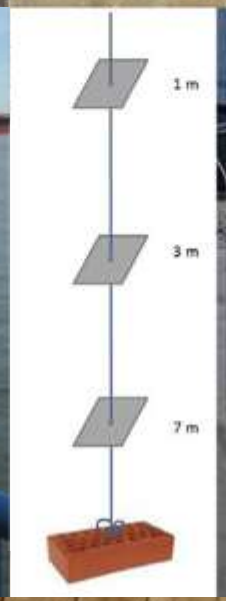
RESEARCH LOCATIONS

HABITAT RESEARCH FOR SPECIES

HELCOM/OSPAR PROTOCOL



SURVEY METHODS



WORKING GROUP ROLE

WP4

1. Definition of testing protocols
2. Monitoring port waters at the Port of Valencia
3. Definition of risk assessment algorithm
4. Implementation on the platform.

IWG members are expected to work closely together, contributing their knowledge and expertise in developing a common approach to defining protocols for granting exceptions and assessing the same potential risk areas. In particular, IWG members will contribute:

1. **Definition of test protocols for the Mediterranean basin to compare different ports in terms of AIS**
   Data to be collected (suggestion: keep to the minimum to facilitate proper implementation.
   Standard procedures for testing and data collection
2. **Port water monitoring at least in the port of Valencia**
3. **Risk assessment algorithm in accordance with Resolution MEPC.162(56) :**
   HELCOM/OSPAR
   GLOBALLAST
   NOTE: Others are outside the scope of the Odyssea Project
4. **Implementation on the platform**
   Validation will be done with data provided at least by the ports of Valencia, Las Palmas, Rotterdam

Information on ports and species: species risk level

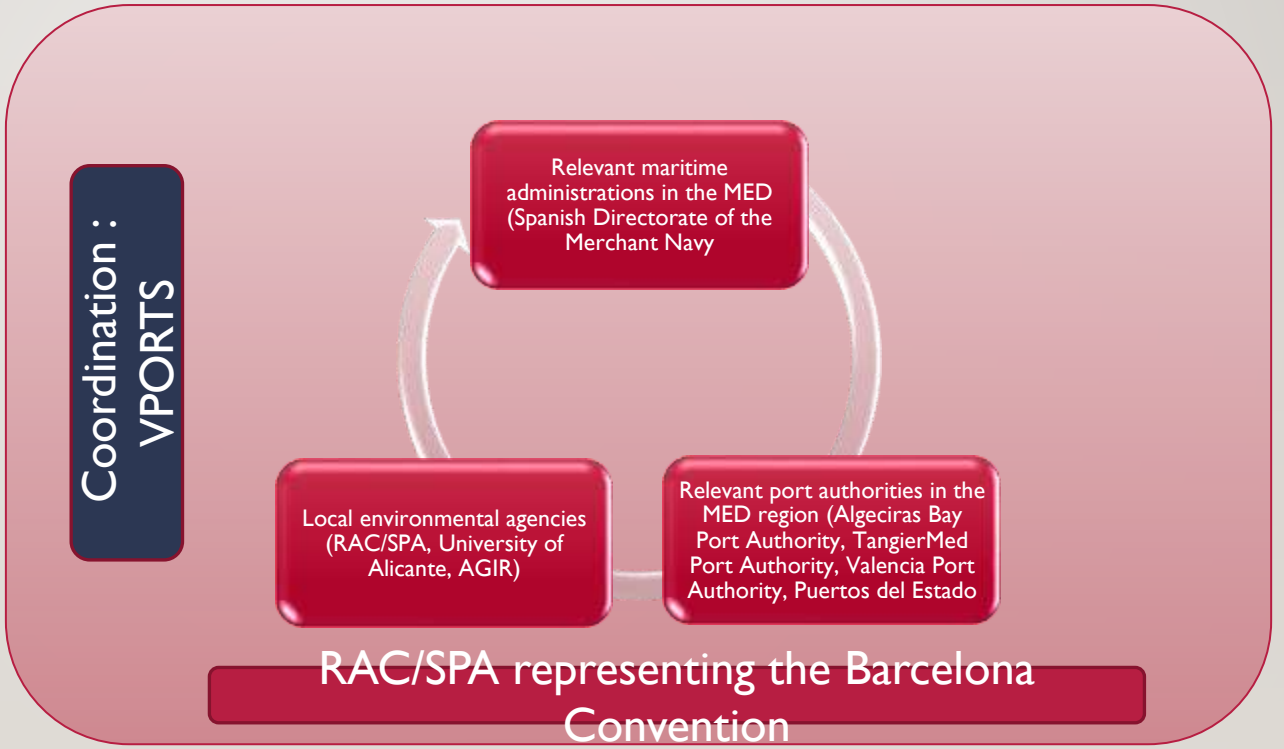
1) Potential for dispersal or invasiveness
2) Colonisation of high conservation value habitats
3) Adverse effects on native species
4) Alteration of ecosystem functions
5) Effects on human health
6) Effects on natural resources (e.g. fisheries)
7) Effects on property (e.g. cooling systems)
8) Dispersed by ballast water or sediment

INSTITUTIONAL WORKING GROUP

WP2/9

1. Analysis of available and requested data
2. Cooperation and coordination between ports, environmental agencies and maritime administrations

Establishment of an Institutional Working Group (IWG)



THEMATIC WORKSHOP PROPOSED

- Definition of the port inspection protocol: survey design, site selection, sampling frequency, etc.

- Sampling processing, analysis and reporting
- Criteria for selection of target species
- Risk assessment algorithm
- Decision support tool: information required for the database, data model, data input file, etc.
- Exemption protocol and clarification of same location
- Survey on costs and sharing mechanisms
- Awareness and training programmes