SHAREMED
First Capitalisation Workshop

Designing the future system of observing systems to assess and address threats to the Mediterranean marine ecosystem - State-of-the-art, needs and future direction

Webinar: 14-15th December, 2020

Béchir Béjaoui, Maher Bouzaiene, Khouloud Athimen, Fehmi Dilmahmod

Co-evolution of coastal human activities & Med natural systems for sustainable tourism & Blue Growth in the Mediterranean: Co-Evolve4BG

Co-Evolve4BG INTRODUCTION

PROJECT OBJECTIVE

Co-Evolve4BG project aims at analyzing and promoting the co- evolution of human activities and natural systems in touristic coastal areas, allowing sustainable development of touristic activities based on the principles of ICZM/MSP and promoting Blue Growth in the Mediterranean.

FINANCIAL DATA

Total budget: **2.9 M €**
Funded by: **ENI-CBC-MED**

PARTNERS

9 Partners
Lead beneficiary: **INSTM**, Tunisia

PROJECT DURATION

Start date: 01 September 2019
End date: 31 August 2022

GEOGRAPHIC EXTENSION

Tunisia – Italy – Greece
Spain – Lebanon

ACCEPTED OUTPUTS

Integrated analysis of Threats and Enabling factors favouring sustainable Coastal/Maritime tourism at Mediterranean level

Pilot Actions for the development of sustainable tourism in the pilot areas

Toolkit containing indicators to analyse the level of sustainability of Coastal/Maritime tourism

NUMERICAL MODEL

Model configuration

- High resolution model in near-real time
- Data source: NOAA, Simple Ocean Data Assimilation (SODA), Copernicus, AVISO+, ERA-Interim, GLORYS, ...
- The topographie is preformed by merging GEBCO dataset and in-situ data measurements (https://www.gebco.net)
- The simulation is forced by the atmospheric data National Center for Environmental Prediction (NCEP) obtained from National Oceanic and Atmospheric Administration (NOAA)
- In order to reproduce the reality, we are forcing the model at the boundaries by Simple Ocean Data Assimilation (SODA) data available on NASA and NOAA websites.

Temporal scale:

- Hourly, Daily, Monthly, Yearly
- Long simulation: 10 years or more

Variables used includes

- Currents
- SST
- SSH
- U, V velocity components
- Chlorophyll -a
- Vorticity

Horizantal Spatial scale:

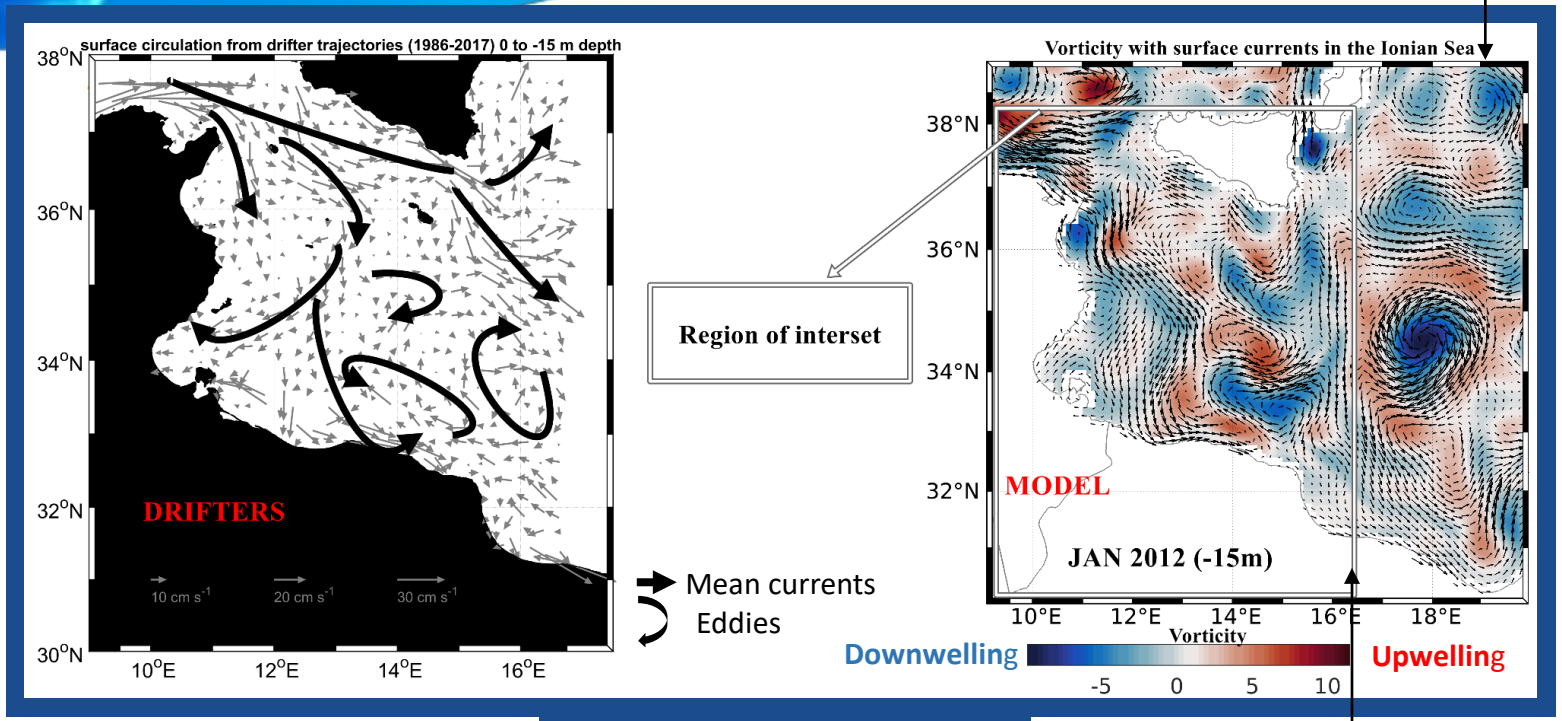
- **28 km** in the Ionian sea including the Tunisian coast
- **2,7 km** along the Tunisian boundaries including gulf of Gabes

Vertical Spatial scale:

- 20 vertical levels were parametrized using the σ-coordinate (~1m at the surface layer)

MODEL OUTPUTS

The mean surface circulation is obtained for a large period (1986 – 2017) using drifters tracks. Available at: OGS website: https://www.inogs.it/ (See for details: Poulain et al, 2012; Menna et al, 2019; Bouzaiene et al, 2020)



Snapshot of the surface circulation with the relative vorticity obtained by the model simulation for January 2012

It can be used to detect pollutant dispersion

Far from zero two tracers will move away from each others

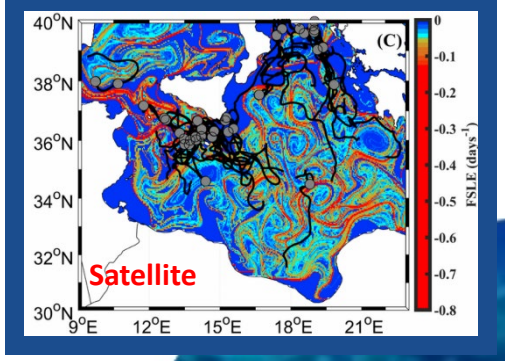
Equal to zero the traces will still where they are located

Vort > 0 => Divergence (cyclonic-eddies)→ **Upwelling**

Vort < 0 => Convergence (Anticyclonic-eddies) → **Downwelling**

FSLE + drifter tracks by adopting to the Bouzaiene et al, (2020) approach

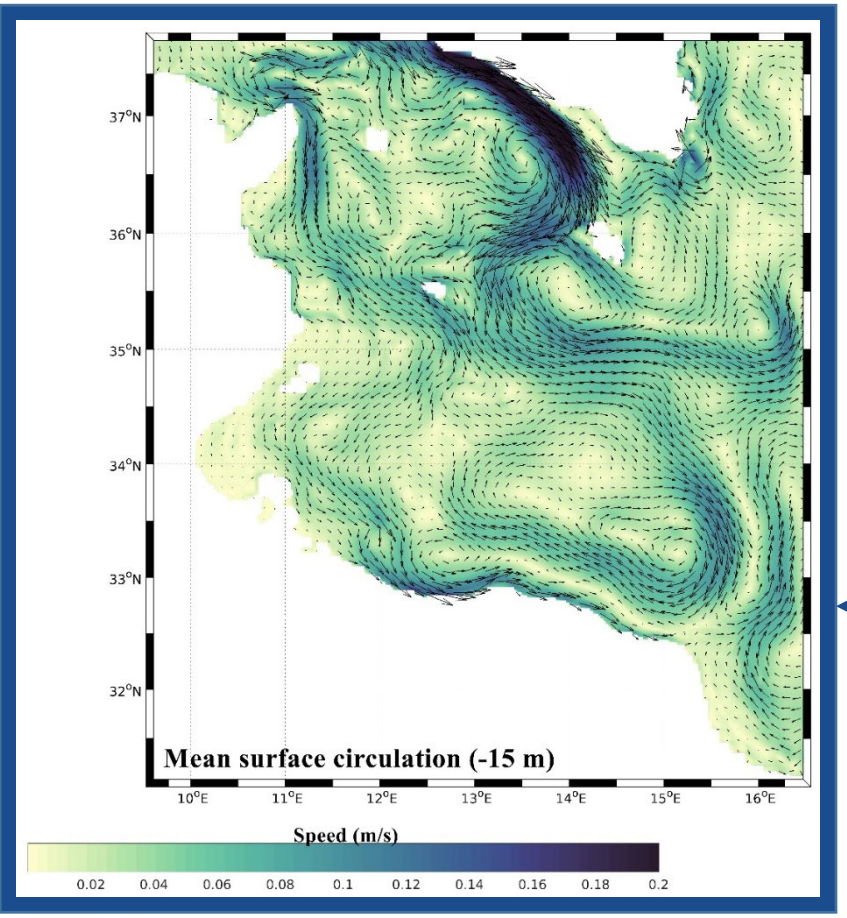
Available on : https://www.aviso.altimetry.fr



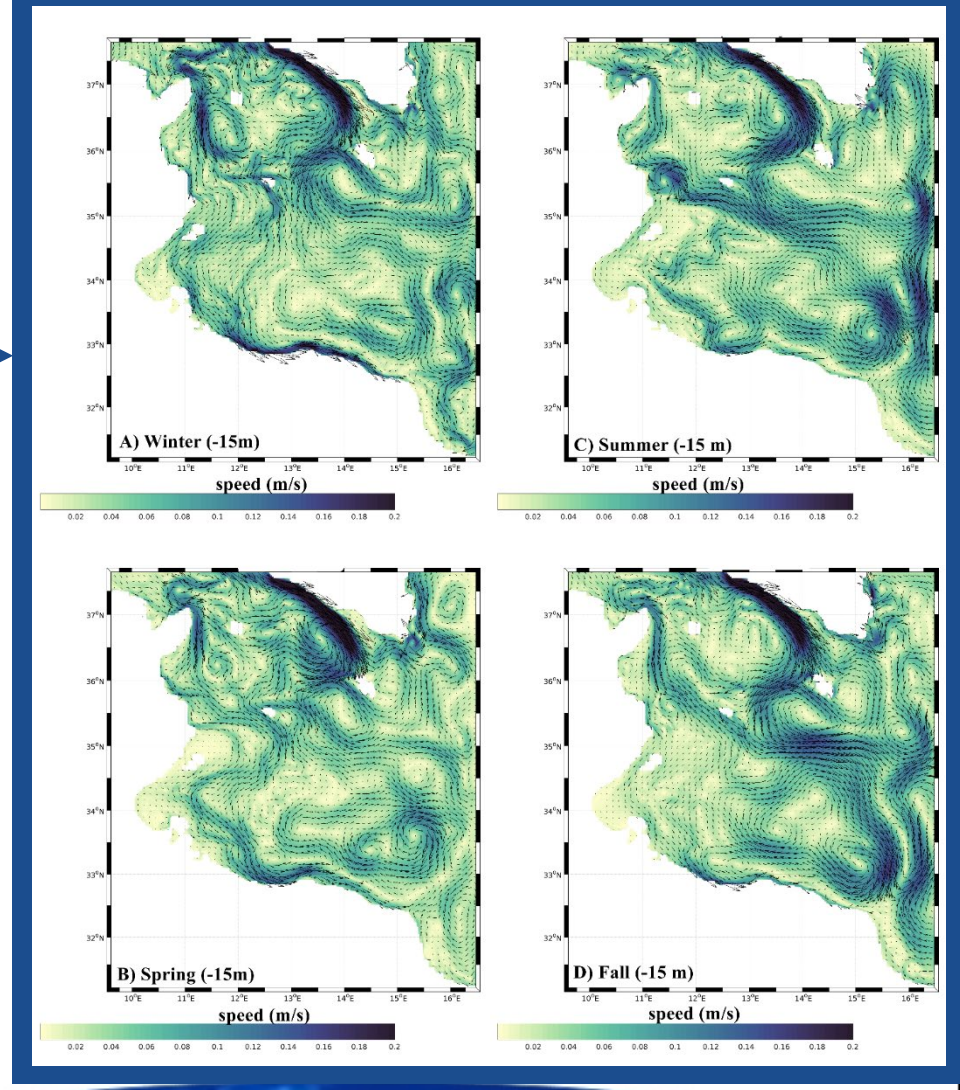
Selected as the image of the month December 2020 on AVISO website

MODEL OUTPUTS

Inter-annual and seasonal variability of 10 years of simulation run

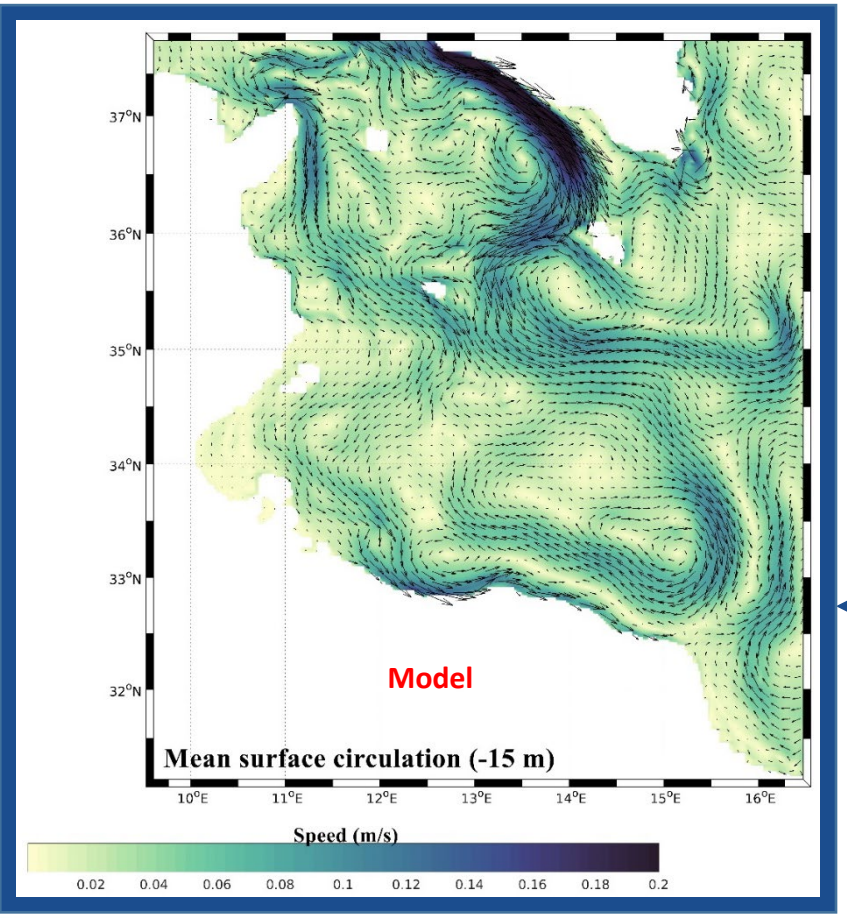


- Seasonal variability of the model
- High resolution (2,7 km)



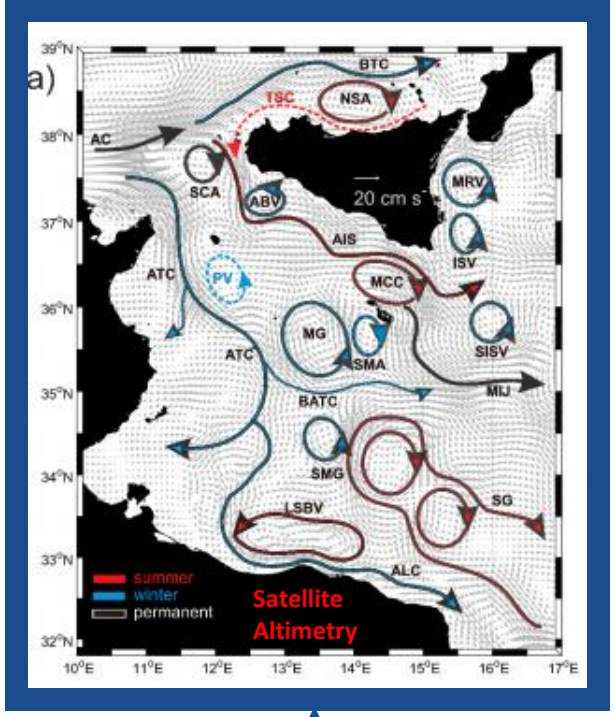
- Mean surface circulation at -15 m depth for the 10 years of the climatological run
- High spatial resolution (2,7 km)

MODEL OUTPUTS



Quite satisfactory between the model and previous studies (See for details Menna et al. (2019))

The model detected the mean coherent structures in the region of interest

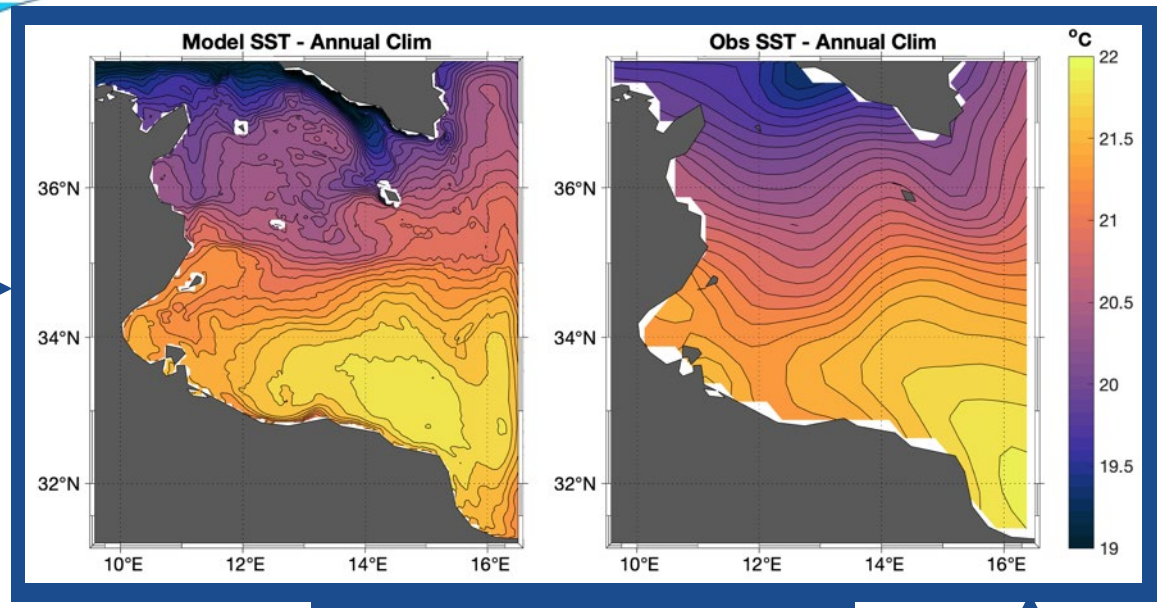


From Menna et al. (2019)

- Mean surface circulation at -15 m depth for the 10 years of the climatological run
- High spatial resolution (2,7 km)

MODEL OUTPUTS

Model results



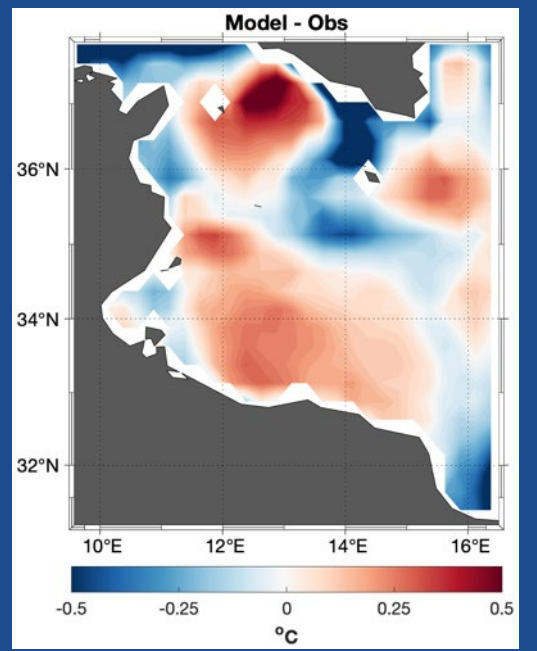
The data generated by the High resolution numerical model

VS

AVHRR In-situ data

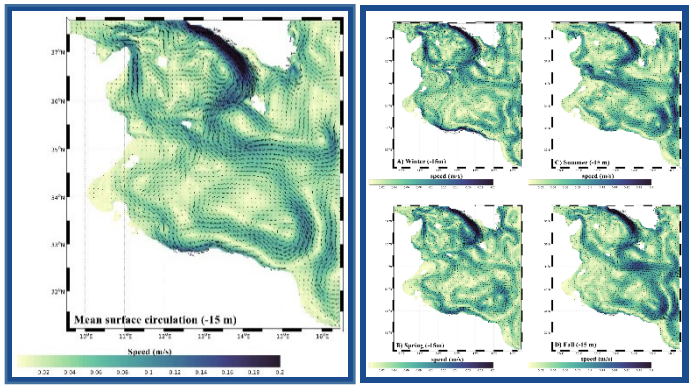
SIGNIFICANT AGREEMENT

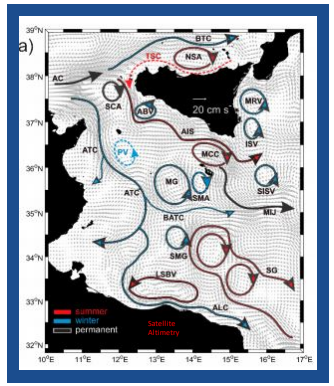
SST difference between the **Model** and AVHRR (0–0,5°C)



Remote Sensing **A**dvanced **V**ery **H**igh **R**esolution **R**adiometer (**AVHRR**)

BENEFITS OF THE MODEL





The model reproduces the reality and answers to complex questions related to the threats and risks (Pollution, Marine species contamination, biodiversity distribution, …) in the Mediterranean sea (Gulf of Gabes)

- Dispersion of pollutant (oil, chemical wastes, …) in the gulf of Gabes,
- Sediment transport in the gulf of Gabes zoom into Djerba island,
- Explore the biodiversity productive areas by identifying the nutrient-rich upwelling, phytoplankton, fish eggs, larvae, jellyfish

CONCLUSION AND PERSPECTIVES

Conclusions

- We built a high resolution configuration in the Gulf of Gabes and Tunisian coast based on high resolution numerical model
- Comparison between the model and drifters, satellite AVHRR reveals a quite satisfactory agreement at the surface layer
- Accuracy of the results generated by the model
- Promote the knowledge of co-evolution of human activities and natural systems in the coastal areas (gulf of Gabes, Djerba island: sediments dynamics)

Perspectives

- Improve the resolution from ~ 2,7 km to ~ 1,5 km
- Coupling the physical model with Biogeochemical model
- Detect the sediment transport by using the nesting capability in the Djerba island

THANK FOR YOUR ATTENTION

bejaoui.bechir@gmail.com
maherbouzaiene73@gmail.com

http://www.enicbcmed.eu/projects/co-evolve4bg

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