

LAgrangian transport of MARIne litter from modeling, analysis, and observations in CoAstal waters: Observation and monitoring in the Bay of Biscay and Balearic Sea coastal areas. LAMARCA-OMO

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LAMARCA



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Context – LAMARCA project

AIM: Role of oceanic transport processes in marine litter dispersion?

Special emphasis on coastal zones and in the range of scales from 1 m to 10 km, where the vertical motions by marine currents play a relevant role.

- ✓ microplastics (< 5mm) + marine litter (> 5mm)
- ✓ ad-hoc observational surveys + very fine numerical simulations → connectivity patterns and structures of transport
- $\checkmark\,$ surface, the water column and the seafloor

Schematic of the physical processes that affect the transport of plastic items (Van Sebille et al., 2020) 26 PHYSICAL PROCESSES Continental She A Large-scale open ocean processes В Submesoscale open ocean processes Open ocean Stokes drif Internal tides Direct wind transport (windage) F Langmuir circulation G Vertical mixing

Н

Ice formation, melting and drift River plumes and coastal fronts

Extreme events Transport by biology

Coastal currents, surface waves and beaching







Sea floor depth

500m

>1.000n

LA MAR

CA

Littoral

LAMARCA – OMO (SP3)

✓ Two study areas

SE Bay of Biscay



LAMARCA-MODS (SP1)

Modeling, scale dependence and descriptors of frontal flows

LAMARCA-SC (SP2)

Structures of transport and connectivity patterns

LAMARCA-OMO (SP3)

Observation and monitoring in the Bay of Biscay and Balearic sea coastal areas.

AIM OMO : in-situ sampling aimed at characterizing the composition, spatial distribution, frequency, lifetime, origin, and factors/physical processes conditioning the macroand meso/micro-litter accumulations along frontal areas at different spatiotemporal scales



West Mediterranean Sea

1 – BOBLIT sea surveys + opportunity surveys BIOMAN &

2 – MEDLIT sea survey in **July 2025**







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SE Bay of Biscay

Work done so far – OMO Sea Surveys (I)

BOBLIT 0.1 (April 2022) BOBLIT 0.2 (October 2022)

- Test different options for frontal line Lagrangian sampling : drifter clusters vs. drifters along transects
- Surface drifters without and with (50cm) drogue
- Insight on the main circulation and aggregation patterns in the area
- Multiplatform approach, combining drifters, in-situ current measurements (ADCP and radar) & satellite observations (and models)















SE Bay of Biscay

Work done so far – OMO Sea Surveys (II)

BOBLIT 1.0 (June 2024) BOBLIT 2.0 (July 2024)

 Regular sampling along a 10-kilometer transect near the France-Spain boundary (litter-free control area)

- Adaptive sampling in coastal current convergence structures accumulating significant loads of floating marine litter and foam
- Suface drifters deployed by pairs (without and with drogue) in litter-free control area vs. drifters deployed along different convergence structures
- Multiplatform approach, combining drifters, in-situ current measurements (CTD and radar) & satellite observations (and models)











Opportunities for collaboration (I)

- 1. LAMARCA web site For updates you can follow #LAMARCA_project in Linkedin and X
- 2. LAMARCA TOOL a collaborative Github tool (in progress)
- 3. Upcoming MEDLIT survey July. 2025, Ibiza Channel)
 - Hydrography & hydrodynamic samplig
 - Surface and subsurface plastic sampling
 - Surface drifters in aggregation structures
 - Lagrangian diagnostics & other exiting data (HF radar, satellite, models)



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Lagrangian approach

DOWNLOAD

Biscay from observational data and a





DOWNLOAD



Sciences Meeting 2024

LAMARCA presentation for Ocean

Outcomes

LAMARCA presentation for XVII Jornadas Españolas de Ingeniería de Costas y Puertos 2024 by AZTI.

Presentation



DOWNLOAD

https://lamarca-project.eu/

LAMARCA tool



Welcome!

This is the software platform for the transference of the results of the LAMARCA project.

LAMARCA tool contains customized data products and methods designed for the integrated management of coastal areas, focusing on the dispersion and accumulation of marine litter.

LAMARCA tool is composed by the following solutions:

- Real time metocean observations and forecasts
- Gap filling tools for HF radar data
- Lagrangian models
- Lagrangian analysis tools for Lagrangian coherent structures (LCS) and Lagrangian divergence
- Marine litter data, paths and hotspots
- Table of Contents
- Ω Tip

These solutions are available in AZTI's github repository and the Getting Started Guide is readily available here.

https://github.com/Fundacion-AZTI/LAMARCA/tree/LAMARCA main







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PUBLIC RESULTS

Opportunities for collaboration (II)

- 4. Analyses of Microplastic samples (2025-2026) Collaboration for optimized processing of the samples at lab
- 5. Scholarship last year of University/Master Degree opportunity (IMEDEA, 2025) Preferential concentration of microplastics in the water column and its impact on marine ecosystems. JAE Intro ICU 2024. Directors: Alejandro Orfila and Ismael Hernández
- 6. Doctoral opportunity (AZTI, 2025) Investigating the physical

processes behind the 3D distribution of plastic pollution in coastal waters of the SE Bay of Biscay. Predoctoral programmes of the Basque Government (residency in BC conditions). Possible evaluation of candidatures for FPU fellowships. Director: Anna Rubio

7. Postdoc position - (IFISC, tbd) Working on the use of Lagrangian tools from complex systems to characterize marine connectivity and mixing. Directors: Cristobal López and Emilio Hernández







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https://lamarca-project.eu/ Acknowledgments MAR **MINISTERIO** DE CIENCIA **E INNOVACIÓN** ESTATAL D Grant PID2021-123352OB-C31, C32 and C33 funded MCIN/AEI/10.13039/501100011033 and by ERDF A way of making Europe FISC CSIC imedea BASQUE RESEARCH & TECHNOLOGY ALLIAN

- BOBLIT 0.X surveys were funded by the #ebegi project (Basque Government). Thanks to the EKOCEAN and Itsas Beñarra crew! #hfradar is part of the <u>euskoos.eus</u> observatory by @azti_brta & @euskalmet.
- French LEFE program DYCOLAG -DYnamique CÔtière à sous-mésoéchelle caractérisée par des mesures LAGrangiennes support the work of ULCO team
- > The work of **Sloane Bertin**, is done under a co-funded Phd between AZTI and ULCO





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