

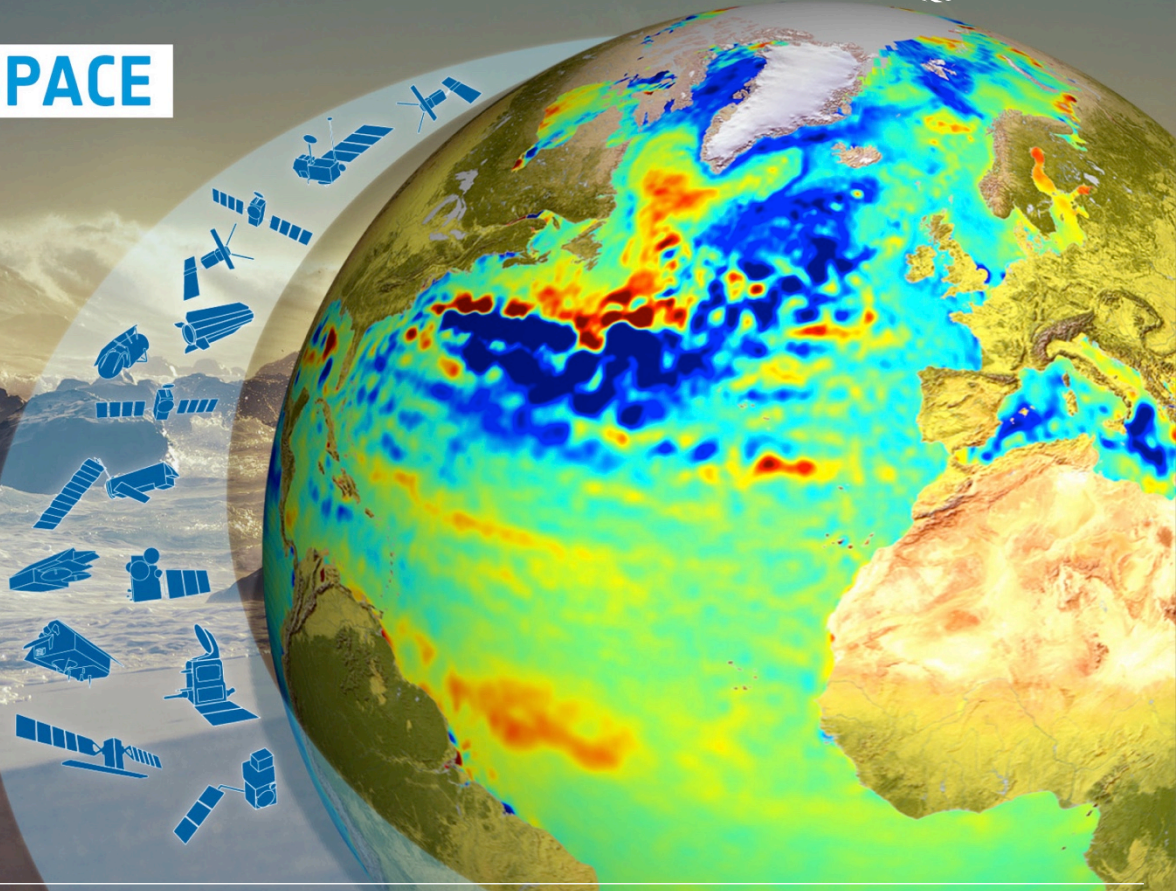
→ ATLANTIC FROM SPACE WORKSHOP

23–25 January 2019
National Oceanography Centre
Southampton, UK

Marine litter monitoring
IFADO project

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NOVELTIS





IFADO (Innovation in the Framework of the Atlantic Deep Ocean) aims to create marine services at regional and subregional scale using the EU Atlantic Waters as case study.

MFSD implementation : 11 MSFD descriptors to guide evaluation of GES ensuring sustainable use of the sea's natural resources

NOVELTIS is involved in modelling, tracking and highlighting pathways and residence locations of marine litter in the Atlantic ocean.

A Lagrangian modelling tool (**Opendrifter**) is fed with global ocean current derived from satellite observations (**GlobCurrent products**)

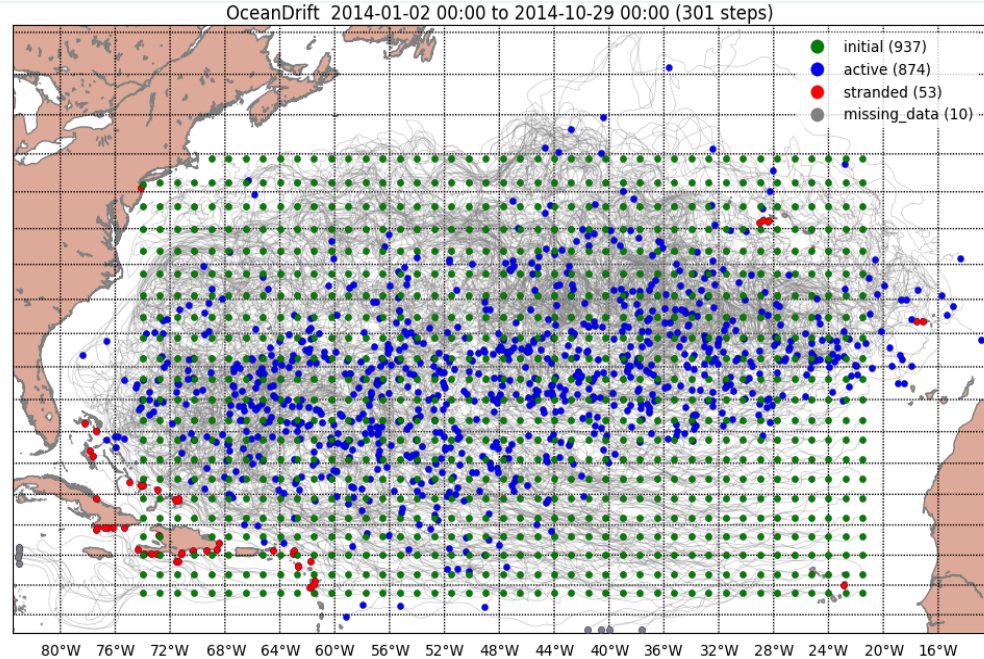
Opendrift is an open-source Python-based framework for Lagrangian particle modelling

Input:

Ocean current data are used to compute particles trajectories

Output:

Animation with particles positions every time step
 NetCDF file with particles trajectories at each time step



GlobCurrent is an European Space Agency (ESA) project.

Estimates of ocean surface current are derived using various satellites techniques including altimetry, SAR, scatterometry... This service is free of charge.

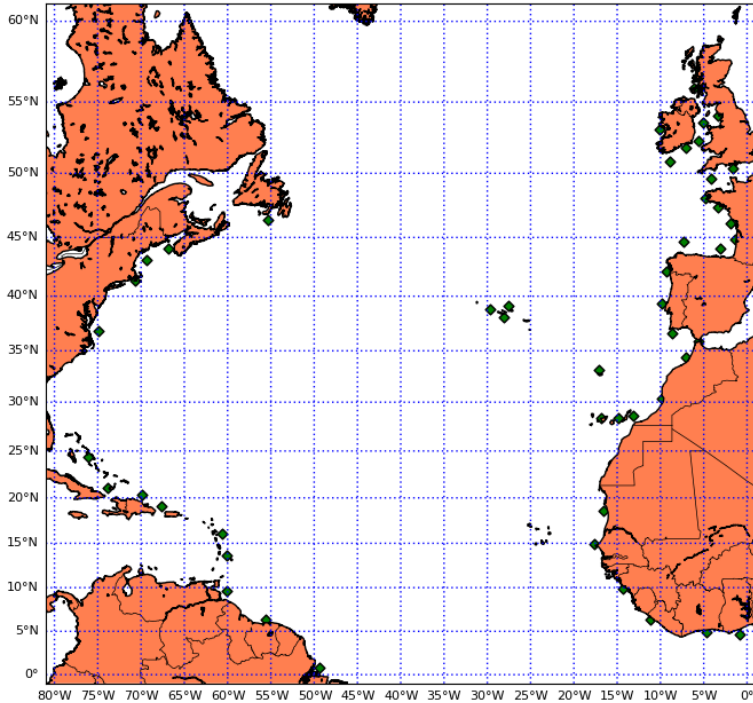
These measurements are completed by sparse in-situ measurements from buoys, coastal installations, gliders or ship observations.

A GlobCurrent portal allows a pre-viewing of the desired data, at <https://globcurrent.oceandatalab.com>

In the frame of IFADO, globcurrent data have been interpolated to a **1/12°** resolution grid and the **tidal current component** has been added to the data for coastal investigations.

Comparison have been carried out with ocean circulation model analyses (CMEMS).

Marine litter: 20% already at sea, 80% come from land



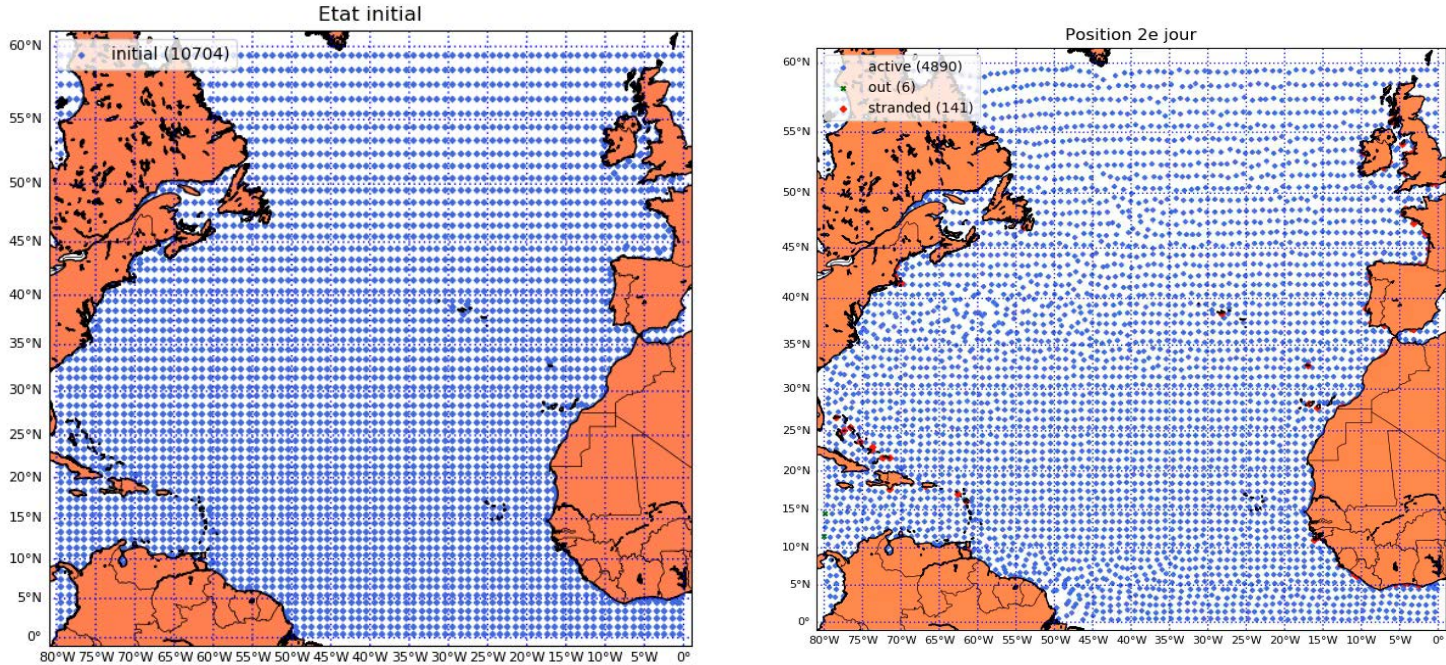
Initialization of particles:

- Initial grid + periodic release along coasts
- Only periodic release along coasts

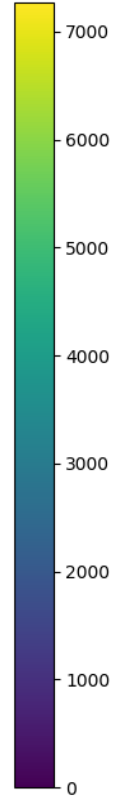
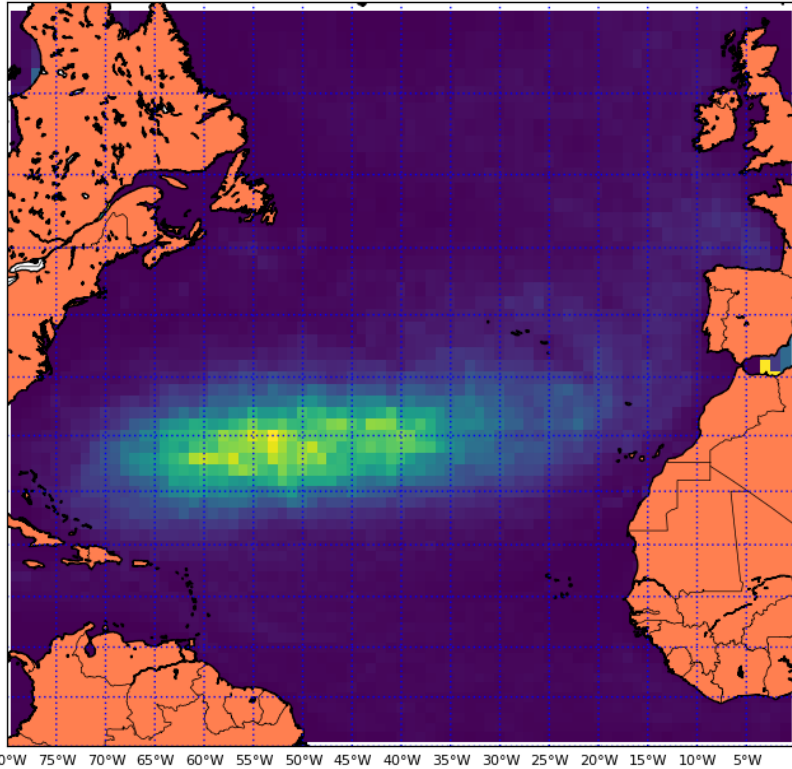
Simulations:

- Long period, without tides: highlight **convergence zones**
- Short period, with tides: highlight **pathways, tidal influence, coastal behaviour**

Globcurrent without tides :



- Initial $1^\circ \times 1^\circ$ grid of particles + 10 days release along coasts
- 3 years simulation in order to highlight convergence zones in the Atlantic Ocean

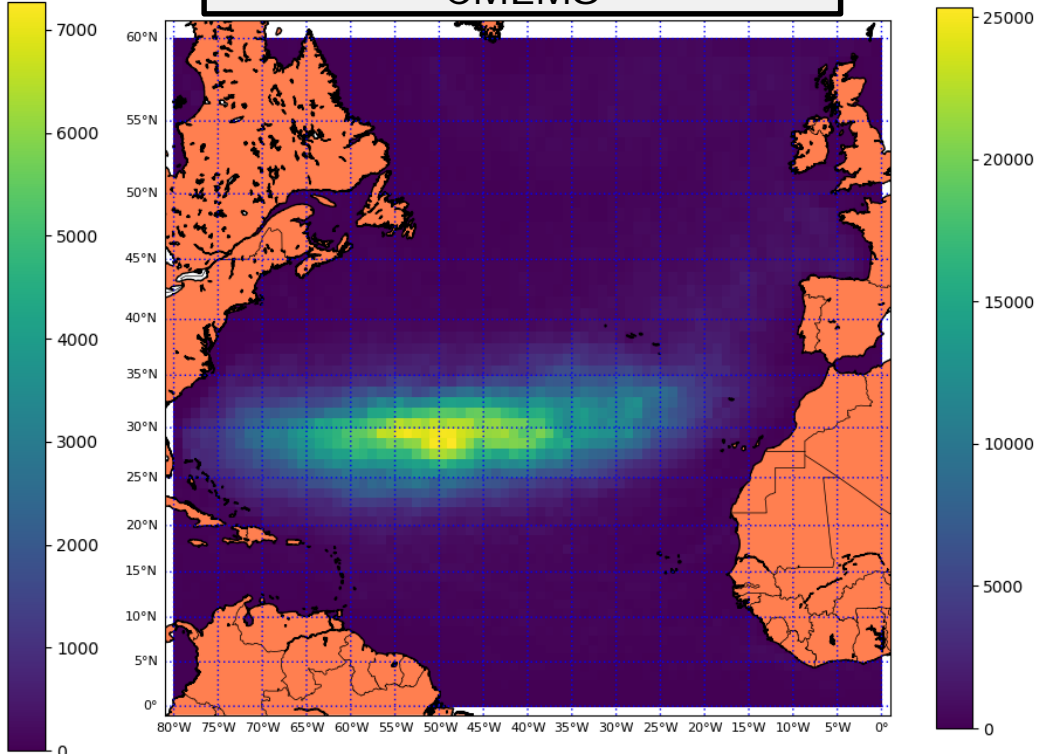
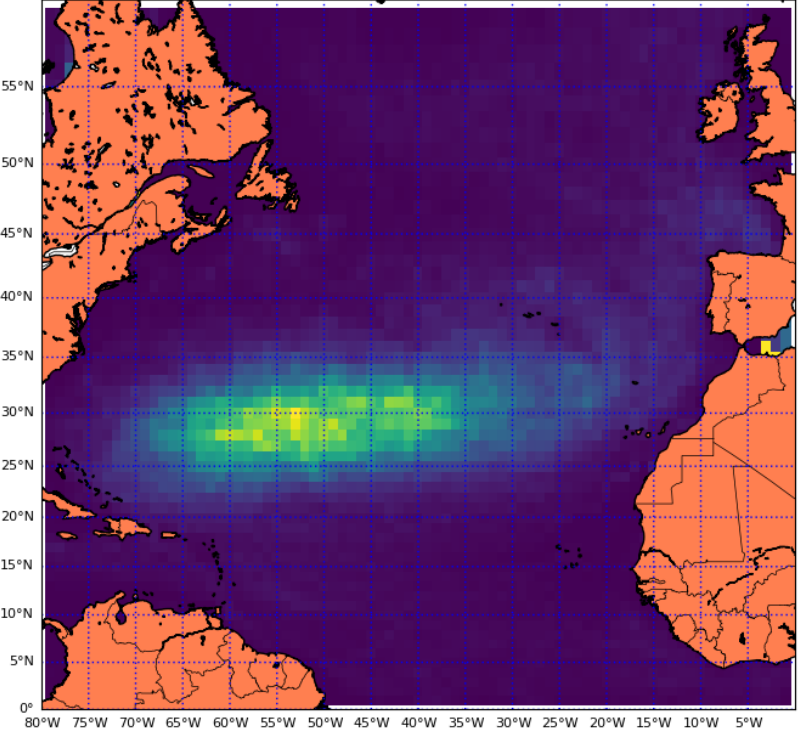


Total time (d) spent in 1 degree boxes

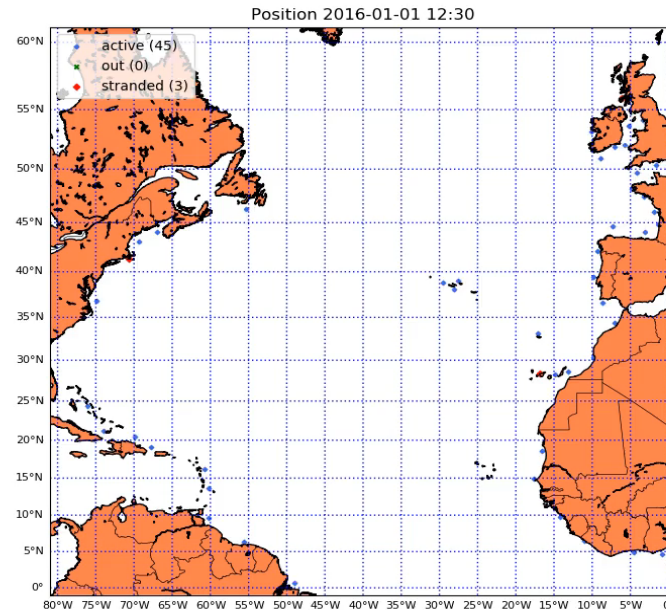
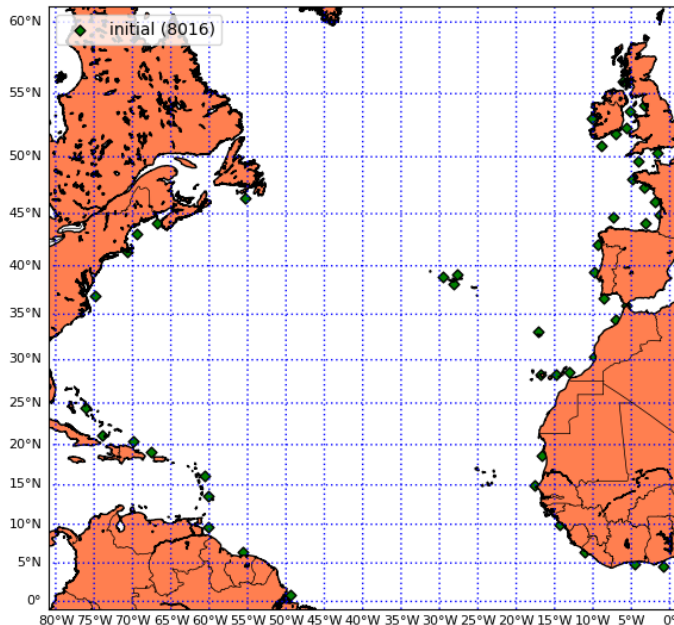
3 years simulation highlights the convergence of particles into the subtropical gyre (global scale)

Globcurrent

CMEMS

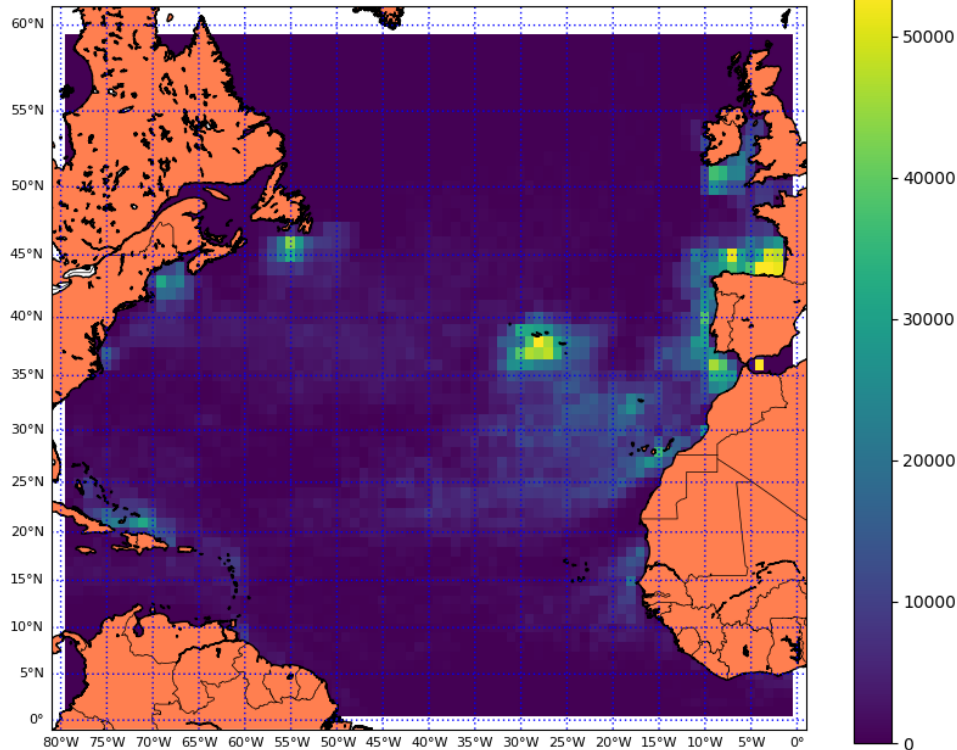


Globcurrent product with tides :



- Release every 3 days along coasts
- 1 year and a half simulation in order to highlight pathways and coastal behaviour

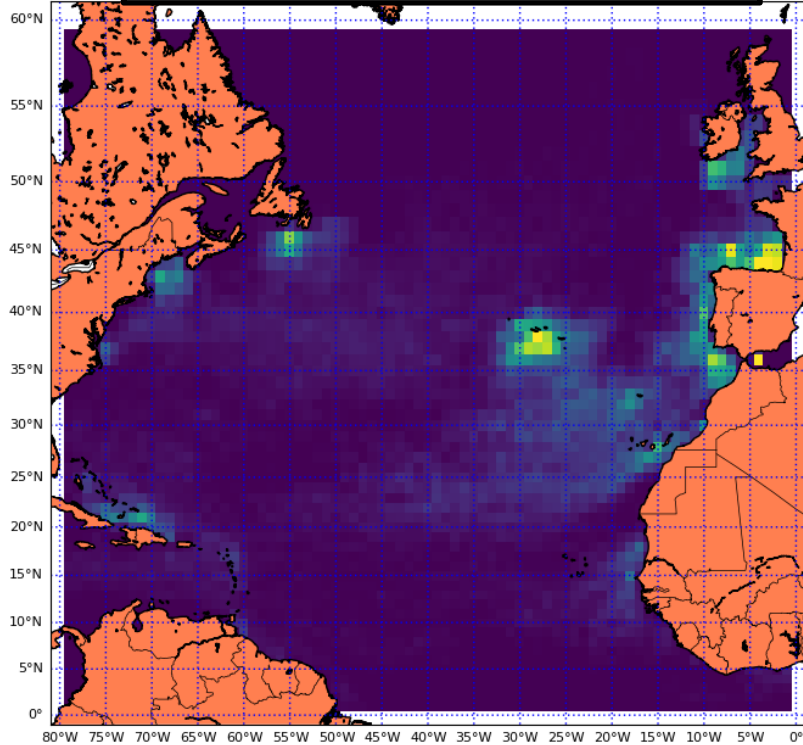
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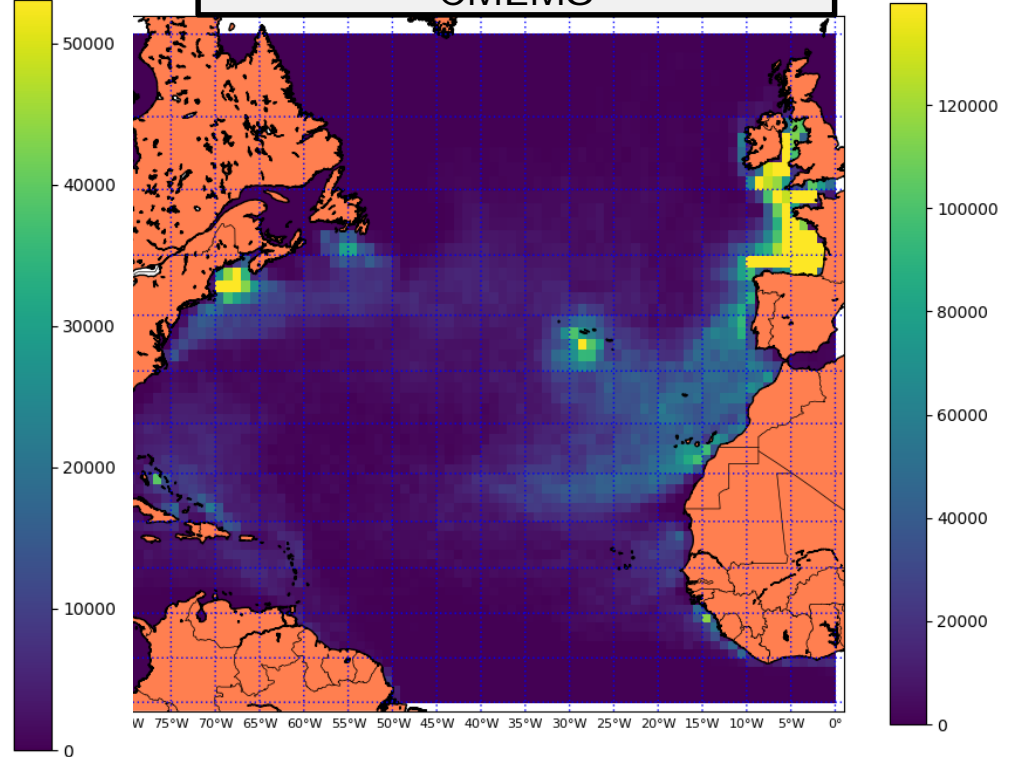
Total time (d) spent in 1 degree boxes

1 year and a half simulation highlights pathways between Azores and Canary Islands and a persistence in the Bay of Biscay

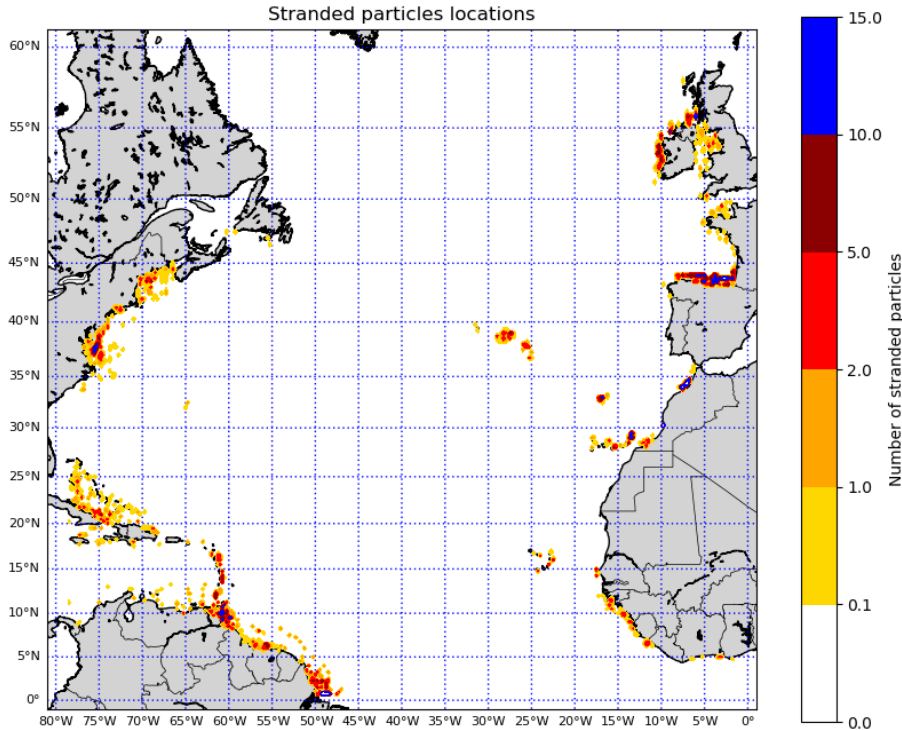
Globcurrent



CMEMS

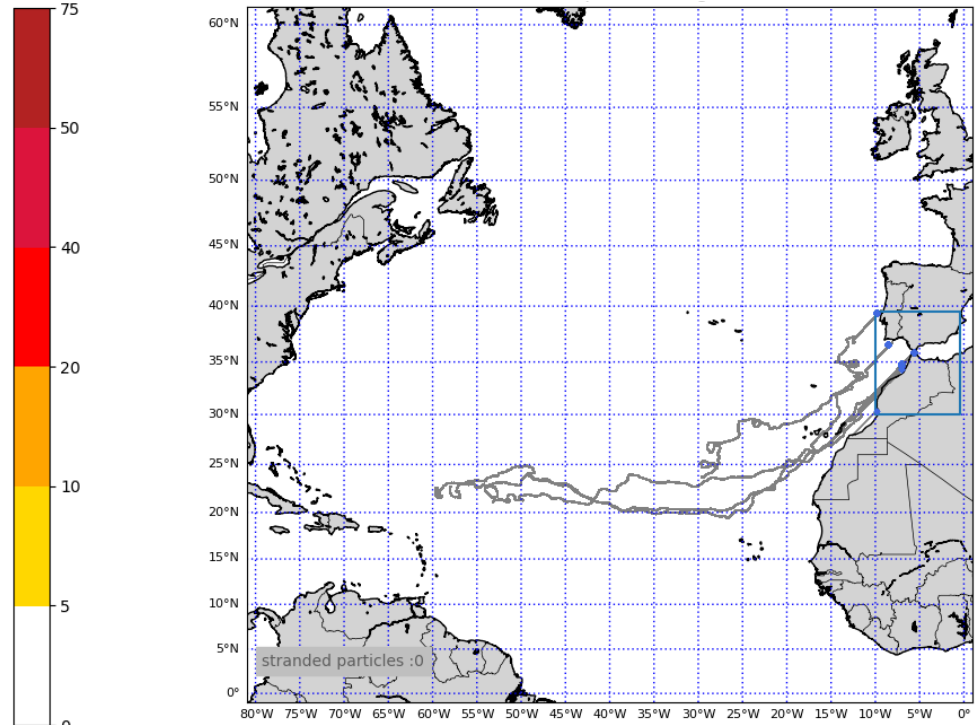
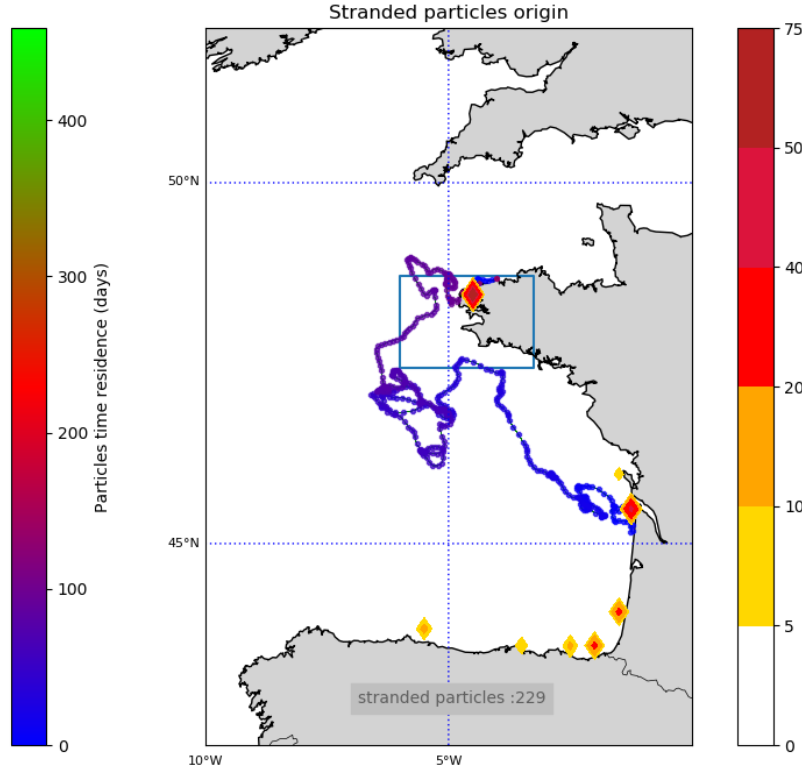


Opendrift outputs are used to determine beach stranding most exposed locations



We can notice that the coast of the bay of biscay and the south american coast are the most exposed to beach stranding

Origin of particles stranded in a box of interest / Faith of particles released at a precise location



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=> Ocean current data are essential for marine litter monitoring

=> **Globcurrent data** are remote sensing derived products without tidal component

-> It is of major importance to take into account tidal component, in coastal areas particularly

-> Tidal component added by NOVELTIS : in-house methodology based on maritime industry best practices

=> EO measurements of ocean currents (SKIM?) / higher resolution datasets for more accurate modelling of marine litter