LAB & PEOPLE

- Name of the hosting lab: LOPS
  General activities of the lab: physical oceanography
  Website: https://www.umr-lops.fr/
  Number of staff / PhD: 140 (total) / 30
- Supervisor names and contact: Dr Christophe Maes & Dr Bruno Blanke (Christophe.Maes@ird.fr)

TOPIC OF THE INTERNSHIP

- Scientific context of the internship (max 20 lines)

Dynamics of the surface subtropical convergence in the South Atlantic Ocean.

The South Atlantic Ocean is a well-known region for the confluence of the southward-flowing North Atlantic Deep Water and the eastward-flowing Antarctic Circumpolar Current, representing a key component of the global meridional overturning circulation. At the surface, the dynamics of the subtropical convergence zone, characterized by an accumulation of floating marine litter, is relatively undersampled and understudied, especially compared to the Northern Hemisphere. The accumulation of litter in the South Atlantic is thought to exist in the area around 25-35°S and 0-20°W as simulated by various numerical models, with some empirical evidence of enriched concentrations more specifically between 34-35°S and 3-8°E. The nature of the different physical processes involved in surface convergence in this region is itself poorly understood, with discrepancies diagnosed depending on the scales considered, from the dynamics of oceanic eddies to the consideration of Stokes drift, a wave and swell related component. The origin of these marine plastics and debris is also a major unknown and their dispersion in numerical ocean general circulation models remains poorly understood. The proposed work aims to study and characterize this surface dispersion at the scale of the South Atlantic basin, based on the identification and qualification of the surface subtropical convergence zone. Basin-wide transfer times and associated long-range pathways will be evaluated as well as coastal connectivity using backward calculations in a Lagrangian framework. A comparison with observations collected in the Atlantic Ocean will be made and interpreted in the context of marine plastics.

Keywords

Ocean dynamics – Lagrangian techniques – sea dispersion – marine litter

Bibliography

Maximenko, N., Hafner, J., Niiler, P., (2012). Pathways of marine debris derived from trajectories of Lagrangian drifters. *Mar. Pollut. Bull*. 65 (1), 51–62. https://doi.org/10.1016/j.marpolbul.2011.04.016

Dobler D., Huck T., Maes C, Grima N., Blanke B. Martinez E., Ardhuin F. (2019). Large impact of Stokes drift on the fate of surface floating debris

in the South Indian Basin. *Mar. Pollut. Bull.*, 148, 202-209. https://doi.org/10.1016/j.marpolbul.2019.07.057

van Sebille, E., et al., (2020) The physical oceanography of the transport of floating marine debris, *Environ. Res. Lett.* 15, 023003, https://doi.org/10.1088/1748-9326/ab6d7d.

Chenillat, F., T. Huck, C. Maes, N. Grima and B. Blanke, (2021), Fate of floating plastic debris released along the coasts in a global ocean model, *Mar. Pollut. Bull.*, 165, doi:10.1016/j.marpolbul.2021.112116.

Maes, C., (2022) Dispersion des plastiques marins flottants à la surface des océans. *La Météorologie*, 119, 10.37053/lameteorologie-2022-0084 (https://lameteorologie.fr/issues/2022/119/meteo_2022_119_53)

- Tasks and duties entrusted to the student:
  Establish scenarios in the Lagrangian framework – Use the LOPS ARIANE Lagrangian tool while understanding its issues and limitations – Run and analyze the numerical simulations

- Skills to be acquired or developed:
  High performance computing facilities in different environments (unix, python, matlab…), use of large sets of numerical experiments and data volume, fine analysis of the basis of ocean dynamics.

PROFILE OF THE DESIRED STUDENT

- Minimum level of study required: master
- Field(s) of study: physics – maths – high performance computing
- Scientific skills
Geophysical Fluid Dynamics – computer skills – autonomy - teamwork
- Language skills required: English (option for French)

THE INTERNSHIP ASSIGNMENT:

Desired duration of the internship (in months): 5
Desired Starting date of the mission: 1st semester 2023
Indicative weekly schedule: *35h / week*
Remuneration: 600€/month, paid on French SEA-EU funds for a maximum of 5 months; additional Erasmus grant could be asked to your own university
Internship agreement: *an internship agreement will be signed.*

To SEA-EU students:
If you're interested please send your CV and letter of motivation to the scientist in charge, Christophe.Maes@ird.fr *asap and before the date 10/02/2023.*