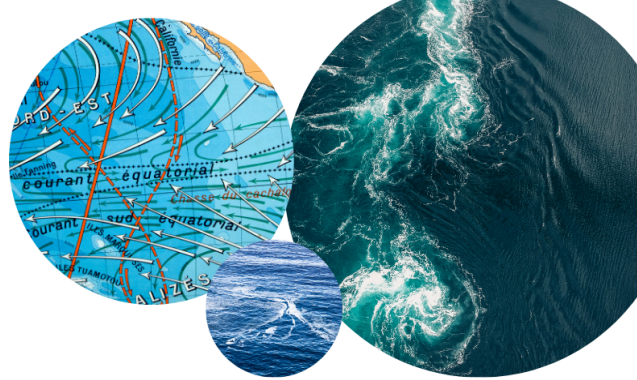


# Spotlight: Ocean transport



**Version V1**  
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## Background

Ocean transport refers to the movement of water masses driven by winds, density differences (thermohaline circulation), tides, and Earth's rotation that redistributes heat, salt, nutrients, and marine organisms across the globe. It is a crucial element in overall ocean health that impacts climate patterns and weather systems, affects sea levels and coastal health, and regulates nutrients and biodiversity in marine environments. Better understanding ocean transport can also support improved long-term climate prediction and modeling efforts.

## The Challenge

Similarly to other ocean characteristics, ocean transport is not fully understood and quantifying and communicating uncertainty in observations and models remains challenging. This is due to limited observational coverage, especially in deep and remote parts of the ocean, as well as complex interactions among multiple current systems (e.g., eddies, gyres, wind-driven and density-driven flows) that challenge modeling efforts.

## ObsSea4Clim activities

At ObsSea4Clim, we monitor and analyse ocean transport in the Atlantic Deep Western Boundary Current, the Faroe Bank Channel overflow and at the Ibiza Channel. We rely on data from ship-based surveys, long-term moored observatories, gliders, HF radars, satellites, and advanced modelling to track and understand key ocean processes. Our activities include:

- Integrating satellite altimeter data for improved calculations of ocean transport in the Atlantic, aiming to determine the offshore termination of a western boundary current. We also test the impact of various types of gridding techniques, including machine learning. The transformation from observational data into EOVS (parameters and quality measures) is refined through the work on the ship and mooring data.
- Sourcing and analysing data from in situ measurements to update transport estimates and understand overflows in the Faroe Bank Channel.
- Monitoring ocean transport in the Ibiza Channel, measuring variables such as pressure, temperature, and salinity, and investigating their impact on eddies.
- Investigating the circulation changes recorded at various moorings on and around the Northwest European Shelf and their relation to sea-level variability on the shelf.
- Analysis of ocean mass and heat transports across the Atlantic and Arctic sectors, utilising global ocean reanalysis products.
- Updating the volume transport Ocean Monitoring Index across the Faroe Shetland Channel (FSC) as an input to the Copernicus Marine Services.



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## Resources

1. Presentation on the **ocean transport in the northern limb of AMOC** delivered by Hjálmar Hátún (HAV) at Ocean Best Practices Workshop, online, on 16 October 2024.  
Zenodo: <https://zenodo.org/records/14177923>
2. Poster on the **coldest and densest overflow branch into the North Atlantic** delivered by Karin. M. H. Larsen (HAV) at the 23rd Arctic-Subarctic Ocean Fluxes Workshop, Barcelona, Spain.  
Zenodo: <https://zenodo.org/records/17035359>

## Latest Publications

1. Larsen, K. M. H., Hansen, B., Hátún, H., Johansen, G. E., Østerhus, S., & Olsen, S. M. (2024). The Coldest and Densest Overflow Branch Into the North Atlantic is Stable in Transport, But Warming. *Geophysical Research Letters*, Vol. 51, No. 16.  
<https://zenodo.org/records/13343494>
2. Diabaté, S. T., Fraser, N. J., White, M., Berx, B., Marié, L., & McCarthy, G. D. (2025). On the wind-driven European shelf sea-level variability and the associated oceanic circulation. *Continental Shelf Research*, Vol. 291, Article 105466.  
<https://doi.org/10.1016/j.csr.2025.105466>
3. Sun, Y., Pickart, R. S., Lin, P., Pacini, A., Macrander, A., Larsen, K. M. H., Hátún, H., Frajka-Williams, E., Lan, J., Dilmahamod, A. F. (2025). Reduced Transport of Overflow Water in the West Greenland Boundary Current System: The Role of Upstream Entrainment. *J. Phys. Oceanogr.*, 55, 2119–2139.  
<https://doi.org/10.1175/JPO-D-25-0024.1>
4. Fu, Y., Lozier, M. S., Bower, A., Burmeister, K., Carrilho Biló, T., Cyr, F., et al. (2025). Characterizing the interannual variability of North Atlantic subpolar overturning. *Geophysical Research Letters*, Vol. 52, e2025GL114672.  
<https://doi.org/10.1029/2025GL114672>
5. R. P. Raj, S. Lien, V., Chatterjee, S., Surendran, S., Bonaduce, A., and Bertino, L.: Freshening of the Barents Sea during the recent decade and its impact on the outflow of dense waters, *State Planet Discuss.* In review, 2025.



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