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High-resolution modelling of ocean-shelf exchange: assessment of a 1/60th NEMO configuration of the Atlantic margin (AMM60)

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The North West European shelf-break is a barrier to the transport and exchange between the open ocean and the coastal waters. The tides, the complex bathymetry, the winds, the slope current, mesoscale processes and internal tides play a key role in the variability of the shelf-sea exchanges. A better understanding of these various processes is a first step towards a better quantification of the seasonal, inter-annual and climate variability of the European continental shelf seas.

The FASTNEt (Fluxes Across Sloping Topography of the North East Atlantic) project is a Directed Research Grant funded by the Natural Environment Research Council. It is a collaboration between SAMS, NOC, PML, and the universities of Bangor, Liverpool and Plymouth and aims at elucidate the key processes controlling seasonal, inter-annual and regional variations in ocean-shelf exchange, through a combined strategy of observations and modelling.
In this context, a new 1/60th degree resolution (1.8km) NEMO configuration has been developed: AMM60 extends on the same domain as the UK Met Office operational Atlantic Margin Model (7km), from 40°N to 64°N, and 20°W to 10°E, enveloping the whole North West European Atlantic margin. With 51 sigma levels, it reproduces high-resolution processes such as internal tides, slope current meanders and eddies, as well along the slope as on the shelf.

The capability of AMM60 to reproduce these processes has been assessed through strict validation with observations. The tidal cycle is well reproduced, as well as the seasonal variability of stratification on the shelf. The spatio-temporal variability of high-resolution structures, such as internal tides, is compared against measurements conducted in the frame of the FASTNEt project.

This work allows us to quantify the spatio-temporal variability of the ocean-shelf exchanges at several scales and aims to highlight the importance of fine scale processes in controlling the wide area across-shelf budgets.