OceanPredict Coastal Ocean and Shelf Seas Task Team COSS-TT
International Coordination Meeting

Theme 2: Ocean modelling at the regional and shelf sea spatial scales and seamless integration with larger-scale estimates

Persistent coastal temperature biases in km-scale climate models due to unresolved ocean mixing.

Author: Audrey Delpech

The advances of numerical performances over the last decades have opened the way for km-scale climate modelling, which not only improves the representation of the climate globally, but also allows the downscaling of climate information at a local scale, critical for climate adaptation strategies. In this context, assessing the performance of such models in coastal shelf seas remains essential.
This study evaluates the capabilities of an ensemble of km-scale coupled climate simulations delivered by HighResMip and the European Eddy-RIch Earth system models projects in representing the sea surface temperature (SST) and air surface temperature (AST) over the shelf seas worldwide. Computing the SST and AST biases relative to satellite observations and atmospheric reanalysis, we identify and quantify systematic strong warm biases in mean temperature, variability and extremes across several key shelf seas: the northwestern European shelf around England, the northeastern American shelf in the Gulf of Maine, the Yellow shelf sea, the Arctic shelf and the Patagonian shelf, all specifically known for their strong tidal currents. A strong correlation is observed between these biases and the location of tidal mixing fronts, as indicated by the Simpson-Hunter parameter. These findings suggest that the absence of tidal mixing parameterization in km-scale climate models is a major source of error at local scales, highlighting the need for improved ocean mixing representations to enhance model accuracy.