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The Bay of Biscay and the English Channel, in the North-eastern Atlantic, are considered as a natural laboratory to explore the coastal dynamics at different spatial and temporal scales. In those regions, the coastal circulation is constrained by a complex topography (e.g. varying width of the continental shelf, canyons), river runoffs, strong tides and a seasonally contrasted wind-driven circulation.

Based on different numerical model experiments (from 400m to 4km spatial resolution, from 40 to 100 sigma vertical layers using 3D primitive equation ocean models), different features of the Bay of Biscay and English Channel circulation are assessed and explored. Both spatial (submesoscale and mesoscale) and temporal (from hourly to monthly) scales are considered. Modelled spatial scales, with a specific focus on the variability of fine scale features (e.g. fronts, filaments, eddies), are compared with remotely sensed observations (i.e. Sea Surface Temperature). Different methodologies as singularity and Lyapunov exponents allow describing fine scales features and are applied on both modelled and observed datasets. For temporal scales, *in situ* high frequency surface temperature measurements from coastal moorings (from COAST-HF observing network) provide a reference for the temporal variability to be modelled. Exploring differences in the temporal scales (from an Empirical Mode Decomposition) advises on the efficiency of our coastal modelling approach.

This result overview in the Bay of Biscay and the English Channel aims illustrating the input of coastal modelling activities in understanding multi-scale interactions (spatial and temporal).