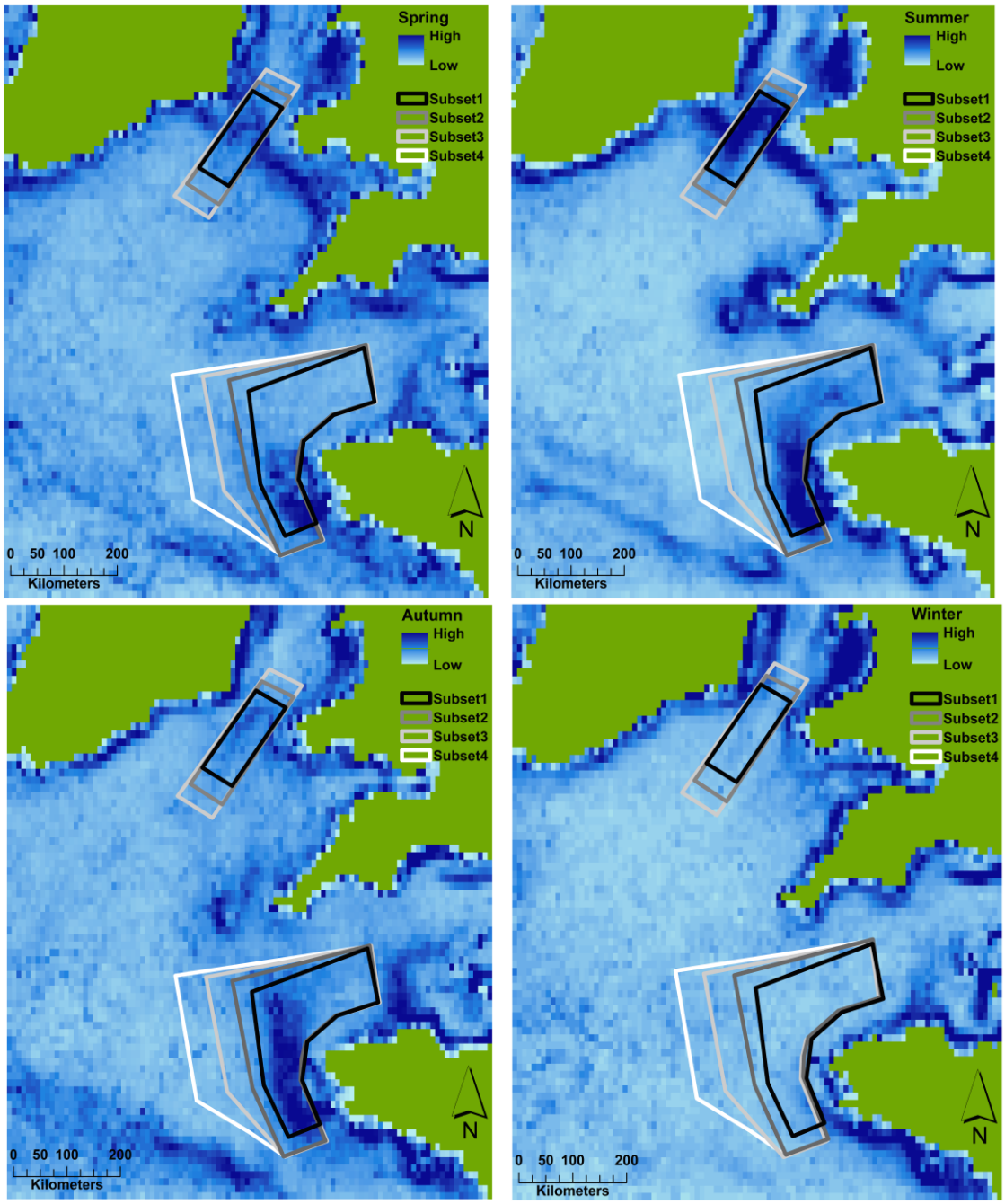
8 Supplementary material

8.1 Determination of sampling areas for Celtic Sea and Ushant Front

To investigate inter- and intraannual variability of the selected frontal metrics at the Celtic Sea and Ushant Front, time series for each metric had to be created, which encompasses the spatial averaging of pixels to obtain a single value per front and monthly map. The position of tidal mixing fronts varies seasonally, in response to tidal movements, storm events and other factors. Therefore, the sampling area for each front needed to be large enough to capture the spatial variability of the fronts, but small enough to exclude unwanted features in the vicinity as much as possible. In order to identify the core area for each front over the yearly cycle, seasonal maps of *Fcomp* were created by averaging monthly composited of *Fcomp* from 1990 to 2010 according to season (Spring: March-May; Summer: June-August; Autumn: September-November; Winter: December-February). To recall, *Fcomp* represents the product of frontal strength (*Fmean*) and probability (*Fprob*) plus and additional weighting, which depends on other fronts in the neighbouring pixels. Each map showed the average spatial extent (from 1990 to 2010) of the Celtic Sea and Ushant Front in each season, which provided a first indication of a suitable sampling area for each front (Sup.Figure 1).

Based on the visually identified core areas for the Celtic Sea and Ushant Front, different sized subsets were created (Sup.Figure 1). Subsets were limited to ≥12km away from the coast to avoid the influence of coastal factors, such as coastal currents and freshwater plumes. Resampling on the different subsets was conducted to a) refine the sampling area and b) ensure no bias caused by an *area size effect* was introduced.

Resampling was conducted in *R* using the *one.boot* function in the *simpleboot* package (Peng, 2008). Bootstrapping with 999 permutations on the mean was performed on the entire data set and a seasonal subset (March-November), which only considers the frontal season. For the Celtic Sea Front three subsets of different size were resampled and for the Ushant Front four subsets (Sup.Figure 1). Boxplots of the resampled mean of *Fprob* and *Fmean* for the Celtic Sea Front show no signs of a *sampling area effect* (Sup.Figure 2). Values declined as expected when increasing the spatial extent of the subsets. At the Ushant Front, the seasonal subset did not show any signs of an area effect. However, the differences of the bootstrapped mean between subset 1 and 2 of the entire dataset were small (Sup.Figure 2) and indicated that the larger subset still captured new frontal pixels. Since this was only the case for the full data set and not the seasonal one, it suggests that the additional frontal pixels belong to wintertime fronts. Wintertime fronts are not of interest in this research and considered noise. Therefore, final analyses were performed on subsets 1 for both fronts.



Sup.Figure 1 (colour): Seasonal *Fcomp* maps at 4.8km^2 resolution. Maps are averaged from 1990-2010 for spring (March-May), summer (June-August), autumn (September-November) and winter (December-February), showing areas of low (light blue) and high (dark blue) *Fcomp*. Green indicates land; coloured polygons show different sized sampling subsets considered for analysis and used during resampling.