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Spatial and seasonal distributions of frontal activity over the French continental shelf in the Bay of Biscay observed from satellite sea surface temperature

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Spatial and seasonal distributions, and development mechanisms of Sea Surface Temperature (SST) fronts ($\sim$ 1-100 km) in vicinity of main French rivers, Gironde and Loire, over the continental shelf north of 45°N in the Bay of Biscay are explored. A dataset of 11 years' (2003 to 2013) remotely sensed SST by MODIS sensor onboard Aqua and Terra satellites has been investigated. This dataset has $\sim$1km spatial and daily temporal resolutions. Front detection is achieved through the Singularity Analysis (i.e. the process of calculating the degree of regularity or irregularity of a function at each point in a domain). The spatial distribution of front occurrence frequency is investigated seasonally. Seasonality of frontal activity in the Bay of Biscay is shown for the first time from the long-term satellite SST archive. The localized hot spots of higher frontal occurrences reveal important characteristics of the fine-scale dynamics including its possible drivers. We find that in winter, density fronts are prominent in a coastal strip where freshwater influence is important; in spring, this freshwater influence domain contrasts and reduces to estuaries while tidal fronts become apparent; in summer, tidal fronts in Ushant region and internal wave activity along shelf break dominates; in autumn, coastal density fronts due to freshwater inputs reappear as these inputs increase, and reduced stratification causes a weakening of the Ushant and shelf break fronts. Additional information and interpretations on the dynamics of these fronts is obtained from in situ observations and model outputs from operational oceanography.