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Extreme event occurrences and impacts in coastal waters of western Europe

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Abstract

The occurrence and the impact of the atmospheric extreme events in coastal waters of western Europe is evolving. Responses of the coastal environment to those events and evolutions need to be explored and explained. In this framework, the hydrodynamical and biogeochemical processes driven by extreme events in the bay of Brest are studied to better estimate their impacts on the local ecosystem. We are analyzing long-term in situ observations (since 2000), sampled at high and low frequencies, from the COAST-HF and SOMLIT network sites, located at the entrance to the bay of Brest. This study is divided into two main parts: the detection and characterization of extreme events, followed by the analysis of a realistic numerical simulation of these events to understand the underlying ocean processes. We focus on freshwater events during the winter months (December, January, February and March), considering the season with most of extreme event occurrence. The relationship between local extreme events and variability at larger scales, considering climate indices such as the North Atlantic Oscillation (NAO), is detailed. A comparison between the low frequency data from the SOMLIT network and the high frequency data from the COAST-HF network is carried out, highlighting the potential of high frequency measurements for the detection of extreme events. A comparison between in situ data and two numerical simulations of different resolutions is also performed over salinity time series. The interannual variability of extreme event occurrences and features in a context of climate change is also discussed. The link between these extreme low salinity events and the winter nitrate levels in the bay of Brest is shown. Then, we investigate the relationship between extreme events and biology in the coastal environment.

Keywords

In-situ observations, High and low frequency measurements, Extreme events, Numerical simulations, Bay of Brest, Weather regimes.

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