Contribution of long-term warming and interannual variability to marine heatwaves in the North Sea

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This study aimed to analyze the long-term changes in marine heatwaves (MHWs) over the Greater North Sea (GNS) using high-resolution (0.02°x0.02°) satellite-derived daily sea surface temperatures from 1982 to 2023. The study also quantifies the role of long-term warming and interannual variability of SST in the evolution of MHWs in the GNS and investigates the main causes of the 2023 summer MHW as a case study. The preliminary results indicate that there is an increasing trend in the intensity and frequency of MHWs in the GNS, primarily due to the long-term warming of SST. When the SST trend was removed before the detection of MHWs, no significant trend was observed in the MHW characteristics. However, interannual variability was found to play a crucial role, leading to an increase in MHW events in specific years, including 1990, 2003, 2006/2007, 2014, and 2022. In June and September 2023, the North Sea experienced exceptionally high SST records since 1982. These extreme SST values were referred to as MHWs. The strongest MHW was recorded in June with an average intensity of up to 4 °C in the northwestern part of the North Sea, lasted 21 days, and was attributed to changes in atmospheric circulation. The longest MHW began on September 4 and lasted for 42 days, occurring mainly on the central and eastern North Sea coast (France, Belgium, the Netherlands, Germany, and Denmark).