Characteristics and trends of marine heatwaves in the Northwest European Shelf and the impacts on density stratification

WEI CHEN[1], JOANNA STANEVA[1]

[1] *Institute of Coastal Systems-Analysis and Modeling, Helmholtz-Zentrum Hereon, Max-Planck-Straße 1, Geesthacht, 21502, Germany*

Marine heatwaves (MHWs) are characterized by anomalous and prolonged increases in sea surface temperatures, driven by atmospheric and oceanic factors. The intensification of MHWs is an evident consequence of ongoing global climate change. The question of whether the North West European Shelf (NWES) is experiencing increased stratification in recent decades is of significant interest in understanding the impacts of these extreme events. In this study, we leverage ocean physics reanalysis data obtained from Copernicus Marine covering the temporal span from 1993 to 2023 to conduct a rigorous examination of the NWES domain. The focus centers on the assessment of potential energy anomaly (PEA) and its role in shaping stratification dynamics. Our findings reveal an increase in both the frequency and duration of MHWs in the NWES area, especially in coastal areas where the duration of MHWs is increasing the fastest, generally by more than 2 days per year over the study period. However, despite the intensified MHWs, thermal stratification in the NWES is weakening, particularly in the middle and northern North Sea. This suggests that the warming effect due to MHWs is insufficient to counteract the overall decline in thermal stratification caused by global warming. Additionally, our study highlights the significance of seawater salinity in driving the trend of density stratification. Specifically, the discharge from the Baltic Sea plays a crucial role in influencing the stratification patterns in the North Sea region.