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Mechanisms of ocean heat anomalies in the Norwegian Sea

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Ocean heat content in the Nordic Seas exhibits pronounced variability on interannual to decadal time scales. These ocean heat anomalies have been shown to affect Arctic sea ice extent, marine ecosystems, and continental climate. It is, however, not known to what extent such heat anomalies are produced locally within the Nordic Seas, and to what extent the region is more of a passive receiver of anomalies formed elsewhere. In order to address this issue, a regional heat budget is calculated for the Norwegian Sea using the ECCOv4 ocean state estimate – a dynamically and kinematically consistent model framework fitted to ocean observations from the period 1992-2015. The depth-integrated Norwegian Sea heat budget shows that approximately 50% of the interannual heat content variability is explained by ocean advection, and 50% is explained by local air-sea heat fluxes. Further spatial analysis of the individual heat budget terms indicates that ocean advection is the dominant driver of heat content variability along the major Atlantic water pathways. Decomposition of the heat transport through the Norwegian Sea domain's boundary sections, show volume transport variations to be dominant in driving heat transport variability at the Norwegian Sea and Barents Sea inflow regions, while temperature variations are dominant in driving heat transport variability at the northern boundary toward the Fram Strait. Our results provide a better understanding of regional ocean heat anomalies and how these interact with the atmosphere, and, hence, improve our knowledge of the ocean's role in near-term climate change.