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Arctic Ocean Heat Content as a Driver of Regional Sea Ice Variability

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The Arctic Ocean is transitioning from permanently ice-covered to seasonally ice-free, with thinner and more dynamic sea ice. This strengthens the coupling with the atmosphere and the ocean, which exert a strong influence on sea ice via thermodynamic and dynamic forcing mechanisms. Short-term predictions are met with the challenge of disentangling the preconditioning processes that regulate sea ice variability, as these often trigger a response that is not uniform in time nor in space. This study assesses the role of ocean heat content (OHC) as a driver of sea ice variability for five different regions of the Arctic Ocean. We choose to focus on a sub-seasonal time frame, with the goal of investigating whether anomalies in ocean heat content offer a source of predictability for sea ice in the following months and whether this coupling varies across different regions and seasons. To account for the different processes that regulate the Arctic Ocean heat budget, we consider ocean heat content in the mixed layer (OHCML) and in the upper 300 m (OHC300), computed from the CMCC Global Ocean Reanalysis C-GLORSv5 for the period 1979-2017. Time-lagged correlations of linearly detrended anomalies suggest a link between heat content and sea ice variability in the following months. This source of predictability is stronger during the melt season and peaks in autumn, with highest correlations in the Kara and Chukchi regions. Consistent with previous studies, a distinctive response is observed for the Barents Sea, where sea ice is more strongly coupled with the ocean during the freezing season. Our preliminary results support a central role of OHC as a driver of sea ice thermodynamic changes at sub-seasonal scales, a mechanism that is likely to become stronger under ice-depleted conditions.