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Upper Arctic Ocean hydrography during the year-round MOSAiC expedition in the context of historical observations

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The Arctic Ocean is characterized by complex processes coupling the atmosphere, cryosphere, ocean and land and undergoes remarkable environmental changes due to global warming. To better understand this system of unique physical, biogeochemical and ecosystem processes and their recent changes, the year-round ice drift experiment Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) was conducted from autumn 2019 to autumn 2020.

In this study we analyse temperature and salinity measurements of the upper Arctic Ocean taken during MOSAiC with different devices, i.e. on an ice-tethered profiler, a microstructure profiler and water sampler rosettes operated from the ship as well as through an ice hole on the ice floe. Combining all these measurements provides us an exceptional data resolution along the MOSAiC track. Moreover, we compare these observations with a comprehensive dataset of historical hydrographic data from the region.

Along the MOSAiC track we find signatures of a convective lower halocline (Fram Strait branch), as well as advective-convective lower halocline (Barents Sea branch). We see pronounced changes in the salinity and temperature of the lower halocline in comparison to the historical data, in particular, at the beginning of the drift. Furthermore, we show polar mixed-layer and upper halocline conditions in relation to seasonality and local surface conditions. We put the warm Atlantic Water temperature in the context of historical observations and investigate indications for the presence of Pacific Water.

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