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Climatic trends of sea surface temperature and sea ice concentration in the Barents Sea

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Sea ice loss in the Arctic region is an important indicator for climate change. Especially in the Barents Sea, which is expected to be free of ice by the mid of this century (Onarheim et al., 2018). Here, we analyze 38 years (1982-2019) of daily gridded sea surface temperature (SST) and sea ice concentration (SIC) from the Operational Sea Surface Temperature and Sea Ice Analysis (OSTIA) project. These data sets have been used to investigate the seasonal cycle and linear trends of SST and SIC, and their spatial distribution in the Barents Sea. From the SST seasonal cycle analysis, we have found that most of the years that have temperatures above the climatic mean (1982-2019) were recorded after 2000. This confirms the warm transition that has taken place in the Barents Sea over the last two decades. The year 2016 was the warmest year in both winter and summer during the study period.

Results from the linear trend analysis reveal an overall statistically significant warming trend for the whole Barents Sea of about 0.33 ± 0.03 °C/decade, associated with a sea ice reduction rate of about -4.9 ± 0.6 %/decade. However, the SST trend show a high spatial variability over the Barents Sea. The highest SST trend was found over the eastern part of the Barents Sea and south of Svalbard (Storfjordrenna Trough), while the Northern Barents Sea shows less distinct and non-significant trends. The largest negative trend of sea ice was observed between Novaya Zemlya and Franz Josef Land. Over the last two decades (2000-2019), the data show an amplified warming trend in the Barents Sea where the SST warming trend has increased dramatically (0.46 ± 0.09 °C/decade) and the SIC is here decreasing with rate of about -6.4 ± 1.5 %/decade. Considering the current development of SST, if this trend persists, the Barents Sea annual mean SST will rise by around 1.4 °C by the end of 2050, which will have a drastic impact on the loss of sea ice in the Barents Sea.

Keywords: Sea surface temperature; Sea ice concentration; Trend analysis; Barents Sea