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Changes and variability in sea ice conditions in the Kara Sea

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The Kara Sea is part of the seasonal sea ice zone in the Arctic, where the warming climate is rapidly changing the sea ice regime. Data from coupled sea ice-ocean model NEMO-LIM3.6 from 1997-2015 and ice concentration datasets derived from passive microwave satellite observations (SMMR, SSM/I and SSMIS) from 1978-2015 are used to examine the changes and variability in sea ice conditions in the Kara Sea. The performance of the sea ice-ocean model is also compared with the observations.

The ice coverage examined in regional and subregional scales shows negative trends in all months in 1978-2015 and in 1997-2015. The variability of the total ice area increased in winter and spring time when the ice regime shifted from full to partial ice cover over the sea. Meanwhile the variability in summer and autumn decreased. The ice free time of the year in the area north of Novaya Zemlya, where the warm Atlantic water enters the Kara Sea, rapidly extended. The mean sea ice thickness, based on the sea ice model data in 1997-2015, had become thinner in all months with the most rapid changes occurring in wintertime. The overall performance of the model is sufficient and in good agreement with the observations in most subregions. The findings confirm that the sea ice conditions in the Kara Sea are changing towards a new regime with shorter and more variable ice seasons.