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Observations of Atlantic water variability during the AREX summer campaigns: impact on sea ice concentration

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Systematically shrinking and thinning sea ice cover of the Arctic Ocean is both an effect and a cause of accelerated climate changes in the Arctic region observed in the last decades. Oceanic water masses from the North Atlantic flow towards the Arctic Ocean in the eastern part of Fram Strait, carried by the West Spitsbergen Current. Fram Strait, as well as the north of Svalbard area, play a key role in controlling the amount of oceanic heat supplied to the Arctic Ocean, and are the place of dynamic interaction between the ocean and sea ice. The north of Svalbard area is one of the regions where the substantial changes in sea ice concentrations are observed both in summer and in winter. Hydrographic data from vertical CTD profiles were collected during annual summer expeditions of the research vessel "Oceania", conducted in Fram Strait and the southern part of the Nansen Basin over the past two decades. The measurement strategy of the original research program AREX, which consists of the performance of cross-sections perpendicular to the presumed direction of the West Spitsbergen Current, allowed to observe changes in the properties and transport of the Atlantic Water carried to the Arctic Ocean. The observed increase in the Atlantic Water temperature was the dominant cause of the decline in the Arctic sea ice concentration in the studied area, especially during the winter. The primary objective of the work is to analyse and present the results of relationships between temperature, volume and heat transport by the Atlantic Water layer along with the West Spitsbergen Current in the context of changes in the concentration and extent of sea ice occurring in two regions: the north of Svalbard and central part of the Fram Strait.