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Recent warming and long-term temperature trends in the northern Barents Sea along the 80th parallel north

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The Arctic has warmed dramatically in recent decades, with greatest temperature increases between Svalbard and Franz Josef Land along the 80th parallel north, according to reanalysis data. However, scarcity of validation data hampers the confidence of the reanalysis data in this region. In this contribution, we therefore want to compile and analyze a large number of unpublished surface air temperature data from eastern and northern Svalbard and Franz Josef Land. Some of these series have not previously been analyzed. The main objective is to establish consistent datasets and study the recent warming and long-term trends in northern parts of the Barents Sea, from Svalbard to Franz Josef Land. It is particularly interesting to get a more detailed picture of the recent warming pattern and how this is related to variations in large-scale atmospheric circulation and the decline of sea ice.

Specifically, we address the following three research questions: Are the temperature trends in the north-eastern area of the Barents Sea area more pronounced than e.g. at western Svalbard? How much of the temperature trends in the study area is related to the reduced ice cover? How do the temperature trends (based directly on station data) correspond to trends in reanalysis data?

The study is based on a Russian-Norwegian collaboration (AARI/SPbSU-MET Norway). The new Russian-Norwegian joint dataset on air temperature for the northern Barents region is denser, and the time series are longer than those used by the scientific community so far. The quality of the temperature series has further improved by using modern homogenization methods and by extensive use of metadata from the archives. Climate data and sea-ice information from Russian weather stations on Franz Josef Land are digitized, quality controlled and made available for the entire period 1928-present. MET Norway has quality controlled and made available automatic weather observations from the 1990 to present from Norwegian weather stations north and east on Svalbard. From western Svalbard a composite long-term series from 1898 already exist. Sea ice data is based on an archive of AARI's historic ice charts from 1933 to present, MET Norway ice charts from 1969 to present, and EUMETSAT OSI SAF sea-ice concentrations climate data record based on satellite passive microwave data covering 1979 to present. Indices for large-scale atmospheric circulation are based on methods developed in the European research initiative: Harmonisation and Applications of Weather Type Classifications for European regions (COST 733).