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Climate changes related to SST trends in the European Arctic and long-term analysis of meteorological conditions in two fjords: Hornsund and Porsanger

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The analysis were done using several data sources. Long-term SAT (surface air temperature), SST (sea surface temperature) and WD (wind direction) were acquired from ERA-Interim climate reanalysis produced by the European Centre for Medium-Range Weather Forecast (ECMWF) (www.ecmwf.int). To compare global reanalysis with changes in regional scale, additional observational data from the Norwegian Meteorological Institute were chosen. Data originate from two stations in the Porsanger fjord. First of them, Lakselv (L), is located in the inner part of the fjord ,and the second, Honningsvåg (Ho), in the outer zone. Observations from the Hornsund station (Hr) were provided by the Institute of Geophysics, Polish Academy of Sciences.

Firstly, the multiyear SAT and SST changes were studied, based on monthly ERA-Interim reanalysis. The calculation of 33-year trends using linear regression method at 95% confidence level ($p<0.05$) was done. Secondly, the analysis of regional differences in two high-latitude fjords based on data from meteorological stations were done. Using three per day observations we have calculated 33-year annual averages trends, but also trends from median, 10^{th} percentile, 90^{th} percentile and from standard deviation (std) after subtracting annual cycle for SAT and WD in three stations.

The results showed two times higher annual averages trend in the inner part of the Porsanger fjord (0.0571˚C/year) than in the outer part (0.0313˚C/year). In Hornsund the SAT trend was equal to 0.0981˚C/year. The negative trends from std after subtracting annual cycle were observed in both station in the Porsanger fjord - -0.018˚C/year (L) and -0.009˚C/year, which is opposite to this trend in the second fjord (0.0106˚C/year). For all cases the trends from median were lower than trends from annual averages, but they were still positive. For Ho and Hr we observed the trends from 10^{th} percentile (0.0436˚C/year and 0.1799˚C/year, respectively). In Lakselv station this trend was not statistically significant. The trends from 90^{th} percentile was observed for L (0.0383˚C/year) and for Hr (0.0244˚C/year). The annual averages trends from wind speed data were observed for two stations: L (0.0367˚C/year) and Hr (0.0155˚C/year). Only for Lakselv station the calculations showed trends from median (0.029˚C/year), 10^{th} percentile (0.0438˚C/year) and from 90^{th} percentile (0.0541˚C/year). Other trends were not statistically significant. Monthly trends were also calculated for the fjords, but they were not statistically significant in all months and all cases.

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