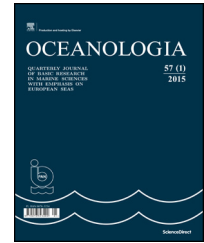




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ORIGINAL RESEARCH ARTICLE

Comparison of meteorological conditions in Svalbard fjords: Hornsund and Kongsfjorden

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Summary This paper presents the results of a comparison of basic meteorological parameters in two Arctic fjords situated on the west coast of Spitsbergen, the main island of the Svalbard archipelago. Air temperature, wind speed and direction, humidity and cloud cover from the period 2005 to 2016 are described and compared with previous (from 1975) analyses of meteorological conditions in the investigated region. Such a choice of dates coincides with the time the GAME project measurements were carried out. The main goal of this study was to compare meteorological conditions in two fjords: Hornsund and Kongsfjorden, during the time of rapid climate changes. The results are collated with research results available in literature from previous years. We discovered that in the investigated period the climate of the Hornsund region is more oceanic than in Kongsfjorden. The stable level of the difference in climate elements is manifested and is evident mainly through greater amplitudes in air temperatures in Kongsfjorden, and in stronger winds in Hornsund.

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1. Introduction

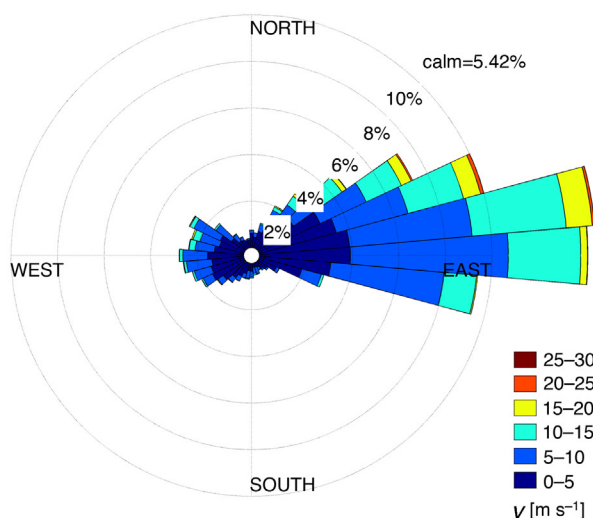
The comparison described in this paper regards two Svalbard fjords: Hornsund and Kongsfjorden. Both are located on the west coast of Spitsbergen, the main island of the Svalbard archipelago. They were both investigated within the GAME project (Growing of the Arctic Marine Ecosystem), which was focused on verifying the hypothesis that the Arctic marine ecosystem is aging due to global warming effects. The selected fjords have a similar area, shape and water circulation. Even though Hornsund is located more southward than Kongsfjorden, the water in this fjord is colder. Warm Atlantic Water reaches Kongsfjorden directly from the West Spitsbergen Current, whereas Hornsund is strongly influenced by the cold Sørkapp Current. Such a system impacts the meteorological conditions in both fjords. As a result, mean temperature values in the Hornsund stations are well correlated with the temperature of the Atlantic Water carried by the West Spitsbergen Current (Walczowski and Piechura, 2011). The climate of the west coast of Spitsbergen, including Hornsund and Kongsfjorden, has been studied for many years and is well described in literature (e.g. Forland et al., 1997; Hanssen-Bauer et al., 1990; Marsz and Styszyńska, 2007, 2013; Przybylak, 2002; Kejna, 2002; Kejna and Dzieniszewski, 1993; Kierzkowski, 1996; Przybylak, 2007). The influence of the atmospheric circulation on the climate of this region has been described by Niedźwiedź (1997), while the problem of precipitation in the Hornsund area was presented by Łupikasza (2009). In this paper, the authors focused on the differences in the main meteorological parameters in the Hornsund and Kongsfjorden fjords. The analyzed parameters included: wind speed and direction, air temperature, humidity and cloud cover, data from the last ten years (2005–2016) was also incorporated. The meteorological parameters that were analyzed are responsible for shaping the conditions of the ecosystems of the studied fjords.

2. Material and methods

Temperature, humidity and cloud cover data comes from the weather stations No. 01003 (Hornsund) and No. 01007 (Ny-Ålesund) of the World Meteorological Organization (WMO) and were taken from <http://rp5.kz>. This website is provided and supported by Raspisaniye Pogodi Ltd., St. Petersburg, Russia. Databases of meteorology and hydrometeorology are maintained on license from the Russian Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet). The time period from 2005 to 2016 was chosen to be long enough to allow appropriate comparisons. It also coincides with the time the GAME project measurements were carried out. However, a period longer than the duration of the GAME project was chosen in order to facilitate a comparison which provides more data on climatic impact than a single measurement. Real data from wind measurements at 10 m a.s.l., from stations located in the fjords: from the French-German Arctic Research Base at Ny-Ålesund (AWIPEV) station in Kongsfjorden (Maturilli et al., 2013) and from the Polish Polar Station in Hornsund, was analyzed and compared to winds at 10 m a.s.l. from the NCEP/NCAR reanalysis (Kalnay et al., 1996). Data from the later period (after 2013) was not available. Temperature and salinity values of the Atlantic Water in the West Spitsbergen Current come from the database of the Institute of Oceanology Polish Academy of Sciences (IOPAS) and was collected during the Arctic summer cruises of *r/v Oceania*.

To observe the climatic changes in the studied region the results obtained from the comparison of meteorological conditions in Hornsund and Kongsfjorden in recent years are collated with research results from previous years. However, the main goal of this paper is a comparison of weather conditions in the two fjords and not the study of climate change.

Wind rose from Hornsund station 1993–2013



Wind rose from Ny-Ålesund station 1993–2013

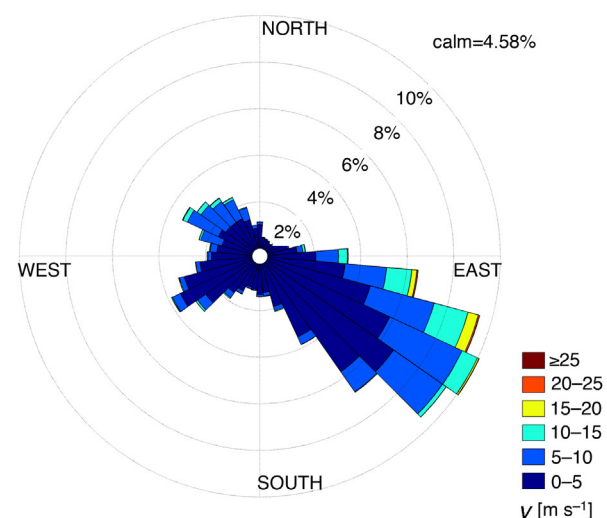


Figure 1 Local wind roses for the Hornsund station (left) and the Ny-Ålesund station (right) for the period from 1993 to 2013.

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