

1. INTRODUCTION

The Polish Polar Station at Hornsund was established in 1957 as a foreign scientific institution of the Department of Geophysics, Polish Academy of Sciences (PAS). The station was a contribution of Poland to the research goals of the International Geophysical Year (IGY; 1957–1958). One of the principal research programs undertaken at the Hornsund station during IGY was meteorological recording to better establish the climate of southern Spitsbergen and, more generally, the Atlantic sector of the Arctic, at that time a poorly known part of our planet. Participation by Polish polar researchers in the Arctic research during the IGY was a continuation of earlier scientific interests, most notably the expedition to Bear's Island (Bjornöya), a contribution of Poland to the second International Polar Year (1932–1933). Meteorological observations at the Hornsund station during IGY were carried out in accordance with the research schedule, between July 1957 and July 1958. Results of this research were analysed and published (see chapter 18.1). After closing of the sample year the IGY team at the Polish Polar Station was withdrawn and systematic observations were suspended.

In 1958–1960 and 1970–1977 different Polish research expeditions, mainly organized by the University of Wrocław, Institute of Geography and Spatial Management, PAS (Department of Geomorphology and Hydrology of Lowlands in Toruń) and Institute of Geophysics PAS have been using the Hornsund station. These expeditions undertook meteorological observations, in general, however, differing from international synoptic standard.

In 1978 the Hornsund station was reopened for year-long activity as a scientific institution of Institute of Geophysics PAS and has continued until the present. Along with research on geomagnetism, seismology and the ionosphere, a meteorological program has operated at the station since July 1978. The basic parts of this program are systematic synoptic meteorological observations at WMO standards. The Hornsund station is international number 01003 in the synoptic register.

Meteorological observations collected at the Hornsund station have been the basis for numerous papers published on different aspects of climate, in the vicinity of the station and Atlantic sector of the Arctic or even the whole Arctic. Comprehensive depiction of Hornsund climate was lacking until now.

The observation series from Hornsund, covering 31 years, despite some gaps and breaks, are documenting the state of southern Spitsbergen climate and changes in the climate of this region very well. In 2007, before the beginning of the 4th International Polar Year, the 28 year-long observational period (1978–2006) was analysed and a monograph on the climate at Hornsund published (Marsz and Styszyńska (Eds), 2007). It was published in Polish and funded within the project "Structure, evolution and dynamics of lithosphere, cryosphere and biosphere In the European sector of the Arctic and in Antarctic" coordinated by the Institute of Geophysics PAS (PBZ-KBN-108/PO4/2004).

In 2009–2010, using the three years longer observational period, 1978–2009, the meteorological data from Hornsund have once more been elaborated and analyzed. The intention of the authors is that the work presented here, based on observations from the Polish Polar Station at Hornsund (data owned by the Institute of Geophysics PAS), should be a relatively complete characterisation of climatic conditions in the region of the station. The study is based on observational series covering the complete 30 years, from January 1, 1979 to December 31, 2009. This period is long enough to present the second generalization of the climatic conditions of this region.

The sources used in this work were yearly books of the Hornsund meteorological station, published after expeditions and covering its period (from July to June of the next year). From July 1978 to June 2000 these data were retained and studied by the Independent Laboratory of Sea and Polar Research in the Marine Division of the Institute of Meteorology and Water Management, first under the supervision of D. Wielbińska and later on by M. Miętus. From July 2000 to present yearly meteorological books are prepared in the Department of Polar Research, Institute of Geophysics PAS, under the supervision of J. Kwaczyński. During analysis some meteorological data (atmospheric pressure, precipitation) of M. Sobik from the Department of Meteorology and Climatology, University of Wrocław (covering the period from August 1981 to August 1982) have been used. Some personal observations and published and unpublished data of different authors (referenced in the text) were also taken into account. Observational data were again verified by the team of authors, and any missing monthly means were completed where it was possible.

The climate of the region of Polish Polar Station has two chief components. The location of the station ensures that in its general climatic setting, regional features of the climate of the Atlantic Arctic and their changes are noted. But also local features, conditioned mainly by the topography of the station's surroundings (for example, anemometric regime or cloud cover regime) are recorded. When interpreting the climatic conditions presented below this should be taken into account. From another perspective (and this should be clearly emphasized) the previous period of meteorological observations at Hornsund fell at a special time: there are strong reasons to believe that in 1976–1978 significant change of the climatic regime of the northern hemisphere has taken place (Marsz 2007), with resulting rapid warming being observed at the hemispheric scale. This warming is very clear in the Atlantic Arctic. Measurements at the Polish Polar Station are documenting its progress, together with changes of other climatic parameters connected with this warming. Because of importance of these issues in the work being presented we could not avoid reference to causes, mechanisms and scale of the warming observed at Hornsund. Purposely, however, there is no discussion of opinions on the genesis of global warming, the role of the Arctic and specially the Atlantic Arctic in the hemispheric warming, the question whether the climate of the Arctic has reached “a point of no return” and similar problems of large scale generalization. It does not appear that a monograph on the climate of one, not so large, fragment of the Atlantic Arctic would be a proper place for this; the results of this research on climate change at Hornsund contribute a good deal of “strong” empirical evidence to these matters.

The insular location of Spitsbergen determines that climate of this region experiences the overwhelming influence of waters surrounding the archipelago. This factor has meant that a lot of attention was paid to changes of physical state of surface of seas surrounding Spitsbergen and its reflection in changes of climatic conditions at Hornsund.

Because the main purpose of the work was to characterise climatic conditions in the region of the Hornsund station and not to enter into detailed issues, there is no comment on some theses presented in the earlier works, and not all literature is referenced. This concerns especially works describing some climatic parameters that are based on much shorter observational series. It is clear that with the change of duration of an observational series both mean values characterizing this parameter and values of coefficients of trends, as well as very often the range of its extreme values, are likely to change. The Reference List contains only the papers that are cited in the text.

The three last chapters following the summary, Chapter 17, contain additional data. In Chapter 18 mean, verified values of the main climatic parameters in chronological series (monthly, annual and in some cases extreme) and different climatic indices calculated with them are presented in tables. Monthly data from the observational period at the Hornsund station in the International Geophysical Year, 1957–1958, are presented to allow other researchers, not only climatologists, to gain access to archival climatic data without searching for poorly accessible source data (Meteorological Year Books). In the same chapter there is a list of meteorological observers working in polar expeditions. Thanks to their work the coming into being of this study was possible.

The two final chapters, 19 and 20, contain climatic characteristics of the snow cover and ground temperature which although not meteorological parameters *sensu stricto* (not describing the state of atmosphere) are of crucial importance for interpretation of the physico-geographical processes (water circulation, formation of periglacial structures, etc. occurring in the Hornsund region and the biotic processes observed there (e.g. changes in the plant cover or microfauna in water reservoirs).

“Climate and Climate Change at Hornsund, Svalbard” is a collective work. Authors of chapters are shown in the table of contents. Authors’ teams consist of specialists in meteorology and climatology of Polar Regions representing two scientific centres: Marine Academy in Gdynia (Department of Meteorology and Nautical Oceanography at the Navigational Faculty) and University of Silesia (Department of Climatology at the Faculty of Earth Sciences).

