CLIMATE WARMING

Changes in the climate in western Sørkapp Land mirror global climate fluctuations. This is especially true of the northern hemisphere and Spitsbergen. There is a lack of meteorological data to show continuous climate fluctuations for the entire Sørkapp Land peninsula. Indeed, basic meteorological observations (mainly temperature) were carried out in different places throughout the peninsula but for very short periods of time, mostly in the summer (Ziaja 1999). Continuous meteorological observations have been carried out at the Polish Polar Station, which belongs to the Institute of Geophysics of the Polish Academy of Sciences, on Isbjørnhamna bay (Marsz, Styszyńska 2007). The bay is located along the northern coast of Hornsund Fjord, only 10 km from the study area. Hence, the station's data may be considered representative of western Sørkapp Land.

The Little Ice Age ended with a very cold period in the 1890s in Spitsbergen, including Sørkapp Land. A relatively warm contemporary period "after the Little Ice Age" began in the early 20th century. Secondary cold and warm climate fluctuations occurred during the 20th and early 21st century. The most recent fluctuations, starting in the 1980s, appear to point to a significant warming trend (Brázdil 1988; Ziaja 2004). This is certainly true of the western island's coast, both north and south of Hornsund Fjord. The mean annual temperature increased by almost 2°C and the mean summer (July and August) temperature increased by 0.6°C since the 1980s when we began our research (Table 1).

A systematic temperature increase occurred during each month. The greatest warming occurred during a winter season from September to February. This statistically significant positive trend in the change in air temperature, also in June and

Table 1. Mean annual temperature changes at the Polish Polar Station at Hornsund, according to data from the Institute of Geophysics, Polish Academy of Sciences, published in part by Styszyńska (2007)

	1980–1989	**2000–2009**
Mean annual temperature	–5,2°C	–3,15°C
Mean summer, i.e. July and August, temperature	+3,9°C	+4,5°C

August (Marsz 2007), accelerated the thawing of snow and ice. This contributed to the lengthening of the vegetation season, the thawing of the permafrost active layer and the ablation of glaciers.

An increase in precipitation, both annual totals (statistically significant trend) and summer (July and August) totals has been detected since the 1980s. A clear increase in rain precipitation totals, the intensity of rainfall and the frequency of rainfall have been noted during this time period. This is also true of the summer season (Łupikasza 2007, Table 2). This increased rainfall intensified a number of geomorphic processes as well as snow and ice ablation. This, in turn, impacted the water cycle and vegetation.

Table 2. Mean annual changes in precipitation totals at the Polish Polar Station at Hornsund, according to data from the Institute of Geophysics, Polish Academy of Sciences, published in part by Styszyńska (2007)

	1980–1989	**2000–2009**
Mean annual sum of precipitation	390,5 mm	451,3 mm
Mean summer, i.e. July and August, sum of precipitation	78,1 mm	94,4 mm

Marsz and Styszyńska (2007) argue that the climate in southwestern Spitsbergen has changed rapidly and considerably during the past 30 years. The following are symptoms of this change: warming, an increase in oceanicity in terms of air temperature, an increase in precipitation totals, increasing share of rain in precipitation totals, a shortening of the snow season and an increase in cloudiness. This climate change prompted other changes as well.