

CONTENS

1. Introduction – <i>Andrzej A. Marsz, Anna Styszyńska</i>	9
2. Location of the Polish Polar Station at Hornsund – <i>Andrzej A. Marsz</i>	13
3. The principal climatic parameters	21
3.1. Duration of day and night – <i>Anna Styszyńska</i>	21
3.2. Potential insolation – <i>Anna Styszyńska</i>	24
3.3. Changes in the sea ice area and the surface temperatures of surrounding seas – <i>Andrzej A. Marsz i Anna Styszyńska</i>	28
3.3.1. Sea surface temperature	30
3.3.2. Sea ice cover	35
3.3.3. Factors influencing changes of SST and ice cover in the region of Spitsbergen	42
4. The atmospheric circulation – <i>Tadeusz Niedźwiedź</i>	57
4.1. The mean baric field	57
4.2. The frequency of occurrence of the circulation types	66
4.3. Index of zonal circulation – western (W)	72
4.4. Index of meridional circulation – southern (S)	73
4.5. Index of cyclonicity (C)	74
5. The atmospheric pressure – <i>Tadeusz Niedźwiedź</i>	75
5.1. The annual course	75
5.2. Extreme values and interdiurnal variability	77
6. The winds – <i>Anna Styszyńska</i>	81
6.1. The structure of wind directions	81
6.2. Wind speeds	87
6.3. The associations between wind directions and speeds	96
7. Cloudiness and sunshine duration – <i>Andrzej A. Marsz</i>	101
7.1. Cloudiness	101
7.2. Clear and cloudy days	106
7.3. Types of clouds, manifestations of local climatic features in the cloudiness	109
7.4. Sunshine duration	119
8. Solar radiation – <i>Anna Styszyńska</i>	127

9. Air temperature – Andrzej A. Marsz	145
9.1. Annual air temperature	145
9.2. Monthly air temperatures	147
9.3. The annual patterns of diurnal temperature	150
9.4. Thermal seasons	156
9.5. Factors shaping interannual variability of the air temperature	159
9.5.1. Associations of air temperature at Hornsund with indices describing the large scale atmospheric circulation	160
9.5.2. Influence of atmospheric circulation on the air temperature at Hornsund – <i>Tadeusz Niedźwiedź</i>	165
9.5.3. The influence of sea ice cover on the air temperature at Hornsund	172
9.5.4. The influence of sea surface temperature (SST) changes on the air temperature at Hornsund	178
9.5.5. Comprehensive effects of changes of sea ice extent, sea surface temperature and atmospheric circulation on the air temperature at Hornsund – <i>Andrzej A. Marsz, Anna Styszyńska, Tadeusz Niedźwiedź</i>	182
10. Humidity – Andrzej A. Marsz	189
10.1. Water vapour pressure	189
10.2. Relative humidity	192
11. Atmospheric precipitation – Ewa Łupikasza	199
11.1. General information, materials and methods	199
11.2. Distribution of monthly means and annual totals of precipitation	200
11.3. High diurnal precipitation	204
11.4. Number of days with precipitation	206
11.5. The annual cycle of atmospheric precipitation, taking the modes of occurrence into consideration	208
11.6. Associations of precipitation with atmospheric circulation	209
12. The horizontal visibility and fog – Andrzej A. Marsz	213
12.1. The horizontal visibility	213
12.2. Fog	215
13. States of the weather and weather seasonality – Jacek Ferdynus	221
13.1. Methods	221
13.2. Structure of states of the weather	222
13.2.1. Weather groups and subgroups	222
13.2.2. Weather classes	224
13.2.3. Types of weather	226
13.2.4. The annual structure of states of the weather	229
13.3. Seasonal structure of the climate in the station region	230

13.3.1. Winter (October 21 – May 10)	247
13.3.2. Spring (May 11 – July 10)	249
13.3.3. Summer (July 11 – August 31)	249
13.3.4. Autumn (September 1 – October 20)	250
13.3.5. Remarks on the observed climatic seasonality	250
14. The climate of the station in the light of selected climatic indices	253
14.1. Continentality and oceanicity of the climate – <i>Andrzej A. Marsz</i>	253
14.2. The humidity of the climate – <i>Andrzej A. Marsz</i>	255
14.3. Wind chill – <i>Anna Styszyńska</i>	260
14.4. Positive and negative degree-days – <i>Anna Styszyńska</i>	267
15. The associations between climatic parameters and a model of changes of climatic conditions in the Hornsund region – <i>Andrzej A. Marsz</i>	273
15.1. Associations between climatic parameters	273
15.2. A model to forecast climatic changes in the Hornsund region	279
16. Changes of climate in the Hornsund station region during the meteorological observation, 1979–2009	283
16.1. Changes of atmospheric pressure – <i>Tadeusz Niedźwiedź</i>	283
16.2. Changes of circulation indices – <i>Tadeusz Niedźwiedź</i>	285
16.2.1. The W index of western zonal circulation	285
16.2.2. The S index of southern meridional circulation	287
16.2.3. The C index of cyclonicity	289
16.3. Changes of direction and velocity of the winds – <i>Anna Styszyńska</i>	292
16.4. Changes of cloudiness, sunshine duration and horizontal visibility – <i>Andrzej A. Marsz</i>	295
16.5. Changes of air temperature – <i>Andrzej A. Marsz</i>	298
16.6. Changes of precipitation – <i>Ewa Łupikasza</i>	303
16.6.1. The multiannual variability of precipitation totals	303
16.6.2. Variability of rainfall and snowfall totals	305
16.6.3. Variability of the number of days with precipitation > 0.0 mm	307
16.6.4. Variability of number of days with precipitation ≥ 0.1 mm	308
16.6.5. Variability of number of days with rainfall and snowfall	310
16.6.6. General trends of changes in atmospheric precipitation	313
17. Summary – <i>Andrzej A. Marsz, Anna Styszyńska</i>	317
18. Results of observations – <i>Anna Styszyńska</i>	321
18. 1. Results of observations of meteorological parameters made at Hornsund during the Founding Expedition (1957–1958)	321

18.2. Results of observations of meteorological parameters at Hornsund in 1978–2012	322
19. Snow cover at the Hornsund station – <i>Tadeusz Niedźwiedź, Anna Styszyńska</i> . . .	367
20. Ground temperatures at Hornsund – <i>Andrzej A. Marsz</i>	373
REFERENCES	381
APPENDICES	
1. Calendar of circulation types for territory of Spitsbergen by T. Niedźwiedź	395
1.1. Monthly, annual and seasonal values of circulation type S	395
1.2. Monthly, annual and seasonal values of circulation type W	397
1.3. Monthly, annual and seasonal values of circulation type C	399
2. LF ₁₋₄ index	401
3. DG _{3L} index	402