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Differentiation of air temperature and relative humidity in the Forlandsundet region (NW Spitsbergen) in summer 2010

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The aim of this presentation is to demonstrate spatial differentiation of the most important meteorological variables determining a topoclimate, i.e. surface air temperature (SAT) and relative humidity (RH) in the area of Forlandsundet (NW Spitsbergen).

Large spatial differences of the SAT and RH noted in the study area were influenced by different factors, e.g. character of ground, altitude above sea level, distance from the sea coast, exposition to the sun, physical characteristic of incoming air masses, and local atmospheric circulation.

In the first half of July, 2010, eighteen SAT measurement sites were established, equipped with automatic weather stations Davis Vantage PRO2 and MadgeTech data loggers. Spatial SAT differentiation in the study area in the summer season is significant and reaches values of 3 and 4°C for mean seasonal and extreme characteristics, respectively. The highest SAT occurred on the Prins Karls Forland island, while the coldest one was in the firn field of the Waldemar Glacier. On the other hand, the highest values of SAT reduced to sea level were noted on the summit of Prins Heinrichfjella. No change was noted in the case of the spatial occurrence of the coldest SAT. Markedly the highest values of the diurnal temperature range were noted in the summit area of Prins Heinrichfjella, while the lowest ones were in the sites with the greatest maritime influences. Larger spatial differentiation of SAT was noted in diurnal hours than in "night" hours, as well as in days with less cloudiness and with the occurrence of local winds, e.g. foehns.

Highest mean values of RH occurred at the site surrounded by the sea, while the lowest ones at the site located 200 m from the Waldemar Glacier termini. The first half of the day saw highest values of RH than the second one. The reason of this may be explained by the opposite daily course of SAT. Daily courses are getting more and more clear in line with decreasing value of cloudiness. In the Forlandsunet region most frequent were air masses which can be described as humid and very humid.