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# Long-term variability of bioclimatic conditions in the coastal part of north-eastern Labrador from the late 19th to the mid-20th century

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The contemporary warming observed on Earth is most pronounced in the Arctic and subarctic regions. Until the mid-20th century, human impact on the Arctic environment and climate was relatively limited, making reconstruction of past conditions essential for a better understanding of current and future climate change.

To date, relatively few climate studies have relied on historical meteorological data, and even fewer have used it to recognise bioclimatic conditions. To fill this gap, this study conducts a detailed analysis of available early-instrumental data to reconstruct the bioclimate of the study region.

Changes in bioclimatic conditions in the coastal part of Labrador Peninsula were assessed using two sets of meteorological data from Hebron and Nain, located less than 200 km apart. The first covers a continuous 36-year period (September 1882 - July 1918), while the second spanned two shorter periods: 31 years (September 1882 - December 1913) and 12 years (December 1926 - March 1939). Moravian missionaries conducted meteorological measurements in Labrador on behalf of the Deutsche Seewarte (German Maritime Observatory). Reference data for the contemporary period (1991-2020) were obtained from the Canadian Climate Services Centre.

The measurement stations were equipped with tested and calibrated equipment provided by the Deutsche Seewarte in Hamburg. Observations were conducted in accordance with the institution's standard guidelines. Historical data gathered by the Moravian Brethren were then digitised and made available by the Deutscher Wetterdienst (DWD).

The meteorological observations used in the study included, among other things, measurements of air temperature, atmospheric pressure, and wind speed and direction. These measurements were done three times per day, at 8:00 AM, 2:00 PM, and 8:00 PM. Based on this data, bioclimatic conditions were assessed using selected indicators: wind chill temperature (WCT) and predicted insulation loss (Iclp), as well as the impact of day-to-day changes in air temperature and atmospheric pressure.

The analysis includes monthly mean values of selected parameters, along with their interannual variability. Furthermore, the frequency of occurrence of specific categories of meteorological conditions was determined using bioclimatic indicators. The results obtained for the historical

period were compared with contemporary conditions on the Labrador Peninsula.

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