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Multiscale variability patterns of atmospheric temperature in the Canadian Arctic

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A comprehensive characterization of temperature variability on different temporal scales is particularly important to climate studies. Changes in variability patterns are expected to have multiple, wide-ranging implications. The Arctic regions find themselves in a particular situation from the point of view of both their sensitivity to and role played for climate change. The goal of this study was to quantitatively describe atmospheric surface temperature patterns from the Canadian Arctic, considered on different temporal scales, and to check if the patterns suffer transformations over time. We processed homogenized temperature data from Canadian Arctic stations with record lengths of fifty years or more, using Detrended Fluctuations Analysis. Station latitudes span the interval from 68.3 to 82.5 degrees. Both minimum and maximum daily temperature data were considered. Scaling properties and distinct temporal scale ranges could be identified for each temperature dataset, as well as consistent differences between minimum and maximum temperature patterns. We also analyzed successive temporal windows, and found that pattern properties change over time. We applied isocorrelation maps to compare the different patterns and explore scale dependent aspects. We found that the changes in pattern variability in different locations are spatially correlated with each other. We explore implications of these results and discuss the possible role of climatic oscillations.