

Arctic Temperature Variability over the last Millennium

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This study presents two new climate field reconstructions (CFR) of Arctic surface air temperature (SAT) variability over the last 1000 years. The CFR is based on collection of 60 temperature sensitive proxies north of 60 N mainly from the recently updated Pages2K v 2.0.0 global multiproxy database (Pages2K, 2017) of the Common Era supplemented with some new records not yet included in the Pages 2K archive. Using two subsets of annually dated proxy records sensitive to summer temperatures and those representative of both summer and annual mean SAT, we generated seasonal (summer) and annual SAT CFR for the study region. This study provides a substantial extension to the previous Arctic CFR reconstruction by Tingley & Huybers (2013) in terms of both the input proxy data density and duration back in time as well as improved reconstruction technique applied. As a major innovation we used a recently developed extension to the BARCAST method of Tingley & Huybers (2010), BARCAST+AMS (Werner & Tingley, 2015) that provides a means to treat climate archives with dating uncertainties via probabilistic constraining the age-depth models of time-uncertain climate proxies within the hierarchical Bayesian framework. Preliminary analysis of the new reconstructions confirms the recent warming to interrupt the millennial scale general cooling trend. The rate of contemporary circum-Arctic warming of 0.04(0.01) C year⁻¹ since AD 1961 is unprecedented on the time scale of at least past 1000 years. Since AD 1990 the circum-Arctic SAT persistently exceeds the two historical warm extremes of AD 1014–1017 and 1028–1033 associated with the Medieval Climate Anomaly (MCA). A previous well-recorded early 20th century Arctic warming is manifested as event with a magnitude and duration comparable to a number of other anomalies detected in past centuries including the MCA. The new reconstructions provide a prospective framework for further analysis of seasonal regional past climate variability on the range of time-scales. It includes the periods of past rapid changes in the Arctic with a focus on the regional manifestation and time evolution of past major climate extremes.

References:

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