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Last nine-thousand years of temperature variability in Northern Europe

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Abstract. The threat of future global warming has generated a major interest in quantifying past climate variability on centennial and millennial time-scales. However, palaeoclimatological records are often noisy and arguments about past variability are only possible if they are based on reproducible features in several reliably dated datasets. Here we focus on the last 9000 years, explore the results of 36 Holocene pollen-based July mean and annual mean temperature reconstructions from Northern Europe by stacking them to create summary curves, and compare them with a high-resolution, summary chironomid-based temperature record and other independent palaeoclimate records. The stacked records show that the "Holocene Thermal Maximum" in the region dates to 8000 to 4800 cal yr BP and that the "8.2 event" and the "Little Ice Age" at 500–100 cal yr BP are the clearest cold episodes during the Holocene. In addition, a more detailed analysis of the last 5000 years pinpoints centennial-scale climate variability with cold anomalies at 3800–3000 and 500–100 cal yr BP, a long, warmer period around 2000 cal yr BP, and a marked warming since the mid 19th century. The colder (warmer) anomalies are associated with increased (decreased) humidity over the northern European mainland, consistent with the modern high correlation between cold (warm) and humid (dry) modes of summer weather in the region. A comparison with the key proxy records reflecting the main forcing factors does not support the hypothesis that solar variability is the cause of the late-Holocene centennial-scale temperature changes. We suggest that the reconstructed anomalies are typical of Northern Europe and their occurrence may be related to the oceanic and atmospheric circulation variability in the North Atlantic – North-European region.

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