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Late Holocene sea surface temperature cooling off southern Norway reversed by progressive warming during the last 400 years

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Variability in the North Atlantic Oscillation (NAO) and the Atlantic Multidecadal oscillation (AMO) affect long term heat transport via the North Atlantic current to high latitudes, and influence climate over northern Europe. To investigate the variability in heat transport to northern Europe during the last 2000 years, we have reconstructed sea surface temperatures (SST) at decadal resolution from a marine sedimentary core (MD99-2286) located in the Skagerrak, off southern Norway. Fine grained marine sediments from the North Sea are transported to the Skagerrak with the North Atlantic current yielding a sedimentary setting with deposition rates of up to 1cm/year.

SST in the Skagerrak show an overall decrease since AD 0 to AD 1300, in common with reconstructions elsewhere in the North Atlantic region, which is related to a decrease in summer insolation at high latitudes during the late Holocene. However we observe a reverse of the long term cooling from AD 1600 until AD 2000 despite the continuous decrease in summer insolation. This warming trend starts two centuries before the onset of the temperature rise which started 150 years ago with the industrial revolution. We argue that warming in SST during the last 400 years was triggered by an increase of the North Atlantic current heat transport starting ca. AD 1600, which was triggered by a progressive predominance of positive modes of the NAO. This is corroborated by the similarities of our Skagerrak SST reconstruction with that of an AMO reconstruction from Mann et al. (2009) at multidecadal to centennial time scales. The results further confirm the important role of the North Atlantic Ocean, and concretely the inflow of North Atlantic water to the North Sea and the Skagerrak, as an important factor regulating continental central Europe climate at multicentennial scales. The recent warming caused by anthropogenic impact on climate is thus superimposed on a much longer warming trend in Northern Europe linked to the natural variability of the North Atlantic Current.

Reference

Mann ME, Zhang Z, Rutherford S, Bradley RS, Hughes MK, Shindell D, et al. (2009) Global Signatures and Dynamical Origins of the Little Ice Age and Medieval Climate Anomaly. Science 326(5957): 1256–1260: doi:10.1126/science.1177303