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Atmospheric circulation forcing of sea surface temperature in the North Atlantic

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The atmospheric circulation over the North Atlantic, which is dominated by the North Atlantic Oscillation (NAO), exerts an influence on the vigour of the ocean circulation. Modelling investigations and observational evidence support that atmospheric changes alter wind stress, which influences northward heat transport along the North Atlantic Current and southward transport of cold water along the East Greenland Current (EGC). Furthermore, the ocean temperature and circulation changes induced by the atmospheric circulation may alter the strength of deepwater formation and therefore the Atlantic Meridional Overturning Circulation. Reconstructions of the NAO have shown significant changes in atmospheric circulation that span millennia, therefore the influence of atmospheric circulation on the ocean can be investigated by comparison with marine reconstructions.

The OCTEL project (Ocean-sea-ice-atmosphere teleconnections between the Southern Ocean and North Atlantic during the Holocene) aims to investigate the ocean, atmosphere and sea-ice teleconnections for the Holocene. We here present a diatom-based sea-surface temperature (SST) reconstruction from the North Atlantic. The reconstruction extends from 5.5 cal ka BP to present and shows a pronounced cooler period between 4 and 2 ka BP, which is also seen in SST reconstructions from around Iceland and in the Greenland Sea. The period 4-2 ka BP had negative NAO conditions; therefore, one explanation may be that the negative NAO caused an enhanced northerly wind to the east of Greenland, resulting in an enhanced EGC that transferred cooler water to the region around Iceland. The results support an important link between atmospheric and ocean circulation over millennial timescales.