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Climate trends in a transient simulation of Holocene Climate in a comprehensive Earth System Model

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Changing orbital parameters of the Earth lead to a varying spatio-temporal insolation forcing and therefore to changes in the strength of the seasonal cycle. Such orbitally induced changes of climate are analyzed within a transient simulation of the Holocene (from 6000 years before present (6kyBP) to today) using a state of the art coupled Atmosphere-Ocean-Biosphere Model (ECHAM5-JSBACH-MPIOM). Results for the general evolution of the climate, regionally differing climate trends and changes in climate variability are presented and compared to existing proxy data.

In particular the simulation suggests changes in ocean circulation and oceanic heat transports especially in the North Atlantic as well as changes in the atmospheric circulation in high northern latitudes. Sea ice cover in the Arctic especially over the Barents Shelf is found to increase associated with a decrease in surface temperature up to 5 K. Temperatures over the North Atlantic show a slight increase (1 K) associated with an increase in Atlantic meridional overturning circulation and a corresponding increase in oceanic heat transport.