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Holocene climate change in North Africa and the end of the African humid period – results of new high-resolution transient simulations with the MPI-ESM 1.3

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The Max-Planck-Institute for Meteorology has recently undertaken high-resolution transient Holocene simulations using the fully-coupled Earth System Model MPI-ESM 1.3. The simulations cover the last 8000 years and are forced not only by reconstructed Holocene orbital variations and atmospheric greenhouse gas concentrations, but also by recent compilations of Holocene volcanic aerosol distributions, variations in spectral solar irradiance, stratospheric ozone and land-use change.
The simulations reveal the ubiquitous "Holocene conundrum": simulated global mean temperatures increase during the mid-Holocene and stay constant during the late Holocene. Simulated mid-Holocene near-surface temperatures are too cold in large parts of the world. Simulated precipitation, however, agrees much better with reconstruction than temperatures do. Likewise simulated global biome pattern fit reconstructions nicely, except for North Western America.
First results of these simulations are presented with the main focus on the North African monsoon region. The amplitude of the mid-Holocene African Humid Period (AHP) is well captured in terms of precipitation and vegetation cover, so is the south-ward transgression of the termination of the AHP seen in reconstructions. The Holocene weakening and southward retreat of the North African monsoon as well as changes in the monsoon dynamic including shifts in the seasonal cycle and their relation to the locally varying termination of the AHP are discussed in detail.

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