

EGU24-11263, updated on 20 May 2024

<https://doi.org/10.5194/egusphere-egu24-11263>

EGU General Assembly 2024

© Author(s) 2024. This work is distributed under the Creative Commons Attribution 4.0 License.



The impact of mid Holocene Saharan greening on the Euro-Atlantic climate variability

Marco Gaetani¹, Gabriele Messori^{2,3}, Francesco S.R. Pausata⁴, Shivangi Tiwari⁴, M. Carmen Alvarez Castro⁵, and Qiong Zhang³

¹IUSS Pavia, Italy

²Uppsala University, Sweden

³Stockholm University, Sweden

⁴University of Quebec in Montreal, Canada

⁵Pablo de Olavide University, Seville, Spain

During the first half of the Holocene (11,000 to 5,000 years ago) the Northern Hemisphere experienced a strengthening of the monsoonal regime, with climate reconstructions robustly suggesting a greening of the Sahara region. Paleoclimate archives also show that this so-called African Humid Period (AHP) was accompanied by changes in the climate conditions at mid to high latitudes. However, inconsistencies still exist in reconstructions of the mid-Holocene (MH) climate at mid-latitudes, and model simulations provide limited support to reduce these discrepancies. In this study, a set of simulations performed with an Earth System Model is used to investigate the hitherto unexplored impact of the Saharan greening on mid-latitude atmospheric circulation during the MH. Numerical simulations show a year-round impact of the Saharan greening on the main circulation features in the Northern Hemisphere, especially during boreal summer when the African monsoon develops. In particular, a westward shift of the global Walker Circulation leads to a modification of the North Atlantic jet stream. The Saharan greening also modifies the atmospheric synoptic circulation over the North Atlantic, changing the North Atlantic Oscillation phase from prevalently positive to neutral-to-negative, and significantly modifying the occurrence of blocking events. This study provides a first constraint on the Saharan greening influence on northern mid-latitudes, indicating new opportunities for understanding the MH climate anomalies in the Euro-Atlantic sector.