

Interactive comment on “The end of the African humid period as seen by a transient comprehensive Earth system model simulation of the last 8000 years” by Anne Dallmeyer et al.

Anonymous Referee #2

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Peer Review File

Title: The end of the African humid period as seen by a transient comprehensive Earth system model simulation of the last 8000 years Authors: Ann Dallmeyer, Martin Claussen, Stephan J. Lorenz, and Timothy Shanahan

Summary The authors present analysis of the African Humid Period (AHP) in a transient earth system model simulation of the mid to late Holocene. They focus on characterizing and understanding the termination of the AHP (wet to dry transition) across northern Africa. They show that wet mid-Holocene conditions were primarily confined to western and central regions of the Sahara, and that the transition to present-day arid-

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ity in these regions was time transgressive, consistent with proxy interpretation. Based on analysis of modeled daily precipitation events and subtropical jet stream characteristics, they find that tropical-extratropical interactions in the form of tropical plumes enhanced mid-Holocene rainfall in western regions of the Sahara, prolonging wet conditions there. The tropical plume hypothesis helps to explain the spatial differences in AHP termination date across the Sahara.

The paper adds to our understanding of the AHP in two important ways. First, it confirms earlier hypotheses and simplified modeling results that tropical-extratropical interactions shaped the AHP using an advanced, state of the art coupled climate model simulation. Second, it presents the tropical-extratropical interaction mechanism in the context of the spatially and temporally heterogeneous termination of the AHP. The analysis is well done and straightforward and the manuscript is well-written. I recommend the manuscript be considered for publication in *Climate of the Past*, and only have a few minor comments for the authors.

Minor comments

Please discuss the suitability of the T63 resolution for studying tropical plumes. Can MPI-ESM1.2 accurately simulate these fairly narrow, transient events?

There are several instances when the authors reference Skinner and Poulsen (2013), but the reference should be Skinner and Poulsen (2016).

Lines 148-149: Please provide evidence (references) that the use of the bare soil fraction is an appropriate indicator for moisture availability in the Sahara. I imagine that this depends strongly on the dynamic vegetation module.

Can you provide a discussion of why the Eastern Sahara does not see a substantive increase in precipitation like the Western Sahara in MPI? Why does the monsoon enhancement remain constrained to the west? This is the opposite of what we see in CMIP5 projections for the 21st century in response to elevated GHG forcing, so it may

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have relevance for understanding future climate.

Line 407: The authors reference a Figure A4, but it was not included in the draft.

Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2019-86>, 2019.