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Ocean feedbacks on the African and Indian monsoon during the Mid-Holocene

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Within the framework of the PMIP (Paleoclimate Modelling Intercomparison Project), we investigated the role of the ocean circulation in mid-Holocene climate simulations from several coupled ocean-atmospheric general circulation models (OAGCMs). The analyses focus on the tropical circulation and the Afro-Asian monsoon. Comparisons with atmosphere alone simulations (PMIP1) show that the ocean feedback acts both on the length and the magnitude of the summer monsoon. In particular, all coupled simulations produce a delayed retreat of the Indian summer monsoon. This phenomenon involves a positive local air-sea interaction. Another feature is a dipolelike SST anomaly over Atlantic Ocean that contributes to induce more moisture from ocean to North Africa and then increases precipitation there. Our analyses indicate that the dipole-like structure is, to first order, the response to orbital change. However, the wind-evoperation-SST mechanism and Ekman transport over the northeastern tropical Atlantic also play a role. Sensitivity experiments show that the change in the seasonal timing of the monsoon is mainly due to precession, whereas obliquity only reinforces the magnitude. New simulations with interactive vegetation will be available as part of PMIP2. We will also discuss the relative strength of ocean and vegetation feedback on monsoon activity and ocean feedback.