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Mid-Holocene vegetation in central Africa: Reconstruction from proxies and models

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The main objective of this study was to simulate the Mid-Holocene (6K BP) vegetation in Africa and to compare the simulation results with proxies such as pollen. The second objective was to test the effect of ocean-atmosphere coupling in General Circulation Models (GCMs), compared to forced atmosphere-only models. The third objective was to test the effect of interannual variability in climate data on vegetation response.

We used climate data simulated by 3 GCMs, ECHAM3, UKMO, and LMD5-IPSL. Climate anomalies were calculated between 6ka BP and the control (0ka) simulations for each GCM, and then applied to two modern climate data sets: the Leemans&Cramer and the CRU (New et al., 2002) data sets. The resulting simulated climate data for the Mid-Holocene were then used as inputs in the LPJ Dynamic Global Vegetation Model (LPJ-DGVM, Sitch et al., 2003) to simulate the vegetation response. The studied area covers from 20° N to the equator and between the Gulf of Guinea and 10° E, in order to include the forest-savanna limit that has been displaced several times in the past. Further, within the region, there is a broad variation in modern vegetation, from closed canopy tropical rainforests to open forests, savannas, and steppes.

A comparison between a modern potential vegetation map (White, 1983) and modern vegetation simulated by LPJ-DGVM revealed that significantly better results were obtained when interannual climate variability was taken into account. Results obtained at 6ka BP show that the vegetation differed significantly to that of the present day, most notably the distribution of tropical deciduous forests and the savanna-steppe limit. This difference between Mid-Holocene and modern vegetation distributions was found with all GCMs (ECHAM3, UKMO, and LMD5-IPSL). The vegetation simu-

lations obtained using the output of a fully coupled ocean-atmosphere GCM (IPSL) showed improvements over those based on the forced atmosphere GCM version of the same model (LMD5). The few available pollen assemblages show an overall agreement with the simulated changes in distribution. However, both pollen records and vegetation simulations indicate problems with the 6K BP simulated climate.

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