



Climate-vegetation-feedbacks as a mechanism for accelerated climate change: the greening Sahara case

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Paleo-environmental records and extensive modeling studies have demonstrated that the Sahara was largely covered by grass and steppe vegetation in the early to mid Holocene. The orbitally controlled incoming summer insolation is the primary forcing factor during the Holocene. It is well-documented that internal feedback-mechanisms between the vegetation and the atmosphere-ocean system caused a sudden shift from the vegetated humid Sahara state to a arid desert climate about 5000–4000 years ago. Proxy evidence suggests also an abrupt onset of the African Humid Period between 14,000 and 11,000 yr BP. However, the attribution of the rapid onset to orbitally driven insolation anomalies or to the Bølling-Allerød, Younger- Dryas transitions is non-trivial. Here we show in transient simulations with climate and vegetation models of different complexity that the abrupt change of the African Monsoon/vegetation system from dry/deserted glacial state to wet/green conditions is accelerated by the vegetation-albedo feedback. The non-linear response of the climate-vegetation system to precessional forcing leads to a 'rapid' onset of the African Humid Period at ~11,000 yr BP.