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# Biogeochemical and biophysical interactions between climate and vegetation: Simulations for the Eemian with a complex Earth System Model

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A complex, coupled earth system model, consisting of an atmosphere and ocean general circulation model (ECHAM-LSG), a dynamic terrestrial vegetation model (LPJ) and an ocean biogeochemistry model (HAMOCC) was used to study feedbacks between the land surface and the atmosphere in the Eemian in a transient simulation (128-113 ky B.P.).

In the warm phase at the beginning of the experiment, the $CO_2$ concentration is relatively low (270 ppm) due to enhanced carbon storage in the terrestrial biosphere. It shows an increase during the experiment (up to 290 ppm around 116 ky B.P.). Terrestrial carbon storage is dominated by temperature effects, but increased storage due to a northward expansion of the boreal forests and decreased storage due to respiration in the mid latitudes make the net temperature effect small and negative for the period 128-120 ky B.P. Positive effects come from changes in the radiation and hydrological conditions.

The strengthened monsoon causes an increase in vegetation cover, with a positive feedback occurring due to a lowered surface albedo, especially in Northern Africa. The high latitudes show a positive land surface feedback caused by albedo decrease with increasing forest growth. This albedo decrease is mainly caused by changes in the snow cover albedo, minor effects come from changes in the vegetation albedo.