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# Mountain uplift and the evolution of the African rainbelt in the late Neogene

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Palaeovegetation data indicate a retreat of the tropical rainforest in Africa in the late Miocene. This transition from woodlands to grasslands, connected to the evolution of the African tropical rainbelt, has amongst others been hypothesized to be linked to mountain uplift processes like the East African rift system and South Africa, but also the uplift of the Himalaya and the Tibetan Plateau.
To investigate changes in the tropical rainbelt due to mountain uplift we use the global climate model CCSM3. The coupled system includes atmosphere and ocean general circulation models, as well as a dynamic-thermodynamic sea ice component and a land surface scheme with dynamic vegetation. The model is run with a resolution of T85 ($\sim$1.4°) for the atmosphere and land surface and a variable resolution for the computation of ocean and sea ice down to a meridional grid spacing of 0.3° around the equator.
We performed a set of sensitivity experiments, altering mountain elevations of the Himalaya and the Tibetan Plateau and of East and South Africa separately and in combination giving the opportunity to analyze the effect of the interaction of both uplift processes on African climate.
The results demonstrate that uplift of both East/South Africa, as well as the Himalaya/Tibetan Plateau alter the African-Asian Monsoon circulation, but the effect on African rainfall and vegetation distribution is generally in the opposite direction. The dynamic vegetation model responds to the changes in atmospheric parameters due to the uplift of East and South Africa with an increase in tree-coverage in Central Africa (where precipitation increases), as well as a decrease in shrub and grass coverage in both Central and East Africa (which shows a drying trend).
Uplift of the Himalaya and Tibetan Plateau from half of their present level to present-day altitude shows a smaller effect with an increase in grass and shrub coverage and a decrease in tree coverage in Central Africa. The simulation lowering both confirms the dominant impact of the East and South African uplift for climate and vegetation development of the African region.