Impact of anthropogenic vegetation changes on the African climate in a B2 scenario for 2050

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The land surface has a large impact on local climate conditions by playing an essential role in the heat and water balance of the ground. Thus changes in the land cover can influence the local climate conditions. The potential role of anthropic vegetation changes such as tropical deforestation is considered as a major environmental issue, and has been investigated with GCMs in several sensitivity experiments. However most of the previous experiment have been of the massive deforestation type and are not truly representative of expected future conditions.

Therefore a more realistic scenario of land-use change has been introduced based on the land cover maps produced by an integrated impact assessment model, the IMAGE 2.2 model from RIVM which has been used for producing the IPCC scenarios. In order to investigate the potential impact of the vegetation changes on the future climate, time-slice simulations have been performed with the ARPEGE-Climat model using the land cover maps for 1980 and 2050.

A control simulation representing the current climate has been performed with climatological SSTs and greenhouse gases concentration averaged over a 20-year period centred on 1980, and with land cover specified from the ECOCLIMAP database for computation of the land-surface properties used in the soil-vegetation scheme ISBA. This simulation has been validated by comparison to observed climatological data. For the 2050 simulations the increase in SSTs and greenhouse gases are specified from a transient coupled simulation according IPCC scenario SRES B2. One of the 2050 simulations is made without vegetation changes, while in the other simulation the changes of vegetation from 1980 to 2050 of the IMAGE B2 scenarios are introduced. The IMAGE B2 scenario produces an extensive deforestation over Africa.

In the presentation of the results the impact of greenhouse forcing and vegetation changes will be compared, with particular emphasis on the surface climate changes over Africa. The results show that the greenhouse forcing is the dominant factor on the climate change over the whole of Africa, with vegetation changes having only a local impact over the deforested areas. The response seems also to be dependent on the choice of parameters in the land surface scheme. The conclusion that can be drawn from these simulations is that realistic future vegetation changes have only a rather modest impact on the simulated climate, but which may be important to consider to improve the simulation of the regional climates.

Wednesday III (Keynote talk)