



Climatic effects of idealized deforestation experiments in Earth System Models

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Past modelling studies showed diverse results regarding the signs and magnitudes of biogeophysical effects of land use and land cover change (LULCC) on climate. The relatively small amplitude of LULCCs in historical reconstructions and future scenarios and the various modelling strategies of their implementation in Earth System Models (ESMs) lead to incoherent signals across models.

We will present first results of idealized deforestation experiments designed within the Land Use Model Inter-comparison Project (LUMIP) to address the above-mentioned shortcomings of previous studies: Increasing the signal-to-noise ratio and guaranteeing a harmonized implementation across participating ESMs. Therefore, global forest extent is linearly decreased by 20 million km² over a period of 50 years starting from pre-industrial climate conditions followed by at least 30 years of constant forest cover. While ocean and atmosphere conditions may adapt to the biogeophysical effects of this large-scale deforestation, other forcings such as atmospheric CO₂ concentration are kept constant.

First analyses of the MPI-ESM reveal statistically significant increases in tropical and decreases in boreal near-surface temperatures (T_{as}) along with uniform decreases of precipitation in regions of deforestation. Interestingly, these changes in T_{as} develop from the centre (first 10-30 years) to the margins of deforestation (after 40 years), e.g. in the Amazon region, hinting to the influence of non-local land cover change impacts on climate that add on to the local deforestation signal. We aim to include further analyses from different ESMs as well as advanced detection methods biogeophysical and biogeochemical effects.