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Influence of forest-age structure on land-atmosphere fluxes in the land surface model JSBACH

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The age structure of a landscape is subject to natural and anthropogenic disturbances. Forest-age structure, in particular, is influenced by human activities, such as land-use conversions (re- and afforestation) and forest management. Forests of different ages have different land-atmosphere fluxes. A young clearing might, for example, absorb less light than a thick old-growth forest. Furthermore, non-linear processes such as growth are age dependant, influencing the rate of carbon accumulation in a forest.
The majority of forests are under some form of human use and show altered age distributions as compared to an undisturbed forest. Nevertheless, many land surface models used in Earth system models still neglect the influence of age structure by assuming an ageless forest or a mean-aged forest per grid cell.
We test the impact of sub-grid scale forest age on different land-atmosphere fluxes in the land surface model JSBACH. Whilst JSBACH formerly assumed an ageless forest, we introduced 15 cohorts covering 10 years each, as a compromise between computational complexity and accuracy. We initialised the model using a global age distribution map based on observations.
Preliminary results show an improvement of simulated LAI in model-data comparisons, with smaller changes seen for GPP. These results indicate the need to account for forest-age structure to properly represent land-atmosphere fluxes in land surface models.