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Changes in atmospheric aerosols from reduced BVOC precursors in future deforestation scenarios

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Biogenic volatile organic compounds (BVOC) are emitted in large quantities from the terrestrial biosphere and play a significant role in major atmospheric processes. Such emissions account for 90\% of the total volatile organic compound (VOC) emissions and exert a significant influence on the atmosphere's oxidation capacity. The oxidation of BVOCs yields intermediate species with lower vapour pressures, resulting in organic condensation and the formation of secondary organic aerosols (SOA). SOA directly affect the radiation budget through scattering and absorption, as well as indirectly by modifying cloud formation and distribution. It has been shown that changes in atmospheric states due to SOA contribute to feedbacks with vegetation, exerting a significant impact on global BVOC budgets. Despite their contribution to the uncertainty surrounding the impact of carbonaceous aerosols on future climate forcings, BVOC-climate feedbacks are often neglected in modelling studies. In this work, we use the chemistry-climate model EMAC coupled with the dynamic global vegetation model (DGVM) LPJ-GUESS, enabling interactive calculations of BVOC emission fluxes that respond to changes in atmospheric and vegetation states. We employ deforestation scenarios using different projections for pasture land to disturb the natural potential vegetation simulated in LPJ-GUESS. Utilising a sophisticated description of secondary organic aerosols, the direct relation of atmospheric particles originating from interactive isoprene and terpene fluxes with the atmospheric state can be analysed. Consequently, we use state-of-the-art process descriptions in EMAC to study the impacts of biogenic SOA on global radiation budgets and clouds, shedding light on potential future changes in the atmosphere resulting from perturbations in the biosphere.