



Net effect of 250 years of forest management in Europe

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Globally, 70% of the forest is managed and the importance of management is still increasing both in relative and absolute terms. In Europe, almost all forest is intensively managed by humans. Forests not only influence the global carbon cycle, they also dramatically affect the water vapour and energy fluxes exchanged with the overlying atmosphere. Recently, forest management has become a top priority on the agenda of the political negotiations to mitigate climate change. However, the net effect of biogeochemical and biophysical impacts of forest management is poorly understood. To this aim, the land surface model ORCHIDEE was extended for studying the effects of forest management on the land-atmosphere interaction and forest management was reconstructed for Europe between 1600 and 2010. The effects of forest management on the C-budget was quantified by means of a factorial experiment between 1750 and 2000. Climate change alone was responsible for a cumulated terrestrial sink of 8.1 Pg between 1750 and 2000, land cover changes and forest management sequestered another 0.8 Pg. In the absence of forest management, climate change alone would not have been able to compensate for the losses due to land cover changes. The factorial experiment was extended by coupled land-atmosphere simulations to quantify the effects of forest management on the climate over Europe. The net effect of both biogeochemical and biophysical changes due to present day land management is an increase of the top of the atmosphere radiative forcing by 0.11 to 0.16 Wm⁻² on top of the increase due to climate change. 0.09 to 0.14 Wm⁻² can be attributed to forest management including litter raking, changes in management strategies and species changes.