Geophysical Research Abstracts
Vol. 15, EGU2013-11022, 2013
EGU General Assembly 2013

Change of soil carbon fluxes in European beech forest under different climate and management scenarios: an example from Serbia

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Soil texture and structure, rainfall, temperature conditions and forest management determine the rate of soil carbon sequestration in forest ecosystems. European beech is one of most important and most abundant tree species in Europe. Forest management strategy influences aboveground biomass as well as belowground biomass and soil organic and inorganic carbon. This study explores how different management strategies (i.e. thinning from above intensities with 10%, 20% and 30% removal of trees every ten years) under three different time periods 1971-2000, 2011-2040 and 2051-2080 of the IPCC SRES A2 climate change scenario, influence total soil carbon stock in a beech stand in eastern Serbia. For the simulations, the process-based tree growth model 4C was used. At the beginning of the simulations, the total soil carbon stock was about 85 tC/ha. The most intensive management strategy appears to provide highest carbon fluxes into the soil and the highest total carbon stock values (between 160 and 180 tC/ha) at the end of the simulation periods. All management strategies under the climate of the period 2051-2080 showed the lowest values (about 160 tC/ha). We analyse the interrelationships between management caused changes in litter fluxes and climate (mainly temperature) caused losses of carbon from soil by respiration. In some cases different thinning intensities showed similar fluxes for the same time periods, whereas both climate scenario periods showed quite similar influence for the same management scenarios. The influence of different management strategies on the final total soil carbon stock will be shown.