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Global change impacts on the C- and N-cycle of European forests: A model comparison study

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Recent studies have shown that nitrogen deposition has been the dominant driver of increased growth rate of European forests during the second half of the twentieth century. It is less clear whether this trend will continue into the present century, with deposition likely decreasing but changes in climate and CO_2 accelerating. There is also increasing concern that environmental change will not only affect forest productivity, but its greenhouse gas balance as well.
The present study aimed to quantify the carbon and nitrogen balance, including the exchange of greenhouse gases, of European forests over the period 2010-2030. For this purpose four different dynamic models were used: BASFOR, DAYCENT, INTEGRATOR and Landscape-DNDC. These models span a range from semi-empirical to complex mechanistic models. Comparison of these models allowed assessment of the extent to which model predictions depended on differences in model inputs and structure. We assessed changes in the aforementioned environmental drivers - deposition, climate and CO_2 – according to two different SRES scenarios, A1B and B2. Model calculations were carried out for 40,991 spatial units across Europe and for the two most common tree species. The results were used to identify regions across Europe where forests contribute most to carbon sequestration or emissions of N2O and NO.