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Interannual variability and climate sensitivity of Net Primary Productivity: a process-based multilayer-canopy vegetation model compared against observed tree-ring width

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For the purpose of modeling future changes in carbon [U+FB02]uxes it is important to correctly simulate the interannual variability (IAV) of global and regional [U+FB02]uxes. Tree-ring data have been used to validate model Net Primary Productivity (NPP) on local or regional scales. Here we present a study, where we used a process-based multilayer-canopy vegetation model forced by a 50-year climate re-analysis dataset. By using an extensive database of tree-ring width (TRW) we quanti[U+FB01]ed how the IAV in model NPP relates to that of tree-ring width. We also mapped regions of climate limitation and quanti[U+FB01]ed regional and global trends in simulated NPP. The magnitude of IAV in TRW and modeled NPP in general agreed but the correlation between TRW and NPP varied greatly between grid cells ($r2 \leq 0.54$) with the best correlation found in drier regions. Modeled NPP on average showed a weaker correlation with TRW than in studies using site-tuned models. The smaller correlation found in our study can partly be explained by differences in spatial scale but also on the inclusion in our study of regions with long winters, for which modeled NPP seems to correlate less with TRW. Climate limitation of NPP in general agreed with earlier studies and shows precipitation to be the main limiting climatic factor (for 45.5 % of all cells). We estimated a global increase in NPP of 0.32 % yr^{-1} for the later half of the 20th century, due primarily to CO2 fertilization.