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Comparing Productivity Simulated with Inventory Data Using Different Modelling Technologies

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The Lime Stone National Park in Austria was established in 1997 to protect sensible lime stone soils from degradation due to heavy forest management. Since 1997 the management activities were successively reduced and standing volume and coarse woody debris (CWD) increased and degraded soils began to recover. One option to study the rehabilitation process towards natural virgin forest state is the use of modelling technology. In this study we will test two different modelling approaches for their applicability to Lime Stone National Park. We will compare standing tree volume simulated resulting from (i) the individual tree growth model MOSES, and (ii) the species and management sensitive adaptation of the biogeochemical-mechanistic model Biome-BGC. The results from the two models are compared with filed observations form repeated permanent forest inventory plots of the Lime Stone National Park in Austria. The simulated CWD predictions of the BGC-model were compared with dead wood measurements (standing and lying dead wood) recorded at the permanent inventory plots. The inventory was established between 1994 and 1996 and remeasured from 2004 to 2005. For this analysis 40 plots of this inventory were selected which comprise the required dead wood components and are dominated by a single tree species. First we used the distance dependant individual tree growth model MOSES to derive the standing timber and the amount of mortality per hectare. MOSES is initialized with the inventory data at plot establishment and each sampling plot is treated as forest stand. The Biome-BGC is a process based biogeochemical model with extensions for Austrian tree species, a self initialization and a forest management tool. The initialization for the actual simulations with the BGC model was done as follows: We first used spin up runs to derive a balanced forest vegetation, similar to an undisturbed forest. Next we considered the management history of the past centuries (heavy clear cuts etc.) to account for potential degradation effects versus unmanaged forests. Finally the current stands are simulated using daily input parameters for each given forest inventory plot. The important resulting output for this study is the stem carbon in kg.m-^{2}. These values must be transformed to stem volume as it is available form the simulation output of MOSES and the inventory plot information by using conversion factors. For comparison we simulated the stem carbon (or stem volume part) for the period 1994/96 to 2004/05 and compared the resulting predictions with the available measurements. The MOSES simulations produced unbiased and consistent results versus the field observations. The predictions with Biome-BGC indicate a strong correlation between predictions and observation but suggest an overestimation regardless of the amount of standing volume. For the CWD Biome-BGC exhibits lower values than the field measurements, however in denser forests the difference between predicted and observed CWD diminishes.