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Simulating crop growth with Expert-N-GECROS under different site conditions in Southwest Germany

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When feedbacks between the land surface and the atmosphere are investigated by Atmosphere-Land surface-Crop-Models (ALCM) it is fundamental to accurately simulate crop growth dynamics as plants directly influence the energy partitioning at the plant-atmosphere interface. To study both the response and the effect of intensive agricultural crop production systems on regional climate change in Southwest Germany, the crop growth model GECROS (YIN & VAN LAAR, 2005) was calibrated based on multi-year field data from typical crop rotations in the Kraichgau and Swabian Alb regions. Additionally, the SOC (soil organic carbon) model DAISY (MÜLLER et al., 1998) was implemented in the Expert-N model tool (ENGEL & PRIESACK, 1993) and combined with GECROS. The model was calibrated based on a set of plant (BBCH, LAI, plant height, aboveground biomass, N content of biomass) and weather data for the years 2010 – 2013 and validated with the data of 2014. As GECROS adjusts the root-shoot partitioning in response to external conditions (water, nitrogen, CO_2), it is suitable to simulate crop growth dynamics under changing climate conditions and potentially more frequent stress situations. As C and N pools and turnover rates in soil as well as preceding crop effects were expected to considerably influence crop growth, the model was run in a multi-year, dynamic way. Crop residues and soil mineral N (nitrate, ammonium) available for the subsequent crop were accounted for. The model simulates growth dynamics of winter wheat, winter rape, silage maize and summer barley at the Kraichgau and Swabian Alb sites well. The Expert-N-GECROS model is currently parameterized for crops with potentially increasing shares in future crop rotations. First results will be shown.