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Simulations of greenhouse gas emissions and soil organic carbon with ECOSSE for a rice field in Northern Italy

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Rice cultivation has high water consumption and emits large quantities of greenhouse gases. Therefore, rice fields provide great potential to mitigate GHG emissions by modifications to cultivation practices or external inputs. Previous studies showed differences for impacts of alternated wetting and drying (AWD) practices for above-ground and below-ground biomass, which might have long term impacts on soil organic carbon stocks. The objective of this study is to parameterise and evaluate the model ECOSSE for rice simulations based on data from an Italian rice test site where the effects of different water management practices and 12 common European cultivars, on yield and GHG emissions, were investigated. Special focus is on the differences of the impacts on the greenhouse gas emissions for AWD and continuous flooding (CF). The model is calibrated and tested for field measurements and is used for model experiments to explore climate change impacts and long-term effects. Long term carbon storage is of particular interest since it is a suitable mitigation strategy. As experiments showed different impacts of management practices on the below ground biomass, long term model experiments are used to estimate impacts on SOC of the different practices. The measurements also allow an analysis of the impacts of different cultivars and the uncertainty of model approaches using a single data set for calibration.