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Inter-comparison of two process-based models of different complexity to quantify N2O emissions from agro-ecosystems in Europe

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An inter-comparison study involving ecosystem models of different complexity to quantify nitrous oxide (N2O) emissions from agro-ecosystems in Europe has been initiated. The complex Daily DayCent model and simple ECOSSE model involve significantly different processes and approaches to quantify trace gas emissions from different ecosystems. Results from this study, in which models used common input data sets will be reported and discussed. Major differences between models include the explicit representation of crop growth in the more complex DailyDayCent model. The major differences in these models and their effects on carbon partitioning and trace gas emissions will be discussed. The simple model explicitly simulates belowground processes, and uses very simple algorithms to quantify N uptake and plant growth. The overall goal was to find a model capable of quantifying trace gas emissions and C dynamics while maintaining a relatively simple model structure that minimized the number of required user inputs. Model results for N2O, NO and soil CO2 emissions, soil N and C dynamics are compared with observed quantities at 3 agricultural sites in Europe. At all sites, the participating models were found to be capable of predicting observed annual values of N2O flux. At the Paulinenaue site, however, both models showed relatively poor predictive capabilities for N fluxes on a daily time step. The influence of model structure and parameters on model performance is discussed.