A comparison of DNDC and DayCent to evaluate GHG emissions from China's main cropping systems

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China contributes the largest share of cropland’s greenhouse gas (GHG) emissions globally. Processed-based biogeochemical models are useful tools to simulate GHG emissions from cropping systems. However, model comparisons are necessary to provide information for the application of models under different climate, soil, and crop conditions. In this study, two widely-used models (DayCent and DNDC) were evaluated and compared under four main cropping systems in China. The field observations from nine experiments were used for model calibration and validation. The DayCent and DNDC models simulated daily and seasonal CH₄ emissions from early rice-late rice and rice-wheat cropping systems reasonably well ($r^2$≥0.49 for daily simulation and nRME$\leq$52.9% for seasonal simulation). Both models were able to satisfactorily predict seasonal N₂O emissions from maize-wheat fields ($0.6\leq r^2<0.8$), but overestimated most daily N₂O fluxes at fertilisation and irrigation events. Significantly positive relationships were found between simulated and observed cumulative N₂O fluxes in spring maize growing season ($0.61\leq r^2<0.85$). The DNDC showed smaller differences in simulated and observed cumulative GHG emissions for spring maize and double rice, while DayCent showed better performance on estimating N₂O and CH₄ for maize-wheat and rice-wheat. This study shows that both models have strengths and weaknesses under a variety of cropping systems and growing regions, which are important to consider when choosing a model for a crop/region-specific simulation.