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Site scale to regional N2O emissions estimates - comparison between two terrestrial ecosystem model, O-CN and CERES-EGC

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Nitrous oxyde is one of the main biogenic greenhouse gases contributing to the global warming potential of terrestrial ecosystems. Estimating the nitrogen fluxes and evaluating the impact of anthropogenic pressure (land-use change, fertilizer, agricultural practices, local pollution . . .) becomes essential in view of a management of these anthropogenic sources.
Two different types of ecosystem models, coupling the carbon and nitrogen cycles, are implemented to evaluate the nitrous oxyde fluxes at site and regional scales : the terrestrial ecosytem model O-CN, and the biophysical crop model CERES-EGC. Calibration and validation of the models at site scale and in France reveals the differences between the two model approaches, on the process-level, on large scale for O-CN and site-specific for CERES-EGC. Having a detailed forcing dataset on soil properties and crop management and a good representation of soil hydrology seems essential to capture the temporal dynamics of N2O emissions. Predicted regional and global estimates are found in the observed ranges for individual vegetation types and global biomes. Comparison with emissions inventories such as EDGAR and GEIA is made and discuss.