Data assimilation framework around the LPJ-GUESS model for the optimised simulation of CH4 emission from Northern wetlands

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Wetlands in the boreal zone are a significant source of atmospheric methane, and hence they have been intensively studied with mechanistic models for the assessment of methane dynamics. The arctic-enabled dynamic global vegetation model LPJ-GUESS is one of the models that allow quantification and understanding of the natural methane fluxes at various scales ranging from local to regional and global, but with several uncertainties. Complexity in the underlying environmental processes, warming driven alternative paths of meteorological phenomena and changes in hydrological and vegetation conditions are exigent for a calibrated and optimised LPJ-GUESS. In this study, we used the Markov chain Monte Carlo (using Metropolis-Hastings formula) algorithm to quantify the uncertainties of LPJ-GUESS. Application of this method allows greater search of the posterior distribution, leading to a more complete characterisation of the posterior distribution with reduced risk of sample impoverishment. We will present first results from an assimilation experiment optimising LPJ-GUESS model process parameters using the flux measurement data from 2005 to 2015 from the Siikaneva wetlands in southern Finland. We analyse the parameter efficiency of LPJ-GUESS by looking into the posterior parameter distributions, parameter correlations, and the interconnections of the processes they control. As a part of this work, knowledge about how the methane data can constrain the parameters and processes is derived.