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Methane emission modeling with MCMC calibration for a boreal peatland

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Natural wetlands, particularly peatlands of the boreal latitudes, are a significant source of methane (CH4). At the moment, the emission estimates are highly uncertain. These natural emissions respond to climatic variability, so it is necessary to understand their dynamics, in order to be able to predict how they affect the greenhouse gas balance in the future. We have developed a model of CH4 production, oxidation and transport in boreal peatlands. It simulates production of CH4 as a proportion of anaerobic peat respiration, transport of CH4 and oxygen between the soil and the atmosphere via diffusion in aerenchymatous plants and in peat pores (water and air filled), ebullition and oxidation of CH4 by methanotrophic microbes. Ultimately, we aim to add the model functionality to global climate models such as the JSBACH (Reick et al., 2013), the land surface scheme of the MPI Earth System Model. We tested the model with measured methane fluxes (using eddy covariance technique) from the Siikaneva site, an oligotrophic boreal fen in southern Finland (61°49′ N, 24°11′ E), over years 2005-2011. To give the model estimates regional reliability, we calibrated the model using Markov chain Monte Carlo (MCMC) technique. Although the simulations and the research are still ongoing, preliminary results from the MCMC calibration can be described as very promising considering that the model is still at relatively early stage. We will present the model and its dynamics as well as results from the MCMC calibration and the comparison with Siikaneva flux data.