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Integrating a Methane Emission Tool into the Land Component JSBACH

M. Tomasic (1), T. Vesala (1), M. Raivonen (1), S. Smolander (1), T. Hölttä (1), V. Brovkin (2), R. Schuldt (2), A. Valdebenito (3), T. Kleinen (2), and C. Reick (2)

(1) Helsinki, Division of Atmospheric Sciences and Geophysics, Department of Physics, University of Helsinki, Finland (marin.tomasic@helsinki.fi), (2) Max-Planck-Instute for Meteorology, Hamburg, Germany, (3) Norwegian Meteorological Institute, Oslo, Norway

Northern peatlands in the northern hemisphere are a very large carbon storage pool and act as a carbon sink due to the greater primary production than substrate decomposition over the last 6000 years [**?**]. This accumulation resulted in a global storage capacity between 220 and 445 GT [**?**]. Between 15to 22 $ of the global terrestrial carbon [**?**, **?**] are stored in these wetland ecosystems. They are one of the largest individual source of emission on the global methane budget. Estimates of total emission vary between $100 - 231\ Tg\ a^{-1}$ [**?**] which respresents about $15 - 20\%$ of the overall contribution [**?**, **?**]. Calculating global methane budgets and emission patterns will depend especially on the developments in this area. Temperature is expected to rise and the following increase in anaerobic microbial activity has a very large significance for detrimental changes in the global climate. Accurate observations and description of the processes related to methanogenesis and emission is of fundamental necessity. We are using two approaches to reach this goal: On one hand we perform continuous measurements of ecosystem emissions of methane at our wetland site, a boreal fen in southern Siikaneva close to Hyytyälä Forest Station in Southern Finland [**?**]. As a second approach we are developing a methane emission scheme for the JSBACH land and vegeation tool of the Max-Planck Earthsystem Model (MPI-ESM). A stand alone version for comparison with the local site in Siikaneva will be the follow up once the global tool has been calibrated and tested. Methane emissions involve the interaction of different gases and thus has to be described with different subprocesses:

1) Production of CH_4 in correlation with the biomass substrate available 2) Oxidation of CH_4 among the different layers leading to CO_2 2)Transport of methane up to the lower boundary layer of the atmosphere via a) Diffusion in peat layer, b) Ebullition and c) Plant enhancement . 4) Oxygen transport from the atmosphere downward to the roots and aswell in the different layers 5) Transport of CO_2 to the lower boundary layer of the atmosphere

Several of the most important pathways of methane release have been described by the modelling study by Wania et al. [**?**]. We are using this as a starting point of our model development. An improved description of the transport process via the plant aerenchyma is described in the model in comparison with the approach taken by Wania and the transport and emission of CO_2 as a process of oxidation of methane is not being neglected. We are currently in the phase of calibrating and testing the model so that we can start running comparison studies with previous works [**?**]. First results of this modeling studies will be presented at the 2012 EGU session.

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