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Assessing Methane Emissions with the Global Land Model JSBACH

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40% of the estimated global methane emissions (ca. 500 $\pm$ 105 Tg per year) come from natural wetlands and rice fields (Crutzen, 1991). Especially wetlands in the northern hemisphere are a very large carbon storage and reserve pool (Roulet et. al. :1997) and contribute with a significant amount to the emission pattern. Temperature rise and the following increase of pace of anaerobic decomposition of organic matter will lead to higher emissions of methane, thus increasing global warming. Assessing the effects of methane emission and estimating its uncertainties will be henceforward essential for climate predictions.
The JSBACH land surface component of the MPI Earth System Model (MPI-ESM) is currently being amended by a methane emission tool which will at first include three main processes of emission: 1) Diffusion through the soil layers, 2) Plant mediated transport and 3) Bubble formation (ebullition) and further release to the atmosphere. Parts of these processes have been already developed in the LPJ-WHY-ME (Lund-Potsdam-Jena Wetland Hydrology Methane) model (Wania et al. 2009). We included (for process 1) the approach of Wania (Wania et al. 2009), developed further (for process 2) its descriptions, or have choose a slightly deviant approach (for process3: Based on the nucleation theory (Hölttä et al. 2002)) in our modeling tool. First results of the global modeling study will be presented at this session.

Crutzen, P.J., 1991. Methane's sinks and sources. Nature 350, 380–381.

R. Wania, I. Ross, I. C. Prentice (2009). Integrating peatlands and permafrost into a dynamic global vegetation model: II. Evaluation and sensitivity of vegetation and carbon cycle processes vegetation dynamics, Global Biogeochemical Cycles, GB3015, doi:10.1029/2008GB003413.

T. Hölttä, T. Vesala, M. Perämäki, E. Nikinmaa (2002). Relationship between Embolism, Stem Water Tension and Diameter Changes. Journal of Theoretical Biology 215: 23-38

Roulet, N. T., D. S. Munro, and L. Mortsch (1997). The Surface Climates of Canada: Wetlands 149-171. edited by W. G. Bailey et al McGill-Queens Univ. Press, Montreal, Que., Canada.