View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by UNH Scholars' Repository

University of New Hampshire
University of New Hampshire Scholars' Repository

Earth Sciences Scholarship | Earth Sciences

5-2010

Exploring the limits of knowledge on boreal peatland development using a new model: the Holocene Peatland Model

Anne Quillet
Universite du Quebec a Montreal

Michelle Garneau
Universite du Quebec a Montreal

Steve Frolking
University of New Hampshire - Main Campus, steve.frolking@unh.edu

Nigel T. Roulet
McGill University

Changhui Peng
University of Quebec at Montreal

Follow this and additional works at: https://scholars.unh.edu/earthsci_facpub

Recommended Citation
Quillet A, Garneau M, Frolking S, Roulet N, Peng C. 2010. Exploring the limits of knowledge on boreal peatland development using a new model: the Holocene Peatland Model, EGU 2010 annual meeting.

This Conference Proceeding is brought to you for free and open access by the Earth Sciences at University of New Hampshire Scholars' Repository. It has been accepted for inclusion in Earth Sciences Scholarship by an authorized administrator of University of New Hampshire Scholars' Repository. For more information, please contact nicole.hentz@unh.edu.

Geophysical Research Abstracts
Vol. 12, EGU2010-10931, 2010
EGU General Assembly 2010
© Author(s) 2010

Exploring the limits of knowledge on boreal peatland development using a new model: the Holocene Peatland Model

Anne Quillet (1), Michelle Garneau (2), Steve Frolking (3), Nigel Roulet (4), and Changhui Peng (5)

(1) Insitut des Sciences de l'Environnement & Géotop, Université du Québec à Montréal, Montréal, Qc., Canada (quillet.anne@courrier.uqam.ca / +1-514-987-3635), (2) Département de Géographie & Géotop, Université du Québec à Montréal, Montréal, Qc., Canada, (3) Institute for the Study of Earth, Oceans, and Space & Dept. of Earth Sciences, University of New Hampshire, Durham, NH, USA, (4) Dept. of Geography & School of the Environment, McGill University, Montréal, Qc., Canada, (5) Insitut des Sciences de l'Environnement, Université du Québec à Montréal, Montreal, Qc., Canada

The Holocene Peatland Model (HPM) (Frolking et al. 2009, Frolking et al. in prep.) is a recently developed tool integrating up-to-date knowledge on peatland dynamics that explores peatland development and carbon dynamics on a millennial timescale. HPM combines the water and carbon cycles with net primary production and peat decomposition and takes the multiple feedbacks into account. The model remains simple and few site-specific inputs are needed. HPM simulates the transient development of the peatland and delivers peat age, peat depth, peat composition, carbon accumulation and water table depth for each simulated year.

Evaluating the ability of the model to reproduce peatland development can be achieved in several manners. Commonly one could choose to compare simulations results with observations from field data. However, we argue that the overall response of the model does not give much information about the value of the model design. Modelling of peatlands dynamics requires a lot of information regarding the behaviour of a peatland system within its environment (including allogenic changes in climate, hydrological conditions, nutrient availability or autogenic processes such as microtopographical effects). The actual state of knowledge does not cover all processes, interactions or feedbacks and a lot of peatland properties are neither well defined nor measured yet, so that estimates have been needed to build the model.

The work presented here aims at analyzing the role of the model parameterization on the simulation results. To do so, a sensitivity analysis is performed with a Monte-Carlo analysis and with help of the GUI-HDMR software (Ziehn and Tomlin, 2009). This method ranks the parameters and combinations of them according to their influence on simulation results.
The results will emphasize how the simulation is sensitive to the parameter values. First, the distribution of outputs gives insight into the possible responses of the simulation to HPM's assemblage of current knowledge. Second, the importance of some parameters on simulation results points out certain gaps in the current understanding of peatland dynamics. Thus, this study helps determine some avenues that should be explored in future in order to improve peatlands dynamics understanding.

Frolking S, NT Roulet, A Quillet, E Tuittila, JL Bubier. 2009. Simulating long-term carbon and water dynamics in northern peatlands Eos Trans. AGU, 90(52), Fall Meet. Suppl., Abstract PP12B-05.
Frolking S, NT Roulet, E Tuittila, JL Bubier, A Quillet. XXXX. A new model of Holocene peatland net primary production, decomposition, and peat accumulation. in prep.
Ziehn T, AS Tomlin. 2009. GUI-HDMR – A solftware tool for global sensitivity analysis of complex models. Environmental Modelling & Software, 24, 775-785.