MODELLING OF SUBSIDENCE, NUTRIENT RELEASES AND EMISSION OF GREENHOUSE GASSES IN PEATLANDS IN THE EUROPEAT PROJECT

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The EUROPEAT project aims to elucidate the processes determining the rate of oxidation, subsidence, release of nutrients to groundwater and surface waters, and emission of greenhouse gasses (GHG) in peat soils depending on drainage and climatic conditions. A main objective of the project is to develop tools to improve the prediction of the effect of land-use and water management and global climatic change on these processes. One of these tools is a dynamic process oriented model. The model to be developed should meet some important requirements. It should be able to perform dynamic simulations:
- of the water balance and transport of water, solutes and heat in the unsaturated and saturated zone of peat soils, including drainage and leaching of solutes to drains at different levels;
- of the complete carbon, nitrogen and phosphorus cycles with their transformation processes and interrelations, depending on the kind of peat and the factors soil moisture, oxygen concentration, temperature, pH, and nitrogen and phosphorus supply, including leaching of nutrients to ground and surface water, and emission of the GHG CO2, CH4 and N2O;
- of swelling and shrinking, development of shrinkage cracks and distribution of water over aggregates and cracks. This is essential for simulating biological and chemical processes, subsidence, preferential flow and enhanced diffusion of oxygen into the profile;
- over a long time period on a PC.

The model will be obtained by linking two existing models that meet most of these requirements: SWAP for simulating the hydrology of the (un)saturated zone and swelling and shrinking of the soil matrix, and ANIMO for simulating the carbon and nutrient cycles, and nutrient leaching and evolution of GHG. SWAP provides hydrological input, e.g. water balance terms and fluxes, for the ANIMO model. Both models are wellknown, internationally accepted, and widely used dynamic, mechanistic models developed by Alterra and Wageningen University. The latest versions of the models will be linked to obtain a model combination with the most recent features. In order to meet all the required features the model combination will be improved and extended with new process descriptions: ripening of peat soil, changing of the soil profile due to disappearance of peat, effects of hysteresis in alternating swelling and shrinking of peat, evolution and emission of N2, N2O and CH4.

The model will be calibrated and validated against data collected in (long-term) field, lysimeter and laboratory experiments of the six countries participating in the EUROPEAT project. The validated model will be used to quantify actual GHG emissions, nutrient leachate fluxes, peat erosion and subsidence rates at a regional scale. In scenario studies the effects of changes in land use, water management and global climate on these quantities will be studied.

First results of model simulations for different experimental fields in Europe will be presented.