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Hydrological Simulation of Runoff from Peat Harvesting Areas Using DRAINMOD

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Peatland drainage and harvesting cause considerable impacts on runoff water quantity and quality. A crucial water quality problem is leaching of nutrients and sediment that occur after summer rainfall and leaching of acid water after groundwater level drawdown on peatlands overlaying acid sulphate soils. Groundwater fluctuations and drain runoff are important parameters that should be better predicted and monitored for load prediction. Also performance and efficiency of drainage network and different water treatment methods depend on good prediction of these parameters during design phase. In order to prevent and control pollution from drained peatlands,
The DRAINMOD model has been developed for soils with shallow water table (Skaggs, 1980). The model simulates hourly hydrological response to rainfall using soil characteristics, drainage specifications and climatological data as input. The main objective of this research is to test the model for hydrological simulation of groundwater level fluctuations and estimation the amount of drained water in two peat harvesting areas in north of Finland. In order to collecting data different loggers are installed in each area to observe groundwater level, drainage water and rain continuously since summer of 2012. Several soil profiles were taken from mentioned sites and tested in the laboratory and some measuring were done in the field to determine soil characteristics as well. Water table depth (WTD) data that were collected during observation period are used for model calibration and validation. Some outliers occurred for certain events, but most simulated values of WTD are matched with observed data, both in terms of timing and quantity, thus, it can be concluded that the model performed satisfactorily for peat harvesting sites. The model allow to simulate daily amount of infiltration, evapotranspiration, runoff, drainage water and water table depth that are useful in the design of control structures, storage and sediment ponds, pump stations and treatment facilities.
References
Skaggs, R. W. 1980. DRAINMOD reference report. Fort Worth, Tex.: USDA-SCS South National Technical Center. Available at: www.bae.ncsu.edu/soil_water/documents/drainmod/chapter1.pdf