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Performance assessment and parameterization of the SWAP-WOFOST model for peat soil under agricultural use in northern Europe.

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Peat soils form a major share of soil suitable for agriculture in northern Europe. Successful agricultural production depends on hydrological and pedological conditions, local climate and agricultural management. Climate change impact assessment on food production and development of mitigation and adaptation strategies require reliable yield forecasts under given emission scenarios. Coupled soil hydrology - crop growth models, driven by regionalized future climate scenarios are a valuable tool and widely used for this purpose. Parameterization on local peat soil conditions and crop breed or grassland specie performance, however, remains a major challenge.

The subject of this study is to evaluate the performance and sensitivity of the SWAP-WOFOST coupled soil hydrology and plant growth model with respect to the application on peat soils under different regional conditions across northern Europe. Further, the parameterization of region-specific crop and grass species is discussed.

First results of the model application and parameterization at deep peat sites in southern Finland are presented. The model performed very well in reproducing two years of observed, daily ground water level data on four hydrologically contrasting sites. Naturally dry and wet sites could be modelled with the same performance as sites with active water table management by regulated drains in order to improve peat conservation. A simultaneous multi-site calibration scheme was used to estimate plant growth parameters of the local oat breed. Cross-site validation of the modelled yields against two years of observations proved the robustness of the chosen parameter set and gave no indication of possible overparameterization.

This study proves the suitability of the coupled SWAP-WOFOST model for the prediction of crop yields and water table dynamics of peat soils in agricultural use under given climate conditions.