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Hydrology and Earth System Sciences Discussions

Interactive comment on "Impacts of ditch cleaning on hydrological processes in a drained peatland forest" *by* H. Koivusalo et al.

Anonymous Referee #2

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This paper describes a modelling study aimed at quantifying changes in catchment runoff and other hydrological processes, resulting from cleaning of ditches in a peatland forest in N Finland. A process-based model is applied at a site level to examine the effects of ditch cleaning, using measurements of the water table depth to calibrate the simulations. Total catchment runoff is also estimated from the site simulations interpolated to the catchment scale, and compared with measured flows. The study uses good long-term datasets of hydrometric observations covering periods both before and after management of the ditch network. These indicate changes in the behaviour of the water table following ditch cleaning, at least in areas with certain soil types.

The process-based model (FEMMA) used for the study has been designed for and previously applied to similar study areas, and therefore includes the most relevant hy-

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Interactive Discussion

Discussion Paper

drological processes for the situation. However I have some serious concerns about the manner in which a model such as FEMMA is being applied in this study.

1. There is an underlying assumption in the application that most parameters can be estimated from physical measurements or previous studies (e.g. for functions controlling stomatal resistance, and the canopy model).

2. The remaining (unclear number of) parameters were calibrated using water table measurements (?), presumably using a manual calibration method (there is no mention of how the calibration was undertaken).

3. There appears to be an assumption that one particular set of parameters gives the optimal solution and no consideration is given to the issue of parameter equifinality, which has been shown to exist in all hydrological models which have been studied.

4. Following on from this, no consideration is taken of uncertainty in any of the data, model structure, or parameter values.

5. The poor simulation of catchment runoff clearly reflects the above comments.

Given the objective of the study that has been undertaken - to quantify the effects of ditch cleaning on hydrological processes - I think the preceding comments largely render the analysis as meaningless, not least because detection of changes in system behaviour is very difficult. It is clear that the model has some success in simulating the observed changes in the water table levels that result from the ditch cleaning, but looking at the results one suspects that this is not a hugely challenging task. Effectively, the steady-state level of the water table is observed to drop from around 40cm to around 80cm, which seems very consistent with the increase in depth of the ditches resulting from cleaning. Hence, successful simulation of these levels does not mean that all internal processes (such as the complex canopy interception / ET model for example) are operating correctly and sufficiently accurately to permit subtle changes in the hydrological processes following ditch cleaning, to be identified.

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Interactive Comment

I am very much in favour of using models to examine sensitivities and to try and improve our understanding of catchment processes, but I believe such studies should be presented as such (i.e. numerical experiments), rather than as factual simulations of complex processes, using highly complex (and very imperfect) models.

In addition to the above comments, I also found the structure of the paper difficult to read, and to follow although most of the detail of the model, processes and parameters is hidden somewhere in the text. A simple table or two summarising the parameters and how they are estimated would be useful.

I believe that the paper is not suitable for publication in HESS in the format in which it has been presented, but I would encourage the authors to consider re-structuring the study in terms of a sensitivity analysis / numerical experiment, in which case it could be an interesting and useful addition to the literature.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 147, 2008.