Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
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Comment on hess-2022-128

Anonymous Referee #2

Referee comment on "Simulating the hydrological impacts of land use conversion from annual crop to perennial forage in the Canadian Prairies using the Cold Regions Hydrological Modelling platform" by Marcos R. C. Cordeiro et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-128-RC2, 2022

The authors conducted a modelling study to evaluate impact of a landuse change on a watershed-scale discharge. The study uses relatively established hydrological model (CHRM) originally designed for cold regions settings and, thus, already incorporating many relevant processes. Different model elements were evaluated in the multiple previous publications.

Overall, the paper is well-structured and well-written, however, it suffers from few issues. The authors fail to follow up on the hydrological data referred to in Methods (L181-186). These data are neither presented in Results, nor in Discussion. The absence of the observed discharge from the results is particularly puzzling, given that authors present simulation data only for the years when streamflow observations are available. Furthermore, while utility of the CHRM in general was confirmed in the previous studies, authors changed the model to account for macropore development under perennial forages (L134-144). It is unclear from the article if adequacy of this change was properly evaluated. This is particularly important given that authors report higher simulated water content under perennial forages than under crops in most years – an observation contradicting numerous previous studies throughout semi-arid grasslands in North America and Eurasia (and acknowledged by authors in Discussion – L314-324). Therefore, there is a clear need to compare model outputs with observations to confirm that completed model modification ('fallstat_correction') adequately captures effects of land use change. It must be noted that capturing observed discharge reduction may not be sufficient on its own, as it can be predicted based on the increased evapotranspiration after crop to grass conversion observed in the previous studies.

I recommend this manuscript for publication after major revisions addressing the issues raised in the paragraph above.

Other notes:

L86 Typo: should be “Vertisols” instead of “Veritsols”

L93 Please cite source of the shown land use file. Please add black line to the legend. Is it denoting borders of the 4 sub-basins referenced in L99?

L99, L121 It is unclear why “four sub-basins” are mentioned. They are referred to just twice in the text and on Figure 1. Also, it adds confusion (there is a LS-05OG008 sub-basin that consists of four sub-basins).

L105 Please consider spelling out most acronyms in the table (as was done at Cordeiro, 2017). Currently there are 22 acronyms in the making it nearly impossible to follow up.