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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Simulating cold-region hydrology in an intensively drained agricultural watershed in Manitoba, Canada, using the Cold Regions Hydrological Model" *by* Marcos R. C. Cordeiro et al.

Anonymous Referee #2

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The manuscript presents a research on cold-region hydrological modelling in an intensively drained agricultural watershed in Manitoba, Canada. The well established Cold Regions Hydrological Model was adopted to simulate the hydrological processes in a small watershed (189 km2) with no-calibration upon streamflow measurement. The hydrograph can be reasonably reproduced for wet years, and other water balance components (SWE, soil moisture, evaporation) are validated by independent sources. The challenges associated with ice cover condition and backwater condition are analysed. Generally, the presented work contains valuable information for similar studies in cold regions and confirm the applicable of CRHM. It contains new advances in hydrologi-

cal simulation practice and potentially interests HESS readers. I suggest its possible publication after addressing the following issues. Major comments:The significance of the research, the novelty of the result and analysis is not clearly stated. For example, the importance of Lake Winnipeg is not the reason for publication (first paragraph); That CRHM has not yet used to simulate hydrological processes in the specific intensively managed lowland agricultural watershed is not the reason for publication either. As a suggestion, I would like the authors to highlight: 1) few hydrological modelling exercises have been carried out in the complex terrain like Red River. The current work provides valuable insights. 2) The study area has global implications (not only for Lake Winnipeg). 3) The challenges identified (ice and backwater conditions) are important for further modelling practices. The possible future research/experimental efforts should be clearly stated, which can be useful for other researchers. 4) How can the non-calibration of CRHM give the reasonable results, especially internal variables like SWE, soil moisture, and evaporation? More explanation can provide valuable insights for the readers.

Minor comments: 1. The eutrophication is background of this paper. It should be presented in a concise manner. The present manuscript talked too much about that, for example, in Ln40, Ln82, Ln109, Ln526. 2. Ln 63: references are needed for ARHYTHM and VIC. Also, It is fair to mention some recently developed cold-region hydrological models like THREW model: * Liqin Mou, Fuqiang Tian, Heping Hu, Murugesu Sivapalan. Extension of the Representative Elementary Watershed approach for cold regions: constitutive relationships and an application. Hydrology and Earth System Science, 2008, 12:565-585. * Fuqiang Tian, Heping Hu, Zhidong Lei, Murugesu Sivapalan. Extension of the Representative Elementary Watershed Approach for cold regions via explicit treatment of energy related processes. Hydrology and Earth System Science, 2006, 10:619-644. 3. Ln328 and other locations: is ice condition mentioned specific to ice cover condition? please clarify. 4. Ln393: soil moisture is not well reproduced as we can see from figure 9. Please be careful with the relevant statements. 5. Figure 4: simulated and observed discharge lines are not easily differ-

entiated (also in figures 6, 7, and 9). The size of dots for WSC manual readings is too big.

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