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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Field-scale water balance closure in seasonally frozen conditions" *by* X. Pan et al.

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This is a well-executed study and a generally well-written paper (although I have made suggested edits directly on the ms). However, my main reservation is that it is not presented as a particularly novel study. Much of the work confirms long-standing knowledge of key hydrological processes in the Canadian prairies (e.g. Gray's work on the significance of pre-freeze-up soil water content on subsequent snowmelt infiltration, Pomeroy's work on snow drifting and sublimation, Hayashi's work on depression-focused recharge). What is needed is a refocusing of the paper to emphasize its novel contributions. Such a refocusing should include a complete error analysis of the various water balance components. As it stands, the paper considers the error in water storage simply in terms of the spatial variation in water storage measured at the various neutron probe access tubes. I feel that this is an

overly-simplistic approach to establishing non-closure of the water balance. The paper would also benefit from a clear definition of what the authors mean by "closure" for the values they present in Table 1, as well as a more complete specification of the main goal of the paper. At present, one of the paper's major goals is to "evaluate whether simplifying assumptions can be justified" (presumably regarding the determination of the site water balance). These assumptions should be spelled out in greater detail, and could be stated as testable hypotheses. In light of these issues, I feel that the paper should not be accepted in its present form. Nevertheless, I think it has promise, and that the authors should be encourage to resubmit a revised version of the paper.

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/hess-2016-260/hess-2016-260-RC2-supplement.pdf

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