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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Peak river flows in cold regions – Drivers and modelling using GRACE satellite observations and temperature data" *by* S. Wang et al.

Anonymous Referee #2

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This study provides a simple yet effective approach to spring snowmelt prediction in cold regions by incorporating temperature data and GRACE satellite observations on total water storage. The mode is applied to forecast spring peak river flow in the Mackenzie River Basin, and leads to a few very interesting results and conclusions. The approach is of great usefulness in flood prediction and water resources management in cold regions where data is scarce, such as the Mackenzie River Basin. The paper is also very well organized and presented. I highly recommend for publication in HESS. I have only a few minor questions and comments as listed below:

1) There are a couple of typos: Line 255 "is" -> "are"; Line 383&384 "km3" ->"m3"

2) Add the number of samples (n) in Tables 1 and 2 for the calibration of the two sub-

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models, the Baseflow model and the Snowmelt model.

3) Looking at Fig. 3 and Eq. (3), my understand is: TWS0 is the total terrestrial water storage at the beginning of a snow season when non-snow water (W) is the largest, and the base flow (Qbase) observed at the hydrometric station during the snow season is modelled using Eq(3). Given a positive value of parameter a and a negative value of parameter b (-195.9 mm; Lines 303-304), this means that the observed base flow is larger than 0 even if TWS0<0. Then, it seems that TWS0 does not only reveal "non-snow water" but also something else.

4) Eq. (5) provides a nonlinear model for determination of snow melt rate using the snow amount and the temperature; Fig. 5a shows a weak correlation between SWE at spring break-up and peak surface run-off for Mackenzie Bain, therefore temperature is considered to have played an important role (Lines 353-355). I agree with the authors that a large capacity of retaining and releasing no-snow water by the basin during a year's cycle would explain this. It would be of great interest to exploit and understand how the temperature impacts the annual variability of peak river flow, and the days of delays from peak snow melt to peak river flow observed at the hydrometric station; but this might not be relevant to the current paper.

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