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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.

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We greatly appreciate the comments from the reviewer. Response to each comment is listed below.

1) The typos have been corrected. Yes, the water flow unit should be m3 s-1.

2) The number of samples used for the model development and test is added in the tables.

3) The TWS from GRACE are values relative to a reference (baseline) value. The baseline in the original TWS data was based on the average from January 2004 through December 2009. In this study, it was adjusted to the minimum value found over the

12-year study period, as described in Section 2.2. So, when TWS<0, it means that the basin total water storage is below this reference level, under which a basin may still be possible to discharge water. This is the case for the Mackenzie River basin as shown by both the observational data and the negative value of parameter b fitted for the model.

4) To explore and understand the major drivers for determining the interannual variations of peak flows is one of the major objectives of this paper. What we found is that temperature variations during the snowmelt season is the main driver for determining the interannual variability of peak river flows for the Mackenzie River basin. The interannual variations of the days from peak snowmelt to peak river flow at the hydrometric station could be a result of several factors, including the magnitudes of flows for the days around the peak flow date and the locations of snowmelt events that mainly contribute to the peak flow, etc. We agree with the reviewer that understanding the travel time for snowmelt water to reach a certain point of the river is important. It likely needs a spatially distributed water routing model and it is beyond the scope of this study.

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