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Hydrology and Earth System Sciences Discussions

Interactive comment on "Streamflow input to Lake Athabasca, Canada" *by* K. Rasouli et al.

K. Rasouli et al.

sdery@unbc.ca

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Response to comments from Anonymous Referee #1:

We sincerely thank Referee #1 for his/her very constructive comments on our paper. We have addressed these comments as follows:

Q1: The current analysis considered trends across different time intervals but due to the chaotic interannual variation, the analyses of shorter time series ('Trend 4') are rather uncertain. This also relates to the 'regime shift' and again, the interpretation and emphasis on the recent, 13-year interval seems excessive.

A1: The analyses for the time period of 1998-2010 are eliminated from the paper as suggested by the referee.

Q2: It would strengthen the analysis to increase this consideration relative to the PDO and also to consider the Arctic Oscillation relative to the particular half century interval.

A2: The regime detection method is now applied for the annual time series of AO and PDO over 1960-2010 and indeed regime shifts are detected in 1988 and 1977, respectively. The following sentence has been added to page 9076, line 14.

"and one decade after the regime change in AO in 1988. The regime changes are assessed based on the annual PDO and AO averaged over January-December."

Q3: There are considerations for both alpha and beta errors and it would strengthen the study to include the standard $p<0.05$ standard as well as the $p<0.1$ criterion for Table 2, for the regime shift analysis, and for other considerations.

A3: When we consider the significance level ($p = 0.05$) in regime change detection method there is no statistical regime change detectable. But, once $p = 0.1$, there are detectable regime changes along the Athabasca River as well as lake inflow. In contrast to the regime shift analysis, for detected trends along the Athabasca River and lake inflow and level, the p-values range from 0.001 to 0.1, which is now clarified and added in parentheses to Table 2. Most of the detected trends show probabilities less than 0.05 in significance.

Q4: Also related to the statistical treatment, for the Figures 3 to 6, associated with the plotted lines, at least for the half-century interval, there should be indications of the R2 and p. It is recognized that this implements a parametric analysis, but since the authors did provide linear extrapolation, the linear analysis should be more fully presented.

A4: The intercept and slope of the linear line for extrapolating the lake inflow over 1960-2010 is 37.64 km3 and -0.142 km3 yr-1, respectively. For the lake level, those values are 209.03 m and 0.008 m yr-1 during the same period, respectively. The p-values for both the lake inflow and level trends over 51 years of study period are 0.03 and 0.10 respectively. The p-values for the most significant trends are now added to Table 2.

Q5: why would this paper be suited for an international journal rather than a journal such as the Canadian Water Resources Journal?

A5: “The Lake Athabasca Basin includes the Peace-Athabasca Delta (PAD), now subject to multiple stressors, that forms an internationally-known, biologically-rich freshwater delta and a wetland of global importance recognized by the Ramsar treaty (Wolfe et al. 2012).” This sentence has been added to the end of the first paragraph of the “Study Site” section. In addition to its ecological importance, the Athabasca River is important internationally for the rapidly expanding oil sands industry that extracts water directly from the Athabasca River for bitumen production. As such, we believe the results presented in this paper are of interest to an international audience and of great interest to the readership of Hydrology and Earth System Sciences.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 9065, 2012.