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Interactive comment on "Future shift in winter streamflow modulated by internal variability of climate in southern Ontario" *by* Olivier Champagne et al.

Anonymous Referee #1

Received and published: 5 September 2019

This paper looks at potential future shifts in climate and streamflow for four river catchments in southern Ontario. The CRCM5-LE RCP 8.5 scenario projections of air temperature and precipitation were used as input in the Precipitation Runoff Modelling System (PRMS) to determine future streamflows.

One conclusion of the work is the increase in winter streamflows in the future, particularly in the months of January and February. I find this very speculative because the bias between the observed and simulated flows for the historical period is greatest for these months. The bias is not adequately addressed in the paper and the uncertainties contributing to this bias are not adequately discussed. Hence, I recommend major

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Discussion paper

revisions be carried out before the paper is considered for publication.

Major comments include:

Page 1, Line 27: “glaciated or nival catchments” – why even mention this since southern Ontario is a region that has neither glaciated not nival areas?

Page 3, Line 20: You use the reference Marstrom et al. But I believe, PRMS was first developed by George Leavesley from USGS in the 1980s – shouldn’t he be credited for the model development as well?

Page 5, Line 16: Please expound on the difference between observational and controlled streamflow.

Page 5, Line 16: Please explain the meaning of “controlled stream flow” and why CanGRD is used specifically to simulate it.

Page 5, Line 18: More discussion is required on the performance of the simulations of the historical period.

Page 5, Line 18: A comparison is required between historical and observed results to provide some confidence in the simulations.

Page 5, Lines 15 to 24: More discussion is required on model and data uncertainties, perhaps not here but elsewhere. Perhaps the bias correction is ok, but there may be some major issues with the hydrological model?

Figure 3: As stated above, the bias in flows for January and February are too large to be glanced over quickly and requires more attention in the paper, especially since you are making substantial conclusions from these periods with largest bias. Due to this major weakness in the paper, the rest of the paper loses credibility and the subsequent discussion seems moot.

Some editorial comments are:

Page 1, Line 28: period at end of sentence is missing

Page 2, Line 12: “conditions”, not “condition”

Page 2, Line15: should read: . . . the GCMs’

Page 2, Line 22: closed bracket missing after Leduc et al., 2019)

Page 2, Line 27: should read: Seiller and Anctil (2014)

Page 2, Line 28: should read: Erler at al. (2018)

Page 3, Line 8: should read: . . . Brantford along (on?) the Grand River and London along (on?) the Thames River . . .

Page 3, Line 22: “The latter”, not “These latest” - the former phrase refers to a position in sequence, the latter to a point in time.

Page 4, Line 25: reference should read: Ines and Hansen (2006)

Page 5, Line 11: reference should read: Deser et al (2014)

Page 5, Line 22: The simulated range . . . is “wide”, not “high”? I’m referring to the second occurrence of “high” in that line.

I’ll stop here. There are too many errors and I’ll leave it to the editor to pick those up.

Comments to figures:

The color shading in the legend of Figure 3 is not consistent with the shading of the graphs. Also the color shading is not consistent with the legend shading in Figure 4. The graphs are very busy and hard to interpret, especially with the inconsistent shadings between graphs and legends. This needs to be fixed.

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