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Hydrology and Earth System Sciences
Discussions

Interactive comment on "A Review and Synthesis of Future Earth System Change in the Interior of Western Canada: Part I – Climate and Meteorology" *by* Ronald E. Stewart et al.

Anonymous Referee #2

Received and published: 21 March 2019

This review is written by researchers with ample experience in the Canadian climate. The manuscript aims at synthesizing expected changes in future regional climate of western Canada due to anthropogenic influences. The authors provide a wealth of information selecting specific processes or phenomena of relevance to the region. In doing so, they define the basis for research priorities to advance on the knowledge of the regional impacts of a changing climate. I found the review and synthesis to be useful, exhaustive and well documented.

As with many review articles written by several authors, there tends to be some inconsistency among the different sections, with some easier to read than others. For

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Discussion paper

example, the motivation section is clear, defined and even entertaining. On the other hand, section 3 could benefit from refining the main concepts and doing a better link between the discussion and the supporting figures. The manuscript has value and quality. It will be even more attractive once the sections that need improvement are refined. I recommend that the manuscript is approved after the following points are addressed.

1. Section 3 seems to lack an introduction and jumps directly to describe changes in large-scale seasonal patterns. As the discussion is based on changes or anomalies, it would be useful to start with a description of the present climate and more specifically of the PNA pattern as known now. This section also assumes that many features are known to most readers. The second paragraph in page 5 is an example of frequent statements presented without a clear argument: “Projected regional climate responses to the circulation changes are consistent with those found during negative PNA, but shifted in association with the projected circulation features.” Not everybody knows the regional features of the negative PNA, or how they would be shifted due to changes in the projections. Is there a way to infer the changes in cold advection from the figures?

Unfortunately, this is not a matter rewriting a couple of paragraphs. Rather, it is about how the (quite complex) concepts of the PNA pattern and its future changes are presented for the four seasons. My suggestion is that the authors simplify the text by limiting the discussion to key issues that can be easily linked to the figures or adequate references.

I suggest following a similar approach to that in section 4.1.1. The discussion of changes in the 0 C isotherm is straightforward and supported by a figure that is easy to follow (Fig. 8).

2. I have difficulty agreeing with the interpretation of Figure 13. “Consistent” features are described for relatively small regions of the domain (e.g., central and northern Manitoba ot north central Alberta), but the main issue that seems to be ignored is that

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there are important inconsistencies over large areas of the domain. These large-scale differences among the models can suggest that agreements over the small regions are just the result of chance. An objective approach is needed to separate the wheat from the chaff.

3. It is discussed that given the lack of lightning data, a proxy based on cloud-top heights has been used by Price and Rind (1994). Has this approach been validated in any manner?

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