

# ***Interactive comment on “High-Resolution Regional Climate Modeling and Projection over Western Canada using a Weather Research Forecasting Model with a Pseudo-Global Warming Approach” by Yanping Li et al.***

## **Anonymous Referee #2**

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This manuscript presents convection-permitting regional climate simulations over western Canada. Specifically, two simulations with the 4-km-resolution WRF model are performed, comprised of a reanalysis-based historical climate simulation and a future end-of-the-century climate simulation using the pseudo-global warming (PGW) method. The validation of the historical simulation shows reasonable capability of the convection-permitting model at reproducing the observed seasonal climatological patterns of near-surface temperature and precipitation, but the widespread cold and wet biases are present. The PGW simulation indicates an increase of seasonal precipi-

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tation over most areas across all seasons, with a shifting in precipitation intensity to the higher end. Overall, the manuscript is clearly written and in good shape, but some modifications/clarifications are needed for the acceptance for publication.

1. The writing is too wordy and also there are too many figures. Here are a few examples:

1) The description of the CMIP5-derived perturbation on page 5 is too detailed. I think the authors only need to present the major features of the dynamical and thermodynamical changes.

2) Figures 3-5: I don't see the need for presenting both the daily mean and the daily maximum/minimum temperature because the mean is just an average of the maximum and minimum.

3) Figures 6-7 can be merged into one. Alternatively, just remove Figure 6 if the authors don't trust ANUSPLIN data.

4) Figures 20-21: Because of the great similarity in warming pattern between the three percentiles, there is no need to show all of the corresponding plots.

2. There are many inaccurate statements, as well as some grammatical errors and typos. Here are just a few examples in the abstract (page 1). 1) L18-19: explicitly resolving cumulus plumes. This is not true. To resolve individual convective elements a sub-kilometer grid spacing is necessary. 2) L19-21: How can you conclude that the simulation agrees with observations in terms of the geographical distribution of cold bias? Logically, this is wrong. 3) L24: "the PGW simulation shows more warming than CTL". The authors may want to say "the PGW simulation shows significant warming relative to CTL".

3. Section 4.1. For a fair comparison between WRF downscaling and CMIP5 projection, the temperature and precipitation changes for CMIP5 should be computed as the difference between the 1976-2005 average and the 2071-2100 average, consistent

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with the climate perturbation used for PGW (i.e., Eq.1).

4. I'd like to suggest presenting the temperature and precipitation changes over the whole domain (i.e., Figure13-14) first, followed by describing the sub-domain results (Figs. 11-12).

5. Add CMIP5 projected changes in Figures 13-14.

6. Page 5, L8: add "the change of cloud population (Rasmussen et al. 2018)".

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