Manuscript: Regional scenarios of change over Canada: future climate projections

Major remarks

The authors present changes in various characteristics of daily precipitation and temperature over Canada such as they are projected by a 15-member ensemble of regional climate simulations with CanRCM4, with and without bias correction. While the methods, figures and tables are adequately chosen to present the results from the climate change simulations, the embedding into existing previous research is poorly done.

There are no statements describing a) what is the really new research obtained in the present study, or b) what are the important differences to previous studies? This lack of informing the reader about the new science of the study starts already with the abstract that just summarizes the conducted experiments and their results, but does not provide any information on what is new or why the study is important. In the discussion section 4, it is stated (line 408) that "The results discussed in this study are certainly in line with existing literature." However, the novelty or importance of the present results are not clearly pointed out. Consequently, the main results (Canada will get warmer, especially to the North, It will generally get wetter, except for some regions that get drier during the summer) seem well known and no surprise.

Using a GCM – RCM –Bias correction modelling chain is not new. A new aspect might be the use of the 15-member RCM ensemble, but this feature is not much used/explored, except from using ensemble means and showing the spreads by plotting each ensemble member in the figures. However, the ensemble spreads are neither discussed nor used. For example, the spreads could be used more thoroughly to quantify variability, and, hence, uncertainty. One possible use may be the quantification of the time/year, when the climate change signal becomes larger than the noise imposed by the natural variability.

The introduction provides general information on why climate change information is important, especially for cold high latitude regions, but no information on previous research over the study region Canada is described or cited. Actually some previous studies are mentioned in the discussion section 4 (lines 417-446). However, despite the section title, these studies are not really discussed compared to the present results and, hence, would better fit in the introduction section. In addition, important studies dealing with climate change over Canada are missing. For example, Li et al. (2018) studied regional-scale projections of climate indices that are relevant to climate change impacts in Canada. This was done based on an ensemble of high-resolution statistically downscaled climate change projections from 24 global climate models (GCMs) under the RCP2.6, RCP4.5, and RCP8.5 emissions scenarios. A discussion of results compared with Li et al. (2018) would be valuable as they used statistical downscaling, opposite to the dynamical downscaling used in the present study. Neither a comparison (for the Eastern part of Canada) nor a reference is made to Leduc et al. (2019). Even though the study of Fyfe et al. (2017) deals with a different variable (snow) than those considered in the present study, it seems worth to be mentioned in the introduction.

References:

Fyfe, J. C., and Coauthors, 2017: Large near-term projected snowpack loss over the western United States. Nat. Commun., 8, 14996, https://doi.org/10.1038/ncomms14996.

Leduc, M., A. Mailhot, A. Frigon, J. Martel, R. Ludwig, G.B. Brietzke, M. Giguère, F. Brissette, R. Turcotte, M. Braun, and J. Scinocca, 2019: The ClimEx Project: A 50-Member Ensemble of Climate Change Projections at 12-km Resolution over Europe and

Northeastern North America with the Canadian Regional Climate Model (CRCM5). J. Appl. Meteor. Climatol., 58, 663–693, https://doi.org/10.1175/JAMC-D-18-0021.1
Li, G., Zhang, X., Cannon, A.J. et al. Climatic Change (2018) 148: 249. https://doi.org/10.1007/s10584-018-2199-x

The discussion section 5 comprises a short summary of results and some information of previous climate change studies over Canada (see above), but only a rather limited amount of discussion. Then, the final section 6 comprises a more detailed summary of results. In the current state, the actual discussion is too short to justify a separate section so that it may be easily merged with section 6. However, a more extensive and thorough discussion of results (highlighting new insights or contradictory results to previous research, making use of the ensemble nature of the present results) would be beneficial for the quality of the manuscript.

In summary, the paper may be accepted for publication if major revisions are conducted.

Minor remarks

In the following suggestions for editorial corrections are marked in *Italic*.

p.6 – line 143-144
Sentence is difficult to read. Please rewrite!

p.6 – line 153
… *human* …

p.7 – line 178-179
Sentence is difficult to read. Please rewrite!

p.7 – line 186
Why do you use a nearest neighbour interpolation, and not, e.g., bilinear interpolation or conservative remapping?

p.12 – line 297
…*Arctic* …

p.12 – line 298
… where *a* mean temperature *increase* of …

p.14 – line 339
… regions *more* than …

p.16 – line 399
… temperature *is* well …

p.17 – line 419
… ensemble *of* climate …

p.18 – line 446
… to *intensify* at …

Figs. 4, 6, 7 and 10
Many panels in these figures look rather similar. Thus, there is certainly room for the reduction of panels, for example by focusing of DJF and JJA. For figs. 4, 6 and 7, focusing on the later period my further reduce the amount of panels.

References
The standard abbreviations of journal names are not used in many references. Please abbreviate accordingly!