

## ***Interactive comment on “Dynamical Downscaling Data for Studying Climatic Impacts on Hydrology, Permafrost, and Ecosystems in Arctic Alaska” by L. Cai et al.***

**Anonymous Referee #1**

Received and published: 4 July 2016

General comments:

The manuscript "Dynamical Downscaling Data for Studying Climatic Impacts on Hydrology, Permafrost, and Ecosystems in Arctic Alaska" by Cai et al. describes a downscaling study with Polar WRF (v. 3.5.1) over the North Slope of Alaska, using both ERA-Interim (ERA-WRF) and historical and future climate simulations from CESM1 (CESM-WRF) as forcing data. The model results are first compared with monthly precipitation and maximum and minimum temperatures from ERA-Interim and five measurement stations, after which a linear bias correction is applied to the output using ERA-Interim as the reference. The time period overlapping between ERA-WRF and CESM-WRF is used to evaluate the CESM-WRF results, and as a basis for bias cor-

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rection of the climate projections using CESM-WRF. A variety of physical and ecological processes in the Arctic which are affected by climate change are mentioned in the introduction, and a number of possible applications of the produced dataset are proposed in the manuscript. These are, however, not explored further in the manuscript itself.

Regrettably, the manuscript does not, in my opinion, "represent substantial progress beyond current scientific understanding", as required for publication in TC. Although it is stated that the ultimate goal is to "better understand climate change and its impacts on hydrology, permafrost and ecosystems", the manuscript does not include any discussion or conclusion indicating that this is achieved. Instead it appears that the goal is to produce a dataset which can be used to study impacts of climate change on these areas. Furthermore, the manuscript does not demonstrate that the dataset produced here is an improvement over existing datasets (e.g. the forcing data used to drive WRF), and can therefore not be considered "a substantial contribution" in itself. Nor are the results and the following discussion at a scientific level which could be considered a substantial contribution as a model evaluation study.

I also have concerns about the way the bias correction is applied in this study. By using the forcing data as the reference for bias correction, the potential added value in the downscaling is removed, or at least considerably reduced. Comparing ERA-WRF and CESM-WRF on a monthly basis (as shown in figure 7 and 8) is also questionable as the historical CESM simulation does not reproduce observed weather on a monthly basis, but is rather one possible realization of the climate given the historical forcing.

The manuscript is overall well structured, although it lacks a clear conclusion to the stated goal. The language is fine, but lacks precision on several occasions, and some sentences need clarification (examples are given below).

Due to the above reasons I am sorry to say I cannot recommend this manuscript for publication in TC. This would require either that the manuscript was expanded to in-

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clude one of the impact studies which is suggested in the Introduction and Applications sections, or that the comparison between WRF and observations was raised to a considerably higher level so that new insight could be reached.

Some specific comments:

P1 L12, P3 L17, P12 L17 (and others): The use of the word “reasonable” needs to be put in context in order to make sense.

P2 L5-8: I believe newer references could be found as examples for the statement that the mechanism behind Arctic amplification is still under discussion. I would also suggest writing mechanisms rather “mechanism”.

P2 L9-10: “The physical and ecological components” and “this affect” should be clarified.

P2 L14L “other climatic variable changes and disturbance events” should be exemplified.

P3 L23-P4 L1: This sentence is difficult to understand and should be rewritten.

P4 L7: I am not sure studies from 2001 can still be used as proof “that regional optimization is necessary for regional climate simulations over the Arctic region”.

P6 L13: Newer references should be used for the Noah scheme.

P13 L19-21: Please explain how you propose to dismiss temperature biases by calibrating parameterizations.

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Interactive comment on The Cryosphere Discuss., doi:10.5194/tc-2016-87, 2016.