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Interactive
comment

Interactive comment on "High-Resolution Meteorological Forcing Data for Hydrological Modelling and Climate Change Impact Analysis in Mackenzie River Basin" *by* Zilefac Elvis et al.

Anonymous Referee #1

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This paper describes the procedures used to generate two bias-corrected data products WFDEI-GEM-CaPA and CanRCM4 for hydrological modelling and climate change impact analysis in Mackenzie River basin. The uniqueness of WFDEI-GEM-CaPA data is from combining the WFDEI and GEM-CaPA data sets with multivariate bias correction and model fitting methods. WFDEI data set has a longer record period (1979-2016), and is biased from the observations in Mackenzie River basin. The GEM-CaPA data set has a shorter record period (2005-2016), and matches well with the observations in Mackenzie River basin. As a result of the combining, the record length of the combined WFDEI-GEM-CaPA data is the same with that of WFDEI and the biases in WFDEI data were corrected. The bias-corrected CanRCM4 data product was ob-

tained from the modified CanRCM4 output (1950-2100) after using the WFDEI-GEM-CaPA data product to correct the 15-member CanRCM4 initial condition ensemble in the historical period (1979-2008). The data products are of significance in developing distributed hydrological models and improving the assessment of the climate change impacts over the Mackenzie River basin.

Overall, the paper was written and organized very well. It introduces the data sources and explains how these data sources were selected and used. It clearly presents the outline of the multi stages of data processing and bias corrections. It uses station observations to validate the bias corrections and the provided results prove the added values of the two data products as a constant set of historical and climate projection data for large-scale modeling and future climate scenario analysis.

Specifically, the paper does not give any details about how the multivariate generalization of the quantile mapping technique was applied to the data sources and how the model fitting was done. More detailed explanations with examples would help readers who are not familiar with this mapping method. A brief discussion about this method's advantages compared to other methods is also helpful. The authors may need to explain clearly why the air temperature, specific humidity and wind speed of GEM-CaPA at 40-m height can be directly used to correct the WFDEI biases of these variables, but the station surface level observations of these variables cannot be inversely used for the validation of bias corrections at 40-m height. Because the surface pressure provided by all data sources is at surface level, the station observations of surface pressure should also be used to validate the bias corrections in addition to the precipitation, though the surface pressure as a forcing variable may not be as important as the precipitation in hydrological models.

A couple minor things include: 1) Line 243 on page 12, to keep the consistency throughout the paper, suggest to replace "0.44 degrees" with the same format as in line 235 on the same page. 2) Suggest to enlarge a bit Figure 4 and Figure 5 to improve their legibility.