Response to Reviewers' Comments

We appreciate the efforts of the reviewers and we thank them for their insightful and constructive comments. We have provided information points and clarifications as to how we will modify the manuscript accordingly below. We provide detailed responses to each of the reviewers' comments. For convenience, we put the reviewer comments in black font, and author responses in blue.

RC2 - Anonymous Referee #2 comments:

The manuscript by Tarek et al compares nine precipitation and two temperature datasets for 1145 African catchments to understand the uncertainties they introduce when used in hydrological modelling applications. The study is substantial, addresses a significant community challenge, and offers practical guidance to others in the field. On that basis, I judge that it will be of clear interest to the readership of HESS, with substantial impact in Africa and insights applicable more widely. There are three major points, which the authors should address in revision, and some minor points which they might wish to consider too.

Thank you for your comments. Please see the point-by-point responses below.

Key comments

- Bias correction is applied but only five lines are given to the description of the method used. It is essential to have more information on the bias corrections made, especially at rarely seen precipitation quantiles, given the sparsity of data in this region.

  In the original manuscript, we tried to balance concision and providing enough methodological details. We will gladly add additional information on the bias correction method and especially its treatment of the larger quantiles. The devil is in the details when it comes to bias correction methods, and this is particularly the case for the large quantiles. We will therefore provide an extended description of the MBCn method of Cannon (2018).

- Hydrological modelling uncertainty (L240): more information is needed to attribute uncertainty in the hydrological modelling part of the work. It is unclear at present which components of the hydrological models contribute greatest uncertainty, especially with the HMETS model.

  This is a good point, albeit a difficult one to answer since this is a topic that has not been studied until very recently. The impact of the hydrological model structure on the uncertainty is now relatively well established in the scientific literature, but the main sources of uncertainty (e.g. PET, vertical and horizontal water movement, snow model) have not been. It is not feasible to do so in the context of this work since it would require us to redo the entire analysis by decoupling the hydrology model into separate parts and recalculating all variance components. This would be a

formidable task indeed. However, in light of recently published work (e,g, Dallaire et al., 2020; Duethmann et al., 2020; Van Kempen et al,.2020), we propose to enhance the discussion to offer insights on what parts of the hydrological model structure are likely critical to climate change impact studies, and which part are likely to carry most of the uncertainty. We will also emphasize this point as a key area of future research.

Dallaire et al., 2020, Uncertainty of potential evapotranspiration modelling in climate change impact studies on low flows in North America . Hydrological Sciences Journal, In press.

Duethmann, D., Blöschl, G., & Parajka, J. (2020). Why does a conceptual hydrological model fail to correctly predict discharge changes in response to climate change?. Hydrology and Earth System Sciences, 24(7), 3493-3511.

Van Kempen, Gijs, Van Der Wiel, Karin, and Melsen, Lieke Anna. The impact of hydrological model structure on the simulation of extreme runoff events. Natural Hazards and Earth System Sciences Discussions, 2020, p. 1-24.

- Applicabilty (L360 onwards): one of the key virtues claimed in the introduction is the guidance offered to future researchers tackling this problem afresh. Yet in this section the reader is left with the sense that there is no clear advantage to any particular dataset, with conclusions left as context dependent. Clearly that's a valid finding but it needs to be reflected in the stance that the paper offers in its opening and concluding paragraphs.

  We agree that we probably should have been more committed in our conclusions. Some precipitation datasets are clearly better than others and we will spell it out more clearly in the revised version. While there will always be some 'context-dependent' issues, by large, we will provide better guidance in the revised version,

Minor comments

Reference formatting is inconsistent with many additional brackets, etc.

This will be taken care of in the revised version.

[Page 6, line 173] hypodermic -> subsurface.

This will be taken care of in the revised version.

Figure 5: annotations and labels are hard to read; please enlarge

We will redraw the Figures to make the text easier to read.