

Interactive comment on “Statistical downscaling of climate data to estimate streamflow in a semi-arid catchment” by S. Samadi et al.

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Dear Reviewer, Many thanks for your kind commands. We focused our research to provide better understanding of future stream flow in a semi-arid catchment. Our goal in this project is to enhance our conceptual understanding of stream flow in semi-arid river system by quantifying daily and seasonally variability of future flow in selected semi-arid catchments. To enhance our conceptual understanding of stream flow processes in a semi-arid catchment, two regression-based statistical downscaling methods were applied in west Iran. In this research, we addressed the impact of climate change in one semi-arid sub-catchment where there is no proper long period measured climate data available! Results show future stream flow will change according to linear downscaling

C4159

method in this region. P.S. This catchment is located in West Iran not Northern Iran! My answers to your commands are as follows: Page 4873- it's not clear what you want the reader to take away from this list of previous studies on downscaling and hydrological assessments.

I just referred some literatures about the impact of downscaling methods on river system (particularly) and explained their results using different downscaling methods in different regions and climate. Page 4874 - I think both your proposed research questions are already answered in the literature. It's clear that downscaling can be used to look at climate effects on hydrological systems and also that the downscaling can be used to look at future climate effects on streamflow. This is why I struggle to see any novelty or contribution in this paper.

Climate change studies are uncertain; the relationships between model and measured data will remain valid under future climate condition only. It isn't exactly clear which downscaling method gives better results in a specific region. Some downscaling methods may have less skill to predict future changes particularly in a semi-arid area. So we cannot assure that by using downscaling methods we can find stream flow changes in the future (we need to assume that, so we addressed these question which aren't clarified in a semi-arid area), we may downscale climate data with small difference to measured one, so when we input such a data to a watershed model, flow prediction might be so close to measured flow!

Page 4875-4876 - It's not clear why you've adopted SDSM and an ANN for your downscaling methods.

We needed to downscale daily climate data using regression based statistical downscaling methods. There are four regression based statistical methods, namely canonical correlation analysis (CCA). (von Storch et al., 1993), Artificial Neural Networks (ANN), Statistical Downscaling Method (SDSM) and Kriging. In this list SDSM and ANN can downscale daily data only so we used these linear and nonlinear methods to

C4160

represent the climate change impacts in a semi-arid area.

For more info, please see below reference: <http://www.narccap.ucar.edu/doc/tgicaguidance-2004.pdf> Page 4893 - you can't assume that the time sequencing of the GCM runs (for the current or future climate) is correct. They are not *predictions* of future change. So it isn't appropriate to report that the biggest changes will occur in 2042 for example. This is why in most climate change impacts literature the results are aggregated into 20-30 year windows.

Yes. We predicted future stream flow in 2040-2069 time period, in summery we discussed that in 30 years' time period, 2042 has highest difference in stream flow compare to measured one in Gharebaghestan stream flow gage.

P.S. I can remove/revise this part if you aren't happy with that!

Figure 2 - I don't think this figure is necessary

This figure is showing the structure of IHACRES model. I can delete it in revised paper!

Figure 5 and 6 - the changes that you are reporting for the future climate seem pretty small compared to the bias in the downscaled results for the current climate

I replied this question to last reviewer,

Downscaling model (particularly SDSM) has a large stochastic component so we would not expect the model to replicate the exact daily sequences found in observations particularly in semi-arid catchment where data are too sparse. Also the level of predictability of site-level precipitation from regional-scale predictors is invariably low. Hence, the missing variance is replicated using the stochastic properties of the model. Likewise we got good correlation and least p_value in this research. However HadCM3 daily data only was available for this study when we started this research. I hope this revision makes you happy with cheerful mood! Thanks again for your kind commands.

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C4161