**Hydrology and
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Discussions

# Interactive comment on "Comparing bias correction methods in downscaling meteorological variables for hydrologic impact study in an arid area in China" *by* G. H. Fang et al.

**M.J. Muerth (Referee)**

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The manuscript of Fang et al. on 'Comparing bias correction methods in downscaling meteorological variables' is generally well structured and well written besides some minor typos. Yet, there are three major issues with this paper that have to be clarified in my point of view before it can be accepted.

The first problem I have is that I don't understand which data is compared and which is used for modelling. Meteorological variables are corrected based on data of one climate station. As we can see, precipitation is overestimated by the RCM-GCM model

chain. Yet, for the whole catchment, this is not true looking at the maps of Gao et al 2013. In some parts, rainfall seems to be well simulated by the RCM. So how does the station relate to the whole basin? Do you compare RCM simulated data for the whole basin with one station or just the RCM box at the station? So, what does "raw" precipitation mean? I can hardly imagine that a correction factor found for one station evens out the heterogeneity of biases in the basin. The authors should be clearer about the relevance of the bias correction in the light of this. Especially as the accompanying paper is not available yet.

The second issue is the weak performance of the LS method for precipitation on runoff. How large are drizzle values? Are they so low, you could easily cut them off because these (daily) values would never affect hydrological processes? Why don't you connect them to a humidity threshold? Does SWAT not compute evapotranspiration if there is very little rainfall? Your graphs look like there nearly no evapotranspiration when using LS, meaning runoff seems to equal rainfall...

Finally, I think the conclusion is a bit weak. If there is drizzle in the RCM, you of course have to correct wet days. Why did you pick the PT and not the QM method as best for precipitation correction after drizzle correction? Please be clearer on how you think your results apply to your specific catchment or region and to bias correction for hydrology in general.

Minor comments and typos:

Title - You don't downscale with these methods, so remove that from the title!!!!!!!!!!!!!!

p12660 Line 21 – 'these simulations' p12661 Line 4 – 'areas and models' p12661 line 13 - 'the hydrologic system of the arid region is...' p12661 line 24 – 'to study potential climate change' p12662 line 14 – 'used to drive a hydrological model especially in an arid region where the hydrology is sensitive to climatic changes' p12664 line 13 – (for more details...)' p12665 line 12 – daily or monthly NS and R2? p12672 line 16 – 'NS equal to -6.65' p12672 line 17 – 'used for a hydrological...' p12673 line 14 – 'All ...

methods improve the raw. . .' p12674 line 15ff – 'The LS method underestimates high precipitation values with probabilities below 0.06. . .' (See also later in this paragraph. You write either a probability of 0.05 or probabilities below 0.06) p12676 line 24 – 'Teutschbein and Seibert'

Thanks a lot for your work! PS: I'm very sorry for the late review!

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