

Interactive comment on “Insights from a new methodology to optimize rain gauge weighting for rainfall-runoff models” by Ashley J. Wright et al.

Anonymous Referee #1

Received and published: 15 October 2019

The study introduces a new methodology to optimise gauge weights as a part of hydrologic model calibration processes. The study also shows that areal rainfall estimation obtained from the new optimisation led to improved performance of rainfall-runoff models, compared to the traditional way (i.e., IDW). This is an interesting approach to produce optimised rainfall forcing for better hydrologic modeling. However, there are some places in the manuscript that need further clarification.

Major comments:

Extrapolation capacity of model parameters

The new optimisation methodology suggested in the study decides gauge weightings based on current gauge configuration and the proportion of available observations (eq.

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4), and the optimisation method affects model parameter values (as shown in Figure 7). In this context, can we guarantee that the model parameters perform well also with areal rainfall estimated from other rainfall data sources (e.g., reanalysis for future projection), compared to the model parameters obtained from the IDW? Moreover, when the gauge configuration is changed (e.g., more gauges are installed in the future), how can we use the obtained model parameters & gauge weightings? Do we have to calibrate models again with the new gauge set-up? Can you address this point with more details?

Specific comments:

p.3 l.69: why PET is considered here? Is it one of forcing data for models? Please clarify.

p.3/Table3: can you specify what time period you considered for each catchment? i.e., the length of 100% time used to calculate % of time that no gauge has an observation.

p.5 eq.4: how do other constant values are decided? Do they have any (physical) meaning for the calculation?

p.7 l.175: Why don't you consider more performance metrics (e.g., correlation, bias of annual runoff) to evaluate the performance of IDW vs OGW from various aspects?

p.8 l.219-220: this point should be more carefully addressed. This also could mean that the model parameters are forced, to some extent, to describe runoff better, regardless of other hydrologic variables (i.e., over-fitting to runoff).

Figure 1. How did you deal with the time steps with missing observation, especially for the Onkaparinga catchment where most of gauges have less than 50% of time series during the study period, so probably there are some time steps when all gauges are not available?

Figure 2 vs Figure 4: given that HBV and PDM shows very similar results in Figure 4 (i.e., OGW increased rainfall), I would expect similar results between the HBV and

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PDM also from Figure 2; do you have any idea why both figures are not consistent?

Figure 7: is it showing the average of parameters obtained from the six split samples? Do you also check the “spread” of parameters (e.g., interquartile range) between IDW and OGW?

Minor comments

p.3: you may want to consider providing the map of study catchments

p.2 l.49: iss -> is

p.3 l.69: please explain “PET”

p.4 l.107: on observation -> an observation

p.9 l.260: which one is the catchment exchange parameter in Figure 7?

Figure 1: please make the y-axis label clear, e.g., 0.2 and 0.3 look like 02 and 03, respectively.

Figure 2: can you make it clear that here the change mean “OGW-IDW”?

Figure 4: this is for the Paddys Flat, right? Please clarify.

Figure 8: its't the X-axis from Jan 2008 to Dec 2013?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2019-450>, 2019.

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