Review of the manuscript HESS-2019-450

Insights from a new methodology to optimize rain gauge weighting for rainfall-runoff models

by
Ashley J. Wright, David E. Robertson, Jeffrey P. Walker, and Valentijn R.N. Pauwels

The authors introduce the OGW (optimization of gauge weights) method and compare their results with the IDW (inverse distance weighting) method, based on data from seven catchments in Australia. Furthermore, results of a case study are presented.

This is an interesting study, which deserves to be published – but the presentation quality should be improved.

I have just noticed that quite some of my potential comments have already been stated by Reviewer # 1, so I repeat just those, which I find most urgent.

General comments:

(1) I found the usage units for "streamflow" quite confusing: In Fig.3 it is m^3/s, in Fig. 9 it is mm/h. Is this obtained by dividing the flow in [m^3/s] through the catchment area? Which units should be used in Equation 5 (for q and t)? There is a square root of [streamflow squared, divided by time]. The result can be hardly [mm], as given in Table 2.

(2) Please check the references throughout: The "scopus" information is hardly readable, like: "https://www.scopus.com/inward/record.uri?eid=2-s2.0-84884921481{&}doi=10.1016{%}2Fj.jhydrol.2013.09.004{&}partnerID=40{&}md5=3554bc7f56537b1b95a3a51160ebe40a, 2013."
I would regards the DOI information as sufficient.

Specific comments:

(1) Abstract: "For a selection of 7 Australian catchments this methodology was able to yield improvements of 15.3% and 7.1% .." This is a bit misleading, since you have excluded 2 catchments to get these numbers – right?

(2) Page 2, Line 35: ".. gauge density of 0.4 gauges per km^2". Please check the numbers. According to Xu et al. (2013) this should be "per **1000** km^2"

(3) P 3, L 68: How did you select the catchments? I understand that all are susceptible to flooding, but are these the catchments, which are most affected?

(4) A map with the locations of the catchments would be very helpful.

(5) You should provide some information on average precipitation in the different catchments. This would help to interpret the results in Fig. 2. Values for Tully look intimidating, but I have just found out that Tully (town) is one of the wettest places in Australia.

(6) P 4, L 116: "taken to be 2 for this study" – why?

(7) P 6, L 158: Please explain "UH"

(8) Figure 1: Values for Hurdle and Warwick seem to be concentrated around ~ 75 %.
Do you have an explanation for that? In general I would have expected at least some values closer to 100 %.

(9) Table 4: You give 3 digits after the decimal point, are those digits significant? With such an uneven distribution, the standard deviation (which is much larger than the mean) is not very meaningful.

(10) Table 4: The GR4H values for Tully is 5525 mm – can this be true?

(11) Equation 6: Shouldn't there be a parenthesis? So you would just be summing up the r values – and the symbol r needs to be explained.

(12) Figure 8: One split sample for GR4H IDW shows a totally different behavior. Do you know why?

(13) Figure 4: One split sample for GR4H IDW shows also a different behavior. Do you know why? And is it maybe the same as in Fig. 8?

(14) Figure 9: The PDM model seems to saturate at ~ 2.5 mm/h. Do you have an explanation for this behavior?

(Some) technical corrections:

I did not specifically search for typos, but found quite some – so there are probably more.

Some examples:

P 1 L 1: hydrolgical

Same line: applictions

P 2 L 55: The nature …. imply

P 3 L 77: Köppen-Gieger (should be "-Geiger").

P 4, L 95: Queenslad

P 4, L 106: oeprator

P 4, L 127: "to potentially have" should be "do …" right?

P 5, L 146: "Thus the water balance is not closed and potential biases in observation data corrected for." seems to be incomplete.

P 6, L 171: "The skill … were .."

P 10, L 281: "weigh" should be "weight" – right?