

Comment on hess-2021-428

Anonymous Referee #1

Referee comment on "Remote sensing-aided rainfall-runoff modeling in the tropics of Costa Rica" by Saúl Arciniega-Esparza et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-428-RC1>, 2021

The authors selected Costa Rica as a case study to evaluate the performance of a global hydrological model, aiming to show that a coarse scale model can be effectively calibrated and used to model streamflow at finer scales in the humid tropics. The study includes the comparison of 4 different calibration strategies which were used to generate a well-calibrated version of the HYPE model targeted to the domain of Costa Rica. Additionally, the authors demonstrate how remotely-sensed data can effectively be bias-corrected using simple strategies to generate input data of sufficient quality for hydrological modelling. Such information is highly valuable for local management of water resources and of general interest to the hydrological community. The methods used are sufficiently described and the results clearly presented but a revision of the paper could further strengthen it.

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After reading the title, I expected to be presented with a modelling study covering larger areas of the humid tropics. I was thus surprised to find that the manuscript only discusses the case study of Costa Rica when reading the abstract. Thus, I suggest to change the title and exchange "humid tropics" with "Costa Rica".

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Line 121 states that delineation of the catchments was performed using "the terrain analysis toolset from SAGA GIS". Were the standard settings used?

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The description of the 4 calibration strategies and the associated schematic in Figure 3 left me somewhat confused. Looking at the figure, I assumed that M2 was a stepwise calibration in which a first iteration calibrated against monthly streamflow, followed by

a second calibration against daily streamflow. I thus wonder what the “first streamflow” in line 307 refers to. Furthermore, the colour coding in Figure 3 left me wondering how M2 and M4 differ from each other and why M4 was similar to M3. The schematic would be clearer if a 4th row could be added, so that each row represents one calibration scheme.

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Both NSE and KGE values are presented for comparing the performance of the 4 calibration strategies with each other. In line 437 a values of $KGE < 0$ are deemed to be poor and in lines 474 and 476, values of $KGE > 0.6$ are said to be acceptable. How is the choice of these ranges justified? As Knoben et al. (2019) show, even negative KGE values could present an improvement over using the mean flow as a predictor. At the same time, there is no guarantee that $KGE > 0.6$ is linked to an improvement over a specific benchmark. While the given values clearly show which of the methods provides an improvement over the other, it remains unclear how good the performance actually is. This is particularly relevant in lines 516-521 where an acceptable performance of $KGE > 0.5$ is linked to both underestimated high and low flows. I would thus like to see a propose-based KGE benchmark specified against which the results can be compared.

Technical corrections

Line 274: The abbreviation IDW needs to be defined.

Figure 5: Please extend the y-axis so that the values for Rancho Ray M1 become visible as well.

All figures: Unfortunately, the colour scheme used is often not colour-blind friendly. Particularly the lines in Figures 8 and 9 are barely distinguishable. Also, the colour gradient green-yellow-red (e.g. in Figure 1f) or the multicolour gradient (e.g. Figures 4a, 6) generate maps which are very hard to read. I thus suggest switching to a different colour scheme and to use different line shapes (dotted, dashed) to further improve the readability.

References:

Knoben, W. J. M., Freer, J. E., & Woods, R. A. (2019). Technical note: Inherent benchmark or not? Comparing Nash–Sutcliffe and Kling–Gupta efficiency scores. *Hydrology and Earth System Sciences*, 23(10), 4323–4331. <https://doi.org/10/ghvjxf>

