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Hydrology and Earth System Sciences Discussions

Interactive comment on "Comparative assessment of predictions in ungauged basins – Part 2: Flood and low flow studies" *by* J. L. Salinas et al.

Anonymous Referee #2

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This paper is well-organized and clearly written. I enjoyed reading this paper, which has a number of noteworthy strengths. Probably, the most important is that this work provides a coherent organization for the synthesis of myriad of case studies. As such, this work may represent a building block for a classification system in hydrology which may assist to predict high and low flows in ungauged basins. At the same time, a few general and specific issues need to be considered for the paper to be published. These are reported below.

P418, L14-15: "Three catchment characteristics are analysed: aridity index, mean elevation and catchment area." The authors should report on the motivations for selecting these characteristics among many others. For instance, geological characteristics have been used in many studies concerning both low and high flows (Winter, 2001; Tague

and Grant, 2003; Norbiato et al., 2009). The following lines in this section (L15-25) are indeed more an explanation of the hydrological meaning of the three characteristics than an explanation on why exactly these characteristics are selected.

P418, L23-25: "and an indicator of the amount of rainfall data that is available for runoff estimation in ungauged basins, since larger catchments tend to contain a large number of rain gauges." As reported in my review of the companion Part 1 manuscript, this sentence is worthy of a comment. The authors should be more precise concerning the relationship between mean areal rainfall accuracy (i.e., estimation variance), amount of rainfall data (in terms of raingauge number or raingauge density?) and catchment area. For example, for a constant raingauge density, the mean areal rainfall estimation variance decreases with increasing the catchment area. On top of this, even the raingauge density may increase with increasing the catchment area, given that most raingauges are located in low lying areas.

P422, L9-11. "The results for the flood regionalisation (Fig. 2, right panel) show that the predictions in humid regions exhibit the largest errors and arid regions have the smallest errors. This means that the predictive performance clearly decreases with increasing aridity." The two sentences contradict themselves. Actually, Fig. 2 (right panel) shows that RMSNE is higher for humid catchments than for drier catchments, which is at odds with the text (second sentence).

P422, L14-15: "due to the associated stronger non-linearities and threshold effects in drier regions". This is a recurrent finding in the study, so it is important to exemplify which are the sources of stronger non-linearities and threshold effects in drier regions. A good reference here is Goodrich et al. (1997). These authors reported that 'Contrary to the conclusions of numerous in more humid regions, .., watershed runoff becomes more nonlinear with increasing watershed scale. ..The primary causes of increasingly nonlinear response are the increasing importance of ephemeral channel losses and partial storm area coverage."

P426, L21-24: "..This means that the performance is consistently lower in drier, and more arid environments. These are regions that tend to be particularly heterogeneous and low flows may be small, which makes them particularly hard to predict." This is the place where the issue of intermittency should be discussed. A large proportion of the river segments on Earth are intermittent, i.e. they periodically cease to flow (Larned et al., 2010). Many river networks in arid regions are entirely intermittent (Jacobson and Jacobson, 2012). Temporal patterns of flow intermittence range from near-perennial flow-regimes with infrequent, short periods of zero-flow to episodic flow regimes with rare flow events separated by long zero-flow periods. These features have an impact on data availability and partially explain the difficulty to regionalize low flows characteristics in arid regions.

P428, L15-20: "The results stratified by catchment area (Fig. 7, bottom panels) indicate a clear increase in performance (decrease of ANE) with increasing catchment area for all methods." It would be interesting to duplicate the analysis concerning the effect of catchment size for arid and humid catchments. As reported above, the literature reports contrasting behaviours for these two classes of catchments. This should be reported in the conclusions as well.

Figures 5 and 7: for consistency with the other figures, the variable EPA/PA should be reported as aridity index.

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