Hydrol. Earth Syst. Sci. Discuss.,
doi:10.5194/hess-2017-9-RC4, 2017

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Bayesian joint inference of hydrological and generalized error models with the enforcement of Total Laws" *by* Mario R. Hernández-López and Félix Francés

Anonymous Referee #1

Received and published: 11 March 2017

I appreciate the effort the authors are taking to clarify their message of the importance of satisfying Total Variance Laws (TVL). But the point is that the case study methodology - most notably, the use of a single catchment, especially one as well-behaved as the French Broad River - is not appropriate to demonstrate and support a research question as broad as "solving problems with joint inference including AR1 components". And the results happen to clearly contradict the proposition that satisfying TVL is "essential" from a practical predictions perspective.

For example, at bottom of page 1 of the last response, the authors state that the French Broad River (FB) case study demonstrates problems such as "meaningless enlargement of the uncertainty bands" and cite Schoups and Vrugt (2010), Evin et al (2013,

2014). In fact these studies report precisely the opposite - joint inference, both with WLS-AR1 and the Skewed Exponential Power error models, performs very well in the FB catchment, with tight and reliable prediction limits. This is achieved without imposing any explicit TVL constraints. The problems reported in previous studies occurred in a different subset of catchments (eg, San Marcos, etc).

So, to be blunt, the French Broad river case study results (and the prior results of Schoups and Vrugt and Evin et al) contradict the manuscript proposition that TVL constraints are essential to obtain good quality (reliable and precise) predictions. This is an interesting conclusion worth reporting, which would require a complete reversal of the current manuscript narrative. I am sure its not the first or last time that statistical approximations produce adequate results (the converse is also true!). It may well be that TVL constraints become relevant in catchments other than the FB river case study (eg, in San Marcos), but obviously this requires to be demonstrated empirically through an appropriately designed case study, including multiple error models, etc.

I would also note that using a single catchment and hydrological model to suggest that methods such as Weighted Least Squares (WLS), which are well-established not just in hydrology but in science in general, represent a "severe statistical mistake", strikes me as patently insufficient. To do so would require far stronger and broader empirical evidence.

I hope this feedback is helpful to the authors as they continue to explore this important research question.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2017-9, 2017.