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Discussions

Interactive comment on "Improving uncertainty estimation in urban hydrological modeling by statistically describing bias" *by* D. Del Giudice et al.

Anonymous Referee #2

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The paper presents a methodology for quantifying input and structural errors of hydrological models and their effects on prediction uncertainty. The methodology treats the (transformed) residuals as the sum of two terms, one accounting for model bias due to input and structural errors, and the other accounting for output measurement errors. The bias term is represented by an autoregressive model with a variance that is either constant or increases as a function of (lagged) rainfall. The methodology is applied to modeling stormwater runoff in an urban water system.

I think the paper is well written and deserves to be published after taking into account the following comments (in chronological order).

- line 21: spell out "iid" on first use

- p5125, line 7: the cited study does not use Box-Cox transformation, but instead uses separate models to explicitly and separately model the variance and non-normality in the residuals.

-p5131, eq.2: I'd suggest using g(Y) for transformed flows, to make the notation more consistent with later sections (same for eq. 4 on next page).

-p5133, line 7: first-order

-p5136, line 20: "The characteristics of the catchment and the monitoring equipment suggested a setting of a =5 L s-1 and b =100 L s-1." Can you be more specific how these values were deduced? The same comment applies to selection of Box-Cox transformation parameter. In general it seems that you would want to estimate these parameters directly from the data (i.e. specify a prior and estimate their posteriors); why was this not done here?

- Relating to the previous comment, a potential disadvantage of the transformation is that it applies to the sum of the two terms (bias and output error). Is that correct? An approach that allows one to separately treat heteroscedasticity in these two terms seems preferable. For example, output error parameters could then be estimated a priori, independent of any heteroscedasticity in the bias term (which has a different source).

-section 2.2.5: beyond measures such as reliability and sharpness, the entire predictive distribution can be checked by constructing predictive quantile-quantile plots (comparing observations to probabilistic model predictions)

-p5148: "The frequentist component of the residuals (the estimate of the observation errors) is virtually normally distributed, has an almost constant variance and no autocorrelation." This is not that easy to deduce from figure 6. The diagnostic plots are better for that; these are now in supplement (figs S1 and S2) and should be included in the main body of the paper. Based on fig S1 I don't necessarily agree that the residuals are "virtually normally distributed". This statement should be qualified.

-figure S3 (and following): specify in caption what solid and dashed lines represent; I assume prior and posterior, but it is not stated explicitly.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 5121, 2013.