

Interactive comment on “Uncertainties on mean areal precipitation: assessment and impact on streamflow simulations” by L. Moulin et al.

L. Moulin et al.

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1 Detailed answers to the Dr. Pegram’s comments

First, we would like to thank Dr. Pegram for the very detailed review. We appreciated his grammatical corrections of the original manuscript. This was very useful. The suggested modifications were taken into account into the revised manuscript.

In this authors comment, we list how each of the remarks provided by the referee was adressed. The comments made by the referee will be refered as RC and printed in bold ; the authors comments and answers as AC.

In a general authors comment, we summarise the main changes that were applied in

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the paper with respect to the main criticisms.

1.1 Question 1 : Concerning the AR error model

41a. **The use of a simple AR(1) model to provide temporal structure to the measurement errors is neat; more useful is that the serial correlation coefficient (ρ) is shown to have an essentially constant serial correlation coefficient independent of site. This uniformity of ρ might be because of the stationary structure of the variogram fitted to the errors; perhaps the authors would like to comment on that issue.**

Please see also section 1.2 in the general comments. The selected error model, which remains simple, cannot fully account for the complex statistical structure of the rainfall interpolation errors. As indicated in the section 1.3 of the general comments, ρ does theoretically vary with the surrounding network, the size of the considered area, the size of rain cells and their speed of advection compared with working time step (here, 1 hour) and the resolution of the raingauge network. Moreover, values of ρ were computed on an important number of hours (and events). Then it is a mean value, and to get a more accurate error model, segmentation process should be done. However, when it is computed (for instance with a ACF-1) on the 40 raingauges available for this area, it appears that it does not vary too much from one raingauge to the another (for normalised errors, the 40 computed values of ρ range in [0.4–0.7]). It's why, we considered that a constant ρ value can be used. We do not know which is precisely the impact of the stationnary structure of variogram on the uniformity of ρ .

41b. **To address the choice of ρ , in Figure 6 a comparison is made between the error quantiles obtained on the one hand by using cross-validation and on the other by alternatively setting $\rho = 0$ and 0.6. Although, in the text**

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(page 2082), the choice of the latter value of 0.6 is mentioned, it was not explained well enough to my mind - a value of 0.3 (based on Figure 6) seemed more appropriate. This is worrisome because the reason given in the last two sentences on the page seems to provide a questionable justification: "The selected constant correlation coefficient (0.6) has been adjusted to slightly underestimate the quantiles of the error distributions at all the validation sites (Table 3). The error model will have a general tendency to underestimate the rainfall estimation errors and hence their effects on RR simulations." Please justify.

Figures have been mixed during the preparation of the manuscript (Please, see also section 1.4 in the general comments). This explains the inconsistency between Fig. 6 and Table 3. Many thanks to the referee for having depicted this error. The proposed Fig. 6 corresponds to the Mazet rain gauge and the second one to a ρ value of 0.8. The figure, in line with the table, will be included (see figure in the final response file). It is also important to mention here that the interpolation model biases and under-representation of large errors, especially underestimation of hourly rain rates (see Fig 4 of original manuscript) remain or even increase when large accumulation periods are considered even with the selected temporal correlation model (see figure in the final response file). The Fay raingauge is located on a relief and more frequently affected by intense rainfall events than the surrounding gauges. But there is no solution to solve this problem (interpolated rain rates at Fay are not biased on average). The only solution would consist in densifying the rain gauge network.

1.2 Question 2 : On the uncertainties of modeled streamflows

42. **The discussion of the modeled streamflow errors, (page 2087: 15+) displayed in Table 5 and Figures 8 to 10, is difficult to follow. In particular I was unable to reconcile the Table contents with the statement that (line**

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17+): 8220; A large proportion of measured streamflows appears to be 8230; [contained in the 90%] 8230; confidence interval.8221; The columns in Table 5 were difficult to reconcile with the text.

That is true. Please, see the response in general comments (see section 1.5 in the general comments). The text had been written based on preliminary results which were slightly different from the results presented in Table 5 (with other confidence intervals). In the revised manuscript the discussion has been reformulated and nuances have been introduced in the text.

1.3 Two other comments

43a. Equations (13) and (14) (page 2077) are erroneously given for standard deviations whereas they should be for variances - the power of 2 seems to be missing after each σ . The text need not be modified.

The text has been modified.

43b. Finally, Figure 11 is not referred to in the body of the paper.

Figure 11, complementary to Table 4 is complex and not really used. It has been removed.

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