

## ***Interactive comment on “Technical note: Analysis of observation uncertainty for flood assimilation and forecasting” by Joanne A. Waller et al.***

**Anonymous Referee #2**

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I read the manuscript by Joanne A. Waller et al. entitled "Analysis of observation uncertainty for flood assimilation and forecasting", with a great interest.

Authors propose to assess the spatial correlation of the uncertainty of water level observations estimated via the fusion between SAR imagery-derived flood extent boundaries and a high resolution DEM. To do so, authors apply the diagnostic approach proposed by Desroziers et al. (2005) and further developed by Waller et al. (2016a) to the assimilation experiment previously proposed by Garcia-Pintado et al (2015).

I think this work is really interesting and represent a very good contribution to the research in the field of data assimilation into flood forecasting models. The manuscript is well structured and well written. The reading is smooth and easy. The scientific quality is high. However I think some discussion points are missing and some clarifi-

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cations are necessary. Consequently I would suggest to consider the manuscript for publication after minor revisions.

I agree with all the comments and suggestions by reviewer 1. Especially I would suggest as well to edit the title.

Additionally, I would suggest the following edits: P 5 lines 4-6: As the standard deviation of the WLOs is estimated using rather strong hydraulic hypotheses, I would suggest to change the word “measured” by “estimated” for instance. Moreover the way the 59 cm is estimated is not so clear to me. Do you define an interpolated plane for each satellite acquisition? If not, you probably overestimate the WLO standard deviation. Could you please try to clarify this? P 4 equation 3: could you please elaborate a little more on the second term. It does not look so straightforward to me. P4 lines 30-32: I found this sentence a little difficult to read. Could you please try to clarify it? P6 lines 7-10: I think I finally understood what is done, but it took me some time. Could you please try to clarify? Especially, I would suggest to mention a “1km bin size” instead of a “1km spatial resolution” that is confusing to me. Could you please mention as well how you estimate the error spatial correlation from the covariance in the bin? Using the estimated 59 cm standard deviation of the WLOs? P6 lines 13-15: What is meant by “error of representation” is not clear to me. Could you please clarify?

Overall my little regret with the manuscript is that the observation errors are only seen from a statistical point of view. In my opinion Authors should try to elaborate a little more on how the WLOs are obtained and what could be the sources of the error spatial correlation. Authors should in my opinion refer to some interesting remarks with that respect in Mason et al 2012. Actually, the water levels used in the study are not observation from a strict point of view, but rather a piece of information derived from actual observations (the backscatter on the SAR images and the DEM). As a matter of fact each step in the process of estimating the WLOs suffer from its own sources of uncertainty. It could be worth discussing which steps of the process and which input dataset are likely to be responsible for spatially correlated errors with correlation length

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up to few kilometers.

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