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Hydrology and Earth System Sciences Discussions

Interactive comment on "Correcting the radar rainfall forcing of a hydrological model with data assimilation: application to flood forecasting in the Lez Catchment in Southern France" *by* E. Harader et al.

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The authors would like to thank reviewer #3 for his or her careful review of the paper. The questions are re-copied below followed by our responses.

Specific Concerns/Comments

1. First of all, I think there is a little logical issue with its structure. I think the authors want to show the advantages of DA and rainfall correction for flooding forecasting. If it

is the case, a table (or figure) comparison on how they can improve the model result would be better. For example, one row shows the model result with raw radar rainfall, second row shows the result with corrected rainfall with observations, and the third row show it with DA.

This information is represented graphically in Fig.10 and Fig.12. In Fig.10, the red bars are the Nash-Sutcliffe criterion for the simulations with the uncorrected radar data and the blue bars are the DA-corrected simulations. In Fig.12 the dark blue bars are the difference in the Nash-Sutcliffe criterion between simulations using MFB-corrected rainfall and DA-corrected rainfall. The light blue bars show the difference in the peak criterion. The MFB-corrected rainfall is radar rainfall adjusted using ground rainfall measurements. The DA-corrected rainfall is calculated by assimilating discharge observations.

2. The authors have adopted a simplified Kalman Filter in this study. My question is that why this method has been chosen. Does it have advantages over other DA methods? If so, what they are. A comparison with modelled results from other DA methods would be good.

The Kalman filter is well adapted to the simple hydrological model used in this study. There is only one parameter corrected by DA and it is constant in time, so ensemble methods such as the EnKF or variational methods are not well suited. A discussion of other types of Kalman Filters is on p.3531, L.4-24. The main advantages of a simplified Kalman Filter are the low computational costs for one parameter and the simplicity of implementation. A comparison of this method to results from similar DA methods has been included in the discussion.

3. Introduction section. It is too long and should be shortened.

Several lines in the introduction have been removed, however most of this section was kept in order to present the challenges associated with the use of radar rainfall data for hydrological modelling and the data assimilation technique.

4. Hydrological model. This section should be significantly shortened. I think the model is not developed by authors themselves. One or two key formulas plus some key references should be enough.

The model was developed and validated in NHESS by Coustau et al., 2012. The section has been significantly shortened.

5. Date assimilation methods. Is this method developed or modified by authors themselves? If they simply use existing methods in the literature, this section can be significantly condensed and the original references should be cited. If it is a new method developed by authors, it should be clearly explained.

The DA methods come from existing literature. The section has been shorted and references included.

Short comments

6. Table 3. What does the star (*) mean?

The stars indicate missing data for that episode. The notation has been changed to dashes. An explanation has been added to the caption.

7. Figures 1 and 2 should be combined.

These figures have been combined.

8. I do not think Figures 3-7 are necessary, because they are not developed by authors themselves. They are simply copied from the model manual.

Fig.4 has been removed. We have kept Fig. 3 and better adapted it to the paper as suggested by reviewer #1. Figures 5-7 were developed by the authors for this paper.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 3527, 2012.