

Interactive comment on “Real-time remote sensing driven river basin modelling using radar altimetry” by S. J. Pereira-Cardenal et al.

Anonymous Referee #2

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General comments

This is a well written and well structured paper. It presents a very interesting application on large scale river basin modelling using generally available remote sensing and reanalysis data for model forcing and data assimilation. It provides an important contribution to operational river basin modelling for data scarce and remote areas.

The paper is, in general, technically sound. However, the motivations for using the ensemble Kalman filter in this case are not clearly stated. Generally, the Kalman filter includes the full system state, whereby all state variables in the model are updated based on few measurements according to the uncertainties in model and measurements and the correlation between measurements and system states. However, in the

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present implementation only the reservoir levels, which are measured, are included in the state vector. In this case the benefit of using the Kalman filter is not clear. Why not just do a direct insertion of the measured reservoir levels in the model or apply a relaxation approach taking measurement uncertainties into account. This is much easier and computationally much more efficient.

Detailed comments

1. p. 8354. It is not clearly described how the NAM parameter settings given in Table 1 will affect the modelling. The settings of TOF and TIF will practically result in no overland flow and interflow being generated, and in this case the parameters CQOF, CKIF and CK12 are insensitive. With the parameter settings baseflow is the only runoff component. However, looking at the calibrated time constants of the upper groundwater reservoir in Table 5, one could question if one should include an interflow component to describe this response.
2. p. 8356. Notation in Eq. (6) is not consistent with notation above.
3. p. 8357, l. 13. Which losses are included?
4. p. 8358, l. 14. Parameter n_s is not defined. X^f should be a matrix containing state vectors of each ensemble member.
5. p. 8358. In this case where all states are measured Eqs. (8)-(9) can be simplified.
6. p. 8359. How is the uncertainty in the rainfall product described? Which distribution is assumed?
7. p. 8359. Why is a log-normal distribution chosen for describing the uncertainty of the model parameters? I would think a normal distribution would be a more natural choice.
8. p. 8362-8363. The presentation of the results is very condensed. This section could be elaborated.

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9. p. 8363. As I understand the data assimilation, altimeter data are assimilated every 35 days. This means that in between assimilation times the model will drift due to different error sources. To avoid that the model drifts too far between assimilation times one could distribute the innovation (difference between model forecast and measurement) in a time window around the time of observation and assimilate into the model.

10. Table 4. The content of this table is not explained. Line with units should be shifted. The table caption indicates that data have been bias-corrected. Is a bias correction included in the assimilation?

11. Table 5. Explain R^2 .

12. Table 6. Unit missing.

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