

Interactive comment on “Towards the sequential assimilation of SAR-derived water stages into hydraulic models using the Particle Filter: proof of concept” by P. Matgen et al.

P. Matgen et al.

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Dear Dr. Di Baldessarre,

First I would like to thank you for the very constructive comments. I agree with you that some of the assumptions made in this study may appear as overly optimistic. Regarding the sampling rates of currently available SAR sensors, it is true that no single satellite provides water stage data with standard deviations of 0.3 m every 12-24 hours. However, existing (e.g. ALOS PALSAR, ENVISAT ASAR, COSMO Skymed constellation, Radarsat-2, TerraSAR-X) and future satellite constellations (e.g. Sentinel-1,

Radarsat constellation) do provide coverage over Europe and many other parts of the world in less than two days. Hence, by combining data sets from different missions it is possible to get the kind of high-resolution data that we refer to in this paper.

While it used to be necessary to do some trade-off between sampling rate and data accuracy, the new generation of satellite constellations promises to provide high-resolution data in space and time. Problems related to differences in data formats, restricted accessibility to data from various data providers and differences in sensor characteristics still need to be solved before envisaging a truly operational service.

You are right when you write that the very fast hydrological response of the catchment under study makes that this is not an appropriate experimental set-up for testing sampling rates of more than 48 hours. This kind of analysis has to be done in larger river systems.

For the sake of simplicity we made the assumption that SAR-derived water stages are normally distributed. This might be unrealistic. However, we simply don't know what kind of probability density function to expect. There is no or little research available on this subject. Moreover, we want to insist that through an adjustment of the weighting procedure (Equation 1), the proposed method can be easily adapted to any form of probability density function. We will explain the flexibility of the Particle Filter in this respect in more detail in the re-submitted manuscript. Also, we believe that with other forms of probability density functions and assuming non-biased observations, the findings of this study would remain very similar.

We will put some more effort in the justifications of the assumptions made in this study. Also, we will develop the discussion around the limitations and challenges of the proposed methodology. We will also integrate all other comments you made.

Again, thank you very much for your advice. I hope that I was able give you a satisfying answer to all your comments. Don't hesitate to contact me if you need any further clarification. I also would like to refer to our replies to the other reviewers for additional

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information and clarification.

Sincerely,

Patrick Matgen

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 1785, 2010.

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