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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Ensemble modeling of stochastic unsteady open-channel flow in terms of its time-space evolutionary probability distribution: numerical application" *by* Alain Dib and M. Levent Kavvas

Anonymous Referee #2

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The authors present a novel way of using the Fokker–Planck Equation (FPE) to derive directly (one simulation) the probability distributions of velocity and depth resulting from uncertain roughness in a hypothetical unsteady open-channel flow problem. Although the efficiency gain over Monte Carlo simulation for the particular case presented seems limited, improving direct ways for probabilistic modelling is a relevant contribution.

The paper is well-written and well-structured, with sometimes a bit too many reminders of the story-line and mentioning in an early stage already the main conclusions (e.g. P.2 l.28).

Main comments are: The title is confusing because of the "Ensemble modeling", whereas the main objective of the authors is to present a single simulation solution for providing a pdf. I suggest changing the title of this paper and the companion paper, taking out the term "Ensemble". (e.g. into something like "Fokker-Planck modelling of stochastic open-channel flow in term..", or "Deterministic modelling of..")

I would suggest to continue reporting and discussing the results for velocity and depth also in the latter part of the Results section (even if only in text, because with figures it would become too long), rather than only discussing discharge results. For velocity and depth, differences are likely to be larger and may lead to better understanding of what are the causes, because in discharge differences in velocity and depth may be cancelled out.

Please include a sensitivity analysis of the MC results with respect to the number of iterations. It would be interesting to check if with more simulations the results go nearer to the FPE result or further away (or no difference), and if with fewer simulations the same result is achieved. This is relevant for the claim on computational efficiency, as also pointed out by Referee#1 (fifth specific comment).

The analysis and discussion on computational time needs to be more detailed (including computational times, hardware used, etc.) and expanded. In particular with whether the FPE approach is suitable for parallelisation, if not, the MC analysis, for the case study presented, can be easily made more efficient. The authors could perhaps also include their expectations on the applicability and computational efficiency of their FPE method for larger systems. Would the gain with respect to MC increase or not?

The gain in computational efficiency, as presently described, seems limited. Hence, the claimed contribution there, in Abstract and Conclusions, should be down-sized or contextualised.

Detailed comments are: P.2 l.28: "..producing the complete ensemble model results.." is not correct, because, if I understand correctly, the method does not reproduce the

individual traces (ensemble members). Therefore, this should be something like "..producing the statistical properties.." P.7 l.14-15: Explain the choice of 1000 simulations. Report the sensitivity of the statistical characteristics to the number of simulations in the MC. P.8 l.27-28: Repetition. There is already a sentence connecting Sections 3 and 4 in lines 23-25. Consider leaving out one of the two. P.9 l.18: Repetition. Delete "..., with very minimal differences among the two" P.9 l.32-33: However, ... ,but... Consider reformulating. P.10 l.13-17: Reformulate removing redundancies. (Or consider leaving out, because it reads perhaps too much as general conclusions, while this is in the middle of presenting and discussing results) P.10 l.20: Why do the authors continue only with Discharge? Differences in velocity and depth may be cancelling each other in the resulting discharge. Also when thinking of flood risk management applications, it may be more interesting to look at velocity and depth variance. P.10 l.18-23: Too much repetition. Suggest to shorten and merge with next paragraph where actually the presentation of variability results starts. P.10 l.33: "relatively small" Suggest to add some of the differences in %. Also provide differences in standard deviation for velocity and depth. P.11 l.15-21: The results for velocity and depth may help in understanding the causes of differences in variability. P.11 l.27-31: As described in main comments above, please expand the analysis and discussion of computational efficiency, and make it a separate paragraph. P.12 l.18: General sentence. Consider deleting.

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