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Hydrology and Earth System Sciences Discussions

Interactive comment on "Deriving global flood hazard maps of fluvial floods through a physical model cascade" *by* F. Pappenberger et al.

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I enjoyed reading this interesting paper which presents a proof-of-concept study on deriving global flood maps. The authors' aim is to create these maps using global data sets of rainfall and terrestrial information, which allows consistent methods to be applied for flood estimation. This distinguishes the study from alternative approaches which stitch together information sources or model results available for smaller regions. While there are clearly many directions in which this work could and should be developed further, the authors openly recognise these limitations. This paper therefore takes an important first step in this interesting research area, and I recommend it for publication in HESS. I have some minor recommendations and comments that may help to

improve the clarity of some parts of the paper.

I felt the introduction skimped a little on the review of previous work in the area and comparisons with alternative methods, which would help to put this work in context. For example, it would be good to hear a bit more about other attempts at national or continental scale flood modelling, and how these approached the provision of uncertainty and data provenance information when combining different data sets.

In sections 2.3 and 2.4 I was left feeling unclear about how the river channel geometry was derived. The authors cite Yamazaki et al but do not touch on the method. It seemed to me that small-scale information on channel width and slope would be a critical control on what discharge was required before rivers broke their banks, and so this aspect deserved more comment.

I was interested in the comments on P6626 regarding the reduction of uncertainty in inundated extent as the boundaries of the floodplain are reached. In previous work (McMillan and Brasington, 2008), albeit on a much smaller scale, we observed the same phenomenon. However the interesting point was that when translated into risk terms (number of houses flooded), the uncertainties were large. The reason being that it was just at this point, on the edge of the natural floodplain, that housing/infrastructure densities increased, as they were perceived as safe from frequent flooding. The authors may well know of more recent references, but I think this is a good illustration of the importance of considering the end use of the information.

The authors mention the uncertainty in the estimates at several points in the paper, but the uncertainty analysis are very limited, i.e. only consider the uncertainty in the fit of the Gumbel distribution. This produces extremely narrow uncertainty bounds (Fig 4) which do not, presumably, represent the true uncertainty magnitude, and may be better omitted. The extrapolation from 30 years of record to the 500 year flood also stands out as a questionable assumption, as the processes generating the floods are likely to be different at the longer return periods. Although I recognise that a full uncer-

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tainty analysis is beyond the scope of the paper, I would like to see a more considered discussion of what the uncertainty sources might be and how their estimation might be approached in future. I suspect there are some interesting points to be made, for example the dominant sources of uncertainty might change with return period from uncertainties in topography/river network parameters at low return periods, to uncertainties in rainfall and storage estimates at high return periods.

A similar point applies to the discussion in Section 4.2 (How useful are the results?). I feel that the current usefulness might be slightly overplayed due to the preliminary nature of the study, which may not currently be in a position to provide applicable risk information. However this is not to detract from the paper which as I previously said is hopefully the first step in a very fruitful line of research. Instead it would be nice to see some more definite recommendations in Section 4.3 on future work, which at the moment is quite a broad brush description of areas for improvement. Hopefully the authors are in a good position to start thinking about guidelines which rank such areas by need and by expected improvements in accuracy and uncertainty reduction, and so their opinions would be worthy of inclusion.

Typos:

P6619 L8: preformed should be performed

P6620 L15 potential

P6622 L1 'in by' – should be 'in'

P6627 L13/P6628 L9 'maybe' should be 'may be'

Reference:

McMillan H., J. Brasington (2008), End-to-end flood risk assessment: A coupled model cascade with uncertainty estimation, Water Resour. Res., 44, W03419, doi:10.1029/2007WR005995.

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