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Discussions

Interactive comment on "Modelling overbank flood recharge at a continental scale" *by* R. Doble et al.

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The authors wish to thank Professor Meixner for his constructive comments on our manuscript. Reviewer comments are in quotes, with our response following the comment.

"In "Modelling overbank flood recharge at a continental scale" the authors develop an approach to understanding and quantifying flood driven recharge on the Australian continent. Overbank flood recharge can represent a significant source of recharge and understanding how to represent it in models is an important scientific insight. The manuscript as currently written represents a technical contribution of how this process could be represented in a regional to continental scale model. The method developed is fairly simple depending largely on a Darcy's law representa- tion of the underlying processes and the integration of a variety of temporal and spatial data sets. Among

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these data sets are a DEM, a soils map and MODIS remote sensing data.

The current paper is a good step in developing this underlying methodology that is needed to better represent flood recharge processes at the continental scale. The authors outline challenges with remote sensing data, observational records for the purpose of comparison, and methods of filtering out outliers in borehole data. In the current structure of the discussion the authors' recommendations get lost in the headings and presentation of the discussion section as a whole. My own observation is inverting the discussion section and starting with the discussion of "how important is the overbank flood process?" would be a better place to start to the discussion. In this way the authors would first emphasize the importance of their results possibly by also pulling in more references form the groundwater/surface water interaction literature on the importance of flood flows to groundwater recharge. Thus once having demonstrated the importance of the process the authors can then lead the readers through the MODIS and spatial data set caveats and then proceed to the problems with observational records. The authors may have a better way of changing the discussion than the one I just suggested the key from the perspective of this reviewer is that right now the need for improved input and groundwater observational data sets gets lost in the discussion of the model results. That problem is the nub of my comment here."

We agree that moving the importance of overbank floods to the start of the discussion section would more clearly emphasise the importance of the results.

"One additional observational record the author does not dwell on is the use of gravity measurements both on site and through GRACE to assess their model results. While the resolution of GRACE is probably too course for the specific study here it could provide some grounding for the approach used by the authors."

We agree that it would add to the paper to mention the GRACE data sets as an option for assessing large scale model performance. In reality, the resolution of GRACE is too coarse for the modelling undertaken, as although it has the potential to provide

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information on groundwater fluctuations at a catchment or continental scale, and not so much at a level of detail required for a model with 500 m x 500 m discretisation. The high uncertainty associated with the inverse modelling required to transform gravity measurements to water responses also leads to inaccurate predictions of groundwater fluctuation at a continental scale. This limits the usefulness of the data for validating water balances. Previous work undertaken by authors of this paper indicated that the GRACE data did not reliably represent groundwater variations for the majority of Australia (Tregoning et al, 2012) http://archive.nwc.gov.au/library/waterlines/71 We are happy to comment on this in the manuscript if required.

"Minor comments Page 12582- The authors go to some length in describing the Healy and Cook 2002 and Crosbie et al. 2005 methods of estimating groundwater recharge from borehole data much of this discussion is unnecessary as the authors ultimately just use before and after head observations and use the difference as an estimate of recharge."

We agree that this section could be shortened, and have done so in a modified version of the manuscript.

"Page 12584 First sentence of results is not needed. Page 12585 line 1 - First sentence is not needed. Second, sentence should end with (Figure 2). Page 12585 line 11 - First sentence not needed second sentence should end with (Figure 3). Page 12586 line 5 - First sentence not needed second sentence should end with (Fig- ure 4). Page 12586 line 9-10 Sentence here not needed following sentence should end with (Figure 5). Page 12587 Lines 16-19 First two sentences not needed third sentence should end with (Table 3 and Figure 8) Page 12587 line 23 This should be followed by the word value Page 12588 Line 9 First sentence not needed second sentence should end with (Figure 9). Page 12588 line 10 Loddon should be added before the word catchment"

We agree that the manuscript could be made more succinct by modifying the results section as suggested.

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References: Tregoning, P, McClusky, S, van Dijk, A.I.J.M., Crosbie, R.S., and Peña-Arancibia, JL (2012) Assessment of GRACE satellites for groundwater estimation. Waterlines report, National Water Commission, Canberra, Australia. URL: http://archive.nwc.gov.au/library/waterlines/71

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 12573, 2013.