Hydrol. Earth Syst. Sci. Discuss.,
doi:10.5194/hess-2016-525-RC3, 2016

Hydrology and Earth System Sciences
Discussions
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Interactive comment on "Indicators of Necessary Storages for Flood and Drought Management: Towards Global Maps" *by* Kuniyoshi Takeuchi and Muhammad Masood

Anonymous Referee #3

Received and published: 15 November 2016

Review of "Indicators of Necessary Steps for Flood and Drought Management: Towards Global Maps"

I struggled with several aspects of this paper, all of which contributed to my decision to recommend rejection of the manuscript.

1 - The novelty of the proposed method is not clear. The method appears to be a minor adjustment to previously published versions of this approach. The authors note this in page 3, lines 3-5. Although in my reading of Takeuchi (1986), it appears that the methodology presented using both the FDC and DDC may not have been previously published. Regardless, there are fairly well-established methods to determine the necessary storage in hydrologic design; some of these papers are mentioned briefly in the

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introduction but there is no attempt to demonstrate the utility of this approach in the context of these other well-established methods - not necessarily show this method is better but - at a minimum - that it performs as well as other methods.

2 - This approach is based on the flow-duration curve, which does not consider the timing or variability of the discharge and, therefore, the accumulation or depletion of storage over time. It is then not clear how this approach can be useful, as it does not consider the storage in the previous time step, particularly for rivers where variability is large and storage is most needed to control this variability.

3 - Following from comment 2, it is repeated throughout the manuscript, “storage is the means to control discharge variation.” The relation between variation in discharge and necessary storage is well established in the literature, with more storage needed as the coefficient of variation in the discharge increases; and yet, there is no consideration of this point in the demonstration of these methods. The coefficient of variation (CV) is not reported for the 3 demonstration sites so the reader has no idea of the variation of the discharge that is being “smoothed” by storage under the calibration/validation dataset.

4 - There are large gaps in the approach and justification missing from the manuscript:

a) The decisions made in Sections 2.2.1 and 2.2.2 seem quite arbitrary with no justification or support to suggest that these would be choices that a water manager or operator would likely choose.

b) Another example is in the assumption that the FDC and DDC curves follow a generalized extreme value distribution. There are no references provided to support this choice of distribution from previously published work and no evidence is presented to demonstrate that this is a reasonable choice.

c) Page 3, line 28 states that the FDC and DDC curve applies precipitation, yet there is no explanation of this further in the manuscript. How is precipitation used in the

method?

d) The methodology described on p. 5, line 6 states that the “interest duration is limited to a year” but I am left to wonder how the analysis is applied to rivers where over-year storage is an important component of controlling variability?

4 - Editorial issues

a) There are incomplete sentences: p. 8, l. 13; p. 2, l. 12-14

b) Acronyms that are not explained before being used. For example, p. 7, l. 10; Abstract, l. 18-19; p. 5, l. 1-2.

c) Although I do not recall that HESS has guidance on the use of “he” and “his,” I think is a lack of sensitivity to use a gendered pronoun and there are alternative ways to phrase these sentences. Page 4, line 17 is the first appearance but gendered pronouns appear in quite a few other places, such as throughout Section 2.2.2.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-525, 2016.

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