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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Historical impact of water infrastructure on water levels of the Mekong River and the Tonle Sap System" *by* T. A. Cochrane et al.

Anonymous Referee #3

Received and published: 27 May 2014

General comments:

The paper aims to quantify river water level changes in the Mekong caused by hydropower dam and irrigation development by analysing indicators calculated from the water level data from seven gauging stations over the period 1960-2010. The impacts of the water resources development in the Mekong have been poorly documented and published and therefore this paper can provide valuable information on those impacts. The findings of the paper can benefit Mekong region as well as other large river basins of the world. The paper is in the scope of HESS and it is well written, but needs to be revised before publication, especially regarding the potential effects of climate on the findings. The detailed comments are given below.

Major comments:

I agree with Masih I. (Referee) that the influence of climate needs to be addressed better in the paper. Currently it is not possible to exclude adequately the effects of climate on the findings. For example, Mekong's mean hydrological conditions have varied during the study period of the paper and the effects of this on the results have not been properly excluded. In particular, the mean water level comparisons in Table 3, Fig. 2, Fig. 3, are most likely affected by the changes in mean hydrological conditions. In addition, the lack of evidence of climate induced hydrological alterations does not mean that there has not been climate induced hydrological alterations, contrary to what the paper implies on page 4417, line 27. The lack of evidence in this case is largely due to lack of research. Especially the variability in precipitation patterns and intensities in the Mekong is not well researched. However, the authors are strongly encouraged to resolve this issue as the paper contains valuable information.

Minor comments:

The paper should link more clearly the observed water level variations to the actual hydropower and irrigation operations. The current discussion in Section 4 does not give clear overall picture of the hydropower and irrigation operations. It is suggested that the hydropower and irrigation operations are introduced in detail before presenting and discussing the results. Please use references when introducing the operations as much as possible. In this way the findings can be discussed in more structured way and linked better to the actual hydropower and irrigation operations. I believe this approach could also help in excluding the effects of climate on the findings, if not fully at least partially.

The literature review on the observed and estimated impacts of hydropower and irrigation operations on the Mekong's water levels/flows could be improved. This comment links to the first minor comment. First, it is suggested that the findings in the literature that are related to the findings of this paper are discussed in more detail. Second, the

literature review is missing papers that are relevant and potentially useful in discussing the findings (e.g. Lu et al. In Press, Observed changes in the water flow at Chiang Saen in the lower Mekong: Impacts of Chinese dams?, Quaternary International; Wyatt and Baird 2007, Transboundary Impact Assessment in the Sesan River Basin: The Case of the Yali Falls, Water Resources Development). Please see if there are also other relevant papers that could be included into the literature review.

The paper would benefit from a figure presenting the Mekong's annual flow/water level regime that illustrates also the most important hydrological indicators. The paper addresses various types of water level variations from various operational sources and currently it is challenging for the reader to keep track of all variations.

Could you reflect how your findings on water level alterations agree with model based estimates done in the Mekong? Various modelling applications have estimated the future river flow changes caused by hydropower and irrigation, but so far no published comparison has been done between the model estimates and the observations. The model estimates could also potentially support your findings. This comment can be considered as a suggestion.

Technical corrections:

- Abstract is relatively long. Please consider shortening it.

- Please take care that the font sizes in figures are large enough.

- In Table 4 the percentage change for 7-day minimum mean at Prek Kdam is missing +/- sign.

- The discussion section starts with justification for the importance of analysing alterations in water level fluctuation. This is partially repetition from the introduction section. Please consider merging it with introduction.

- Figure 4 presents the findings in more easy and comprehensive way than Table 4. Would you like to consider presenting the other results in figures as well?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 4403, 2014.