Hydrol. Earth Syst. Sci. Discuss., 9, C2604–C2607, 2012
www.hydrol-earth-syst-sci-discuss.net/9/C2604/2012/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Future changes in Mekong River hydrology: impact of climate change and reservoir operation on discharge" *by* H. Lauri et al.

Anonymous Referee #1

Received and published: 28 June 2012

1 General comments

In this paper, a model chain is used to assess future changes in hydrology of the Mekong river including reservoir operation of future dams. In order to assess the impact of different climate change scenarios, the authors choose to use an ensemble of coupled general circulation models (GCMs). The hydrology of the basin is modelled with only one model, though. Calibration is performed mainly for one station in the lower basin and the efficiency coefficients yield very good results.

It is found that the impact of dam operation is stronger than the impact of climate change in the hydrology of the Mekong River. Even counting in all the model related and scenario related uncertainties, dam operation seem to have a significant impact in both dry and wet season.

The paper is in general well written and presents an important contribution to the current discussion around the topic of future change in the hydrology of the Mekong River. It should be published, after a few minor comments are addressed.

2 Specific Comments

2.1 Hydrological model uncertainty

The calibration was performed mainly based on one time series (discharge at Stung Treng). However, tributaries in the basin contribute very differently to total runoff during dry and wet season. For example, an important contribution to the flood hydrograph comes from the sub-catchments on the mountain range along the border between Vietnam and Laos. One can imagine that any of your CC scenarios will cause a change in spatial precipitation patterns, which may reinforce or weaken the importance of these sub-catchments (Eastham 2008). Since you did not present any measure of the efficiency for tributaries, it is impossible for the reader to know if the spatial heterogeneous climate change signal will be well translated into the hydrology of the basin. In simpler terms, there is an equifinality problem that has to be accounted for in the final uncertainty estimation, or at least discussed more thoroughly.

HESSD

9, C2604–C2607, 2012

2.2 Model chain

- The authors seem to want to stress the novelty of including GCM uncertainty into CC impact assessment. That is a valuable contribution to the present discussion of CC impacts in the Mekong hydrology, but your manuscript falls short of a quantification, discussion or comparison with other sources of uncertainty. For example, comparing different hydrological model parametrizations (also related with the problem of equifinality discussed above) or different kinds of climate downscaling methods.
- If there is no critical appraisal of the statistical downscaling of GCM data, its description should be reduced to a minimum: there are enough papers out there dealing with this topic.

2.3 Manuscript structure

There are several papers and reports dealing with climate change impacts and water management in the Mekong basin. The strengths of this particular manuscript are *a)* the use of an ensemble of GCMs and *b)* in the author's own words "novel reservoir operation optimization algorithm". *a)* is sufficiently discussed, but the authors seem to forget *b)* in the structure of the paper and relegate it to the supplement. This method deserves more attention and should be included in the main manuscript.

To compensate, some parts could be presented in the supplement and not in the main manuscript (or even deleted). The description of the meteorological data including Fig. 1 could be moved to the supplementary material. The spatial distribution of the stations is normally important, but you don't present any model result concerning spatially distributed variables, so you don't need to show the spatially distributed input. Instead, you should present a spatially distributed model result, like soil moisture or annual runoff in order to strengthen the model validation. The same applies to the

HESSD
9, C2604–C2607, 2012

description of the statistical downscaling methodology. There are enough papers out there dealing with this topic and unless you discuss the contribution of the downscaling to the uncertainty of your estimations (which you should) you don't need to describe it and may move it to the supplement (or simply delete it).

3 Technical Corrections

- page 6570, line 8: "we downscaled the output"
- page 6574, line 20: "precipitation"
- page 6592, lines 15-23: is this really relevant to this paper? Remember that the paper is already too long and you did not discuss reservoir operation in the main text.
- page 6594, line 15: "(...) uncertain. We see (...)"
- page 6595, line 12: "Maa-ja vesitekniikan (...)" this is not english, maybe you should consider writing it it italics.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 6569, 2012.