Manuscript: esdd-5-849-2014: Multi-model climate impact assessment and intercomparison for three large-scale river basins on three continents

Major remarks

The authors consider uncertainties of projected changes in runoff quantiles over three different river basins. Three sources of uncertainty are considered stemming from GCMs (5), RCPs (4), and hydrological models (3). The analyses of uncertainties in projected hydrological changes and their sources is an interesting topic and of broader interest, thereby fitting well to the scope of Earth System Dynamics.

The manuscript may be improved in several places. The authors should also take into account recent research that addresses global multi-model hydrological studies with several GCMs and global hydrology models (GHMs) conducted within the EU project WATCH (see, e.g. Haddeland et al. 2011; Hagemann et al. 2013). In this way sentence as "Nevertheless …" (abstract line 6-7) and "However, …" (Introduction, p. 851, line 19-21) are not really true anymore as WATCH (and later ISIMIP) provided a consistent setup for GCMs-GHM studies that allow to create a more complete picture of uncertainties, and first studies already started to deal with this topic (e.g. Hagemann et al. 2013).

Haddeland et al. 2011 Multi-Model Estimate of the Global Terrestrial Water Balance: Setup and First Results. J. Hydrometeor. 12, 10.1175/2011JHM1324.1, 869-884.
Hagemann et al. 2013 Climate change impact on available water resources obtained using multiple global climate and hydrology models. Earth Syst. Dyn. 4, 129-144, doi:10.5194/esd-4-129-2013.

While those WATCH studies set a focus on several large catchments around the globe, the authors focus on a kind of arbitrary selection of only three different catchments. What is the motivation to focus in exactly these catchments? Why only smaller sub-basins of Niger and Yellow river are considered? Why do they authors do not focus on catchments that have been addressed previously in WATCH or ISIMIP to allow an intercomparison of results?

Why does the study only take into account three different hydrology models? This likely leads to an underrepresentation of uncertainty originating from the hydrology models. This question needs to be properly addressed, especially as the data of more hydrology models are available since within ISIMIP, many more hydrology models have been used to conduct simulations using the ISIMIP forcing.

With regard to the representation of results, i.e. impacts: Instead of describing the differences between single GCM driven simulations it may be more useful to focus on the mean changes and the ranges/spreads between the models.

At several places the figure caption is repeated in the main text (e.g. p. 866 line 7-12). Please avoid this as this is redundant and unnecessary.

In summary, I suggest that the paper may be accepted for publication after some revisions were conducted.

Minor Comments

In the following suggestions for editorial corrections are marked in *Italic*.

p. 850 – line 14-16
Sentence is difficult to read. Please rewrite.

p. 850 – line 18
… basins. *Robust* results …

p. 850 – line 24
… in *the* future …

p. 854 – line 14
… providing *scenarios, hydrological* models ….

p. 858 – line 10-12
Sentence is difficult to read. Please rewrite.

p. 858 – line 13-14
Sentence is a partial repetition of lines 9-10. Please shorten.

p. 859 – line 1-4
Sentence is difficult to read. Please rewrite.

p. 861 – line 4-7
… *the model, eight for SWIM and 19 for HBV*. Four of *the HBV* parameters are …

p. 863 – line 4
It is written: "But in two three cases …"

Two or Three?

p. 863 – line 13
… number *of* GCMs …

p. 863 – line 20-21
… subsampled *in* a way … …models, *five* GCMs and *four* RCPs …

p. 864 – line 13
What are the calibration and validation periods?

p. 868 – line 23
…, respectively. *The* trends …

p. 868 – line 26 and p. 869 - line 3
It is written: … Figs. ??-8 …

Please correct!

p. 872 – line 2
For Q_{90}, *CMs* and …

p. 872 – line 22
… of *the* hydrological *model* is …

p. 873 – line 9
… of CMs *is* highest …

Fig. 2
Insufficient quality. I cannot see the grey line. I suggest using thicker lines and replacing the grey line by a black line.

Figs. 4, 6, 10
Figs. are too small and the content can hardly be recognized (especially for Fig. 6).
In Fig. 10, I can't separate some of the colours/curves given in the tiny panels below each small panel.