

Reply to Editor and Reviewers

Manuscript #	esd-2014-84
Title	Propagation of biases in humidity in the estimation of global irrigation water
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Thank you very much for taking the time to evaluate our manuscript.

We have revised the manuscript according to the comments from Referee #2. The amendments that we have made are listed here. Besides, we have deleted an unnecessary word from Fig. 7. We hope our manuscript has been in the final step for publication in the ESD.

Yours sincerely,

Yoshimitsu Masaki (Corresponding author)

Comments from Referee #2

Three last comments from my side, which however are not necessarily meant to inquire another revision round.

1. This paper shows that IWD/IWCR estimates do not change with bias-corrected humidity, the range across GCMs narrows (which is a great result). But it could be revealed more transparently in the abstract and conclusion.

---Thank you for your comments. We have mentioned the results more clearly in the abstract (P.2) and conclusion (P.27). The amendments are highlighted in a bold face.

2. IWCR estimates (agricultural water consumption) are here ~500-550 km³ from river systems without reservoirs, but reference values are cited to amount to ~1200 km³.

Since a reservoir module is available in H08, it remains unclear why it is not used in this study to arrive at higher IWCR values (and possibly stronger impacts of humidity bias). The authors argue in the author's response that they focus on irrigation water demand, but IWCR seems to be as important in the manuscript.

---In this paper, we switched off two modules (reservoir operation and environmental flow) because incorporation of these processes makes our analyses substantially (and unnecessarily) complex. For instance, the carryover storage of reservoir operation (i.e., water stored in reservoirs in a flood year and for future dry years) makes the inter-annual results of IWCR different for grid cells with/without reservoirs in upper streams. Thus, we designed to make simulation under simple and homogeneous conditions. We agree with you in that IWCR was underestimated by switching off the reservoir module because flow regulation generally flattens seasonal variation of river flow. On the other hand, we also consider that IWCR was overestimated by switching off the environmental flow module because more water can be abstracted. We assume that these two opposite contributions cancelled and, as a result, prevented significant underestimation of IWCR in this paper.

3. Figures of monthly profiles often hide spatial differences, particularly in Figure 7. To my regards, spatial maps (maybe in addition) would reveal interesting results (also Figure 10 and 11).

--- Thank you. We agree with you that the figures you suggested would be helpful for readers, but in the same time, drawing full combinations (different variables X GCMs X RCPs X 12 months X ...) seem unrealistic. In this revision, we have added the global maps of monthly anomaly of each GCM from the ensemble mean, only for the humidity in January and July (i.e., the midst of boreal winter and summer) [see new Fig. 10 (P.59-60)]. We believe that these new figures will be very informative for readers because similar geographical patterns were clearly detected both in the present and future.

We have also added a paragraph on this figure at the end of Sect. 3.2 (P. 16, highlighted in a bold face).