

**Response to Reviewer's comments on submission to *Hydrol. Earth Syst. Sci. Discuss.*, 8, 7399-7460, 2011 (doi:10.5194/hessd-8-7399-2011)**

Note: textual remarks, inconsistencies and minor errors have been updated in the new text wherever applicable. References refer to those used in the manuscript.

We would like to thank the Anonymous Referee #3 for his/her constructive comments and suggestions. The Referee's valuable comments substantially contributed to improve the quality of the manuscript. Our detailed responses to the comments of the Referee #3 are presented below.

**Response to comments raised by the Anonymous Referee #3:**

Referee's comment (1): The study is very well done and combines very well different kind of global datasets. I feel, however, that authors are covering too many issues in the article. Thus, I would suggest that particularly the methods section could be shortened and partly moved to online supplement. Further, there are at the moment many tables and figures that are not necessary in the main text and could be removed or moved to online supplement. This would make the article more readable and better highlight the key findings.

Response to the comment (1): We would like to thank the Referee #3 for his/her high appraisal on this study. We have revised the methods section and moved parts of the section including Table 2, 3, 4 and 7 to an appendix.

Referee's comment (2): Authors could think of separating the discussion and conclusions from each other. The discussion part is rather short compared to other parts of the paper. This could be expanded to cover, for example, some of the below mentioned issues.

Response to the comment (2): As suggested by the Referee, we have made individual sections of the discussion and conclusions, and expanded descriptions of each section to further discuss findings, limitations and uncertainties of this study.

Referee's comment (3): Authors are doing the analysis in 0.5° grid scale. I would argue, however, that water resources are not always managed with that scale. Sometimes water is transported from far distances to large cities, for example. Other examples are long irrigation channels, when water for irrigation is coming from distance of tens of kilometres. Further, the actual size of the analysis scale (in km<sup>2</sup>) is varying depending on the latitude. Impact on the selected scale on the results should be discussed.

Response to the comment (3): We concur that (inter-basin) water diversions can be important for some regions, e.g. aqueducts in India and Central Valley Project in California, USA and reduce the magnitude of local water scarcity or stress. Yet, data for such information is very limited. In addition, it is difficult to assess the amount of water actually transferred by canals and aqueducts from their maximum capacity, e.g. Periyar Project in South India: a maximum capacity of 40 m<sup>3</sup>·s<sup>-1</sup>, Kurnool Cudappah Canal in South India: a capacity of 85 m<sup>3</sup>·s<sup>-1</sup>, Irtysh-Karaganda Canal: a maximum capacity of 75 m<sup>3</sup>·s<sup>-1</sup> (World Bank, <http://www.worldbank.org/>; UNDP,

<http://www.undp.org>). As a result it is difficult to incorporate water diversions in a consistent manner throughout the globe. We have described this issue as a limitation of our study in the discussion section. In addition, we have also added a paragraph to discuss the impact on the selected scale (0.5<sup>o</sup>) on the results.

Referee's comment (4): In globalised world the virtual water flows are playing more and more important role in the water resources management. The role of virtual water trade has changed dramatically during the last 50 years. Thus, I feel that this should be discussed in some extent within the article.

Response to the comment (4): The virtual water flows are indeed an important factor affecting water resources management through international trade, which has dramatically changed for the past decades. We have added a paragraph to discuss virtual water flows in relation to water scarcity in the discussion section.

Referee's comment (5): Definition and names of key terms: Authors should clearly define the key terms of water scarcity. According to for example (Falkenmark et al., 2007): - water stress refers to use-to-availability ratio (the one used in this study) - water shortage refers to water availability per person - water scarcity is normally used as a meta-term for both, water stress and water shortage Authors should not mix these terms and definition of the thresholds (page 7404; lines 10-14) should be written open more explicitly.

Response to the comment (5): We have revised Sect. 2.1 (Definition of blue water stress) to clarify the terms we use to define water stress. We have also revised the use of the terms regarding water stress, water shortage and water scarcity throughout the revised manuscript.

Referee's comment (6): It is fine to compare the results between water stress and water shortage results. Those do not, however, always reflect the same issues. This could be better addressed in the article.

Response to the comment (6): We concur that comparisons (Sect. 3.6) between simulated water stress and observed droughts are somewhat ambiguous. We have revised Sect. 3.6 to better address the comparisons and to clarify the terms (e.g., drought, water shortage and water stress). We have also added a paragraph to discuss the limitation in comparisons between simulated water stress and observed droughts.

Referee's comment (7): When referring to existing literature, a present tense is normally used. While then referring to own results, a passive tense should be used. In some parts of the article these are mixed and thus, should be corrected.

Response to the comment (7): We have corrected the tenses in sentences throughout the revised manuscript.

Referee's comment (8): The article is written in general with good English. There are, however, parts that are not flowing that well. Thus, I would recommend a proof reading of a native speaker before publishing.

Response to the comment (8): We will make sure that the revised version of this manuscript will be proofread by a native speaker before submission.