

Interactive comment on “Quantitative analysis on the ecological impact of large-scale water transfer project on water resource area in a changing environment” by D. H. Yan et al.

Anonymous Referee #1

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General comments:

This study uses a comprehensive climate-hydrology-ecology coupled model that incorporates regional climate models, land surface hydrologic models, eco-hydrology or crop models and water quality models, to quantify the effects of interbasin water transfer (China's Western Route of South-to-North Water Transfer Project) on local climate, wetland, and water quality etc, within the context of global change. This paper deals with many interesting but also challenging topics, covering a huge number of issues related to climate change and human interventions, where various interactions and un-

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known processes need to be understood. The paper is potentially interesting and lies within the subject areas and scope of HESS. However, I do not recommend its publication in present form. My major concerns are the interpretation and implementation of the climate-hydrology-ecology coupled model that has been proposed (developed) by the authors.

Major comments

1. Table 2 lists the processes represented by the climate-hydrology-ecology coupled model, Fig. 4 shows the links of different parts of the model, and Table 3 presents the verification results. However, there are too few introductions of the model and its validation in the paper, and there is no reference about the model or its components. To my knowledge, the authors coupled multiple regional climate models (what is CWRWF?) with a number of bio-physical and bio-chemical land surface or hydrologic models. Detailed references for each component, and the key processes in the coupling should be presented. The validation is a very important part of this paper since it is a new model without any references in the literature, while the authors only shows a simple table. I suggest re-organizing the paper that 1/3 to half of the text could be dedicated to the introduction and validation of the model; or the authors can divide the paper into two papers: model and application. As far as I know, there is no fully atmosphere-hydrology-ecology-water chemistry coupled model in the literature that can deal with all the processes proposed by the author. Therefore, it will be an important contribution from the authors if they can demonstrate that their coupled system is reasonable both in the framework and performance. The validation should include detailed experimental design, and observation data used for comparison. As long as we feel comfortable with the newly developed model, we can believe the quantitative analysis conducted in this study.

2. The manuscript needs the attention of a skilled and rigorous editor who can ensure that it meets the standards of professional English. There are a plethora of small grammatical errors and some strange phrases (e.g., P10466, L4). Please also check

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the tense consistency throughout the paper (e.g., P10467, L13).

Specific comments

3. P10471, how to select 4 primary and 8 secondary indices? More introduction or references are needed. What is “70% information of the target level” mean? Explained variance? Please clarify that.
4. P10473, how to represent “mutual action among climate, hydrology and ecology”, please clarify it with details about the key processes in the couple system.
5. P10474, when investigating the interaction between regional climate and reservoir construction, do you build a regional climate model with a reservoir model? Could you clarify the two models and explain how to couple them? Do you consider the reservoir regulations in the coupled model? What are the critical feedbacks between them? For the current climate simulation, do you use the boundary condition from reanalysis data or GCM? For future projection, which GCM do you use? Have you investigated the uncertainty of the driving GCM?
6. Section 3.2.1 and 3.2.2. Are the statistics of the influence of water transfer on downstream rivers and hydraulics based on modeling results or observations?
7. Section 3.3. Is the wetland model dynamically coupled into your system that can predict the water level? Or it is just a diagnostic model having inflow (from overland flow and upper stream) without outflow?
8. Section 3.4. The title is for quantitative analysis, while Table 6 only lists some qualitative results that are not relevant.

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