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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Evaluating impacts of climate change on future water scarcity in an intensively managed semi-arid region using a coupled model of biophysical processes and water rights" *by* Bangshuai Han et al.

Anonymous Referee #2

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The authors present an assessment of the impact of climate change scenarios on water availability for irrigation in Treasure Valley (USA). For this aim, the outputs of 11 GCMs from te CMIP5, downscaled and bias-corrected and run under the RCP4.5 and RCP8.5 scenarios, are sampled using the Latin Hypercube Sampling technique, providing the input for a stochastic weather generator (WXGN). Then, a set of daily time-series is generated using WXGN to provide the input for a semi-distributed hydrologic model (HBV). The methodology proposed allows estimation of allocated and unsatisfied irrigation water through the comparison of the available water in the stream with water

rights and biophysical water demand of agriculture lands.

The topic is of interest for the audience of Hydrology and Earth System Sciences, but the manuscript needs a deep revision. The overall presentation is not well structured and clear. Important information is in some case not provided, or is provided after many pages, or is presented with a lot of repetition. General and specific comments are provided in the following.

GENERAL COMMENTS

1. The authors write that a socio-hydrologic model was used to evaluate spatiotemporal water scarcity, but they do not consider population and land use change, as they write in the section "Future work". Why then do they refer at all to socio-hydrologic systems? I suggest removing these references.

2. Repetition of information previously given should be avoided: e.g., in the "Introduction" the authors provide a discussion on stochastic weather generators. In the subsection "Methods" they should thus describe the stochastic weather generator they adopted, but without repeating contents of state of the art already given. Other examples are provided in the specific comments.

3. As regards the structure of the manuscript, I think that a reorganization of the contents is strongly suggested. The section "Methods" is too broad and not all of the background given is pertinent. After the introduction I suggest describing in separate sections the "Study area", "Dataset", and "Methods". The section "Discussion" can be removed: subsection 4.1 is a sequence of well-known considerations; subsection 4.2 can be moved in the previous section "Results and discussion"; subsection 4.3 is not necessary.

4. The daily climate data are referred to a single station, "Boise Air Terminal". I guess that the same precipitation value is assigned to each hydrologic response unit into which the watershed is divided. But what is the extension of the considered basin?

This important information is not provided.

SPECIFIC COMMENTS

1. Line 207: “Historical” period. The authors refer to this as a scenario group. But two pages later, in line 243, they specify that historical climate data correspond to observations at the single station Boise Air Terminal. Under CMIP5 the “Historical” experiment is referred to GCM runs forced by observed atmospheric composition changes (see Taylor et al. 2012), to reproduce the 1950-2005 climate. In addition, the authors need to clarify the considered 30-year historical period (1980-2014 – 35 years – as in line 244, or 1981-2014 – 34 years – as in line 390?), and also the considered periods for the RCP4.5 and RCP8.5 scenarios.

2. Lines 263-264: another example of repetition. This same information has been previously reported in line 260-261.

3. Line 321: please provide reference(s) for the HBV hydrologic model.

4. Line 358: “As previously stated” where??

5. Line 507-508: why are the authors using the acre-feet unit and not SI units?

6. Page 42: In the caption of Figure 6 there is a misprint of some other figures?

7. Please use a consistent style for all the references.

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