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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Basin-scale multi-objective simulation-optimization modeling for conjunctive use of surface water and groundwater in northwest China" *by* Jian Song et al.

Anonymous Referee #2

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This paper developed a multi-objective simulation-optimization framework for sustainably conjunctive use of surface water and groundwater and applied it to water allocation in Yanqi Basin, an arid region in northwest China. The framework employed the epsilon multi-objective memetic algorithm with the MODFLOW-NWT based simulation model and used four management objectives in their optimization. The final results are very useful for sustainable water management in the study area and provided useful support to decision makers for water allocation. This paper can be suggested for possible publication in HESS after taking carefully into account the comments listed below.

Specific comments:

1) This study developed a multi-objective simulation-optimization framework for sustainably conjunctive use of surface water and groundwater. I didn't really see the new insights the readers can get, if only from the introduction part of this manuscript. Can the authors clarify the differences between their work and others? Partially solving the domination resistance phenomenon seems not new. Adding an epsilon to MOMA seems not new as well. 2) You mentioned SFR2, LAK3 and MODLOW-NWT. Since this is an important part of the framework, can you add more details about these simulation models in the revised manuscript? For example, SFR2 is a streamflow-routing package. Does this model include hydrological simulation, or just a hydraulic model since it is only named as a routing model?How was MODLOW-NWT developed in the study area? 3) Was the epsilon MOMA algorithm developed by yourself? The references attached are not enough to understand the algorithm. Please add more details about the logic line of the algorithm. 4) Figure 2: the figure didn't show clearly the river names in the basin. For example, I cannot find Kongqi River and lower Tarim River in the figure. This figure should help us understand the rivers, aqueducts etc. Please add a more detailed map. 5) When setting up the simulation model, what kind of data and also the details of data should be explained. What data were used for model calibration and validation? 6) What is "stress period"? 7) What is the time resolution in your simulation model? From Fig.4, you can see that the resolution is very coarse, semi-annually? This model fails to show even the seasonality of runoff, lake level and water allocation. 8) How did the simulation consider all human activities in the model? For example, how SFR2 take into account the diversion or abstract of water from the river? 9) Page 17: How did you obtain the scheme before optimization? 10) Climate change has substantial impacts on river runoffs in arid rivers in Xinjiang Province. The authors used only three simple scenarios (Current runoff; reduce 10% runoff and reduce 20% runoff) to investigate the impacts of climate change. These scenarios are just toys and don't provide useful information for climate change adaptation for the study area. Why didn't the authors use more practical climate change scenarios like RCPs? 11) Pos-

sible uncertainty in the simulation-optimization model and decision making should be discussed in the manuscript.

Technical corrections: Only minor typo is found.

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