

Reviewer #1:

We thank Dr. Leng for the helpful comments and suggestions, which are in plain text below. Our response is in bold text.

1. Irrigation is prescribed at fixed rates or depend on crop water stress? Please clarify and add discussions on the advantage and disadvantage of the two approach. In addition, brief introduction on the parameterization of groundwater withdrawals are required in the methodology section, although it was well documented in published papers.

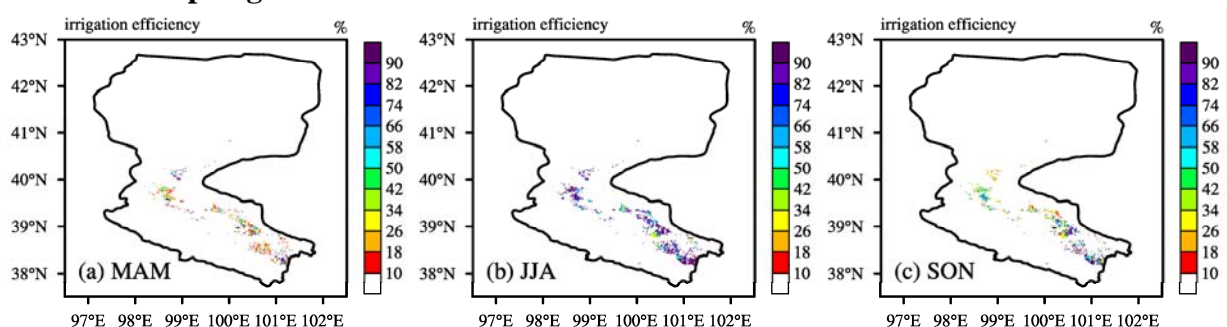
Response: The irrigation rate in this study was from an external high-quality irrigation dataset as Section 3.3 described. As suggested, we clarified and added some discussions on the cons and pros of the two approaches (P7, L10-16) and some descriptions for the parameterization of groundwater withdrawal (P5, L33-P6, L19).

2. Could you please show the spatial pattern of crops considered in this study? Is irrigation treated the same way for the three crops? That is, how irrigation water is determined, abstracted and applied for each of the three crops?

Response: As suggested, the spatial pattern of crops was shown in the Figure 1. In the simulations, we did not consider different treat ways for different crop types. It may be taken into consideration in the future (P12, L32-34).

3. Is irrigation efficiency accounted in the experiment? When water is supplied to ground, I would expect substantial losses to runoff and/or groundwater, which is considered in the model. If so, could you elaborate on this and show the range of estimated irrigation efficiency in the model?

Response: Yes, the water losses to runoff/groundwater would be considered by the CLM4.5 in its runoff and infiltration schemes (P6, L17, 18). As suggested, the spatial patterns of the irrigation efficiency were shown below. The efficiency was higher in summer and lower in spring and autumn.



Spatial pattern of irrigation efficiency in (a) MAM, (b) JJA, and (c) SON



4. Authors stated that one advantage of the irrigation scheme is consideration of groundwater withdrawals. In fact, recent works by Leng et al. has done similar studies with CLM for this topic. I suggest to review Leng et al. explicitly in the introduction and method sections. Leng et al. 2014, 2015 are found in the list but not cited in the text.

Response: As suggested, these citations were added in our manuscript (P3, L9-11; P5, L30-32).

5. Authors found a threshold of 5mm/day irrigation rate, above which irrigation effects on LH and SH does not change considerably. This is very interesting. Could you please elaborate on this and add discussions on the underlying mechanisms?

Response: As suggested, the underlying mechanisms was elaborated in the Section 5 (P12, L13-22).

6. Figure 5 and 6 shows the ET and NPP from observations and the simulations, respectively. I would suggest adding subplots on the difference between simulations and observations.

Response: As suggested, the subplots for the difference between simulations and observations were added in Figure 6 and 7.

