

## ***Interactive comment on “Groundwater Dynamics under Water Saving Irrigation and Implications for Sustainable Water Management in an Oasis: Tarim River Basin of Western China” by Z. Zhang et al.***

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### **General Comments:**

Overall this is an interesting paper on an important topic. The data collection methods seem thorough, and use current technology to quantify previously difficult fluxes. The water balance model is quite simple and in some ways not explained thoroughly. The paper could benefit greatly by omitting much of Sections 2 and 5, improving the description of the methods, especially the calculations, and ensuring that the Discussion and Conclusion actually focus on the results of this paper, rather than reviewing other

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literature.

### **Specific Comments:**

-The history of the TRB is interesting, but not needed to support the paper conclusions.

-Statement that water saving irrigation mitigates soil salinization is arguable. I can't find the paper (Ma et al, 2010) in English. If this was a conclusion of that paper, then it should be introduced as a hypothesis, or at least stated with respect to areas with shallow water tables only.

-Section 2 can be shortened to include only the relevant material for the project.

-Do you calibrate between the two SWC methods, hydra sensors and gravimetric method?

-Lateral flow is ignored in Eq 1 because it's negligible in the control volume, however it's included in Eq 2. Is LF needed to close the water balance in this case? Please explain why it is needed here and not before.

- Please explicitly define  $\Delta S$ ,  $\Delta S_D$ , and  $S_D$  and make sure their use is consistent. When you discuss in section 4 changes in the soil water, does this refer to  $\Delta S$  or  $\Delta S_D$ ?

$-(\theta_{sat} - \theta')\Delta Z_{wt}$  is the change in water storage associated with the change in water table, and the description of  $\Delta S_D$  makes it sound like the change in water storage between the water table (the bottom of the control volume) and the upper boundary of water table variation (where the water table was?). These appear to be the same. Please clarify the text to differentiate between these two, and confirm that they account for the full mass balance without counting anything twice.

-Clarify Figure 2 to illustrate what areas  $\Delta S$  and  $\Delta S_D$  apply to. This will also be clearer when you define them in the text (previous comment).

-p1790, ln 21. How did you measure the porosity? Did you also determine  $\theta_{sat}$  from

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any saturated SWC measurements?

-Section 5. The discussion on human-water systems, including the review of water use in the area seems like an appendix to the paper, rather than an integrated part. It should either be omitted or shortened significantly and justified by integrating with the results of the paper.

-The paper would benefit from a limitations section in the discussion.

-The Conclusion section should emphasize the findings and conclusions drawn explicitly from this paper, rather than summarize the motivation for the study.

**Technical Corrections:**

-Several language issues p1781 ln 22, (and elsewhere in text) "mainstream" should be "main stream" or "primary channel"

-overuse of the word "serious" and "seriously"

-p1781, line 27, start new paragraph with "Large-scale irrigation..."

-p1783 ln14, no "in general"

-p1784 ln 4, "conveyed" should be "conveying" or "routing"

-Section 4.2. Please revise and clarify the first sentence.

-Table 1 needs more explanation. Should 2012 and 2013 listed be the same year? Please also list the year for the bottom two rows.

-Figure 1. Can't read the lat/lon values in the top two maps, too small.

-Figure 3. Hard to distinguish between two grays. It also might be more intuitive to flip the y-axis for exchange flux to show negative flux going up.

-Overall could benefit from an English language review, I did not edit for language throughout the manuscript.

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