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Hydrology and Earth System Sciences
Discussions

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.

Anonymous Referee #4

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General comments:

This paper investigated the water balance of an arid inland basin, where knowledge about the interactions between water and salt balance is very important for sustainable socio-economic, agricultural, ecological and water resources managements. Measurements by contemporary advanced eddy co-variance techniques was used in this paper, which facilitate the researchers to close water balance and help us to derive more reliable knowledge about this kind of important ecosystem. Overall, the topic is important and interesting. However, this paper is subjected to major revision for publication. I am reporting below two general comments and some specific remarks, which I hope are

useful.

(1) Quantitative analysis of salt balance is needed.

This paper only presented one essential cycle, i.e. water balance, for the sustainable water management in an arid inland basin. Without quantitative results of the other critical cycle, i.e. salt balance, and coupling between two cycles given me a strong perception that, at current stage, novelty of this paper for sustainable water management in the Tarim River was very limited and the discussion digressed from data and results. So, major revision is expected.

(2) More attention should be paid to uncertainty in EC data.

EC data provided observed evidences of water evaporated from control volume. However, this data includes many uncertainties for estimating ecosystem evapotranspiration, such as closure of energy balance as authors mentioned. According to the data and methodology, uncertainty in EC measured ET was eventually introduced into exchange flux (EF) of the control volume, which is very critical for understanding groundwater table dynamics and salt cycle. Uncertainty in ET derived from EC data has important consequences to results of this study. Figure 4 shown daily upward EF could be larger than 10 mm/day. It was larger than I thought. I was wondering that to what extent the estimation of EF was affected by the uncertainty in ET. Soil water contented data of multiple layers has been collected. It can be used to quantify these uncertainties.

Specific comments:

(1) Providing maximum rooting depth at the experimental site.

(2) Using mm as unit of soil and water depths in the context, figures and tables.

(3) P1789-L7: exchange flux (EF) is too general. Cannot recall easily and directly what specific process it represents.

(4) P1789-L10: Lateral flow can be considered as one component of runoff. Should R here be defined as overland flow?

(5) P1789-L14: during the flooding period, the depth of groundwater table is less than 0.9m. Thus, control volume was NOT always above the groundwater table. And, please introduce how equation (1) was tackled under this situation.

(6) P1790-L19: why measurement of SWC at 150cm does not represent SWC at depth at 130 170 cm as those intervals centred on measurement points at depth of 100 and 120cm?

(7) P1791-L20-22: "The sum of .... during period 1" What does this sentence mean?

(8) Discussion section: if salt balance will not be analysed, the discussion should be shortened significantly.

(9) P1901-L13-15: "The results show that .... than in spring and autumn". Please provide which figure or table supports this conclusion.

(10) Figure 3: Define "IP" and "GWTD" here and for hereinafter use.

(11) Figure 3: Make the width of bars equal to corresponding width of time interval. Space between bars was not easy to understand.

(12) Figure 3: why downward EF occurred before next IP event between 5-13 and 5-20 of 2013?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 1777, 2014.