Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2019-411-AC1, 2019

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Responses of soil water storage and crop water use efficiency to changing climatic conditions: A lysimeter-based space-for-time approach" *by* Jannis Groh et al.

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Received and published: 13 November 2019

Response to comments by Anonymous Referee #2

General Comments:

The manuscript by Groh et al. presents results from the lysimeter network SOILCan. The focus of this study is on the effects of different weather and soil texture conditions on crop water use efficiency using a space-for-time approach. Hereby, weighable lysimeters with soils from four sites were moved and monitored at two of the sites with a drier and wetter climate, respectively. Instead of assessing changes in soil water stor-

age as a residual of the water balance components the changes in lysimeter weights were used to avoid an accumulation of errors. One of the main outcomes was that the water-use-efficiency was improved (due to lower evaporation loss from soils) under drier soil moisture conditions not following a linear function. Further, the effects of drought were still visible in the following season and even beyond that especially on finer-textured soils. Overall, the manuscript reads very well with a logical structure. The manuscript deals with the very relevant topic of changing climate conditions on agricultural productivity. The combination of weighable lysimeters in a space-for-time approach investigating four different soils with data over seven years provides valuable and interesting insights on how crop production may be affected. One of the strengths of this MS is that the authors present a comprehensive data set covering a seven-year period. The measurement data can be used for model development, calibration and validation. I recommend that the authors present such a model study in a follow-up paper. I recommend the acceptance of the manuscript upon minor revisions.

Response: The authors thank Referee #2 for reviewing our paper and their positive feedback/ comments concerning our manuscript. We are currently conducting a study and use lysimeter data for the calibration of different crop models.

Specific Comments:

M&M section information about the soil texture of all four soil would be helpful as it later becomes an important part in the discussion (coarser vs finer textured soils)

Response: We will add as suggested a soil profile description in the supplement of the revised manuscript.

Figure 2 Please improve readability. Tick mark labels are very small

Response: We will change the tick mark labels to improve the readability of Figure 2

L24 & L123 'monitored from April 2011 until December 2018' versus 'lysimeter data from April 2011 until December 2017' Please clarify.

Response: We will change December 2018 to December 2017 in L24

L244-264 Could this be related to a higher infiltration capacity of the coarser textured soil allowing for a more rapid recharge? It would be interesting if the authors made any observations on silting, cracking etc. of the soil surfaces especially of the finer-textured soils which might explain deficiencies in soil water recharge.

Response: The infiltration capacity is dependent on the conductivity at the soil surface. Silting, which more often occur at the soil surface of fine textured soil, affects the macropore structure (destruction of soil aggregates) and reduce the infiltration. No surface runoff was observed during the observation period. Thus we don't think that the annual carry –over of soil moisture deficits are related to a different infiltration capacity of the soil.

Some qualitative observations were made during the harvest time, but the soil surface has been modified by tillage, and the topsoil organic matter content and the plant roots are counteracting silting and cracking. We will include this information and discussion in the revised paper.

L410 '. . .net fluxes were observed. . .'

Response: We will change "net fluxes observed" to "net fluxes were observed" in the revise manuscript

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