

***Interactive comment on* “Estimation of Evapotranspiration and Other Soil Water Budget Components in an Irrigated Agricultural Field of a Desert Oasis, Using Soil Moisture Measurements” by Zhongkai Li et al.**

Michael W. I. Schmidt

michael.schmidt@geo.uzh.ch

Received and published: 8 May 2019

A note upfront from the submitting person: This review was prepared by Basil Frefel and Michèle Bösiger, both master students in geography at the University of Zurich. The review was part of an exercise during a second semester master level seminar on “the biogeochemistry of plant-soil systems in a changing world”, which I organize. We would like to highlight that the depth of scientific knowledge and technical understanding of these reviewers represents that of master students. We enjoyed discussing the manuscript in the seminar, and hope that our comments will be helpful for the authors.

C1

Addressing sustainable irrigation in semi-desert regions, Li et al. observed in a soil-moisture time series the soil-water holding ability in the Heihe River Basin, northern China. Soil properties such as saturated hydraulic conductivity and soil retention capabilities were combined with the soil water balance method and the inverse Richards equation (water movement in unsaturated soil) in order to estimate the Soil Water Base Components (evapotranspiration, irrigation, drainage). The measurements were taken at six sites in sandy soils, which differed in agricultural technique (rotational, permanent cultivation), plant species and mulching application. The results show that the estimation of the Soil Water Base Components corresponds to the soil-moisture time series and thus should be helpful for future irrigation planning.

Overall, the issue addressed by Li et al. is of great importance regarding future water management. Especially with increasing water scarcity, the study lays the foundation for a sustainable water strategy for one of the biggest agricultural producers worldwide for rice and wheat and thus is a valid contribution to the present scientific knowledge. The article is well structured, and the thinking steps are described profoundly, in addition to the reflected approach to the results. However, we have also found some caveats. In general, the type size is too small, and the sentences tend to be too long and interlaced to comprehend the article at the first read (see further comments). Moreover, the exact time span of the experiment is unclear, and it should be mentioned what (important) role sandy soils play in the agricultural production of China and the world. Besides, the abstract should be shortened to stay attractive for the reader and abbreviations such as NT1-NT6 should not be used in this very first paragraph. In our opinion, many explanations are too complicated; Keep explanations short and simple. In contrast to the detailed abstract, the conclusion is too short, again overloaded with abbreviations and therefore not understandable standing alone. More detailed remarks are listed below.

Unclear section, parts which need further specification: 12: SWBC: In this paper the term soil water budget components and its abbreviation SWBC is used as if it were

C2

a standard term in soil science or hydrology. is this really the case? Otherwise it should be mentioned that this term as such is only used in this paper. 22: Since the inverse Richards equation is of great importance in this work, but is not necessarily known to the general public, a brief description of what this method is used for, e.g. in parentheses, would be helpful 26: Why only one site without film-mulch? Comparison to other sites without mulching would have been helpful 29: What should be special about an obvious correlation between the volume of irrigation and drained water? is this really a significant result of the study or could this statement also be omitted? 47: What is a high leaching fraction? Explain. 40-54 and 55-69: The second paragraph is redundant. 106-107: Reference is needed for the sentence "The annual average precipitation..." 107: What does a dryness index of 15.9 mean. Please put this number into context. Is this a high or a low value compared to the surrounding region or the rest of China? Is the dryness Index a common value which is need to be stated? 111: What exactly is meant with sandy soil? What official soil name does it correspond to? 111: leave out "...coarse texture and..." 111: Scotch or Scots pine? Us familiar expression 124-126: Please explain why the different treatments used in the study were chosen. 127: Why using exactly this type of irrigation (furrow irrigation)? Please explain in more detail. 128: Why just using one site with no film-mulching and five with mulching? Not a sufficient comparison possible between the sites 242: Is it not unrealistic to use a ground level of the soil matric potential, even though the water level never reaches that high up? 245: Which software? Please specify. 343: In what dimension is the soil water content measured?

Sentences which were too long or hard to follow: 55-59: The sentence is too long, therefore hard to follow and should be divided into two or three sentences. End the first sentence with a full stop after (Wright, 1971). 92-95: Unorganised sentence order makes it even harder to follow the content. 165-171: Subdivision into subsets probably better for this sentence. 219-226: Hard to follow the derivation

Remarks concerning formal structures (typos, figures, etc.): 42: missing 'the' ...the

C3

Heihe river basin (HRB) is one of the largest... 81: Cross out "...quite common and..." 83: Cross out "...and more..." 85: Also, with this process_, ... 86: ..., almost no work_ have been... 112: ... (planted since the 1970s), include Haloxylon anmodendron, ... → either no comma or 'including' Figure 1: The figure is not entirely clear→to what do the roots belong on the right?/figure on the left→layout and position of the legend and unprecise placement of the small map of China Figure 2: Probably better 'day of year' as axis label instead of DOY 140: 'was' instead of 'were' 195: 'dominates' instead of 'dominants' Table 1: we propose to insert this nomenclature-table at the beginning of the chapter. Table 2: Vertical lines between wilting point value of one study site and the saturated water conductivity of the next study site could probably increase readability (see attached pdf) Figure 5: Does it need this figure at this place? and what exactly, apart from the clearly visible irrigation events, should be shown with it? Figure 6: left graph→use other scaling, since nothing is readable/ right graph→why is the scale in the middle of the graph (a bit weird position), why using such fancy boxplots if normal rectangular ones could be used? 381: 'Literature' instead of 'literatures'? 437: explains 443: ... (Fares and Alva, 2000), suggesting that there is... In general: Reflect on the placement and use of figures and tables in the work, so that these stylistic tools fulfil their purpose of increasing the attractiveness of a scientific paper.

Further comments: 1-2: as the use of soil moisture measurements is a major part of the scientific work, we would adjust the title as follows: Estimation of Evapotranspiration and Other Soil Water Budget Components, Using Soil Moisture Measurements, in an Irrigated Agricultural Field of a Desert Oasis Or also the following possibility seems easier to understand to us: Estimation of Evapotranspiration, Irrigation and Drainage, Using Soil Moisture Measurements, in an Irrigated Agricultural Field of a Desert Oasis 29-30: Leave out the obvious parts and concentrate on the findings 106: lowest and highest temperatures for winter and summer, respectively→that's logical, no need of repetition. Pleonasm. It would be probably better to use the terms 'minimum' and 'maximum' in this context. 323-324: water content values are difficult to read in the presented form of a listing. 512: Setting upper boundaries would have been a nice

C4

addition 566: It would be desirable for the conclusion to mention what would be appropriate irrigation methods for this variety of agricultural soil.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2019-89>, 2019.

C5

Basil Frefel and Michèle Bösigler

**Review on Li et al. 2019: Estimation of Evapotranspiration and Other Soil Water Bu
in an Irrigated Agricultural Field of a Desert Oasis, Using Soil Moisture Measureme**

Addressing sustainable irrigation in semi-desert regions, Li et al. observed in a soil-m the soil-water holding ability in the Heihe River Basin, northern China. Soil properties: hydraulic conductivity and soil retention capabilities were combined with the s method and the inverse Richards equation (water movement in unsaturated soil) in the Soil Water Base Components (evapotranspiration, irrigation, drainage). The m taken at six sites in sandy soils, which differed in agricultural technique (rota cultivation), plant species and mulching application. The results show that the esti Water Base Components corresponds to the soil-moisture time series and thus sh future irrigation planning.

Overall, the issue addressed by Li et al. is of great importance regarding future wa Especially with increasing water scarcity, the study lays the foundation for a sustaina for one of the biggest agricultural producers worldwide for rice and wheat ar contribution to the present scientific knowledge. The article is well structured, and are described profoundly, in addition to the reflected approach to the results. How found some caveats. In general, the type size is too small, and the sentences tend t interlaced to comprehend the article at the first read (see further comments). M time span of the experiment is unclear, and it should be mentioned what (importa play in the agricultural production of China and the world. Besides, the abstract sh to stay attractive for the reader and abbreviations such as NT1-NT6 should not be us