

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
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Comment on hess-2022-323

Anonymous Referee #1

Referee comment on "Benefits of a robotic chamber system for determining evapotranspiration in an erosion-affected, heterogeneous cropland" by Adrian Dahlmann et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2022-323-RC1>, 2022

Review of "Measuring evapotranspiration on an eroded cropland by an automated and mobile chamber system: gap filling strategies and impact of soil type and topsoil removal" by Adrian Dahlmann et al., for HESS.

Summary

This manuscript presents a study of roughly one year of evapotranspiration measurements of a winter rye crop on a number of soil types. The ET measurements are novel, using an automated and mobile chamber system. The study reports and highlights the negative impact of eroded conditions on biomass growth and water use efficiency. Because of the novelty of the ET method, the study also investigates different gap-filling techniques. Here they find that machine learning approaches are better than simpler regression or look-up techniques. While this is an interesting study, I think there are many improvements that can be made to give it more relevance to both application users (farmers, land managers) and to the scientific community.

Major comments

- The focus of the paper is not clear and wanders between the new ET method and its gap-filling, the erosion gradient of soils, the role of ET in the water balance, and other impacts of erosion (e.g., on biomass production). A tighter, clearer focus will help – and then the methods parts can better be written to support the key aim, which is (to me at

- least) to explore the impact of soil conditions on agronomic and water balance impacts.
- Hypothesis-testing should be performed – it should be clearer both in the abstract and end of the introduction what the expectation is – how should the different soils change agronomic and ET outcomes? How should we be able to anticipate, from the literature, different performance among the gap-filling techniques?
- In general, there are many mistakes in the English language related to article use, comma positions, sentence structure, possessive apostrophe, etc. I have noted some of these below, but a careful edit should be performed with these issues in mind.

Minor comments

- The intro could be condensed, particularly the first paragraph (e.g., L36-40, 47-52, and remove “according to the European Union”).
- Consider moving L53-62 to the site description section in the methods.
- L77-81, Remove/condense; consider “field” instead of plot for eddy covariance
- L103-5 consider at minimum three aims (i.e., separate soil type and management from spatio-temporal variability). In general note other comments that there should be clearer hypotheses in this area about expectations related to soil/management type, seasonal development of ET and WUE, and the gap-filling methods
- L141 what kind of digestate?
- Section 2.3 misses info on measurement times, accuracy, precision, etc. of this novel system
- L157 describe the adjacent field a bit – given that the soils and management status can drastically change the soil moisture, how was the adjacent field treated? Also please add where this field is to the site map.
- L180 some chamber info is missing – what is the headspace, how tall is it relative to the biomass)
- L177 consider moving all or some of this on flux calculations and gap-filling to section 2.3
- L214 clarify if there is a moving window to this NLR or it’s just clumping all the data – if so – how about trying a moving window or adding a term like days after planting (though RVI may be sufficient, it’s not clear – were regressions of the residuals tested?).
- L295 “differ between” and “minor differences” – are statistics performed here? Perhaps also some ranges of values can be given in the text
- L297 it’s not clear what magnitude is being described
- L302 start with the result as a topic sentence, rather than the exposition. The result and not “figure 4” should lead the paragraph.
- L308 the allocation problems could be described / tested? (also “one can quickly see...” can be edited)
- L310 “a large number of negative ET fluxes” – first, how many? Second, is there evidence of dew? A negative ET isn’t so implausible
- L318-320 could be put at the top of the paragraph
- L321 this section could be merged with the previous – consider the treatment effect and then the drivers
- L430 “to the amount of data” – how much? – you have a lot right? What would be sufficient?
- L432 this section is very long- be more concise, move parts that cite other work to other parts of the discussion (or a new section there) – moreover, this section starts with a description of gap-filling – is that the main finding? If so the paper should be reworked so it’s the dominant research question and the rest is a case study to test it.

- I'd tend to think the focus should be on soils, management, and the resultant ET
- Fig 1 what do the colors in plot c represent? Where are the soil moisture measurements and adjacent field as indicated in text?
 - Fig 2 clarify that this is incoming par and not absorbed, reflected, etc.
 - Fig 3 change Okt to Oct, describe here or in the text where are values below zero? Indicate here or in the text whether these are already quality-screened and what those methods were, what is the estimated detection limit?
 - Fig 6 some stats perhaps could help tell us if these curves or cumulations are different, significantly
 - Fig 7 what are the colors?
 - Fig 8 is an nova possible here, which are specifically different from each other?
 - Fig A1 can real data be plotted here?

Technical comments

- L13 Add the before ongoing
- L16 change ingoing to incoming (and throughout)
- L17 the paper doesn't really address the full water budget – perhaps main water budget term would be better?
- L92, 114 change build to built
- L95 change the aim was to the paper's aim is...
- L102 reword "This enabled to asses"
- L103-4 be consistent with WUE vs WUEagro
- L114 the description of CarboZALF repeats the intro (and this sentence is too long)
- L120 "organic fertilized" interrupts the flow; it can be omitted
- L129 just topsoil (not topsoils) – and was not were
- L135 weighed not weighted
- L146 and elsewhere the "by" is not needed
- L155 remove comma after both
- L163 channel not canal
- L166 write out three, clarify "10 seconds = 10 records"
- L174 perhaps replace "further called" "what we term the"
- L208 change I to 1 (i.e., "eye" to "one")
- L208-210 consider re-organizing like: "a simple stat approach: (1) MDV), two empirical... (2, 3), and two machine learning..(4,5) for consistent structure
- L258 add values after NSE
- L259 remove "the" and the s in parameters
- L269 change photosynthetic to photosynthetically
- L274 remove "in the observed period" or otherwise reword
- L275-6 to where does this downward trend go (Describe/quantify in text so one doesn't have to look at the figure to determine it)
- L282 has a unique date style compared to the rest of the text
- L285 "nearly no differences" – perhaps negligible?
- L287 "clearly" ?
- L327 remove s from variables
- L330 remove used
- L331 change offers to offered
- L333 consider fewer rather than less
- L335 remove comma
- L337 reword – no need for "As well as" twice
- L337 add of after suitability

- L365 change was to were
- L397 change were spanning over to spanned
- L402 add t to constraints
- L445 remove comma after demonstrate