

Interactive comment on “Anatomy of the 2018 agricultural drought in The Netherlands using in situ soil moisture and satellite vegetation indices” by Joost Buitink et al.

Anonymous Referee #1

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The authors present a very interesting and for the scientific community (hydrology and remote sensing, and agricultural science, modelling and resources management in a broader sense) highly relevant study on the spatiotemporal assessment of the critical soil moisture content in different soil depths and based on selected space-borne vegetation indices, and compared with in situ data from two soil moisture measuring networks (Raam and Twente) in The Netherlands. The focus is on the drought and heat event in the spring and summer months of 2018, which was particularly evident in northern and central parts of Europe with below-average rainfall and above-average temperatures. The derivation of the thematic superstructure, the description of materials and methods as well as the presentation of results and subsequent discussion

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follows a clear logical structure. The writing/language is precise and stylistically confident. Sometimes some sentences are too long, which makes them difficult to read. The conclusions are clearly understandable and unambiguous. All in all, I would like to state that I enjoyed reading the manuscript very much. Except for a few revisions that I think are necessary (see below points 9 to 14), the manuscript is in a condition worthy of publication. I would like to thank you for the opportunity to review the manuscript and would like to recommend publication of the article in HESS.

1. Does the paper address relevant scientific questions within the scope of HESS? The authors present a very interesting and for the scientific community (hydrology and remote sensing in the narrower sense) highly relevant study on the spatiotemporal assessment of the critical soil moisture content in different soil depths and based on selected remote sensing based vegetation indices for two soil moisture measuring networks (Raam and Twente) in The Netherlands. The focus is on the drought and heat event in the spring and summer months of 2018, which was particularly evident in northern and central parts of Europe with below-average rainfall and above-average temperatures. In my own opinion, the study is thus fully within the scope of the HESS Journal and is therefore likely to be of great interest to readers from the fields of agricultural science and modelling as well as, in a broader sense, resources management (e.g., scope and need for action in context of one central finding by authors that “[. . .] negative soil moisture anomalies develop weeks before the first reduction in vegetation indices.”, lines 243-244).

2. Does the paper present novel concepts, ideas, tools, or data? Indeed, the authors present a new approach to the determination of the critical soil moisture content by means of highly temporally resolved daily remote sensing data. Not only the approach as such is new, but also the input data (NIRv and VOD) are up-to-date.

3. Are substantial conclusions reached? The provided conclusions are precisely presented and clearly understandable. The objectives mentioned in the introductory chapter are answered in sufficient detail.

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4. Are the scientific methods and assumptions valid and clearly outlined? To my best knowledge, the scientific methods used and assumptions are adequately chosen and clearly outlined.

5. Are the results sufficient to support the interpretations and conclusions? Yes, absolutely. As already mentioned below, the entire manuscript follows a logical and clear structure. This also applies to the presentation of the results (textual as well as in the form of the five illustrations and a table). The interpretation of the results and the conclusion of the findings is coherent and comprehensible. No generalizing statements are made without reference to the study.

6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? The description of the experimental/study setup is given in full. The information on the data sources utilized is complete.

7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? The findings from other studies are contextually related and clearly recognizable. A corresponding differentiation to new/original contributions is possible.

8. Does the title clearly reflect the contents of the paper? In my understanding, the title of this study adequately summarizes the content. The title is clear and interestingly designed. In my opinion, a change of the title is not necessary.

9. Does the abstract provide a concise and complete summary? The abstract is a concise, precise and more or less complete summary of the work. Only the definitions of the abbreviations (see note under point 12) are missing. For a complete summary in my opinion, information on the most important data sources (e.g. MODIS product, spatiotemporal resolution) and most important results should be given in figures (e.g. fit statistics and critical soil moisture).

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10. Is the overall presentation well structured and clear? The manuscript follows a clear logical, causal structure, also in accordance with HESS guidelines. The central theme of the study is recognizable throughout the manuscript, from the introduction to the topic to the conclusion. Unnecessary repetitions are not visible in the text. Nevertheless, I recommend a slight shortening of the introductory chapter up to a maximum of 1.5 to 2 pages.

In my understanding, the sentence "The availability of a [. . .]" (line 71) marks a new paragraph.

11. Is the language fluent and precise? The authors present a very concise and well written, and logically structured manuscript. The language is fluent and precise without major exceptions.

Only some sentences seem to be too long, so that the readability is a bit difficult. For this reason, I recommend a revision regarding the shortening of some sentences or separation of one sentence into two (e.g., lines 17-19, 39-41).

In line 48, the sentence "This is confirmed [. . .]" is missing the preposition "by".

In line 85, the reading flow of the sentence is a bit hampered by double "due to". I recommend restructuring this sentence.

12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Mathematical functions are not included in the manuscript. Although the mathematical function for deriving the daily NIRv index would certainly be beneficial for the reader, this is not urgently necessary due to the comprehensive reference.

The listed symbols are introduced accordingly and used consistently in the text. An indexing of the unit of volumetric water content (water/soil) is not necessary in my opinion, but it is also not negatively noticeable.

The listed abbreviations are introduced adequately and are used consistently in the text. Only for the abstract, a definition of the abbreviations NIRv, VOD and GPP ac-

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cording to the HESS guidelines has to be implemented.

13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? As mentioned above, the structure of the manuscript follows a clearly recognizable red thread. For the chapter 'Introduction', a slight reduction of the text to a maximum of 1.5 to 2 pages is recommended. On the other hand, some additions in the form of examples would certainly be advantageous. A list of two or three examples of mentioned 'remote sensing products' (line 39) and corresponding references should be added in my opinion. Also specifications on the temporal resolutions for NIRv, VOD, and SIF data should be added – for instance using brackets – even though it is obvious from the section 'Material and Methods'. Furthermore, the basis for the assumption in lines 105 to 106 is not clearly evident. What is the basis of this assumption? How are the soils in Raam and Twente soil moisture networks characterized?

For the inexperienced reader, information on the area size of the individual Raam and Twente networks and the density of the networks would be helpful. How far apart are the individual stations located in each area? Are the soil moisture networks heterogeneous in terms of topography? In my opinion, an appropriate characterization of the areas would increase the readability of the results.

Moreover, a specification of the space-borne microwave sensor (line 121; AMSR-E and AMSR2, WindSat?)

14. Are the number and quality of references appropriate? In total, 64 references providing actual information from a diversity of international high-ranking journals is listed. The references are appropriate and adequately support the content of manuscript. The list of references is complete, meaning that all citations in the text are provided in the list too. The style of citations and references is in agreement with the guidelines of HESS. Only the abbreviations of the journals according to the guidelines (Journal Title Abbreviations by Caltech Library) should still be implemented by the authors.

15. Is the amount and quality of supplementary material appropriate? There is no supplementary material provided.

Please also note the supplement to this comment:

<https://hess.copernicus.org/preprints/hess-2020-358/hess-2020-358-RC1-supplement.pdf>

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2020-358>, 2020.

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