Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2017-223-AC1, 2017

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Impact of capillary rise and recirculation on crop yields" *by* Joop Kroes et al.

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Received and published: 5 July 2017

Reviewer's General comment 1: "The authors are ignoring the work of the early Dutch physical scientist, Symen Barend Hooghoudt" Our reply to General comment 1: As the reviewer suggested we read [1], [2] and [3]. We agree with the reviewer that Hooghoudt did quantative work on capillary rise and crop yields, especially in [1]. Indeed Hooghoudt mentions the relation between capillary layers and yields in at least 2 publications mentioned by the reviewer. But his relations are always related to groundwater tables. Recirculation as we discuss is not mentioned. However the quantitative work done by Hooghoudt on capillary rise and crop yields was long before computer models, it should be recognised and we will refer to his early work when we talk about the importance of capillary rise and refer to his earliest publication [1] in line 90. Ref-

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erences: [1] Hooghoudt, S.B., 1937. Contributions to the Knowledge of Some Physical Soil Properties. No. 43 (13) B, p. 461-676. Determination of the Conductivity of Soils of the Second Kind (In Dutch: Verslagen van Landbouwkundige Onderzoekingen, no. 43(13) B, Dep. van Economische Zaken, Directie van den Landbouw. Algemeene Landsdrukkerij), The Hague. [2] Hooghoudt, S. B. (1952). Tile drainage and subirrigation. Soil Science, 74(1), 35–48. [3] Raats, P. A. C., & Ploeg, R. R. van der. (2005). Hooghoudt, Syman Barend. In D. Hillel (Ed.), Encyclopedia of Soils in the Environment. Vol. 2 (pp. 188–195). Elsevier, Amsterdam.

Reviewer's General comment 2 : "I do not understand Figure 2b." Our reply to General comment 2: Figure 2b illustrates the hydrological condition "Free Drainage with recirculation across bottom of Rootzone". As stated below the figure this condition b is a common free drainage situation which includes upward flow due to recirculating percolation water. Recirculation also happens in free drainage situations. We quantified recirculation separately from capillary rise using model experiments illustrated in figure 2a and 2b. see also the special paragraph in lines 250-264 To make the role of recirculation even more explicit we changed line 101 from "The driving force for induced capillary rise is the difference in soil water potential," into "The driving force for induced capillary rise "and recirculation" is the difference in soil water potential,"

Specific comment From reviewer: l. 42 and l. 623: Our reply: SSA was changed into SSSA

Specific comment From reviewer: l. 52-54: Our reply: The use of names of USDA soil taxonomy can be avoided here. Aquepts were explained because this is relevant. The sentence with names of Histosols and Inceptisols was deleted because it has very little added value.

Specific comment From reviewer: l. 57, 69, 72, and 125: Our reply: We verified the references and give both scientific and common name for those crops where the reference also uses Scientific names. This was the case in l.69 (quinoa) and l.72 (coybean)

where we added the scientific name according to the reference. This comment also made us look at the reference Geerts et al (2006) which was missing in the References and therefore added to the References.

Specific comment From reviewer: l. 96: Our reply: i) the “ss” was a typing error and is changed into “as” ii) Zipper et al.(2015) quantified “groundwater yield subsidy” as harvested biomass in Mg.ha-1 Dry Matter. The unit was added to the text.

Specific comment From reviewer: l. 101: Our reply: clarified by defining the difference (=” at different soil depths”)

Specific comment From reviewer: l. 106: Our reply: “Richards equation” was applied throughout the text

Specific comment From reviewer: l. 109: Our reply: we defined SWAP at the suggested location. And added the latest reference to the model: Kroes et al. (2017).

Specific comment From reviewer: l. 109 and 138: Our reply: WOFOST is defined at the first place where it is mentioned, similar to SWAP.

Specific comment From reviewer: l. 153: Our reply” “van Genuchten” (no capital letter, but “v” in “van”) was applied

Specific comment From reviewer: l. 179: Our reply: CO2 as CO2

Specific comment From reviewer: l. 190: Our reply: “is grown” changed to “are grown” and the sentence was improved.

Specific comment From reviewer: l. 195-196: Our reply: Table 1 is extended with an explanation of the acronyms used for the names of the case studies.

Specific comment From reviewer: l. 214: Our reply: by referring to Table 1 this should become clear.

Specific comment From reviewer: l. 246: Our reply: this is too much detail, and also ex-

plained in the extended material. So we deleted part of the sentence between brackets and referred to the extended material(s).

Specific comment From reviewer: l. 259: Our reply: 'artificial restriction' is not mentioned before, se we deleted the phrase "that inherently include the mentioned 'artificial restriction"'

Specific comment From reviewer: l. 275: Our reply: DM indeed stands for Dry Matter. We agree that it was confusing. But with the explanation given in Table 1 we hope that this is clear now (see also our previous reply to comments: l. 195-196). DM is used 47 times, the first wime DM is used as Dry Matter we give now an explanation.

Specific comment From reviewer: l. 296, 305, and 306: Our reply: These acronyms are now explained in Table 1 (see also our previous reply to comments: l. 195-196).

Specific comment From reviewer: l. 336 Our reply: we moved the abbreviation FDrc to the end of the sentence where it directly is linked to Table 4. We feel that the tables 1 and 4 together with the update text make the text readable enough and an additional list of abbreviations is not required.

Specific comment From reviewer: l. 345: Our reply: capital letters were deleted

Specific comment From reviewer: l. 349-350: Our reply: in the text we use "the Netherlands", only in References we allowed "The"

Specific comment From reviewer: l. 372: Our reply: see our reply to Specific comment From reviewer: l. 336

Specific comment From reviewer: l. 383: Our reply: Sentence was extended to clarify the differences : "differences between downward flux across the bottom of the rootzone (qpercolation in Figure 2) of 3 hydrological conditions"

Specific comment From reviewer: l. 393, 394: Our reply: clearly was deleted

Specific comment From reviewer: l. 421-422: Our reply: We started with the statement

"High upward flow values are found in loamy soils as is expected". Low values for loamy soils were found because of high water stress which reduce upward flow and can be more important than soil type. The sentence was slightly rephrased to make this more clear.

Specific comment From reviewer: l. 430: Our reply: We looked at figures 46 and 47 in Tolman (1937, p.157) and indeed mention that we did-not consider hysteresis. Perhaps an additional study might zoom in on this aspect. Reference: Tolman, C. F. (1937). Ground Water. Retrieved from https://ia801500.us.archive.org/16/items/in.ernet.dli.2015.1788/2015.1788.Ground-Water.pdf

Specific comment From reviewer: l. 452: Our reply: "then" changed to "than"

Specific comment From reviewer: l. 460: Our reply: we changed "difference" into "impact of upward flow on crop yields" because it is more clear and that is the core of our message.

Specific comment From reviewer: l. 494, Our reply: all References have year in parenthesis

Specific comment From reviewer: about definitions in Tables 1, 5 and 6 Our reply: Table 1 was already updated; Tables 5 and 6 have now explanation of FDnc, FDrc and Ave

Specific comment From reviewer about Figures 4, 5, 6, and 7:: Our reply: Number on the y-axis are rotated by 900 , so they face the reader now.

Please also note the supplement to this comment:
https://www.hydrol-earth-syst-sci-discuss.net/hess-2017-223/hess-2017-223-AC1-supplement.pdf

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