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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Sensitivity of water stress in a two-layered sandy grassland soil to variations in groundwater depth and soil hydraulic parameters" *by* M. Rezaei et al.

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The study presents a numerical analysis of hydraulic properties, water stress, and potential yields using a time-dependent sensitivity analysis. Overall, it is well written and presented. I not sure I follow the whole time-dependency argument but it is could be very interesting with a little more clarification. More clarification is required on the LINGRA-N model and the metrics presented for the sensitivity analysis. Fist, what is driving the LINGRA model so that it can feed LAI into HYDRUS? Please expand this section. Second, is the sensitivity analysis presented in Eq 12-14 new? Is there any reference? I am familiar with regional sensitivity analyses and monte carlo based

approaches (Freer et al, 1996; Mertens et al., 2005); I even did one myself using Hydrus (Caldwell et al., 2013), but I don't know this method. What are the limitation of only changing a single parameter while holding everything else constant?

Line specific comments

p6886 l14: Despite topographic and groundwater depth variaibilty, is there no variation in Ap thickness (33cm)?

p6886 l18: how was rooting density measured or determined?

p6888 l17: I am not following how LINGA-N was integrated into HYDRUS. At a minimum, tell me what the forcing functions are for LINGA-N. Was it only used to parameterize a time-varying LAI in hydrus?

p6689 l17: ... air entry or hysteresis ...

p6890 eq8: add 'DWS =' to this equation - it will make it a little easier to figure out what DWS means throughout the manuscript.

p6891 l8: the subscript of ET are coming and going - I suggest sticking with the subscripts on ETo and ETp, ETa, etc.

p6892 eq. 11: S(h) was previously defined - seems odd to now have 'S' be a function of another variable, time. Obviously they aren't related but perhaps you could change this for clarity.

p6893 l17: what error term was used for the objective function? And how was this optimization performed? You present 3 different cost functions later. Also, did you use the Levenberg optimization routine built into Hydrus?

p6898 l23: 'model performance during the calibration was superior to the validation period' or something to replace 'less well'.

p6908 Table 1. Where did this data come from? Lab analysis? How many samples

make up the average? You note 'measured values' on p6896 l23 - unless this data is in another manuscript - you need to present the methods for C, texture and hydraulic properties.

p6910 Table 3: Node Depth - not Nodes

p6920 Figure 8: the units on the y-axis could use a space between mm and h - it looks like there's a millihour in there.

References cited herein: Caldwell, T. G., T. Wöhling, M. H. Young, D. P. Boyle, and E. V. McDonald (2013), Characterizing disturbed desert soils using multiobjective parameter optimization, Vadose Zone J., 12, 1-23, doi: 10.2136/vzj2012.0083.

Freer, J., K. Beven, and B. Ambroise (1996), Bayesian estimation of uncertainty in runoff prediction and the value of data: An application of the GLUE approach, Water Resour. Res., 32, 2161-2173

Mertens, J., H. Madsen, M. Kristensen, D. Jacques, and J. Feyen (2005), Sensitivity of soil parameters in unsaturated zone modelling and the relation between effective, laboratory and in situ estimates, Hydrol. Process., 19, 1611-1633.

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