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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Quantifying energy and water fluxes in dry dune ecosystems of the Netherlands" *by* B. R. Voortman et al.

Anonymous Referee #1

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This paper follows up with a 2014 paper which presented unsaturated hydraulic properties of mosses. The present paper provided datasets on lysimeter-measured ET and ET-related fluxes, compared the measurements with Penman-Monteith equation whose parameters were derived from the measurement datasets. Through the comparison they showed the change of surface resistance before and after drought and they showed behaviors of different moss species. I found this paper to be a nice contribution to HESS. The ecosystem and the hydrologic processes studied (ET and groundwater recharge in inland dunes) are obviously of societal importance. The data was carefully collected and the calculations were meticulously carried out. Moss ecohydrology is a knowledge gap and I believe the datasets presented in this paper will be a great value for improving our understanding and representation of moss in earth system models. I

believe the paper can be published with moderate revision.

Some main suggestions: 1. The finding of higher surface resistance after drought deserves some more discussion. Most land surface or hydrologic models have a root resistance term linked to soil moisture (e.g, see CLM and its use by hydrologic models [Oleson et al., 2013; Shen et al., 2013] and the body vegetation water stress literature [Lai and Katul, 2000; Braud et al., 2005]). Since the rs in this paper was back-calculated, it might have lumped the soil moisture limitation into rs. If this were the case, it is still valuable data but hardly novel. On the other hand, if the effect of soil moisture cannot explain all the increase in rs, this is more interestingâĂŤit might be related to some ecophysiological traits of the mosses after drought, perhaps due to cavitation. If soil moisture measurements had been collected, this is a good opportunity to add a moisture limitation term into the ET equation to resolve the different effects. If not, the authors need to be more careful about their conclusions and the claim of novelty. 2. I found the discussion of moss ecophysiology to be interesting (behave just like soil). How can we model moss in a global or basin-scale setting? How should it be fundamentally differed from grass or trees? Some discussion will be welcome. 3. The authors need to acknowledge that the method they used to estimate ET is very data-intensive, and unlikely to be available on large scales. Therefore, the limitation of the net longwave radiation model should be discussed? 4. Just a suggestion, if the authors could include site-gathered pictures of different species discussed in the paper, it will be much more intuitive. It will also be nice to have some general background information of the climate conditions of the study region (annual precip, ETp and their distributions).

Some detailed comments

1. The authors kept referring to moss carpets "tempering" ET, but this word is very vague and unclear. I had to go to the cited paper to understand what they meant – "reducing the magnitude of". Please considering switching this word to sth else. 2. In the abstract, "due to the desiccation of leaves", how do we know it is the desiccation

of leaves? Why not stems/rhizoids? It could be because I am not familiar with moss, but this part deserves more clarification. 3. Abstract page Line 22âĂŤ"feedback on the parameters of Penman Monteith equation" → should be more specific "influence on the surface resistance" (but please see main comment pt 1 above) 4. Section 3.2, again, please see above comments about soil moisture limitation.

References Braud, I., N. Varado, and A. Olioso (2005), Comparison of root water uptake modules using either the surface energy balance or potential transpiration, J. Hydrol., 301(1-4), 267–286, doi:10.1016/j.jhydrol.2004.06.033. Lai, C.-T., and G. Katul (2000), The dynamic role of root-water uptake in coupling potential to actual transpiration, Adv. Water Resour., 23(4), 427–439, doi:10.1016/S0309-1708(99)00023-8. Oleson, K. W. et al. (2013), Technical Description of version 4.5 of the Community Land Model (CLM), NCAR technical note, NCAR/TN - 503+STR, UCAR Earth System Laboratory, Boulder, Colorado. Shen, C., J. Niu, and M. S. Phanikumar (2013), Evaluating controls on coupled hydrologic and vegetation dynamics in a humid continental climate watershed using a subsurface - land surface processes model, Water Resour. Res., 49(5), 2552–2572, doi:10.1002/wrcr.20189.

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