Dear Anonymous Referee #2,

Thank you very much for your review and your constructive comments. The entire text of your comment is shown (RC) together with our authors' responses (AR).

Kind regards,

Niccolò Tubini and Riccardo Rigon

RC: The paper is well written, and it address the important topic of implementing Richards equation in a land surface code. It is useful to have both radiation estimation in complex terrain and the surface energy implemented.

I'm not really sure of the utility of changing water viscosity in infiltration processes, in fact the diurnal cycle in soil field measurements are always to be watched carefully because of temperature dependent erros in instruments (especially electronics). However, solving the heat transport equation is useful for the surface energy budget evaluation.

I think that it can be published after it is modified following the remarks of reviewer 1.

AR: We thank the reviewer for the good review of the paper. About the dependence of water viscosity on temperature, thus also of the saturated hydraulic conductivity, we are aware of the possible errors in measurement and that measurement must be interpreted carefully but we think that a numerical tool should offer the possibility to the user to also include this type of modelling solution.

It is possible that other factors overshadow temperature effect on saturated hydraulic conductivity (Lentz, 2001) but it is worth to point out that in arid regions, and bare soil, especially if dark and containing peat, may experience high temperature in summer. In this case temperature can become a leading factor in controlling the infiltration rate, therefore it is advisable that numerical simulators can account for the temperature effect on saturated hydraulic conductivity (Vereecken et al., 2019).

On this opportunity there are two aspects that we think should be considered:

- In the foreseeable future the instruments will be better than today's so we will be more confident with the measurements.
- From the informatic point of view, i.e. the possibility to further develop WHETGEO-1D, the dependence of the saturated hydraulic conductivity has been included in such a way that not only it is possible to change the formulation relating temperature and water viscosity but allows the developers to easily include other factors that modify the saturated hydraulic conductivity, for instance the dependence on depth (Decharme et al. 2006, Shlemmert et al. 2019).

References

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