

Interactive comment on “Effects of freezing on soil temperature, frost propagation and moisture redistribution in peat: laboratory investigations” by R. M. Nagare et al.

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This study explores the freezing characteristics and freezing induced water redistribution of variably saturated peat columns. This is motivated by the fact that for a better understanding of the permafrost hydrology in high latitude wetlands of Canada or Eurasia needs firm basics of such processes close to the surface. And, in fact, lab experiments highlighting the freezing processes in columns are scarce for peat soil. The experiment has been carried out with great care and is described comprehensively. In particular, the authors were careful in calibrating the measurements sensors (TDR)

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and determining soil properties, initial and final water content. So, I'm very confident that the quality of the data is high – as good as it gets. Nevertheless, there are always a few limitations and drawbacks that are inherent for such column experiments. E.g. the accuracy of the final water content, which is a key-data of this manuscript, is restricted by the sampling mode (as discussed on page 5395, line 22). Nevertheless, I think that the presented data are of best possible quality. I agree with the interpretation of the data and the general conclusions that the freezing characteristic curves don't show a clear dependence on initial water content, that initial content very well controls the rate of freezing and water redistribution through its influence on the thermal conductivity and on the latent heat. Thus, the experiment nicely confirms current knowledge. The critical question is to what extent this experiment provides us with new insights. Where exactly is the innovation of this paper? I claim that the conceptual model discussed in section 3.4 (page 5402, line 20), which is proposed as the ultimate result of the observations in this experiment, not necessarily needs the column experiment. In other words, the authors would have been able to propose the same model with the knowledge of soil freezing processes that was already available before this experiment. I think it is crucial that the authors clearly highlight the new lessons learned from this experiment. Finally, it is unfortunate that the most interesting and new result of this experiment, the evidence of water loss at the surface as a result of vapour flow (page 5400, line 6 and following) is presented in another paper. I think that this result would be a really interesting contribution to current knowledge.

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