

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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Received and published: 20 September 2011

We would like to thank the Dr. Staehli for his comments. However, we would like to point out that water movement in freezing peat has not been reported in English literature in the past. There is very little know-how on if there is water movement towards the freezing front in freezing peat. Only one experimental study has reported such movement before (Gamayunov et al., 1990). For our field investigations, it is very important to understand if there is freezing induced water movement in the active layer in organic covered permafrost terrains. This is crucial because, as mentioned in the paper, during

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our investigations we found that at the end of winter season peat is essentially saturated and the water table is deep at the onset of the winter. This might indicate that water moves along the slopes of the peat plateaus and is drawn from the bogs which do not freeze over the winter season. However, it was first important to understand if freezing induced water redistribution takes place in first place. The Mesocosm experiments help partly to answer this question. Also, the sublimation/evaporation of water at the surface during the freezing period as seen from the weights of the Mesocosms (see Figure attached) indicates loss of water equivalent to ~ 17 mm depth. Part of this water could be originating from deeper regions and moving upwards and out as vapour. Studying the mechanisms or validation of mechanisms as explained by Gamayunov et al. (1990) would require further studies using smaller columns, but this study presents comprehensive evidence of water movement in peat. We believe this is novel as we could not comprehensively include water movement as a reason in explaining the field observations before this work. Therefore though it was possible to propose the conceptual model before conducting this study, confidence in such conceptual model would be very low. Now the next step really will be to go back to the field and study if there is any contribution from the high moisture sources near the bog-peat plateau periphery and if the movement is more upslope than vertical.

References:

Gamayunov, N. I., Stotland, D. M., Agafonova, O. N. and Tovbin, I. B.: Investigation of heat and mass transport during freezing in peat soils, *Soviet Soil Science*, 22(8), 88-97, 1990.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 5387, 2011.

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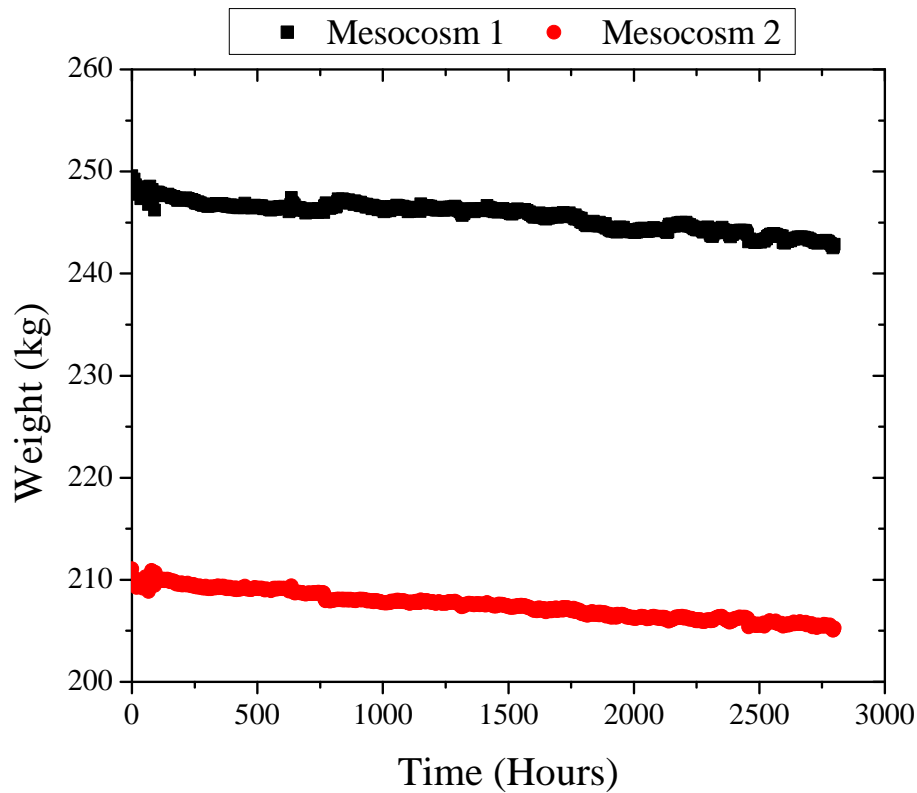


Fig. 1. Change in weight during freezing of the variably saturated M1 and relatively dry M2. The weight loss is due to sublimation/evaporation at the surface of the Mesocosms during the freezing cycle

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