

Interactive comment on “Evidence for enhanced infiltration of ion load during snowmelt” by G. Lilbæk and J. W. Pomeroy

Anonymous Referee #1

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The manuscript "Evidence for enhanced infiltration of ion load during snowmelt" by Lilbæk and Pomeroy outlines a laboratory experiment to validate their model and theory of "enhanced infiltration" presented in 2007. The manuscript is well written, the methods clearly explained, and the results and conclusions justified by the data. I have a number of comments for the author's to consider.

1. The term 'enhanced infiltration' is not appropriate for the process outlined here. 'enhanced ionic infiltration' is perhaps more appropriate as it is only the ion load, not the water mass, that is enhanced. This of course is reflected in the title. In essence, this is just the extra ion concentration that deviates from the product of mean concentration and average infiltration rate due to preferential elution.
2. The pathways of infiltration/percolation and runoff described here are largely asso-

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ciated with cold regions. More clarity is required. Is not infiltration into organic soils infiltration? Does enhanced infiltration not occur in this circumstance? If not, why not? There needs to be more detail here on the factors that control infiltration into frozen soil. 

3. You mention (and support with the Tao and Gray reference) that infiltration is least sensitive to frozen soil temperature. I agree that this is likely true in the range of temperatures that you have tested in this study. If soil temperatures are very cold (perhaps <-7°C), latent heat and re-freezing become extremely important, particularly in creating impermeable barriers at depth. Infiltration studies conducted into frozen soils high arctic environments show very different patterns and results than more southerly frozen soils. Mentioning this would be appropriate. I believe that your temperature range is too small to make any definitive statements about its affect on infiltration.

4. What are light textured soils? (p1434 Line 20).

5. p 1433 Line 21 - the word 'huge' is colloquial and should be replaced.

6. What role does the speed of freezing have on your results and the migration of water, if any? It is a neglected point.

7. Is there a reference to confirm that the maximum 10 mm head is similar to field conditions?

8. I appreciate the discussion of the solute effect on freezing points in the discussion. I believe that this should also be mentioned in the introduction as well as it was a question I kept asking myself until I finally reached the discussion.

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