

Interactive comment on “Hysteresis in soil hydraulic conductivity as driven by salinity and sodicity: a modeling framework” by Isaac Kramer et al.

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[english]article [T1]fontenc [latin9]inputenc babel In this paper, the authors present a model for the hysteretic relationship between the saturated hydraulic conductivity K_s and salinity C . Since K_s is an indicator of the degradation and rehabilitation of the soil and these changes can be reversible or irreversible depending on the history of the salinity or the sodicity. It makes sense to me that hysteresis should be accounted for.

The Preisach model used to represent hysteresis in this paper is clear and well described. The supplemental interactive widgets would be helpful for the new-comer to this modelling approach. The Preisach model is quite a general phenomenological

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model, used in diverse fields such as magnetism, economics, and many others, as is evident in the book chapters in ().

It should be noted that previous models based on the Preisach operator to model hysteresis between the moisture content θ and matric potential ψ of unsaturated soils. Those models did not include salinity and sodicity. In addition, K_s was taken to be fixed in those models, whereas it varies with C in this paper. I mention this, as both use the Preisach model but what is modelled is quite different.

While this paper has many positive qualities, there is room for improvement. I have attached a pdf with annotations for the smaller issues. Please note that it displays best with Adobe reader.

I will start near the end of the paper, with the caption of Figure B1. I was initially concerned with the mention of “guesstimated” FORCs in first reading the paper. While I now understand that these “guesstimated” FORCS are there to demonstrate the improvement to the model if hypothetical extra data were available, as shown in panel (b) of the figure. I would still be concerned that the term “guestimated” might give the wrong impression, i.e. that a less rigorous approach was used, to improve the quality of the model. I would recommend that the caption be rewritten to reflect more clearly the intended meaning.

I finally would like to note that () developed a numerical method for approximating the Preisach density function when there is not enough experimental data. It may help the authors to get the most out of their experimental data in producing their Preisach density.

References

Bertotti G, Mayergoyz ID, editors. The Science of Hysteresis: Mathematical modeling and applications. Academic Press; 2006.

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Iyer RV, Shirley ME. Hysteresis parameter identification with limited experimental data. IEEE Transactions on magnetics. 2004 Sep 13;40(5):3227-39.

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