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Interactive comment on "Improved calibration of Green-Ampt infiltration in the EROSION-2D/3D model using a rainfall-runoff experiment database" *by* Hana Beitlerová et al.

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Dear Authors,

thank you for your detailed responses to the reviewers' comments. I think that the changes you are proposing will address most of the comments convincingly. However, I have concerns about the treatment of the water potential at the wetting front. As you describe in your replies, the initial water content is used to estimate the water potential at the wetting front in the EROSION2/3D model. But according to reviewer 2, this is not correct and leads to an adjustment of a lower skin factor for drier soils.

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Discussion paper

A lower skin factor would also imply a lower steady state infiltration rate. The figure that you are showing in your replies indeed suggests that you are understimating the steady infiltration rate. The simulated infiltration rates still decrease further whereas the measurements seem to have reached a constant value. I understand that this is the way it is implemented in EROSION2/3D but this would mean that the Green and Ampt model is incorrectly implemented in the EROSION2/3D. A consequence of this is that skin factors need to be adjusted as a function of the initial soil water content. But, this is only required when the Green-Ampt model is incorrectly implemented and cannot be transfered to other models that use a correct implementation of the Green-Ampt model. Furthermore, it would lead to an underestimation of the steady infiltration rate. In order to address the issue of the effect of the initial water content on the infiltration characteristic, I think it is essential that you show simulations with a 1D model that solves Richards equation, such as the freely available Hydrus1D code. With this code, you can simulate infiltration for different initial water contents using always the same hydraulic parameters. The infiltration curves that are simulated can then be fitted with a Green-Ampt model using a constant and known Ksat (in the Hydrus simulations, Ksat was not changed between simulations with different initial water content and so it shouldn't be changed in the Green and Ampt model either) by fitting the water pressure at the wetting front. Alternatively, you could fix the water potential at the wetting front in the Green and Ampt model to the water potential of the dry soil and fit the Ksat used in the Green Ampt model. I suspect that in that case, you will fit a smaller Ksat for drier soils (or a smaller skin factor) but the Green Ampt model will not be able to simulate the steady state infiltration rate, which is the same in all simulations and does not depend on the initial water content.

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