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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Using hydro-climatic and edaphic similarity to enhance soil moisture prediction" *by* E. J. Coopersmith et al.

Anonymous Referee #2

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This model attempts to represent soil moisture storage by modifying the model of Pan et al. The model has 6 parameters and includes two exponential functions, which should be sufficient to represent a wide variety of soil moisture response to precipitation, if hydrology is a model. Yet, the model does not consistently reproduce soil moisture patterns at a single depth with this limited information. It is not clear how this is an improvement in modeling soil moisture. The paper does give rise to several questions and concerns.

Major concerns The authors correctly state that soil heterogeneity poses a substantial challenge for soil moisture modeling. This restricts model application to the relatively homogenous soils. Yet, even in homogenous soils bulk density is commonly regarded to decrease with depth. In the model phi is a singular value for the soil profile, how

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is phi determined or chosen? Is this physical parameter subject to change from the genetic algorithm, if so, is it a physical parameter or a “degree of freedom” parameter?

The authors state that the prediction is made for a specific soil depth, but none of the demonstration figures identify sensor depth, not do they compare performance for multiple depths at a single site. Such comprehensive analysis would be of interest to the reader and perhaps give the authors insight into the model performance, especially near the upper and lower boundaries of the soil.

The soil moisture conditions of greatest concern to agriculture are excess moisture, which limits soil strength and trafficability in the spring, and excessively wet or dry soils during various stages of crop development. The vertical fluxes to drainage and evaporation differ dramatically under these conditions and would seem to require greater control than a precipitation decay function coupled with a soil water flux resistance term. It will be beneficial to the reader for the authors to explain clearly how their model accomplishes a water balance through a growing season without separate representations of percolation and evaporation. The causal dismissal of the need for farmers to know extent of saturation is disappointing. In this model, and in reality, the time until a farmer can resume field operations is largely dependent on the extent of saturation.

The KNN correction is intended to allow consistent model biases, but the results show that the model consistently over predicts or under predicts for some case studies. This is not a convincing demonstration.

Minor concerns The basis of adding a diurnal cycle to soil moisture is not well supported if prediction for agricultural management is the goal.

The benefit of using LT (presumably local time) rather than simply stating the 24 h time is not clear.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 2321, 2014.