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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Development of an efficient coupled model for soil–atmosphere modelling (FHAVeT): model evaluation and comparison" *by* A.-J. Tinet et al.

Anonymous Referee #3

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1) General comments The authors present a paper on the development of a new model to predict the soil moisture content during sowing (bare soil) and irrigation (soil with vegetation). The newly developed model FHAVeT is based a coupled soil–atmosphere model based on Ross fast solution for Richards' equation, heat transfer and detailed surface energy balance. The model results were tested and evaluated versus other model results (model TEC). The topic and research are within the scope of HESS. The presented paper shows difficulties in the area of a) meeting the objectives by neglecting vegetation and b) the evaluation process. The figures do not meet the criteria for scientific publishing.

2) Specific comments The objective of the paper is to present a model with can predict the soil moisture content of soils having bare soil (snowing) or vegetation (irrigation – P8572, L1 & L21). While evaporation is considered (P8576, L21 & chapter 2.1), transpiration seems not to be. The model is finally evaluated at bare conditions. An evaluation with vegetation is not part of the paper.

The objective of the paper is to present a model with can predict the soil moisture content of soils having bare soil (snowing) or vegetation (irrigation – P8572, L1 & L21). While evaporation is considered (P8576, L21 & chapter 2.1), transpiration seems not to be. The model is finally evaluated at bare conditions. An evaluation with vegetation is not part of the paper.

The model was evaluated at two locations for a period of less than two months. The general soil type of both locations is loam (P8580, L9 & P8591). However, this limitation in the evaluation is not mentioned in the conclusion. It is difficult to evaluate a model versus the result of a different model. The model setups were not explained, e.g. in terms of discretization, boundary conditions. It was shown that predictive model results are not only depending on the model structure but also on the modeler's decisions during the modelling process (e.g. Holländer et al., 2014). I suggest adding a chapter where the model setup is explained in detail. Moreover, evaluation of newly developed models versus results of a different model is not a strong indicator of the validity of model results. It would be of favor to test the model versus observed data.

A major part of the introduction is related to numerical fast solution (ROSS solution). However, the manuscript misses a comparison of the computation times for FHAVeT and TEC.

The structure of the paper needs to be improved. The paragraph P8582, L11-21 contains a method. The content should not be introduced in the results chapter. Next to this point, it would be favorable to split the results and discussion chapter in two chapters. In this new chapter result, the first part might be on the model evaluation instead

of the mass balance. Although the mass balance errors in TEC might be large, and the mass balance of FHAVeT seems to be better, it is not a strong indicator since the amount of soils and locations are limited. The results on the model comparison are not adequately presented. If the authors use three pedotransfer functions (PTF), they might have identified differences in the results. The use of a scatter plot (P8596) does not allow studying the soil moisture timing (P8576, L6-11). The derivations between results by the two models are only discussed on a visual basis (P8596). The use of statistical indicators can help to evaluate the data on an objective view.

The figures do not have an adequate quality for publication. Units are either completely missing (e.g. P8595, Figure 3), wrong (P8594, Hourly precipitation – unit: mm/hour), or invisible (1:1 line in scatter plot, P8596). Superscripted letters should be used in figure 6 (P8598) & figure 8 (P8600). Figure 9 (P8601) uses Drying 0day in the legend while the caption mentions Drying0.

Reference: Holländer, H.M., H. Bormann, T. Blume, W. Buytaert, G.B. Chirico, J.F. Exbrayat, D. Gustafsson, H. Hölzel, T. Kraußе, P. Kraft, S. Stoll, G. Blöschl, and H. Flühler. 2014. Impact of modellers' decisions on hydrological a priori predictions. Hydrol. Earth Syst. Sci. 18 no. 6: 2065-2085.

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