Hydrol. Earth Syst. Sci. Discuss., 11, C3748–C3751, 2014
www.hydrol-earth-syst-sci-discuss.net/11/C3748/2014/

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.

A.-J. Tinet et al.

anne-julie.tinet@univ-lorraine.fr

Received and published: 11 September 2014

We thank you for your review on our paper. We addressed the following points in a general answer to all reviewers:

- Confusing description of the aim of the paper
- Choice of the benchmarking
- Modeling the vegetation
- Performance of the model in regards to computation time

Therefore, we will focus this answer on other points.

Figures were modified accordingly to your comments (including accurate units and added information), legends were also modified when necessary. Moreover, the different PTF were identified in Figure 3.

The structure of the paper was modified. Subchapters were added in chapter 3 ("Model intercomparison"): "3.1 Climatic forcing", "3.2 Soil types", "3.3 Soil hydraulic characteristics", "3.4 Soil thermal characteristics", "3.5 Model setup". Subchapters were also created in chapter 4 ("Results and discussion"): "4.1 Models performance", "4.2 Water content evaluation", "4.3 Day detection capacity evaluation".

On the use of scatter plot, we would like to point out that a scatter plot allows an exhaustive presentation of the results. We however added metrics to support the analysis of the scatter plot. In the plot, we defined a range of 0.04 m^3/m^3 around the first bisector. In the Avignon climate 1.55% of the points are out of this range for the 0-5cm layer and 0% for the 0-30 layer. In the Mons climate 6.76% of the points are out of this range for the 0-5cm layer and 1.17% for the 0-30 layer. Other data allow the evaluation of timing, namely Figure 5 and 7. It should be noted that the timing for Figure 7, is chosen as the one leading to the most significant error in all soils and PTF considered.

In regards to the study on the impact of the PTF, we would like to point out that the comparison between the results using different PTF was done with TEC in Chanzy et al. (2008). It is true that depending on the PTF chosen, the comparison between FHAVeT and TEC varies. Specifically, the two models agree very well when using

Cosby PTF and show more discrepancies when using Van Genuchten – Mualem description. However, we noted that this may be due to the fact that Cosby PTF leads to high water content and little vapour transport. Therefore, we choose to focus our evaluation on a range of soil hydraulic functions, soil conditions and climatic forcing rather than on the effect of PTF. The aim of the paper is to upgrade Ross model to make its use more general and suitable in various applications.

Impact of the modeler's choice and models setups:

You noted that: "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."

The subchapter "3.5 Model setup" contains information on boundary conditions, initial conditions and spatial discretization for both models. The choice behind those conditions are detailed and justified in the work of Chanzy et al. (2008).

We agree that modeler's choices are essential during the modeling process. However, evaluating the modeler's choice in particular in regards to boundary conditions, initial conditions or spatial discretization was not the objective of the paper. As described in the general comments, we tried to be clearer as to what the objective of our work. We however insisted on the role of the modeler in our revised version and to this end cited the work of Höllander et al. (2014). We should note however that we somehow included the role of the modeler's when evaluating the effect of neglecting vapour transport.

Soil types:

You noted that: "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." and "it is not a strong indicator since the amount of soils and locations are limited."

As described in the paper, the two climates chosen correspond to different conditions occurring in France. In regards to the soil types, we would like to point out that the locations only refers to the climates and that four soils were simulated for each climates. The clay content ranges from 17% to 48% and the sand content from 2% to 34.3% which is quite wide for soils in agronomical applications. We however added a reminder in the conclusion that the study was limited to climate and soils occurring in France.