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

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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.

The grammatical and language remarks were all taken into account in the revised version of the paper.

Abstract:

Metrics (on mass balance and day detection success rate) were added to the abstract.

Description of the Ross solution:

In the introduction we tried to limit the description of side considerations (such as PTF and coupling) that were partly moved to the model description section. Moreover the equation description of the model was removed and a more detailed description of the extensions that were done to the original model was added. For a detailed description of Ross method, reference to Ross (2003) and Crevoisier et al. (2009) is made.

Applications in agricultural management:

You noted that we were not clear as to which applications we are aiming for in regards to the decision making. Considering we chose to focus on bare soil (justifications are detailed in the general comments), the target would indeed be sowing. As future work for the model, description of vegetation is being done, which would to more targets to aim for.

Atmospheric forcing and soil-atmosphere coupled model:

We used the term soil – atmosphere coupled model due to the use of a surface energy balance that is coupled to both the soil mass balance and the soil energy balance as shown in Figure 1. We however accept the fact that our terminology is abusive. Therefore, we tried to limit the use of soil – atmosphere coupled model and insist on the atmospheric forcing term.

Added value of our model compared to existing models:

Our model has too major developments compared to existing models:

- Coupling the Ross solution with surface energy balance (and soil energy balance). This coupling is common with the regular solution for Richards equation but new with the Ross solution.

- Extension of the soil characteristic curves to Van Genuchten – Mualem (with $\eta \neq 0.5$), that allow the use of classic PTF such as the one developed by Wosten et al. (2001) or ROSETTA. Considering soil characteristics is not straightforward when using Ross solution as it requires the calculation of Kirchhoff potential (integral of the hydraulic conductivity over soil potential). The Kirchhoff potential can be calculated analytically when using Brooks and Corey description but requires numerical methods for the Van Genuchten – Mualem case. Ross (2003) points out this shortcoming of his model.