

# ***Interactive comment on “Agro-hydrology and multi temporal high resolution remote sensing: toward an explicit spatial processes calibration” by S. Ferrant et al.***

## **Anonymous Referee #1**

Received and published: 8 August 2014

### General comments:

The goal of this paper is to evaluate whether or not there is a significant gain of using LAI derived from RS on the simulation of water and nutrient fluxes at the watershed scale using an agro-hydrological model. This is a relevant scientific question and it is well aligned with the scope of HESS.

Many studies already show that the assimilation of RS data in crop models improved a lot the model performance, especially when input parameters are not readily available. However, most of these previous studies have been done at the field scale, and the

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impact of RS data assimilation at the watershed scale has not been fully investigated. In this paper the authors try to fill this gap by using a coupled model (STICS crop model and TNT hydrological model) on a small experimental watershed well instrumented. The results of the studies are well presented although the figures appear quite small and difficult to read in some cases (especially figures 1, 5, 6, 7 and 8). The results clearly show that the use of the LAI derived from RS data to re-initialize the seeding date improved the model performance for simulating crop yields and Nitrogen fluxes at the watershed scale.

However, I have a comment concerning the initialisation and optimization of seeding date. The authors chose to compare two situations: simulations with a priori seeding date versus simulation with optimized seeding date. The author should clarify what is or what are the a priori seeding date(s). Is there a different date for each field or is it the same date for all fields with the same crop? In the material method it is mentioned that some dates are collected using field surveys. If these dates are used in the a priori simulations it should be clearly mentioned in the material and methods section because it has a significant impact on the results/discussion section. Indeed, I think that the authors should indicate if the improvement of LAI and biomass predictions was higher for fields with deduced seeding than for fields with actual seeding date? For fields with actual seeding date, are the optimized dates similar to the actual dates? If not, that could mean that the crop growth parameters are not well calibrated. I think that these modifications can be easily made, so I recommend a minor revision.

Finally, I would like to mention that if the authors continue their work on this subject, it could be interesting to add a third scenario using average seeding date for the region (without using the dates collected in the field surveys). Indeed, in many occasions, agro-hydrological models are applied over large areas using rough estimates of seeding date based on regional recommendation. I suspect that in that case the improvement of simulation results would be much larger than those found in this study. A sensitivity analysis of the model concerning the seeding date would also be an inter-

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esting complement to this work.

Specific and technical comments:

P7691 I14: ... a temporal...

P7694 I24: Please explain what AET means. Is it actual evapotranspiration?

P7695 I12: authors

P7695 I17: do you mean crop growth input parameters or crop management input parameters? Or both?

P7695 I23: Dedieu et al., 2006 is missing from the references

P7696 I5-6: "...physical knowledge-based base agro-hydrological models..." not clear. Please rewrite.

P7696 I6: Please explain what HTSR means.

P7696 I20: ...the way to shift...

P7701 I 19: a bibliographic reference is missing.

P7702: Could you please indicate in section 2.4 witch method is used to calculate the potential evapotranspiration (Penman, Penman-Monteith, Priestley-Taylor,...)

P7702 I19: crop emergence

P7703 I15: check the brackets. They do not seem well positioned.

P7704 I8: Nash and Sutcliffe reference is missing.

P7704 I11: ... in Ferrant et al. (2011, 2013), ...

P7707 I5: the re-initialization instead of the reinitializing

P7708 I6: seeding date re-initialization

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P7708 I17: re-initialization instead reinitializing

P7710 I1: is it really NNE-SSW? On fig 8 it seems to be WNW-ESE.

P7710 I14: I recommend removing “about” in subtitles 4.1 to 4.5.

P7710 I18-20: “In the study ... crop productivity” This sentence is not very clear. Could you please rewrite it.

P7712 I15: STICS instead of TICS.

P7712 I21-22: It is true that the results showed that the re-initialization of the seeding date does not affect significantly the simulated water fluxes. However you also showed that AET was not very well simulated. So, I think that you could add a sentence saying that an improvement of AET simulation is needed in order to better evaluate whether or not the seeding date re-initialization has an impact on water fluxes.

P7713 I9: hydrologic and atmospheric systems.

P7713 I10: a space is missing between “input” and “(crop field level)”

P7713 I16: other input parameters

P7714 I18: “physical knowledge based crop model (STICS)”. Could you please use the same description throughout the text. I recommend to use “process-based model” for STICS.

Fig. 6: in the material and method section it is mentioned that some seeding dates were initialized using field surveys and missing dates were deduced. Is it possible to identify in Figure 6 what are the actual dates and the deduced dates?

Fig.7: I am not sure that it is relevant to show the interpolated LAI in 2008 since there was not enough data to make a good interpolation.

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