Geoscientific
Model Development
Discussions

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Interactive comment on "Modeling sugar cane yield with a process-based model from site to continental scale: uncertainties arising from model structure and parameter values" *by A. Valade et al.*

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Received and published: 17 March 2014

We thank the reviewer for his thorough reading of our paper and the precise comments that help to revise the paper.

Comment 1. The model for which we analyzed parameters uncertainty, ORCHIDEE-STICS is a widely used agro-LSM (Ciais et al., 2009, Eglin et al., 2010, Li et al., 2011, Wattenbach et al., 2011). Here we seek to separate the components of the uncertainty of the model as used by the community. Indeed, as described in Gervois et al., 2004,

the coupling strategy is a one-directional exchange of variables from STICS to OR-CHIDEE. This was a choice made during the development of the ORCHIDEE-STICS model based on differences in the nature of the two models. For example the time resolution of the STICS processes was not directly applicable to ORCHIDEE. The LAI was chosen as the main variable exchanged because of its crucial role in the calculation of above-ground biomass in ORCHIDEE, especially as timing of plant growth is concerned. Root depth was also chosen to implicitly link the soil status of STICS into ORCHIDEE. We agree that this approach brings some inconsistencies since LAI is dependent on the soil state calculated by STICS and the ORCHIDEE variables depend upon another soil state and that this strategy brings a systematic uncertainty of its own. However, we think that this uncertainty is, to some extent, captured implicitly in our analysis. The change in the coupling of ORCHIDEE and STICS through the addition of a two-way communication of variables is interesting and would provide a more consistent coupling but is beyond the scope of this paper that aims at evaluating the uncertainties in the commonly used ORCHIDEE-STICS model. We will include this discussion in our concluding remarks section of the paper.

Comment 2. We agree that the lower uncertainty propagated by the STICS parameters compared to the ORCHIDEE parameters is likely to be related with the limited number of processes involved in the few variables transferred to ORCHIDEE. Also, the early saturation of the LAI for the case of sugarcane is clearly an important factor to the limitation of STICS' weight in the total uncertainty and could be different with other crop types. We will develop the description of these links in the paper's discussion since it seems very relevant.

Comment 3. The local growing conditions (temperature, rainfall, date of sowing) are indeed strong driving processes for the dominance of one or the other parameters. We tried to explicit this dependence with the (T,P) scatterplots of Correlation Coefficients in figures 11 and 12. We thank the reviewer for helping in making the link between general results to local growing conditions and will add this possible explanation to the

figure description.

Comment 4. Thank you for this suggestion, which we agree with.

Comment 5. With this conclusion we deliberately wanted to extrapolate our results to a general case to show their applicability. However, we agree that the choice of a nationally based reference study includes inconsistency between the way our uncertainty estimates and the production estimates are derived. Indeed our estimates are very general, with parameters' guess from several continents and different growing conditions. To apply our uncertainty ranges to production estimates we should indeed consider production values derived from similar scale studies such as FAO production data.

Comment 6. We agree and will add a column with parameters' definitions.

Comment 7. We agree and this will be changed.

Interactive comment on Geosci. Model Dev. Discuss., 7, 1197, 2014.