Point-to-point response to reviewers' comments

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1. *I have a concern about the advantage of the new model. Several models have been presented to simulate cropland processes (e.g., DNDC by Li et al., 1992; LPJmL by Bondeau et al., 2007; AgroIBIS by Kucharik et al., 2007; JULES-SUCROP by Van den Hoof et al., 2011). What are the characteristics and advantages of the model presented in this study? Please clarify the point in discussion.*

   Response: Thank you for your comments. Indeed, there are a lot of models are developed to simulate the croplands processes. All those models can be grouped into two categories: crop specific models (such as Crop-DNDC, STICS, etc.) and Agro-land surface models (such as, LPJml, JULES-SUCROP, and ORCHIDEE-crop). ORCHIDEE-crop is designed as an Agro-LSM, so here we discussed the progress of different Agro-LSMs, which can simulate both managed and natural vegetation dynamics interacting with climate change. Some of the existed DGVM crop modes are suffered from any/some of the following short-comings: a). adopted a simplification strategy for representing the growth dynamics of varied kinds of crops in some Agro-LSM (e.g., the CFTs in LPJml); b). model performance is limited to specific crops (e.g., Agro-IBIS for corn, soybean and wheat specifically) and/or regions (e.g., Agro-IBIS for Northern America specifically); and c). processes of crop growth and carbon allocation is not explicitly simulated but rather with some artificial approximations (e.g., the emergence start of crops and the initial carbon allocations in JULES-SUCROP is artificially fixed and the carbon allocations into of dry matter into different organs are also parameterized with fixed factors within different growth stages). Rather, the ORCHIDEE-crop is developed as an Agro-LSM by adopting a generic framework through integrating the crop processes of STICS into a DGVM model ORCHIDEE. Thus, managed and natural vegetation share the same fundamental biophysical and biochemical functions within the DGVM framework. ORCHIDEE-crop can simulate many different kinds of crops over the global with a generic crop development structure. The crop phenology, developments and carbon allocations during crop growth are with a relatively complete scope. The emergence, growth, maturity and senescence of crops are determined by climate conditions and some kinds of limitations (e.g., nitrogen limitation). The carbon allocations of dry matter into different organs are determined by specific component growth rates, which is dynamically determined by climate conditions and limiting factors. Additionally, crop processes were modelled differently within different DGVM crop models and it is the purpose of some MIP projects to compare model outputs and model skills.

2. *Page 4655 Abstract In abstract, you mentioned about the comparison with ORCHIDEEv196 but not with STICS. Please add some statements.*

   Response: In the revision, we add some statements for the comparison between the ORCHIDEE-crop and STICS.

3. *Page 4656 Line 17 "ressources" should be replaced by "resources".*

   Response: Done.

4. *Page 4657 Lune 21 "Incomplete" should be replaced by "incomplete".*

   Response: Done.

5. *Page 4662 Line 19 I could not understand the statement "If the NPP available after the grain demand is satisfied is not sufficient to meet the allocation to grain, ...".*

   Response: We checked this sentence and found that the latter "*grain*" should be leaf. Therefore, the sentence has been revised into "*If the NPP available after the grain demand is satisfied is not sufficient to meet the allocation to leaf,…*".

6. *Page 4665 Line 5 "long-wave incoming radiation" appears twice.*

   Response: we deleted the redundant one.

7. *Page 4668 Line 7 Results section should be, in general, described with the past tense.*

   Response: Done.

8. *Page 4672 Line 1 The simplified root distribution could also account, at least partly, for the discrepancy in LE. Is it correct?*

   Response: Yes, we agree with you completely. We include your suggestion into our discussion part for explaining the discrepancy in LE simulation.