Interactive comment on "Plant phenology evaluation of CRESCENDO land surface models – Part I: start and end of growing season" by Daniele Peano et al.

Anonymous Referee #1

Received and published: 23 September 2020

The study evaluated the plant phenology simulated by CRESCENDO land surface models using satellite observational LAI products. Specially, the 4GST method was applied to extract the times of start and end of growing season based on the simulated and remote sensing monthly LAI values. Then, the growing season types, variability of growing season start and end, latitudinal variability, and reginal variability were compared between the model simulations and satellite observations. Recommendations were also given for future model improvements. In general, the manuscript was written well, organized well, and the results were summarized clearly and interesting. So, I think the manuscript can be accepted for publication on the journal. Only one main remark is that the description of the phenology schemes of the models. As we know,

the phenology schemes in the models are quite different, in terms of their parameterizations of solar radiation, day-length, temperature, and soil moisture conditions. In section 2.2, the description of phenology schemes makes me a little bit hard to follow the differences among these models. So, I encourage the authors to summarize the similarities and differences of the processes of the schemes, according to some standards such as how to parameterize the effects of soil moisture, how to parameterize the effects of soil temperature etc. This summary will help us understanding the differences of the model and simulated results more clearly (e.g., Page 12, 349). Meanwhile, in the results section, more direct comparisons among the model simulations should be made towards the differences of processes. In addition, the comparisons were based on monthly LAI values (Page 4, line 89 and Page 9 Line 268). However, the temporal scale may cover up the real phenology characteristics. For example, based on the 8-day LAI data, Zhang et al., (2019) demonstrated that the CLM simulated growing season type is TGS in a temperate grassland, but the MODIS LAI-based type was SGS-S. It seems like that this discrepancy was not found in the study (Fig. 2b). Therefore, the monthly LAI mean output from the models may cause uncertainties on the model evaluation. Moreover, as mentioned by the authors (Page 16 Line 479), double cropping cropland can not be easily detected by the monthly LAI data, for example, a large area of winter wheat-summer maize double cropping system in the North China Plain was not detected by the method based on MODIS LAI (Fig 1 a). So, the uncertainty from the monthly LAI output from the models should be also discusses. I have no other remarks.

References: Zhang, L., Lei, H., Shen, H., Cong, Z., Yang, D., & Liu, T. (2019). Evaluating the representation of vegetation phenology in the Community Land Model 4.5 in a temperate grassland. Journal of Geophysical Research: Biogeosciences, 124(2), 187-210.