Geoscientific
Model Development
Discussions

Interactive comment on "Description and Validation of the Simple, Efficient, Dynamic, Global, Ecological Simulator (SEDGES v.1.0)" *by* Pablo Paiewonsky and Oliver Elison Timm

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Overview:

P. Paiewonsky and O.E. Timm are developed a Land surface model (LSM) call SEDGES and test it against global observation of GPP, carbon stock, LAI etc... They attempted to create a simple LSM in order to better understand which processes impact atmospheric change in coupled simulations with a global circulation model (GCM) calls PlaSim. This effort of simplification is welcome in global modeling science since the last generation of LSM are sometimes too complex to understand which are the most important processes that link the biosphere and the atmosphere. The descrip-

tion of SEDGES is precise and permit me to understand how SEDGES calculates different processes like carbon sequestration, evapotranpiration ...etc. Each simplifications/modifications are well documented and relevant arguments are proposed to support their choices. But in the validation process, the authors are more focus on showing how better SEDGES simulate GPP and compared their results to the state-of-the-art LSM (ORCHIDEE, JULES, and CLM4CN). I think it will be better to pay more attention to understand how far SEDGES can be simplified before losing efficiency in coupled simulation. A lot of models of this level of complexity was developed in the past (see review of Pitman et al. 2005) and SEDGES need to be replaced in this context. Authors must answer these questions : "Why SEDGES are different from others second generation LSM ?", and "How they deal with the trade-off between simplification, precision, robustness ?". I think this study can be published with deep changes in the aim and the structure by adding relevant tests and also being more honest on results they will decide to show or not.

In detail:

To clarify the aim of the study and increase the impact of this paper, I have some comments :

- First, I do not understand if SEDGES is a new model built from scratch by picking some ideas from other models like, SimBA, VECODE, ENTS, or if this is an improvement of SimBA. Especially when I read this sentence in introduction : « SEDGES is based on the original SimBA model (Kleidon, 2006b), which was coupled to the Planet Simulator (PlaSim) [...] even more strongly based on a later version of SimBA (Lunkeit et al., 2011), also coupled to PlaSim. » This sentence are in contradiction with the sentence in the conclusion : « A new simplified model for the representation of dynamic ecological processes for use in conjunction with climate models has been developed. » For me an improved version of SimBA are more suitable than another second new generation LSM. But if the authors will add features to SimBA, they increase the model complexity, they do not create simple model. The authors need to clearer this part !

- The authors argue that the GPP was better simulated by SEDGES than other state-of-the-art LSM models but strangely, authors only show this comparison for GPP. Is there something they don't want to show for ET, LAI, soil carbon, albedo ...etc ? In addition, a better comparison was to test their results with models of the same level of complexity like second generation LSM, SimBA, VECODE, ENTS. A comparison with far more complex LSM like ORCHIDEE, JULES, and CLM4CN are not relevant in this context because these LSMs are not developed just to provide information to GCM but also to understand global dynamics of vegetation across centuries that SEDGES are not able to simulates.

- To convince others that SEDGES is a good LSM for coupled simulations, the authors must test SEDGES with a coupled simulation and check if the simplifications/modifications they made, have an impact on the GCM outputs. Otherwise, a least, authors must write a couple of sentence to explain why this test was not done and when they plan to realize this essential step. When I read the conclusion part, I have the feeling that the authors are convinced that SEDGES are already validated for coupled simulations and no more tests are needed : « In conclusion, we feel that SEDGES provides a new viable and computationally efficient alternative to currently-implemented terrestrial vegetation/ecological models, [...] »

- In part dedicated to LAI. The authors explain that LAIm is only dependent to vegetation carbon stock (Cveg) and constraint by LAImin and LAImax (from calibration). In fact, LAI is not really use in SEDGES because LAIm is directly translated into Forest cover (fveg). Why do you need to pass by LAI ? Why not just calculate fveg with Cveg. I have the impression that the authors just put LAI in SEDGES just to say, "we have LAI". It becomes even dangerous when the authors try to validate SEDGES against observed LAI the same data used for calibration !

- Discussion part must be developed. For each matchless outputs, the authors must explain why they obtain this result and how this lack of precision can affect the outputs of coupled simulations.

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- Figures are in general in a good shape but too much effort was made for spatial variations and less for temporal variations.