Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2017-75-RC1, 2017

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

Anonymous Referee #1

Received and published: 12 June 2017

Review of paper: "Description and Validation of the Simple, Efficient, Dynamic, Global, Ecological Simulator (SEDGES v1.0). By Paiewonsky and Timm.

Abstract: The wording could be tightened in the Abstract to explain how SEDGES is "auxiliary" to the land-atmosphere coupling scheme. This will make it easier to understand better the sentence "evaluate. . ..using a simple land surface scheme that is driven by reanalysis data". If SEDGES is compared extensively to another existing land surface model as ground truth, then from the Abstract alone, the reader will wonder what it does in addition.

Extending further the comment above, maybe get in the Abstract a list of ecological

variables and quantities that SEDGES generates, but are non-standard for most land surface models?

Introduction. Around line 20. JULES land surface model is also one that now has ecological components in it, for instance land fraction changes and terrestrial carbon stores. These are derived as a function of land-atmosphere water and CO2 fluxes.

Sentence starting "In such a framework" gives two reasons for needing a more sophisticated model. But the third, is potentially a reason for keeping a simple model i.e. "computational burden. . .for increased complexity".

P2, lines 1-9 reads as if unduly critical of existing analyses – potentially of the original model developers. Was there really no validation of SimBA?

P2, lines 10-15. This really is the point at which more information should be provided on what SEDGES actually does, at an over-arching level, before leading in to detailed Model Description. What are the core additional quantities that SEDGES generates, and that are in addition to existing land surface models? It is also still vague about "model evaluation". Both SEDGES and another trusted land surface model are forced simultaneously with reanalysis data, and certain diagnostics compared?

P2,3 Overview. Again, please present what is different about SEDGES compared to existing models. In my view, it is that the model links more tightly land-atmosphere flux exchange components with other land surface elements that more traditionally would go in to Dynamic Global Vegetation Models (DGVMs). Hence p5, line 3 "Forest cover and leaf cover fractions", these are dynamic vegetation components that would not always be found within a standard land surface model.

Page 3. Assumption that NPP/GPP=0.5. This does feel like a very large assumption, and particularly as thermal responses in respiration might behave differently to gross photosynthesis. The authors themselves appear cautious, with the caveat that this might be accurate on very long time scales. However, this does mean that in compar-

ison with other land surface models, then only long-term averages of NPP and GPP should be compared.

Page 4,5 The Tables are excellent, and highly appropriate for a model development journal. It is also appreciated that all units are presented, and where justification of parameters is linked to existing literature.

Page 6. However, the caption for Table 3 could be clearer? I'd also avoid the word "climatologies" for things like ET, GPP. For a moment, I thought momentarily this might be referring to climatological drivers (so temperature, humidity etc).

Page 6 lines 5-9, and a few other places. The lines have been wrapped incorrectly, with a new line starting after each ";" symbol (or ",", e.g. p9, lines 6-9).

Page 7. There is some evidence now that splitting SW radiation in to direct and diffuse can have an influence on PAR. Is this something the authors considered, or maybe for the next model version?

The paper makes quite a lot of use of footnotes. Some of these feel more natural simply being in the main text itself?

P11-14. These variables are the more novel parts of this land surface model, and it might be appropriate to re-iterate this point? That is, components more associated with carbon stores than the fluxes.

P12, 13. The terminology could be made clearer between leaf cover fraction and forest cover fraction. In some DGVMs, these could potentially be the same thing. I guess from Equation (18) this is to do with wilting of leaves and that does not appear in forest cover fraction. It also includes seasonal phenology?

P17, Section "How to Couple SEDGES". Unfortunately at this point in the paper, I am again confused as to exactly what SEDGES is, given that it needs the variables listed lines 24,27. The issue here is that some of these components do not uncouple? For instance, if SEDGES predicts LAI, then altered LAI will adjust transpiration, in turn

affecting soil moisture content. So soil moisture content cannot be regarded as a pure input? I am happy to accept that I might not have fully understood the direction the paper is taking, but this could be made clearer. I can see that there are hints of this discussion around the middle of page 18.

P18. Related to the point above, in Equation (29), is ETsoil derived from SEDGES? If so, then Wsoil becomes a diagnostic, rather than an independent forcing.

P20. Model Evaluation. The comparison against observation-based datasets of things like GPP is an important and novel part of this paper, and indeed this should be more routine for all land surface modellers. However I am less convinced by the need to compare against other land surface models. Whilst any model developer may want to check if their simulations are outliers, there is a risk with fitting to other models. This creates a circularity and gives overly small uncertainty bounds that captures uncertainty expressed across land surface models.

The exception to the point above is if wishing to check components of SEDGES which are not considered as the new novel components – instead just verify such "drivers" are reasonable. In these circumstances, then the paper really needs to make a very clear statement. Something along the lines of "Many parts of SEDGES are common to other land surface models. We adopt similar approaches to other models for these parts. This then allows us to make projections of new terrestrial attributes that are important but not routinely in other models. These include. . .. . ."

Interactive comment on Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2017-75, 2017.