

Interactive comment on “A simple object-oriented and open source model for scientific and policy analyses of the global carbon cycle – Hector v0.1” by C. A. Hartin et al.

Anonymous Referee #1

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This manuscript describes a reduced-complexity fully-coupled carbon climate model. Because this model is open source, it has a large potential for applications in different disciplines. Furthermore, it can be improved over time as a community effort. The model structure and component equations are well described in the manuscript, and I only found minor issues that should be addressed before acceptance for publication.

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General comments

- Land carbon uptake in the model is represented by net primary production and not by gross primary production. This may have some conceptual and practical problems because, i) the autotrophic flux of carbon is not included in the calculations of the land-atmosphere C exchange, and ii) this land-atmosphere exchange can't be compared against many available data products. For example, soil respiration fluxes, which include both autotrophic and heterotrophic sources can't be compared with model predictions. Similarly, ecosystem level fluxes can't be compared with eddy-covariance derived fluxes or GPP estimates from satellite products. Can you explain why the autotrophic component of the land C cycle is not included in the model? Do you plan to include this in the future, or is there a particular reason why you believe this should not be included?
- The documentation of the model in GitHub is incomplete and needs to be finished. In particular, the authors should describe better the steps for compiling and running the model in different OS. Given that this documentation is written in Markdown language, the authors should provide a step-by-step procedure for compiling and running a simulation using syntax highlighting. A demo on how to analyze the results using the R scripts would be also very useful.
- Figure 4 shows a very high sensitivity of Hector for predicting temperature anomalies. The slope after the 1960s is much larger in Hector than in the other models. Can you comment on this large sensitivity?

Technical and other comments

- Page 7076, lines 22-23. I would say that fully coupled Earth system models (atmosphere-ocean-land) are at the complexity end, and not just AOGCMs.

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- Page 7080, line 28. Change δ for d . The δ notation is commonly used for isotopes in C cycle models.
- How do you calculate NPP_0 and RH_0 ? I think this formulation of RH is potentially dangerous because you may respire more C than what is available in the pools of equation (8) and (9).
- Equation (12). What is the last term F_i ? It seems to me that this term violates mass balance. What additional flux, different from all inputs and outputs, can modify the net change?
- Page 7058, line 25. Replace 'model' for 'version'.
- Equation (15). Why do you use a difference equation instead of a differential equation? Is this processes discrete in time?

Interactive comment on Geosci. Model Dev. Discuss., 7, 7075, 2014.