

Interactive comment on “GEOCLIM reloaded (v 1.0): a new coupled earth system model for past climate change” by S. Arndt et al.

Anonymous Referee #2

Received and published: 15 March 2011

Arndt et al. present a new version of the coupled Earth system model GEOCLIM. They linked the GEOCLIM reloaded to a temporally and spatially resolved model of the global ocean circulation. The ocean model is further coupled to a diagenetic model.

The manuscript begins with a detailed description of important equations and parameterizations for each module and then discusses the model performance by comparing present-day simulations with observational-based and modeled oceanic estimates. The text is clearly written and well organized. The evaluation is well constructed. As such, this manuscript is a very welcome contribution and certainly merits publication in Geoscientific Model Development. I am eager to see first simulations with the GEOCLIM reloaded for the past climate and I think that the model has clearly the potential to perform calculations that will lead to scientifically important results. However, prior

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to its publication I would like to see a few minor revisions to the manuscript addressing the points below.

(i) The authors point out on p.2116 that computational cost renders a direct coupling of the atmospheric module FOAM with GEOCLIM reloaded infeasible. On p.2115, the authors say that the atmospheric module FOAM is a parallelized version of CCM2. The authors should add a paragraph about model performance in terms of computational costs. How does the performance of this climate model compare with other comparable models? Can the entire model run on a single-CPU and/or in a parallelized version? I think the computational costs may be a critical point for other potential users and this journal is the right place to discuss and clarify that. The authors may include a table in the model section with some benchmark tests.

(ii) I would like to see the source code of the present model to be put on an open-access server to get even more transparency.

(iii) I do not understand why the authors compare their model output with bottle data from WOCE Hydrographic Program. What is the advantage over using the gridded quality-controlled WOA01/05 or GLODAP?

(iv) I have a question regarding the length of the simulation until steady-state is reached. How long does it take (in model years) to reach 'quasi' equilibrium for the atmospheric module as well as the coupled continent/ocean/sediment system in the performed present-day model simulations?

(v) The authors point out that the model is mainly capable to deal with very long-term simulations for the past climate. However, all of their model-data comparison is focused on present-day observations. Please add why the focus is on the present-day, and/or change the introduction accordingly.

Technical points: There are quite a few typing errors which should be fixed before publication process. Here is an incomplete list:

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p.2111 I.6 ...2008 and references therein)

p.2115 I.16, I.19, I.26: why is there a C after degree?

p.2124 I.1 change 'parametes' to 'parameters'

p.2124 I.16 correct reference of Sarmiento.

p.2125 I.4 change 'consitions' to 'conditions'

p.2126 I.25 change 'inetgration' to 'integration'

p.2128 I.14 change 'hundereds' to 'hundreds'

p.2132 I.5 delete 'the'

p. 2137 equation 53: shouldn't it be 660?

p.2143: include e.g. in front of Gnanadesikan. Many other biogeochemical model estimates have been published so far. You even point that out in Table 9.

p. 2146 delete 'from with global observations'

p. 2146: I.22 change 'Figure6' to Figure 6

p.2149 I.20 change 'resluts' to 'results'

p.2160 I.28 change 'produetivitz' to 'productivity'

p.278: Fig1. Shouldn't it be GEOCLIM reloaded instead of GEOCLIM?

Table 8: Change 'Redfieled' to 'Redfield'

Interactive comment on Geosci. Model Dev. Discuss., 3, 2109, 2010.

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