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Interactive comment on "Evaluation of biospheric components in Earth system models using modern and palaeo observations: the state-of-the-art" *by* A. M. Foley et al.

Anonymous Referee #1

Received and published: 23 August 2013

Title: Evaluation of biospheric components in Earth System models using modern and palaeo observations: the state-of-the-art

Authors: A. M. Foley et al.

1. Does the paper address relevant scientific questions within the scope of BG? yes
2. Does the paper present novel concepts, ideas, tools, or data? yes
3. Are substantial conclusions reached? yes
4. Are the scientific methods and assumptions valid and clearly outlined? yes

5. Are the results sufficient to support the interpretations and conclusions? yes

6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? seems not applicable to this review

7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? yes

8. Does the title clearly reflect the contents of the paper? partly

9. Does the abstract provide a concise and complete summary? yes

10. Is the overall presentation well structured and clear? yes

11. Is the language fluent and precise? yes

12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? yes

13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? yes

14. Are the number and quality of references appropriate? yes

15. Is the amount and quality of supplementary material appropriate? yes

[General comments]

The manuscript by Foley et al. presents a excellent review on wide range of topics towards a more robust evaluation of ESM's ability to simulate key components of earth system. The paper presents methodological issues in model evaluation like choice of metrics, handling uncertainty in dataset, and how to constrain the performance of Earth System Models. The review on variables of palaeo reconstruction, modern data, and corresponding metrics suitable for the model evaluations will help standardization of community effort of benchmarking ESMs, such as International land model bench-

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marking (ILAMB) project.

Section 2 and 3 are well written and will served as a comprehensive review for model benchmarking. One problem I noticed in the section of palaeo data use is that Harrison et al. submitted is cited many times there, but details of their work is written ambiguously, so please update the description about their study if it is published.

I felt section 4 like a book chapter, and the structure is not very consistent (i.e. subsections doesn't seem to itemize the equal level topics). I would remove section heading 4.1 and just start the paragraph after the heading of section 4; and shift 4.2, 4.3, and 4.4 to 4.1 and 4.2, 4.3. Also "Emergent constraints" subsubsection could be a separate subsection from "Recommendations for model evaluation methodologies" because that topic seems rather independent from a narrow sensed "model evaluation methodologies" written in the subsection (like Fig 4.). This may also apply to the Table 5. Making them consistent with the structure drawn in Fig 4. would help readers to understand the section easier.

[Specific comments]

Page 10944, line 22: Could you add references of benchmarking ocean model evaluation? All of the literatures cited here seem for the terrestrial model. Also please update citation for Kelley et al. and Dalmonech and Zaehle from BGD to BG.

Page 10945, line 9-14: It is not very clear for me why the use of opposite directional use of the same function could verify the comparison.

Page 10949, line 16: Published year of Daniau et al. is 2010 instead of 2012.

Page 10949, line 17: Published year of Charman et al. is 2013.

Page 10950, line 6: Published year of Bartlein et al. is 2011.

Page 10953: line 1: Please fix spelling of Jolliff et al.

Page 10957, line 6: It seems Jakob and Tselioudis 2003 GRL is more appropriate to

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be cited here rather than Jakob 2003.

Page 10963: line 17: Holden et al. 2009 must be published in 2010.

Page 10968: line 27: period is missing at the end of the sentence.

Page 10988, Table 2: Could you explain "mixed variables" in (1)? If you mean comparison of continuous and categorical, writing the definition in the parentheses, like "mixed (continuous and categorical) variables" would help readers understand.

Interactive comment on Biogeosciences Discuss., 10, 10937, 2013.