

Interactive comment on “Modelling feedbacks between human and natural processes in the land system” by Derek T. Robinson et al.

Anonymous Referee #2

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The authors present a review of 4 approaches to representing interactions between humans and the environment in land systems using coupled models. Based on the review of these approaches, the authors provide discussion and recommendations for representing human-environment interactions in land systems using coupled models.

The subject of the article is interesting but work is required to restructure the manuscript, improve writing style and provide novel insights based on the review provided.

Comments

1. The 4 approaches are presented in an inconsistent way in Section 2.
 - a. My recommendation is that in section 2, in each case, introduce the type of model

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coupling you are referring to, the motivation of the original researchers for coupling the models and how they are coupled. Following this, as you have done, outline the interactions/feedbacks each model captures between human and natural systems. A case study is useful, as you have done. I recommend following the case study with a sub-section explicitly outlining the strengths and weaknesses for each of the 4 approaches. These should be summarised and combined in a table in the discussion section of the document so the reader has a clear impression of how each of the 4 approaches compare. A diagram illustrating the differences in coupling or how feedbacks are captured may be instructive.

b. Section 2.1 and 2.2 headings sound like case studies and therefore this should be the sub-section title related to case studies. Since you are comparing 4 approaches, the main title of section 2.1, 2.2, 2.3 and 2.4 should illustrate the approach you are addressing in each section as you have done in section 2.3 and 2.4. c. The cases provided in section 2.1 and 2.2 are new models or approaches. As a review paper, I find this somewhat problematic as the idea, I would think, is to appraise pre-existing approaches rather than adding two new approaches. If there are pre-existing approaches that are consistent with those presented in section 2.1 and 2.2, then these should be reviewed. If the authors feel that the approaches they are presenting here are novel and address some of the shortcomings of the approaches in section 2.3 and 2.4, then by all means present your approaches as novel frameworks. However, if they are not, then this article does not strike me as the appropriate platform to present new work (as it is now structured).

2. The article states that there is a lack of suitable frameworks to guide the building of coupled models of land systems. Given the wide-ranging expertise of the co-authors here, I would expect the article to present a new framework to tackle these issues based on an assessment of the strengths and weaknesses of existing approaches. I understand that you are addressing systems that operate across multiple scales. Nonetheless I would like to see the authors make an attempt to outline a framework

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that can be applied across scales or at the minimum a list of best practices and core knowledge gaps that are required to be filled. A call to action, if you will. These should be explicitly outlined as they will form the main novel findings of the manuscript.

3. The writing style is very loose with statements made that are imprecise, insufficiently explained or qualified. For example, the motivation for coupling on page 5 line 16 – page 6 line 7. Page 6 line 16-17. The coupling approach enables a greater degree of transparency and accuracy in coupled models. There are examples like this throughout the manuscript that need to be made more precise, properly qualified and backed up by citations where appropriate. In addition, many of the sentences are too long and contain multiple arguments. Better to split these into shorter sentences for clarity.

4. The motivation of the study (stated page 6 line 17 – page 7 line 5) is unclear to me. These are the aims are written as:

Aim 1: We present multiple approaches to coupling land-change and natural-system models to evaluate how alternative approaches to representing feedbacks add value to scientific inquiry into global change and thus generate new insights into the sustainable management of human-environment interactions.

Aim 2: Based on the current state of the science, we categorize conceptual approaches to coupling land-change models with natural-system models that differ across a range of spatial extents and coupling methods.

Aim 3: Using four case studies, we critically assess the influence of land-change processes on natural-system processes and vice versa, focusing on the implications of these feedbacks for system dynamics, the research questions that model coupling enables, and the strengths and weaknesses of the coupling approach.

Aim 4: we describe the lessons learned from the various approaches, the different types of consistency that should be maintained between coupled models as well as the feedbacks represented between the human and natural systems.

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Aim 1: I thought the focus was on the land system and land system models, not global change, which is a much broader topic.

Aim 2: Okay, a useful aim but I don't think the paper achieves this. You should make a clearer distinction of the differences between the 4 approaches presented. See comment 1 and 2.

Aim 3: I thought the specific aim of the paper was to investigate how human-environment interactions in the land system are captured using coupled modelling approaches. As it is written, it comes across as quite a verbose research aim. I recommend focusing solely on how human-environment interactions in the land system are captured using coupled modelling approaches.

Aim 4: See comment 1 and 2.

Specific comments

Page 4: Avoid the use of footnotes

Page 6 Line 20: State of the science is incorrect English

Page 28 Line 18-19. Please qualify this statement.

Page 38 and 39. The conclusion section on interdisciplinary collaboration is valuable and insightful.

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