Biogeosciences Discuss.,
doi:10.5194/bg-2016-37-AC5, 2016

Biogeosciences Discussions
Open Access
EGU

Interactive comment on "Reviews and syntheses: Four Decades of Modeling Methane Cycling in Terrestrial Ecosystems" *by* X. Xu et al.

X. Xu et al.

xxu@mail.sdsu.edu

Received and published: 19 May 2016

[We really appreciate the reviewer for the comments, which significantly improve the manuscript in terms of clarity and organization. All detailed point-by-point responses are listed below.]

The manuscript by Xu et al. reviews the past four decades of modeling methane emissions from terrestrial ecosystems. The authors provide a timeline and structure for assessing both the level of detail in terms of the processes represented and also in terms of how the processes are represented. Overall, the authors do a very nice job of comprehensively summarizing the current state of art in methane modeling and tracing the history of model development over the past four decades.

[We appreciate the positive comments.]

Printer-friendly version

Discussion paper

My main comments are : 1. The authors categorize the representation of processes into empirical to mechanistic approaches. This is rather subjective and it would be very helpful for the reader to have a section (1-2 paragraphs) describing how the authors define these terms. For example, even some of the mechanistic representation of processes rely on empirical response functions, and are thus only semi-mechanistic. In an ideal setting, what would be the definition of a purely mechanistic modeling approach?

[We totally agree that separation of mechanistic and empirical is rather arbitrary, while it does help understand the model representation of CH4 processes. In this revised manuscript, we provideddetailed description to show how to define the empirical and mechanistic models in terms of modeling CH4 dynamics.]

2. Some of the descriptions of the processes are fairly vague. For example, even the description of methanogenesis is abbreviated to just mentioning “acetoclastic and hydrogenotrophic methanogenesis”. Given that the authors are trying to emphasize a more mechanistic modeling approach, increasing the level of detail for each process would be helpful.

[We agree that it is important to have more detailed description of two methanogenesis processes. Yet the processes themselves have been reviewed, while for all the present CH4 model, only few models simulate acetoclastic and hydrogenotrophic methanogenesis; which are not sufficient for a detailed review section.]

3. The discussion on substrate is particularly useful because most methane models do not consider this explicitly. Given the rise of atmospheric CO2, addressing how substrate has changed due to CO2 interactions, and what this means for modeling approaches and methane emissions is necessary to be mentioned.

[We added a short paragraph to discuss the potential impacts of elevated CO2 and substrate on CH4 emission.]

4. Lastly, in the discussion for data needs, the list and ideas for integration within

Printer-friendly version

Discussion paper

models is also very helpful. However, some discussion of the benchmark targets that the modeling community should aim for, and how to handle the uncertainties in benchmarks, would be very useful.

[We have added one small paragraph to summarize the benchmarking targets of the benchmarking system and uncertainties in benchmark.]

Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2016-37, 2016.

Printer-friendly version

Discussion paper