

## ***Interactive comment on “Use and uncertainty evaluation of a process-based model for assessing the methane budgets of global terrestrial ecosystems” by A. Ito and M. Inatomi***

**Anonymous Referee #1**

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### Overall Evaluation

This manuscript represents a very useful study of evaluating different existing schemes and parameterizations to estimate different components of the global methane budget along with their uncertainties. The schemes considered by this study are the major schemes that have appeared in the modeling literature in the last 15 years, and it is very helpful to see them compared. In general, the manuscript is well organized and well written. However, there are some awkward phrasings that need revision (see my comments below). Also, there are a few things that need clarification (see my comments below).

C4078

### Specific Comments

- (1) Page 7035, sentence from line 14 – 16. Awkward wording. Perhaps revise to: “Also, aerobic emissions of CH<sub>4</sub> from plants (Keppler et al., 2006) is arguably an influence source of CH<sub>4</sub>.”
- (2) Page 7035, line 24: Change “premature” to “immature”.
- (3) Page 7036, line 12: Change “simulates” to “simulate”.
- (4) Page 7037, lines 1-2: Change “difference” to “different”.
- (5) Page 7037, end of sentence at beginning of line 10: Should this sentence end “industrial) emissions.”? Note that some people would consider “livestock” emissions to be anthropogenic.
- (6) Page 7038, line 6: Change “coupling with climate model” to “coupling with a climate model”.
- (7) Page 7045, sentence on lines 14 and 15: I’m not sure what you mean by “are among the largest in the terrestrial biosphere”. Largest of what? Largest “source” of emissions. At 15 – 27 Tg C per year in your estimates, it is about 3-7% of total emissions including anthropogenic sources. Maybe just say that it is a “non-trivial source”.
- (8) Page 7047, line 17: I don’t understand where “576 different combinations” comes from. I came up with 512 different combinations.
- (9) Page 7048, line 3: Change “We estimated the global terrestrial CH<sub>4</sub> budget” to “We estimated components of the global terrestrial CH<sub>4</sub> budget”.
- (10) Page 7048, line 4: Change “summarized” to “summarizes”.
- (11) Table 1 legend: Change to “Comparison of components of the global CH<sub>4</sub> budget for terrestrial ecosystems (Tg CH<sub>4</sub> yr<sup>-1</sup>) between the different simulations in this study and estimates from previous studies.” Also, I was confused by Potter et al. scheme for

C4079

wetland sources in Table 1, but I see that the other review has noted that absence of reference to the Cao et al. scheme.

(12) Page 7048, sentence from lines 22-25: You shouldn't call the 350 and 30 Tg CH<sub>4</sub> per year, the "estimated global CH<sub>4</sub> budget". Also, these numbers don't really appear in Table 1, so Table 1 is not appropriate to cite here. Or add some lines to Table 1 so that the 350 and 30 Tg CH<sub>4</sub> can be compared.

(13) Sentence spanning pages 7048 – 7049: Change to "A key uncertainty found in this study is associated with the available wetland and inundation maps, in which estimates were different by more than 20 Tg CH<sub>4</sub> yr<sup>-1</sup> (Table 1)."

(14) Page 7049, sentence spanning lines 4 and 5: Suggest that you change this sentence to "This difference suggests that it is important to accurately delineate the location of wetlands to more accurately estimate their contribution to global CH<sub>4</sub> emissions".

(15) Do Figures 7 and 8 cited on page 7050 depict the baseline simulation? If so, please indicate in the table legend.

(16) Page 7050, line 24: I think that "buffalo" is plural, and that "buffaloes" is incorrect. Also, I'm assuming that this refers to water buffalo. If so, it would be good to be explicit so as to not confuse with North American buffalo (i.e., bison).

(17) Page 7051, end of line 10: Change "increases" to "increased".

(18) Page 7051, second half of sentence spanning lines 18 – 21: The meaning of "further studies at both biogeochemical and socio-economical dimensions" is unclear. I think you could end the sentence after the citation to "(Archer et al., 2009)" and that would be fine.

(20) Page 7051, line 24: Change "in the estimation schemed used and the input data" to "among the different estimation and parameter schemes".

C4080

(21) Page 7051, line 25: Delete "Fortunately".

(22) Page 7052, sentence spanning lines 6 – 8: Change beginning of sentence to "However, it should be noted that several sources were not accounted for in this study, namely emissions from mining, landfills, wild ruminants, . . .".

(23) Page 7053, sentence spanning lines 3 and 4: Change to "It is difficult to constrain and validate large-scale models because observation-based estimates of CH<sub>4</sub> emissions at these scales is very uncertain."

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C4081