Biogeosciences

Discussions

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Interactive comment on "Projecting the release of carbon from permafrost soils using a perturbed physics ensemble" *by* A. H. MacDougall and R. Knutti

Anonymous Referee #2

Received and published: 24 January 2016

The authors present a modeling analysis of future projections of carbon emissions from thawing permafrost. These results contribute the general knowledge of the permafrost carbon feedback. The new contribution includes the new statistical technique and the projections extending out for 8000 years to evaluate the long-term effect on climate. I found the paper well written and the results interesting. I suggest the paper can be published after minor revisions.

I have several specific comments:

P500, L17-19: The authors should rewrite this statement to reflect the estimated fractions of anthropogenic emissions. The current wording implies previously published

papers imply 'cataclysmic' emissions. While common in the blogosphere and media, the published literature never makes such assertions.

P501, L25-7: The authors should remove this statement for two reasons: 1) it is unrelated to the subject of the paper and 2) the broader community of soil scientists and modelers do not agree with the assertions of Schmidt et al [2011]. Schmidt et al. make a number of useful recommendations, but they base their analysis on a very small set of global models. The large spread in simulated soil carbon fluxes result as much from differences in simulated GPP as from the problems they identify.

P502, L8: 'emissions'

P502, L15: Replace 'Montecarlo' with 'Monte Carlo.' The technique is named after an actual place, the casinos of Monte carlo.

P503, L15: I suggest rewording this.

P506, L10: What is the value range for the saturation factor and how is it calculated.P507, L16-18: The reason for this is a problem common to all models: sub-grid representation of permafrost distribution. A model grid cell is either all permafrost or no permafrost, so simulating permafrost in areas like south of Hudson Bay is extremely difficult.

P510, L15: Use '10,000 AD' rather than 'deep future.' I had trouble figuring out exactly what you meant.

P511, L7-25: Make all these numbers into a table. I found it very difficult to read and impossible to remember the numbers. A table is a much more effective way to present a lot of numbers than sentences in text.

P511, L1: Why is there a peak in emissions in 2050?

P511, L1: The authors need to include loses in simulated permafrost area.

P512, L19: The authors need to be careful about relative vs. absolute importance. The

relative importance is much less for RCP 8.5 vs. 4.5, but the absolute magnitude of the fluxes is still 3x those for RCP 4.5.

P513, L7: What about the importance of these parameters in 2300?

P513, L25-7: A major field campaign is not required. What we do need is a strategy to collect the right samples from the right locations and set up incubation experiments at the right temperatures.

P513, L27: The authors should discuss dissolved organic carbon (DOC) as a factor, with some references.

P514, L26-8: What causes this warming?

P515, L3-5: How does this cause the difference?

P517, L23-4: The authors should delete this statement. I do not agree at all that Schmidt et al. calls into question the multi-pool model.