

## ***Interactive comment on “Large methane releases lead to strong aerosol forcing and reduced cloudiness” by T. Kurtén et al.***

### **Anonymous Referee #2**

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Review of manuscript “Large methane releases lead to strong aerosol forcing and reduced cloudiness”, by Kurtén et al.

The paper describes the effect of elevated methane concentrations on oxidant and aerosol concentration fields and the relative forcing. The manuscript is well written and in the scope of ACP. It can be published on ACP after a minor revision.

#### Comments

General: CH<sub>4</sub> concentrations have been increased by a factor of 10 or 100 everywhere over the globe to study the effects, to simulate the permafrost releases the emissions would be increased only for some areas. Will the effects of methane release from

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permafrost take place in the same areas as in this simulation? In other words, how the model applications done here are comparable, in effects, with the case of permafrost release? Could the radiative forcing be totally different in a world where CH<sub>4</sub> emissions increase are from the Arctic permafrost only?

Detailed: 2.1 global models

Emission inventories for the year 2000 are used in this study, if future emission scenarios are used, should the authors expect the same results on the effects?

ECHAM5-HAM is run using climatological sea-ice and SST values, are they centered around the year 2000?

Page 9062 Line 14, “The aerosol radiative forcing was evaluated. . .”, is it meant the indirect effect?

2.2 1-D chemistry-transport models

The use of this model is not mentioned before in the manuscript, it should be mentioned in the introduction, where the study of this manuscript is introduced

2.3 : Pag. 9064, line 16

Can the authors explain better the sentence “The forcing was computed as . . . concentration as such”? I do not understand the method used here.

Page 9065, Eq 2. calculates CH<sub>4</sub> lifetime, it would be better to add CH<sub>4</sub> in “tau(OH)” and “tau present”

3 Results and discussion

Page 9065 line 22, better to report the results from Schmidt and Shindell 2003 and Shindell et al. 2009 for clarity.

Figures

The figures have different colour bar scales for the two experiments. It would be good

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if they have the same scale so that the difference in magnitude is immediately evident.

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