

## ***Interactive comment on “An analysis of atmospheric CH<sub>4</sub> concentrations from 1984 to 2008 with a single box atmospheric chemistry model” by Z. Tan and Q. Zhuang***

### **Anonymous Referee #2**

Received and published: 30 January 2013

The publication explores the impact of different modelled OH concentration scenarios on the global modelled CH<sub>4</sub> concentration, which is compared to global CH<sub>4</sub> observations for the years 1984 to 2008. The publication contributes to the ongoing discussion of reasons for the flattening of the CH<sub>4</sub> concentrations in the 2000s from the OH point of view.

Major points: I would recommend using more updated CH<sub>4</sub> emissions than those from Fung et al. (1991), e.g. IPCC (2007), Bergamaschi et al. (2007) or the Transcom CH<sub>4</sub> flux set would be alternatives. For examples, the CH<sub>4</sub> uptake by soils is estimated to ~30 Tg CH<sub>4</sub> a<sup>-1</sup> in IPCC (2007) compared to ~10 Tg CH<sub>4</sub> a<sup>-1</sup> in Fung et al. (1991).

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Please check the consistency and currentness of the data sets used in comparison to the most up-to-date data sets.

The discussion section should be revisited taking into account recent papers published about the flattening of the CH<sub>4</sub> concentrations (e.g. Heimann (2011), Aydin et al. (2011), and Kai et al. (2011)).

I would suggest to either leave the wetland section (3.3) out or to explore it more in detail.

Minor points:

Page 30261, line 5: “reaching nearly zero in the 1990s” this should be replaced by the 2000s as the growth rate in the 1990s was on average higher compared to the 2000s.

Page 30262, line 8: Please check for reference studies that used a single box atmospheric chemistry model for approximation of the atmospheric system (using other atmospheric compounds).

Page 30262, line 15: Please add a reference here.

Page 30263, line 18-19: I would rather reformulate it that “wetland emissions are by far the largest CH<sub>4</sub> source that has a temperature sensitivity” as also soil uptake, emissions from wastewater treatment, etc. are temperature dependent.

Page 30267, line 24: I would appreciate to have here a short quantification of the Prinn et al. 2005 OH values as well.

Page 30269, line 9: Please explain more detailed the factors which are responsible for the stronger reduction of CH<sub>4</sub> concentration in the Northern Hemisphere.

Table 1: Please add the according references. It is not clear to me how the [%]-distribution for the Northern and Southern hemisphere was derived.

To me the reason for having Fig. 1b and e (also true in similar way for Fig. 2 and Fig.

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3) is not yet 100% clear. The figures are not explicitly mentioned in the text and I am struggling with the content gain as it is not separated for seasons or e.g. 5-year time intervals. Is there a possibility to change this figure to have finally a higher information content (separation into seasons, etc.)?

It might be worth showing the timeseries of the CO concentration used as model input in Fig. 4b as well to check for correlation of CO and OH. The usage of CO data further seems to improve the match between observed and modelled CH<sub>4</sub> growth rate. Are there any explanations for a potential bias?

Technical corrections:

Page 30262, line 4: I would rather call it "chemical reactions" than just "chemistry".

Page 30263, line 16: Please add  $k\text{CH}_4+\text{OH}$  and  $k\text{CO}+\text{OH}$ .

Page 30278, Fig. 1: Would it be possible to add the heading "Changing OH scenario" on the left panel and "Constant OH scenario" on the right panel? The axis notation and the legend are very small and hard to read. The same applies to Fig. 2 and Fig. 3.

Page 30281, Fig. 4: The assignment (a), (b), (c), (d) is missing in the figure caption.

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Interactive comment on Atmos. Chem. Phys. Discuss., 12, 30259, 2012.

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