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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Model simulations of atmospheric methane and their evaluation using AGAGE/NOAA surface- and IAGOS-CARIBIC aircraft observations, 1997–2014" *by* Peter H. Zimmermann et al.

Anonymous Referee #2

Received and published: 17 April 2018

In this manuscript the authors describe the global atmospheric CH_4 budget using the EMAC modelling system trying to understand and simulate the observed trends of the years 1997–2014 from a number of ground stations and a vast collection of aircraft observations.

The manuscript is rather well written and the results are well presented with a large amount of figures to support the text. Also there are interesting findings on the sources of CH_4 contributing to the existing knowledge around it. However there are a few points that need to be addressed before publication to ACP.

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Discussion paper

General Comments

The authors should really explain how the selection of stations was made. It is even stated in the title that they use NOAA stations for methane, but only the Mauna Loa Observatory is used. Also the number of stations seems quite limited to accurately represent the global methane.

The choice of meteorological data seems a bit strange. The operational data of ECMWF have changed vertical resolution at least twice within the study period, definitely affecting the height of each level. This must have an impact on the nudged values and the model results. How did you deal with these issues? Did the meteorological data vertical resolution near tropopause match the model vertical resolution? Also a validation of the computed meteorology is missing from the manuscript.

Specific Comments

P1 L25: RMS abbreviation used before defining.

P4 L153: Which GFED? GFED4s? Clearly state the version.

P5 L178: emission flux, the “e” is missing.

P7 L231: A higher resolution of sampling should be used for the CARIBIC data. Daily samples for flight data is far too long.

P8 L297-305: As mentioned in the general comments, 6 stations are not enough to reach definite conclusions.

P10 L360-368: Couldn’t this be because of the meteo data?

P11 L418 and P12 L434 and P13 L495 and Fig13b caption: Be consistent when reporting these numbers.

Fig1: A different color code for the different periods would be helpful.

Fig4a and b: I believe the lines connecting the circles are misleading.

Figs 5, 6, 9, 11, 14, 15: Really hard to read because of size.

Fig13b: again I fail to see the need for the line connecting stations.

Fig17: State either in the caption or in the legend which set of lines is for every period.

Supplementary material:

There are some inconsistencies between the figures and the captions making it sometimes confusing.

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