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Interactive comment on “Variations in global methane sources and sinks during 1910–2010” by A. Ghosh et al.

Anonymous Referee #1

Received and published: 6 December 2014

General comments:

This study is able to reproduce well the observed variations in global atmospheric methane over the last century, providing some insight into changes in particular sources (principally biomass burning) and sinks (principally stratospheric atomic chlorine). The authors use a chemistry transport model with initial estimates of anthropogenic emissions taken from bottom up inventories and wetland emissions simulated by a biogeochemical model. A mass balance approach is then used to minimize the difference between the initial forward modeling results and a range of global observations (direct atmospheric measurements, firn and ice core data) and thereby optimize global total emissions. A further constraint, using $\delta^{13}\text{C}$ observations allows the authors to attribute the high CH_4 growth period largely to increases in biomass burning.

C9836

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The manuscript is well written, clearly structured and is likely to be of considerable interest to others in the greenhouse gas research community. The referee recommends publication in ACP.

Minor comments:

P27621, L24: insert 'the' between 'estimate' and 'global'.

P27622, L22: with -> to

P27623, L11: latest -> last

P27624, L24: The authors say that the use of zonal mean winds does not affect the long term simulation as it only results in a 5 Tg CH₄/yr higher loss rate than when the model is nudged to JRA-25. Giving this variation in loss rate as a percentage would make it easier for the reader to assess this claim.

P27627, L11: insert 'a' between 'used' and 'consistent'.

P27631, L1: insert 'the' before ACTM

P27631, L20: isotopes -> isotopologues

P27632, L5: insert 'the' before ACTM

P27632, L6: suggest replacing 'will' with 'should'

P27633, L15: fractionations effect -> fractionation effects

P27633, L23: insert 'of' after because

P27636, L5: insert 'the' before CH₄

P27636, L6: insert 'the' before CH₄

P27637, L15: insert 'the' before 'Antarctic'

P27637, L17: insert 'the' before 'IPD'

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P27637, L27: insert 'the' before 'period'

P27639, L8: insert 'the' before 'Global'

P27639, L28: Supplement -> supplement

P27640, L25: leaving -> leave

P27640, L26: suggest changing 'erroneous' to uncertain

P27642, L13: insert 'the' before 1990s.

P27656: Frin -> Firn in the legend for NGRIP and NEEM data

P27660. Legend difficult to read in Figure 6. Increase font size.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 27619, 2014.

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