Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-160-RC4, 2016

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Global tropospheric hydroxyl distribution, budget and reactivity" *by* J. Lelieveld et al.

Anonymous Referee #2

Received and published: 8 April 2016

With respect my earlier comment:

P9 l3 onwards. The discussion of the methane lifetime (to oxidation by OH) of 8.5 years in the model should also be compared to observational estimates (e.g., Prather et al., 2012: 11.2 1.3 yr). Pretty much all models, and EMAC with MOM seems not to be an exception, apparently underestimate the methane lifetime. Do we have any idea why this is? It seems that we need less OH in model's atmospheres, but by adding new OH sources from recycling this discrepancy gets worse. Doesn't this suggest that models are missing something fundamental about OH?

And your reply:

Reply: Prather et al. (2012) derive a CH4 lifetime of 9.10.9 yr [9.1+/-0.1 yr], and indicate this is 5% higher than the multi-model mean, as presented in the IPCC (2007) AR4

Printer-friendly version

Discussion paper

assessment, being 8.71.3 yr [8.7 +/-1.3 yr]. Our estimate is somewhat less (8.5 yr) but still consistent.

—

The Prather et al. lifetime of 9.1 +/- 0.1 yr is the total methane lifetime, and includes sinks of methane in the stratosphere, reaction with Cl, and deposition to soils, as well as (the main sink) reaction with OH. Unless I am mistaken, the methane lifetime you quote in the paper is only with respect to reaction with OH. Prather et al. give a breakdown of these components of the total methane lifetime. The methane lifetime with respect to oxidation by OH is 11.2 +/- 1.3 yr (details in the "supporting information", file: grl29135-sup-0006-ts02.xls).

So I believe there to be a discrepancy between the EMAC methane lifetime (to OH) of 8.5 yr and the observationally derived value of 11.2 +/- 1.3 yr.

Feel free to set me straight if you think this is the wrong comparison to make.

Reference:

Prather, M. J., C. D. Holmes, and J. Hsu (2012), Reactive greenhouse gas scenarios: Systematic exploration of uncertainties and the role of atmospheric chemistry, Geophys. Res. Lett., 39, L09803, doi:10.1029/2012GL051440

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-160, 2016.

Printer-friendly version

Discussion paper