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Atmospheric Chemistry and Physics Discussions

Interactive comment on "On the emissions and transport of bromoform: sensitivity to model resolution and emission location" *by* M. R. Russo et al.

Anonymous Referee #1

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Review of "On the emissions and transport of bromoform: sensitivity to model resolution and emission location" by M.R. Russo, M. J. Ashford, N.R.P. Harris, and J.A. Pyle.

The manuscript describes the impact of different emission scenarios and different model resolutions on the mixing ratio of bromoform (CH3Br) in the tropics with a focus on the tropical transition layer (TTL).

Bromoform is an important contributor to the stratospheric bromine budget, which has a significant influence on the stratospheric ozone budget. The distribution and chemistry

of CH3Br has been examined through laboratory, field, and modeling studies, however a comprehensive understanding is still elusive. This work offers an important contribution to furthering our understanding of the distribution of CH3Br as represented in global chemical transport models.

As such, the manuscript should be published after the authors address my comments below.

General: This manuscript is very well written and referenced. In recent years there have been a number of studies focused on bromoform and the other organic and inorganic forms of bromine in order to understand the bromine budget going into the stratosphere. This work provides another piece in the puzzle. It will be interesting to see if these results are replicated by other investigators using global models with different transport and chemical representations. Modeling these short-lived species is certainly a challenge and in my opinion this work offers an excellent contribution to that effort.

Specifics;

1. You define the TTL as tropical transition layer, but should also define it in terms of altitude, and maybe also theta, space since you provide specific results that are in the TTL, both regionally and globally. 2. Your point that aircraft measurements from a particular region, when used to calculate global emissions, may bias those calculations is reasonable. However they could also help refine the regional emissions from a given area, which could then be used to improve the global emission estimates. 3. In the Introduction, on page 20657, line 28 you first mention coarse resolution but don't define it until line 10 on the next page, 20658. Also on p. 20658, line 18 you mention high resolution and define it later. It would be helpful to define both course and high resolutions when they are first mentioned. 4. P. 20659, lines 13 and 14 please provide references for the photolysis and OH reactions for your CH3Br tracer. 5. Also on p. 20659, lines 24 and 26 you mention "sigma-height hybrid levels". It would be useful

to define these for those that do not regularly use global models. 6. Section 4.2.2; P. 20663, line 26 and 27 you note that the contribution of extratropical emissions to the total TTL mixing ratio is small. How was this determined, e.g. did your CH3Br tracer have identifiers for tropical and extratropical emissions? 7. P. 20664, lines 20-22, you discuss mixing ratio levels between 365 and 370K. This is the first mention of theta levels and it is important to relate those to the km altitude levels you have previously been referring to. The text implies that the maximum mixing ratio is above 15.7 km, which would then imply that there would be vertical as well as horizontal transport from the location of convection. 8. Section 5, p. 20667, lines 10-11, please provide references for your comments on dibromomethane, e.g. 2-3 month tropical lifetime and dominant open ocean sources.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 20655, 2015.