

Interactive comment on “Mercury distribution in the upper troposphere and lower most stratosphere according to measurements by the IAGOS-CARIBIC observatory, 2014–2016” by Franz Slemr et al.

Anonymous Referee #2

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General

I have some questions regarding how the measurements were performed. To me, the methods shed uncertainty on the results. I think the authors are making sweeping hand-waving analysis of these large data sets. To me, the answer(s) lies in very detailed analysis of all the data sets. This would present a more convincing argument for their theories. The calculated lifetime just seems unreasonably long.

Abstract

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Line 54 – if the lifetimes are really 70 some years, why are the mixing ratios so small? It seems to me that TM and GEM must be removed faster than this.

Introduction

Line 64 – do we really know that its oxidation is slow? I do not think so.

Line 92 – Conflicting information? Or, differences in meteorology and atmospheric conditions?

Line 120 – “to figure out” I would reword to “in an attempt to unravel and decipher the chemical cycling of GEM in the UT/LS.” Experimental

Line 140 – temperature controlled inlet line. What temperature is maintained? This is critical to maintaining the integrity of the mercury phase partitioning.

Line 144 – why is the sampling rate 0.5 SLPM? What not 1 SLPM? This would improve your sensitivity, especially with a sampling time of 5 minutes.

Line 150 – I personally would not use quartz wool. This non-descriptive material is unpredictable in how it acts under varying atmospheric conditions. It just adds unnecessary uncertainty in your analytical scheme.

Line 159 – No in-flight checks on instrument operation are performed? It seems to be that this is not a great strategy and leaves uncertainty in the results.

Line 165 – 167 This is all highly speculative adding more uncertainty.

Line 181 – 183 This too is all highly speculative, adding uncertainty.

Line 227 – 228 I would not say that CH₄ has large emission from biomass burning. CO yes of course.

I think this discussion on biomass burning could be shortened as it detracts from the main focus of this paper.

Line 259 – You might want to add how the altitude of the thermal tropopause was

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determined.

Line 330 – This is another reason not to use quartz wool.

Line 363 – 365 These data should be interrogated to try and determine why the difference is greatest in these air masses. This could provide important information on mercury cycling.

Lines 387 – 401 All of these investigators are top scientists. These data set need to be interrogated independently to try to decipher differences in what was measured. The instruments are all operated with different sensitivities and LODs. These need to be factored in to the analysis.

Stratospheric Lifetime

Although the method used in this section is valid, I have a gut feeling that it is wrong. Mercury and N₂O and SF₆ are chemically very different. I just can't believe that lifetime is 70 + years.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-1233>, 2018.