

Interactive comment on “Total gaseous mercury depletion events observed at Cape Point during 2007–2008” by E.-G. Brunke et al.

Anonymous Referee #2

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I found this manuscript to be very clear and interesting to read. The major contribution is the observation of very frequent, more or less all year long, very low apparent total mercury concentrations "events" at this site (depletion events or DEs). The authors clearly note that this is an unusual set of observations, with the only other vaguely similar situation observed at high altitude stations where the impact of free tropospheric air (which is thought to be relatively rich in gas-phase ionic mercury and might not pass through the sampling manifold to the analyzer) is thought to be the driver. There are also high latitude depletion events, but those appear to be constrained to polar spring-time. While there are some hints (from transport modeling) that perhaps some of the DEs observed at Cape Point are the result of convective mixing of free tropospheric air to ground level, most apparently do not seem associated with this or other indicators of such behavior (low relative humidity, low radon). Thus, there really is no data con-

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tained within this manuscript, either through modeling or direct observation, that can help shed light on these results.

My first reaction is that there may be analytical problems. The events are so frequent as to be suspicious (though there is really very little of this kind of data, so there's not a lot to compare to). I was left wondering if the authors ever take steps to ground truth the instruments during the DEs? They appear to be span checked every 25 hours, but are manual injections of Hg₀ ever used. . . and in particular while a DE is underway? Can we be certain the gold traps are not being passivated by some other species? Similarly, is the manifold ever cleaned to remove seasalt buildup. . . preventing scavenging of Hg₀ within the inlet? If this were occurring, then some condition in the ambient air might promote the artifactual removal of Hg₀ within the inlet during those apparent depletion events. Unfortunately and until more is understood about the situation at Cape Point, the diel and seasonal frequency of the events can not be used to bolster the authors arguments, as they might just as reasonably be taken as evidence of some systematic artifact. I think the authors need to demonstrate a bit more that they've run down some of the potential problems. . . the extensive work done by authors who first observed the Arctic DEs could work nicely as a guide in this case. Another potential experiment would be to site one of the Hg speciation units at the station (also manufactured by Tekran), to see if TGM and RGM are anti-correlated, which they should be if the authors observations are indeed valid.

It pains me to say so, but i think this report may not be ready for publication if the authors do not have additional quality control information available to help guide their interpretation. While their discussion regarding halogen chemistry was interesting and may be right on the mark, these observations are a bit hard to believe at present.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 20979, 2009.