Atmos. Chem. Phys. Discuss., 9, C6277–C6280, 2009
www.atmos-chem-phys-discuss.net/9/C6277/2009/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Circumpolar measurements of speciated mercury, ozone and carbon monoxide in the boundary layer of the Arctic Ocean" *by* J. Sommar et al.

Anonymous Referee #2

Received and published: 28 October 2009

General Comments:

This manuscript presents data from a circumpolar cruise in the Arctic Ocean during summer covering 60 – 90N. The dataset is unique yet I was disappointed in its presentation. There was too much emphasis on reporting mean values rather an in-depth analysis of interesting events that occurred during the cruise. Looking at figure 2, many events are evident, but not even mentioned in the text. Certainly boreal wildfires must have influenced the data, but it's not even mentioned. The focus of the manuscript apperas to be on mercury, yet I believe there is more discussion of O3 and CO. The text would be improved greatly by infiltration of more discussion directly on mercury. Most

of the figures presenting time series information are hard to read, and need improvement. The discussion on ship plume impact needs to be brought together in one place, and made more succinct. Although trajectory analysis was conducted, it is hardly utilized in the text. In summary, the authors need to conduct more in-depth analysis of the mercury data, and improve its presence in the manuscript. For example, why is mercury not shown in figure 5? In general, the discussion needs to follow the key figures more closely and in more detailed discussion. The discussion jumps immediately to impact of ship plumes, instead of presenting the large-scale picture first. There is almost no discussion of this, and it's a main point of the manuscript. The authors have a very nice data set; they just need to focus more on the mercury data.

Specific Comments:

Abstract:

p. 20914, "strong Hg(0)pulse in the water was spilled with some time-delay. . ." The use of the word "spilled" here is puzzling.

p. 20915, "suggesting that atmospheric mercury deposition to the Arctic basin is low during summer and autumn." I would expect the deposition to be continuous year-round, and actually highest in summer due to open water. The fact that high mixing ratios of mercury were not encountered does not imply any information about its downward flux.

p. 20915, elevated levels (how much?) were episodically observed . . . indicating regional pollution. Were trajectories run to confirm this? Why could it not be from long range transport. What type of pollution sources could account for these events? Wildfires?

Mercury Measurements:

If the gold cartridges were changed frequently (how often?), was the instrument recalibrated each time? It appears so, what was the change in response? I'm amazed that

the washing procedure used actually cleaned the gold surfaces.

p. 20191, Was this a custom fabricated sampling system, or a modified Tekran?

Ozone and CO measurements:

p. 20920, line 14 – the 150C temperature to oxidize CO seems low. Most use at least 250C. Did you test this to see if all CO was oxidized to CO2? I am surprised if it was.

p. 20920, line 14 – why did you select FEP tubing? Most researches use PFA. What type of tests were conducted on the tubing to ensure high passing efficiencies?

p. 20920, line 15 – what material was the protective housing constructed out of?

Data Analysis:

p. 20921 – I assume since you used the O3/CO to detect the ship plume that no other direct measurements of it such as NO, SO2, or CN were available? I now see you actually used CO/O3 to screen, so I would revise line 18.

p. 20922 – Delete the two sentences at the top of the page that describes the software used to generate the plots. It is unnecessary information.

p. 20922 – the authors have used Hg(0)/TGM in the manuscript, but this is misleading since it implies that you divided Hg(0) by the TGM values. It doesn't appear that this is the case. I would use a comma between them instead to avoid confusion.

Figure 2 – I can not distinguish the open from colored symbols on this figure. It needs to be improved to show these better.

p. 20924, line 12 – Any idea what caused the decreased O3 values?

Figure 5 – this figure is also very hard to read. It should be improved. Why is there not a panel showing mercury? After all, this is the focus of the manuscript.

p. 20925, lines 7-8 – "which appear not to be inferior over . . .." This needs to be re-written, as inferior is not a correct word here and I don't understand what your trying to

say.

p. 20926 – what does DGM refer to? Define it.

p. 20926 – To me, much of the discussion on this page should be in the Introduction Section, as its background information.

p. 20926, line 23 – what does this sentence mean, the number of hours sampled each day was 22?

p. 20927 – why would Hg(0)evasion from seawater follow a diurnal cycle?

p. 20927 – I assume that dissolved mercury was measured on the cruise by Anderson et al.? This should be more clearly stated in the methods section.

p. 20928 – The discussion on future predictions uses almost no data from this manuscript, so I would reduce it substantially. It appears to have been already published by Anderson.

Oxidation Capacity:

The first paragraph is not the focus of this manuscript. The second paragraph deals with mercury, but does not add any new information. I would consider cutting this section of the manuscript.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 20913, 2009.