

“Chemical cycling and deposition of atmospheric mercury in Polar Regions: review of recent measurements and comparison with models” by H. Angot et al.

Response to referee comments by Referee #1.

We provide below a point-by-point reply to the comments (points raised by the referee in bold, changes made in the manuscript in red).

Interesting read, nicely resuming the last 4 years of atmospheric mercury research in Polar Regions. I only have a few minor comments/edits:

- L223ff: how does this compare to Sommar, J., M. E. Andersson and H. W. Jacobi (2010). "Circumpolar measurements of speciated mercury, ozone and carbon monoxide in the boundary layer of the Arctic Ocean." *Atmos. Chem. Phys.* 10(11): 5031-5045 and Yu, J., Z. Xie, H. Kang, Z. Li, C. Sun, L. Bian and P. Zhang (2014). "High variability of atmospheric mercury in the summertime boundary layer through the central Arctic Ocean." *Sci. Rep.* 4.? The latter 2012 is also missing in the figure 1 of current arctic data, and could be discussed a bit more. Is there no other ship-based arctic data?

The path of the CHINARE 2012 cruise (Yu et al., 2014) has been added in Figure 1 of the revised manuscript (see below).

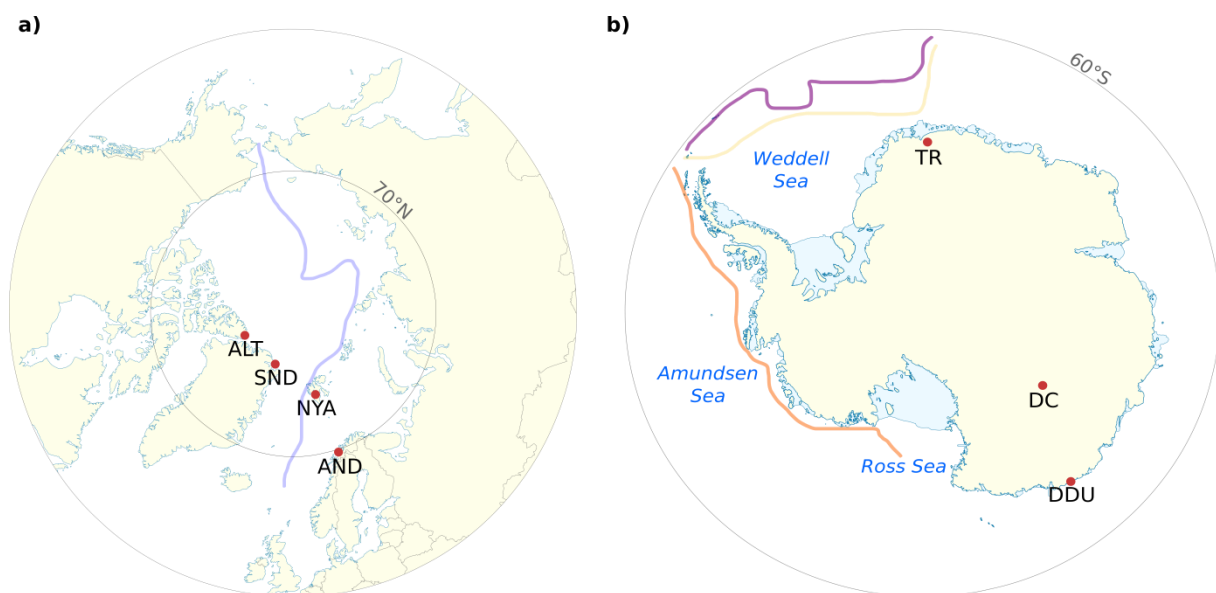


Figure 1: Location of **a) Arctic and b) Antarctic ground-based** sites whose data are reported in this paper: Alert (ALT), Villum Research Station at Station Nord (SND), Zeppelin station at Ny-Ålesund (NYA), Andøya (AND), Troll (TR), Concordia Station at Dome C (DC), and Dumont d’Urville (DDU). Additionally, **the approximate path of cruises performed in recent years (2011-2015) is given: CHINARE 2012 in the Arctic onboard the Chinese vessel Xuelong (in blue), ANT XXIX/6-7 (denoted ANT in the paper) over the Weddell Sea onboard icebreaker Polarstern (in yellow and purple), and OSO 10/11 (denoted OSO in the paper) over Ross and Amundsen Seas onboard icebreaker Oden (in orange).**

Additionally, results from the two aforementioned cruises are discussed here and there in the revised manuscript (where appropriate):

Lines 320-322:

“In contrast, lower concentrations were found in the Chukchi Sea in July ($1.17 \pm 0.38 \text{ ng m}^{-3}$) than in September ($1.51 \pm 0.79 \text{ ng m}^{-3}$) during the CHINARE 2012 expedition (Yu et al., 2014).”

Lines 432-435:

“Inhomogeneous distributions of Hg(0) were observed over the Arctic Ocean during the CHINARE 2012 (Yu et al., 2014) and the Beringia 2005 (Sommar et al., 2010) expeditions. Both studies reported a rapid increase of concentrations in air when entering the ice-covered waters, highlighting the influence of sea ice dynamics on Hg(0) concentrations.”

- L244: better unify units to °C as used above L226.

This has been corrected in the revised manuscript.

- L359: 38 and 38 % sounds odd.

This has been reworded in the revised manuscript:

“Over the 2011-2015 period, AMDEs at NYA are evenly distributed between April and May (38 % of the time in both cases) as ~~38 and 38 % respectively~~, and fewer in March and June (14 and 10 % of the time, respectively).”

- L366: remove frequency.

This has been removed in the revised manuscript.

- L499: remove extra period in GEOS-C hem.

Done.

- L675: what is the threshold for Antarctic AMDEs? You mentioned 1 ng m^{-3} for Arctic AMDEs before?

This is specified line 672:

“AMDEs in Antarctica are operationally defined as Hg(0) concentrations below 0.60 ng m^{-3} (Pfaffhuber et al., 2012)”.

References:

Pfaffhuber, K. A., Berg, T., Hirdman, D., and Stohl, A.: Atmospheric mercury observations from Antarctica: seasonal variation and source and sink region calculations, Atmospheric Chemistry and Physics, 12, 3241-3251, 2012.

Yu, J., Xie, Z., Kang, H., Li, Z., Sun, C., Bian, L., and Zhang, P.: High variability of atmospheric mercury in the summertime boundary layer through the central Arctic Ocean, *Scientific Reports*, 4, 6091, 10.1038/srep06091 <http://www.nature.com/articles/srep06091#supplementary-information>, 2014.