Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-257-RC2, 2016
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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Multi-year record of atmospheric mercury at Dumo d'Urville, East Antarctic coast: continental outflow and oceanic influences" *by* Hélène Angot et al.

Anonymous Referee #2

Received and published: 3 June 2016

General comments:

This manuscript describes novel measurements of Hg(0) and surface snow samples from a coastal Antarcitc location. It is not the first paper presenting a multi-year data from on atmospheric mercury from Antarctica as the other anonymous reviewer states; however, it is the first dataset from the east Antarctic coast and reveals a different annual pattern of atmospheric mercury as compared to previously published Hg measurement from other Antarctic coastal stations. This difference makes the manuscript interesting and a valuable addition to Antarctic atmospheric mercury measurements. I agree with the other reviewer that the manuscript is well written and presented, and is of high quality. The discussion of results, and theories presented are supported by

the measurements. I recommend publication of this manuscript after addressing some minor issues as outlined below.

Specific comments:

Line 92: Estimated MDL sound very unscientific. I would suggest changing it to " According to the instrument manual, MDL is . . ." The reference Tekran, 2001 is missing in the reference list.

Line 102: You state using internal standards as a part of the QA/QC of the Hg-tot measurements with the Tek2600. This is to my knowledge not common and has to be explained. Or do you mean external standards?

Line 105-110: I do not understand the logic of this paragraph, in particular the last sentence. You refer to surface snow samples collected at McMurdo as being representative for your surface snow samples collected very different locations and even year. This has to be explained a little more in detail. See also my comment on surface snow further down.

Line 190-193: The fact that NM, HA and TR are not significantly impacted by air from the Antarctic plateau does not explain why the Hg concentrations at NM and TR are stable in winter. This statement should be changed.

Section 3.1.2: The section deals with AMDEs and that they are not frequently occurring at DDU caused by weak Br-chemistry at DDU. This is a probable cause however, what about the katabatic winds? Are they also dominant in spring? If so I would assume they to some extent can explain the lack of AMDE-observations at DDU.

Line 272-277: You explain about the summertime diurnal cycle of Hg(0) as emissions from snow covered soil. How thick is the snowpack in summer at DDU? Figure 7 and 9 show that the diurnal cycle is quite large, so I am just wondering how it can be possible that the penguin excreta on the soil is the source of this diurnal variation. This means that Hg emitted from the soil has to penetrate the snowpack. What about other

possibilities, have you considered meteorological phenomena such as boundary layer height? The penguin excreta explanations is funny but I do not see it as a plausible cause.

Section 3.2.2, in particular the paragraphs dealing with surface snow samples. Figure 10 shows a quite nice snow concentration gradient between the two stations. However, I think you should mention that the snow samples are from 2009 and the atmospheric measurements between 2012 and 2015. Papers about surface snow in the Arctic have repeatedly shown how inhomogeneous the snow is and that the deposition of Hg onto surface snow quickly is being re-emitted to the atmosphere. Why should the Antarctic be any different? You state Cl in the snow complexes HgII and prevents re-emission, did you do any anion analysis on your snow samples to back up your Hg snow measurements? Your snow samples are very much higher than the transect studies you compare with, even your non-coastal snow samples. Any thought on why you observe such big differences? Your coastal snow samples are compared to Brooks et al 2008 from MM, and yours are also higher than these. Any thoughts on why?

Line 369-371: You state that during summers of Hg measurements there were a significant unusual amount of sea ice. Was it more or less than normal?

Line 388-391: This paragraph seems a bit out of context as it is located here. Should it go with sections 3.2.1 dealing with the diurnal cycle of Hg(0)? Is it even expected that oceanic emissions are follow a daily cycle?

Figure 4: This figure is an attempt to visualize the air mass origin, and I find this figure very busy and it is difficult to get any useful information. Have you considered plotting the percentages as bars instead, such as the exemplified figure below

Technical corrections:

Line 32: Consider replacing “since” with “and”.

Line 38: This is a very oddly constructed sentence, not grammatically wrong, just odd.

Consider revising it.

Line 143: Consider removing “a” from “. . . impacted by a local pollution”

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-257, 2016.

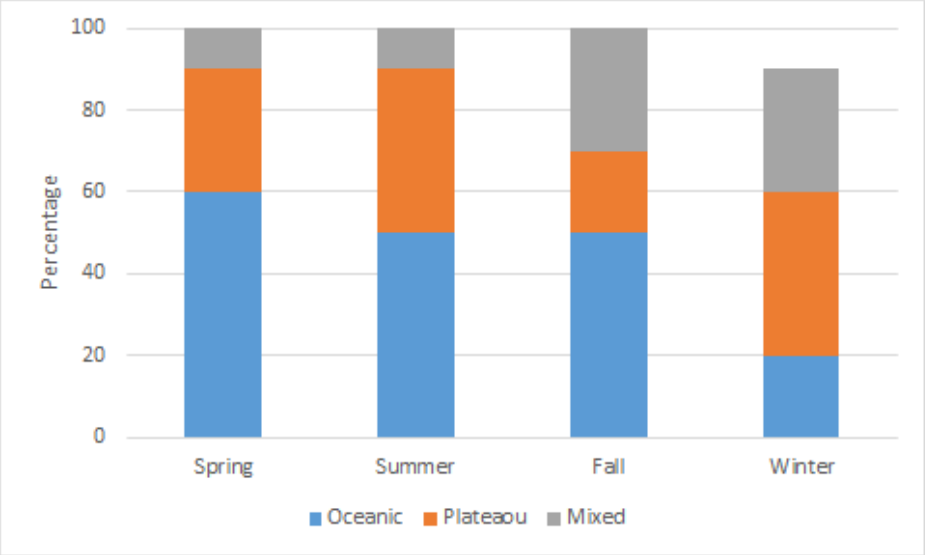

Fig. 1. Example figure