

Interactive comment on “A compilation of tropospheric measurements of gas-phase and aerosol chemistry in polar regions” by R. Sander and J. Bottenheim

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Received and published: 3 December 2012

We thank Kenjiro Toyota for his very detailed and helpful comments. Replies to the suggestions are embedded below.

I have some reservation, however, in that this surely useful material (to the community of polar tropospheric chemistry research — more than several times I did look up in the previous version from Simpson et al.) does not necessarily appear to satisfy the conventional standard of scientific publication or the tentative publication criteria for the Earth System Science Data journal, as this work (categorized as a review paper in conventional sense)

C268

neither provides the critical evaluation of previous measurements, nor does it archive the datasets in digitized forms (but I know it is impossible or at least unreasonably demanding).

We completely agree that adding detailed information about the measurement methods for each data set would improve this compilation a lot. However, as the reviewer already mentions, this would be a tremendous task which is out of the scope for this study. We hope that our manuscript fulfils the criteria of Earth System Science Data, which is specifically dedicated to the publication of data collections, and mentions in their “Aims and Scope” section that “any interpretation of data is outside the scope”.

How each of “measurements” was conducted is not indicated/explained in Tables 4 and 5 (e.g., Cl-atom concentrations were actually not measured but inferred from hydrocarbon concentration ratios, BrO concentrations and/or column densities were measured either remotely by MAX-DOAS and LP-DOAS or in-situ by CIMS at the ground/sea level or from aircrafts). Also, some of the datasets include profile information in the near-surface atmosphere and/or into the free troposphere but not mentioned here explicitly. Simpson et al. (2007), in which the previous version of data compilation tables was included, described these aspects in detail, so it would be useful if the authors could refer to relevant sections in the Simpson et al. paper from Table 4 and 5 or from the main text.

We now briefly mention these methods in the introduction and refer to Simpson et al. (2007) for details.

For ozone data, it may also be useful to add information (in Table 4) as to how the data were acquired, e.g., ozonesonde, surface and aircraft in-situ

C269

measurements, to each entry. That will indicate if the data contain profile information.

To indicate data with vertical profile information, we have added the terms “ozonesondes”, “VCD”, and “SCD” to the measurements of ozone, BrO, and IO.

The World Ozone and Ultraviolet Radiation Data Centre (WOUDC) is particularly relevant to the present work for its comprehensive archive of ozonesonde data from across the world including the polar regions (http://www.woudc.org/index_e.html). This data center should be referred to in Section 3.

Thanks for mentioning this web page, we have added it to Section 3.

The “filterable Br” from Skov et al. (2004) is entered as aerosol data in Table 5 (Page 683), but this data probably represented a mixture of gaseous and aerosol Br as discussed (based on some evidence) in their Experimental Procedure section. In addition, throughout Tables 4 & 5, the entry of “filterable Br” occurs only once by the Skov et al. (2004) data. I wonder if some of the bromine data entered with different names (such as “Br”) in Tables 4 & 5 are actually equivalent to “filterable Br” and therefore represent the mixture of gaseous and aerosol Br (e.g., Barrie and Barrie, 1990).

Yes, many of the measurements listed for aerosol bromine actually refer to “filterable Br” which may also include gaseous Br. We have added a general remark as a footnote.

shouldn't you include “filterable Br” from the Barrie et al. (1988) Nature paper in Tables 4 and/or 5?

C270

Yes, of course. It has been added.

*Kelly (1973)
Yurganov (1990)
Hirdman et al. (2009)
McElroy et al. (1999)
Wagner et al. (2001)
Wagner et al. (2007)
Yokouchi et al. (1996)
Staebler et al. (1999)
Virkkula et al. (1999)*

We apologize that we missed these references so far. They have all been added now.

P586, L20-22: In the present paper, have you simply expanded data compilation by including those published after 2007? It looks like you have added some datasets published before 2007 but missing in the previous version of data compilation from Simpson et al. (2007).

Yes, while adding publications after 2007, we also discovered several additional papers from before 2007 that were missing in the supplement of Simpson et al. (2007). This is now mentioned in the text.

P589: “... several web sites providing large data sets.” This statement perhaps needs to be adjusted because, among the websites listed, the AMAP does not provide/archive observational datasets within itself, does it? Can you be a bit more specific about what type of information or chemicals (mercury, black carbon, etc?) we may find from AMAP's scientific reports?

C271

Indeed, the AMAP web page provides only reports but no data sets. Therefore, we have remove it from the list.

P589, L14: As far as I can look up by using their search tool, the WDCA does seem to archive some aerosol chemistry datasets as it claims, although at the moment only from outside the polar region. Is this data center mainly archiving physical and optical kind of datasets?

Yes, most of the data is physical and optical. However, there is also limited chemical data, e.g. aerosol chloride and more from Zeppelin mountain. Thus we prefer to keep the link in the list.

P589, L24: Is this website at Grenoble still active? I tried to browse it on a few different occasions and failed all the time. And again, can you expand on what type of chemical measurements we may find from this website?

The web site from Michel Legrand contains aerosol data for Concordia and Dumont d'Urville. Apparently, the site was recently restructured. The following link still works: <http://www-igge.obs.ujf-grenoble.fr/CESOA/>

P590, L6-8: The EMEP website also provides aerosol chemistry data (SO4 etc) from Zeppelin. I found these aerosol data very useful for my own model evaluation.

Thanks for mentioning this. We have added "aerosol chemistry" to the description.

P636, Table 4: Anlauf et al. (1994) reported surface ozone measurements at Alert Baseline Observatory (what is now GAW site perhaps, at 210 m C272

a.s.l.) and at the Special Studies Laboratory nearby (at 200 m a.s.l.) and ozone profiles obtained by ozonesonde launches from the Alert (Canadian Air Force?) base (perhaps at 60 m a.s.l.).

We added a footnote mentioning that measurements at two sites near Alert and vertical profiles are presented by Anlauf et al. (1994).

P638 & P665, Table 4: In addition to in-situ O3 measurements from the Special Studies Trailer (SST) at ca. 190 m a.s.l. near the Alert GAW observatory (at ca. 210 m a.s.l.), the Morin et al. (2005) GRL paper presented in-situ O3 and MAX-DOAS BrO measurements from the "Out On The Ice" (OOTI) site on the Arctic Ocean sea ice, ca. 5 km off the coast of Canadian Forces Station at Alert. The OOTI site (ca. 0 m a.s.l.) should be distinguished from the Alert GAW site, as is done already for SWAN ice floe camp (SW) and Narwhal ice floe camp (NW).

We added a footnote mentioning the OOTI measurements. We do not want to include this OOTI site in Tab. 1 because the OOTI sled has been used at different locations.

Possible typos (suggested changes)

P587, L4: Hemisphere -> Hemispheres

P632, Table 1: gaseous elemental mercury

P683, footnote: 83 and 740 pg m-3(STP), respectively (check also footnotes in P692 & P701)

P695, Table 5: Add a horizontal line between Fe and Ga.

P702, Table 5: Add a horizontal line between Sr and Ti.

All typos were corrected.