

Interactive comment on “The spatial scale of ozone depletion events derived from an autonomous surface ozone network in coastal Antarctica” by A. E. Jones et al.

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The authors describe first results of a network of autonomous stations around the Weddell Sea to measure year-round surface ozone. They summarize results from the network together with observations from three further manned stations for the period August to November 2008 to study so-called ozone depletion events caused by active halogen (especially bromine) chemistry leading to efficient chemical destruction of tropospheric ozone regularly observed during springtime in both polar regions. During the observational period two events with low ozone concentrations detected simultaneously at many stations were encountered and analyzed in detail (including mesoscale

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meteorology from re-analysis data and tropospheric BrO vertical columns from satellite data). The authors conclude that air masses containing low ozone originate over the Weddell Sea and that the largest observed ozone depletion extended over an area of almost 200000 km² reaching a height of more than 500 m from the surface. These results constitute for the first time concerted measurements of ozone over an extended area in Antarctica. In an unprecedented way they clearly indicate the spatial extent of ozone depletion in Antarctica. The presented observations demonstrate that the chemical processing causing the destruction of tropospheric ozone happens over the sea ice-covered are of the Weddell Sea similar to processes over the Arctic Ocean. The study represents an important step forward with respect to our understanding of ODEs in Antarctica. It is a well-written manuscript describing clearly the major results and findings of the authors. It should be published in ACP after some minor revisions related to the comments below.

Minor and technical comments:

Throughout the text the authors use “h” instead of “hour”. I find this a bit awkward.

P. 27558, l. 4: Better “sea salt” instead of “salinity”?

P. 27558, l. 5: Better “source” instead of “mechanism”? In my opinion the chemical mechanism at least related to bromine chemistry is quite clear. The uncertainty is rather related to the exact source.

P. 27559, l. 9: Aren't such flights rather “non-existent” than “extremely rare”?

P. 27560, Technical/Instrumentations I find the estimated accuracy of 0.5 ppbV and detection limit of 1 ppbV for the 1-min averages of the dual-cell instruments surprising. I believe that with the given instruments such values can only be reached with 10-min averages. Furthermore, they only present the manufacturer's specification for the 2B Technologies instruments. I assume that under the harsh conditions in Antarctica the performance of the instruments was worse. It would be good to add an estimate for

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these instruments, too. I am also quite surprised by the assumption of a warm-up time of only 3 minutes for the 2B Technologies instruments. Has this been tested? What about zero and span measurements for the 2B Technologies instruments? In summary, I guess that the authors are very optimistic regarding the performance of the instruments and I recommend stating more clearly the uncertainties in the measurements. Nevertheless, I am convinced that this would have no impact on the results and conclusion because the observed depletions of ozone are in any case stronger than the instrument uncertainties. It remains unclear if the authors use 1-min average in the figures and for further analysis. Only the title of figure 10 indicates that 10-min averages are shown. This should be clarified. Final point: Did the authors screen the data or remove parts concerning local pollution at the permanent stations? This should also be stated.

P. 27565: I find it surprising that with such high BrO vertical columns the ozone is not completely destroyed. Later on the authors mention that the BrO may be present in higher layers. On the other hand, the results from sites B and C reported on p. 27567f indicate that at least in this case the observed BrO resided below 1000 m altitude. Maybe that should be discussed here as well.

P. 27567, l. 9: Better “sea ice” than “coast”?

P. 27567, l. 26: How is the “amount of ozone depletion” (also used on p. 27568, l. 11) defined? How the “ozone loss” used in the titles of tables 2 and 3? Is it the same as “ozone anomaly” used earlier in the manuscript? If yes, the same term should be used.

P. 27568, l. 20: Better “area” than “square kilometers”?

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 27555, 2012.

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