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Atmospheric Chemistry and Physics Discussions

Interactive comment on "BrO, blizzards, and drivers of polar tropospheric ozone depletion events" *by* A. E. Jones et al.

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First concern: whether the BrO has been transported or evolved in situ. This concern can be tackled in two ways. 1) The section discussing the satellite BrO observations of October 8th (page 8913) is not linked to any ozone observations. It is simply looking for a consistency between the met and the BrO, and probing whether the wind fields would allow transport of BrO over sufficiently large distances to account for the satellite images. The answer is that they can't. 2) The reviewer raises the issue of the ODE over Halley observed at high wind speeds. We assume s/he refers to the event of October 9th. In order to understand the origins of the air measured at Halley (i.e. the surface ozone measurements) we presented back-trajectories that showed the path of the air prior to being sampled at Halley (Fig 4). The air that was low in ozone clearly

originated over the Weddell Sea, in the same region (in terms of lat/lon) as the BrO cloud. The only way in which these two trace gases could have avoided each other would be if there was a very large difference in their vertical profile. Although we cannot explicitly rule this out from the data presented here, we feel it is highly unlikely – after all, something destroyed the ozone, and the air mass did originate over the Weddell Sea where the satellite suggests BrO was present. However, we note the reviewers concerns and have re-worded to clarify that these ideas are still open to question, as indeed, is laid out already in the final stage of the discussion section.

Second concern: We believe that it is, up to a point, possible to generalise from this single event. Although it is rare to observe a BrO cloud over Halley station, there are ample examples within the GOME and SCIAMACHY data. There is also a wealth of information about meteorological conditions associated with BrO clouds available from reanalysis data (NCEP, ECMWF etc). Theory into conditions associated with blowing snow provides additional input. What is rare is to find the opportunity to bring the disparate threads of information together to see if they hold a robust story when scrutinised by ground-thruthing. That is what we have aimed to do in this paper. However, we note the reviewers concerns and have re-worded as outlined above to clarify that these ideas are still open to question, as indeed, is laid out already in the final stage of the discussion section.

Trajectories: No systematic study of satellite images and back trajectories has been done for Halley in the way the reviewer has in mind, and any attempt to do so should be done carefully and methodically (more the scope for a further publication). An earlier study (Jones et al., 2006) used back trajectories to trace air mass paths en route to Halley. These were only used in appropriate cases where partial depletion attributable to local halogen sources was apparent. The same study reported ODEs where depletion was complete – these were attributed to transport. With regards the earlier event mentioned in the current paper, occurring on October 7th, this was a transport event, as is evident from the fact that it arrived at Halley swiftly and shortly after midnight. For

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such an event one would not expect an association with BrO.

Technical note: page 8913, line 22, “let’s” has now been amended to “we”.

The heading “Conclusions” has now been amended to “Summary and conclusions” as we have added further thoughts into this section.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 8903, 2009.