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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Vertical structure of Antarctic tropospheric ozone depletion events: characteristics and broader implications" *by* A. E. Jones et al.

Anonymous Referee #3

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The manuscript 'Vertical structure of Antarctic tropospheric ozone depletion events: characteristics and broader implications' by Jones et al. investigates the vertical extend of ODEs in the Antarctic based on measurements made by free flying ozonesondes and by tethersondes accompanied by sodar measurements providing detailed information on the physical structure of the boundary layer. The tethersonde observations revealed that the ODEs observed under low wind speed conditions were often confined within a very shallow layer (between 10 and 40m), and appear to be locally driven and without any wider atmospheric implications. The ozonesonde record was investigated for ODEs at altitudes > 1km and the authors found that in every case the 'high altitude' depletion was preceded by an atmospheric low pressure system. In this context,

the authors also discuss previously published studies based on observations made at two more Antarctic stations (Neumayer and Arrival Heights). The authors suggest that in Antarctica such depressions are responsible for driving high altitude ODEs and for generating large-scale BrO clouds as observed from satellites.

The manuscript is well written, the results are clearly presented and the content is well suited for ACP and should be published after consideration of some minor suggestions.

Specific comments:

P8190, L15-20: The discussion presented here regarding a strong association between enhanced BrO and atmospheric low pressure systems is definitely very interesting and timely. There are currently a lot of ongoing discussions in the community about the influence of tropopause height on total column BrO and if the observed enhancement of total column BrO measured by satellites is partly due to stratospheric origin caused by a low altitude tropopause (caused by low surface pressure). If this stratospheric entry to the total column is not properly taken into account than this will lead to an overestimation of the extent of enhanced tropospheric BrO by associating satellite BrO 'hotspots' with local surface emission of bromine. This needs to be taken into account and discussed by the authors before they can proceed with their conclusions.

P8192, L19: In my experience, the vertical resolution of ozonesonde measurements is clearly better than 100m; can the authors please elaborate where they obtained this limit from?

P8205, L4: '. . . with a large number of ODEs probed . . .' I would suggest to drop the 'large', since the number of ODEs investigated here is 5 and 'large' seems to be a bit of an overstatement.

P8205, L5-7: I disagree with the statement that ozonesondes are 'essentially blind' over the lowest few hundred meters. This is not true! See also Fig 9 of this manuscript.

P8207, L19: wording is somewhat unclear and 'transparent to surface ozone measure-

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ments' should be replaced with 'unattainable by surface measurements'.

P8209, L11: should explain that '10-m wind vectors' are measured at a height of 10m above ground.

P8212, L14-15: The authors should also consider/discuss the possibility that the ODEs observed under low pressure system conditions could have been - at least in part - caused by increased transport of ozone depleted air masses from the sea ice zone to Halley rather than to allocate it solely due to an enhancement in BrO caused by saline blowing snow lofted into the troposphere.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 8189, 2010.