

## ***Interactive comment on “LIMS observations of lower stratospheric ozone in the southern polar springtime of 1978” by Ellis Remsberg et al.***

**Anonymous Referee #1**

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### GENERAL COMMENTS

First, it is great to see that 'old' data such as those obtained from LIMS are still be re-worked and used in analyses. Previous analyses, based on chemistry-climate models (e.g. Langematz et al...), have shown that ozone destruction through heterogeneous halogen-catalysed chemical reactions was occurring over Antarctica well before 1980 which is often (erroneously) considered as when Antarctic ozone depletion started and which is why many studies consider a 'return to 1980 values' as indicative of a recovery of the ozone layer over Antarctica from the effects of ozone depleting substances. This is one of the few papers to provide observational evidence of halogen-catalysed ozone depletion occurring over Antarctica prior to 1980. I think that this point should be made more strongly in the paper. It is made, almost in passing, around line 162 but I believe

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it should be highlighted in the abstract.

### SPECIFIC COMMENTS

Figure 1: I wonder whether this is an older version of the TCO distribution from TOMS on 1 November 1978? It looks different to the file I have on my computer. Sure enough, when I go and download the raw data file from GSFC, here is the header:

Day: 305 Nov 1, 1978 Production V70 NIMBUS-7/TOMS OZONE Asc LECT: 11:49 AM Longitudes: 288 bins centered on 179.375 W to 179.375 E (1.25 degree steps) Latitudes : 180 bins centered on 89.5 S to 89.5 N (1.00 degree steps)

and here is the data line for 45.5°S:

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3563573563493543543543513553613623603573543513503453453453463433453523523
3573553533543573643723803863943973953963973973983983883783813813833843833
383378387383377376 0360364364363351343336338341342344350350351 0 0 0 0
0 0 0 0353353354355358358359363358356361370372371366367365364359360359
357358364362361363365364364365366366 0 0 0 0 0 0 0368368368365363
3593583573533573513563533503473453483453463453443413473473533563543533473
3433363343333413443473533563673723793914114224184094054144043943763653543
3393363293233233173183213233213223183143102962973063103183233263353433493
3543583693733743773743713623553423393343243113063073103093163173253343373
3373303253223203153153183213243233213173143143153173163183213223223233233
328330333332332339340340 0 0359366367376377382383388392400407384360353
346346348347332329335338343343351347 lat = -45.5
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it shows some missing data but not as much as is apparent in your Figure 1 and certainly no data missing just west of the international date line. So why the discrepancy between the TCO field shown in your Figure 1 and the TOMS data stored on the GSFC server?

Line 40: You state that 'Minimum polar ozone is of the order of 250 Dobson units (DU)

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at (75°S, 270°E) on this day'. When I go and look at the actual TOMS data file for that day at 74.5°S and 75.5°S at 270°E (which is 90°W; cell number 72 in TOMS-world) I see values in excess of 400 DU. These are quite different to the value of 250 DU that you are reporting here. What is the source of this difference? Perhaps you mean 90°E, but even then the lowest ozone value is 270 DU.

Lines 82-83: When you say that 'We note that daily plots of GPH are also available from LIMS V6' do you mean that LIMS also retrieves temperature and pressure profiles from which GPH fields are calculated? or do you mean that GPH fields are provided (from some other source) along with the LIMS data? If the latter, can you please describe the source of those GPH fields. Thank you.

Lines 93-95: You may also find the following paper relevant and of interest: Hassler, B., G. E. Bodeker, S. Solomon, and P. J. Young (2011), Changes in the polar vortex: Effects on Antarctic total ozone observations at various stations, *Geophysical Research Letters*, 38, L01805, doi:01810.01029/02010GL045542.

Line 101: I would suggest replacing 'is now in terms of partial pressure' with 'is now presented in units of partial pressure'.

Line 107: Are formally derived uncertainties on the LIMS measurements available? If so they should be quoted here.

Line 117: For clarity I suggest replacing 'for it' with 'for indication of denitrification'.

Line 128: I always thought that the chlorine activation threshold on PSCs was 195K not 193K?

Line 147: It was not clear to me what was meant by 'remains good'? Can you please describe that more specifically.

Line 149: By 'lowest heights' to you mean 'lowest amplitudes' of the wave-1?

Line 272: Would it not be better here to state that  $1\text{DU} = 2.687 \times 10^{20} \text{ molecules/m}^2$

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#### GRAMMAR AND TYPOGRAPHICAL ERRORS

Line 105: 59.5°S not just 59.5°

Line 109: Should this be 'ozonesonde' rather than just 'sonde'?

Line 127: Replace 'no colder than' with 'no lower than'. I was always taught 'the air is cold - temperatures are low'. There can be no more a cold temperature than a heavy temperature.

Line 144: Replace 'lowest species values' with 'lowest species concentrations' and again on line 147.

Line 170: Replace 'ECC ozone' with 'ECC ozonesonde ozone'.

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Interactive comment on *Atmos. Chem. Phys. Discuss.*, <https://doi.org/10.5194/acp-2019-1086>, 2019.

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