

# ***Interactive comment on “Representativeness of single lidar stations for zonally averaged ozone profiles, their trends and attribution to proxies” by Christos Zerefos et al.***

**Anonymous Referee #2**

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This paper uses correlations and trends to examine the similarities between ground-based lidar measurements of ozone profiles with SBUV observations in order to assess the representativeness of the ground stations of zonal and global behaviour. The work is interesting and suitable for publication in ACP; however, as pointed out by the other reviewer, several topics require more detailed explanation. As well, it seems that work could provide a more quantitative assessment of the representativeness of the ground stations. As it stands, the conclusions are vague. I would challenge the authors to consider pushing the analysis to provide better quantification of this representativeness. For example the correlations in Figs 3-6 are interesting and could be presented in a more condensed fashion that would provide some actual numbers about the geophys-

ical behaviour. In addition to this, the following minor comments should be addressed.

Section 3: It is not clear how the reduced vertical structure in the correlation for monthly means shows that the decreased correlation above 35 is due to instrumental differences. Purely random variability would also average out in the means and increase the correlation. As requested by the other reviewer, please provide details on how all these correlation calculations are performed so that the analysis is repeatable. Also, the role of atmospheric variability is important here and should be discussed in detail, e.g. the strength of the QBO in altitude and latitude has a very strong and predictable effect on correlations.

Section 4.1: How is the tropopause pressure term “filtered”? Also, the GloSSAC data set would be a much better choice for the AOD and would not require artificial extension of the end of the ozone data record (Thomason, et al.: A global, space-based stratospheric aerosol climatology: 1979 to 2016, *Earth Syst. Sci. Data Discuss.*, <https://doi.org/10.5194/essd-2017-91>, 2017.)

Section 4.2: The large difference in contribution from AOD between lidars and SBUV at the highest altitudes should be noted and explained if possible. This sweeping statement (on line 250 page 7) “Together with the correlations shown in the previous section, this means that ground-based instruments at single stations can provide representative information about ozone trends (EESC) and ozone variations related to the QBO, the solar cycle, ENSO, as well as large scale circulation variations described by AO or AAO” really needs quantification, i.e. to what degree, what “information”, over what scale? And on line 260, the major contribution from AOD is highly limited to the two strong eruption time periods.

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Interactive comment on *Atmos. Chem. Phys. Discuss.*, <https://doi.org/10.5194/acp-2017-1040>, 2017.

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