Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2019-1042-RC3, 2020

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Year-round record of near-surface ozone and "O_3 enhancement events" (OEEs) at Dome A, East Antarctica" *by* Minghu Ding et al.

Anonymous Referee #1

Received and published: 9 March 2020

I agree with most of the comments and criticism that has been voiced already by the two other reviewers. This manuscript presents surface ozone data from a badly under-sampled region on Earth. This makes me wish to eventually see this work published. However, the experimental description, and the data presentation and interpretation, as well as the writing of the manuscript need substantial additional work before it meets my expectation for peer-reviewed publication. Below are some specific comments in addition to the points already raised by the two other reviewers.

Line 20: Clarify which data go with which station. Reduce significant figures of the averaged results here and in remainder of the text. Explain what the error margins are

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Discussion paper

(e.g. 1-sigma variability of hourly data?).

Line 47: Define NOx when it's mentioned for the first time.

Line 64: There are further publications that should be considered in the discussion of ozone chemistry in Antarctica: [Bauguitte et al., 2011; Davis et al., 2004; Davis et al., 2008; Helmig et al., 2008a; Helmig et al., 2008b; Neff et al., 2008; Oltmans et al., 2008]

Line 111: The 2B ozone monitor does not quite reach the analytical accuracy and precision of regular benchtop ozone analyzers. It can also have quite some sensitivity drifts over time. The performance of the analyzers should be presented in more detail. Calibration results/graphs should be provided as Supplemental Material.

Line 117: Please provide more information on the reference ozone monitor. This is not a commonly recognized instrument.

Line 125: Give credit, possibly offer co-authorship to the P.I.s and agencies that produced the data from South Pole.

Line 131: What caused the loss of data coverage at Kunlun Station?

Line 155: Define 'PM'.

Line 176: 'Concentration' is the wrong term as ozone data are presented as molar ratio, not as concentration.

Line 179: Specify if you mean average, median, or ? higher mole fractions.

Line 182: Define the polar day and night windows by day of year margins.

Line 189: I found this whole section hard to read and comprehend.

Line 219: Same here. What do you actually mean by 'diurnal variability'?

Line 224: How can you state that the diurnal concentration fluctuated greatly if the standard deviation is just 0.7 ppb?

Line 244: There is a rich body of more recent ozone snow photochemistry literature that should be considered in this discussion as well.

Line 422: The Neff et al., 2008, paper is about South Pole.

Line 430-432: I have been wondering about this all along reading this manuscript. Is this SST discussion even worth the effort given these pretty obvious limitations?

Line 436-437: Absolutely not acceptable. Quality-controlled final data should be made available in a well-recognized public data archive.

Line 636: I would prefer defining the time windows by day of year. There is no diurnal radiation or temperature cycle at South Pole. How do the authors explain the diurnal behavior seen in the ozone 'on a normal day'?

Line 639: Explain abbreviations in the graphs in the figure legend.

Line 640: I would expect the annual frequency results to be much smaller than the monthly results. How can they be this similar?

Line 643: Trajectory colors are hard to differentiate.

Line 649: Harmonize time stamps between figures.

Line 656: What are you trying to show with this figure? I don't really see a convincing dependency?

References

Bauguitte, S. J. B., N. Brough, M. M. Frey, A. E. Jones, D. J. Maxfield, H. K. Roscoe, M. C. Rose, and E. W. Wolff (2011), A network of autonomous surface ozone monitors in Antarctica: technical description and first results, Atmospheric Measurement Techniques, 4(4), 645-658, doi:10.5194/amt-4-645-2011.

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tors controlling variability and absolute levels, Atmospheric Environment, 38(32), 5375-5388.

Davis, D. D., et al. (2008), A reassessment of Antarctic plateau reactive nitrogen based on ANTCI 2003 airborne and ground based measurements, Atmospheric Environment, 42(12), 2831-2848.

Helmig, D., B. Johnson, S. J. Oltmans, W. Neff, F. Eisele, and D. D. Davis (2008a), Elevated ozone in the boundary layer at South Pole, Atmospheric Environment, 42(12), 2788-2803, doi:10.1016/j.atmosenv.2006.12.032.

Helmig, D., B. J. Johnson, M. Warshawsky, T. Morse, W. D. Neff, F. Eisele, and D. D. Davis (2008b), Nitric oxide in the boundary-layer at South Pole during the Antarctic Tropospheric Chemistry Investigation (ANTCI), Atmospheric Environment, 42(12), 2817-2830.

Neff, W., D. Helmig, A. Grachev, and D. Davis (2008), A study of boundary layer behavior associated with high NO concentrations at the South Pole using a minisodar, tethered balloon, and sonic anemometer, Atmospheric Environment, 42(12), 2762-2779.

Oltmans, S., B. J. Johnson, and D. Helmig (2008), Episodes of high surface-ozone amounts at South Pole during summer and their impact on the long-term surface-ozone variation, Atmospheric Environment, 42, 2804-2816.

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