Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2017-778-RC2, 2017

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Climatology and long-term evolution of ozone and carbon monoxide in the UTLS at northern mid-latitudes, as seen by IAGOS from 1995 to 2013" *by* Yann Cohen et al.

Anonymous Referee #2

Received and published: 28 October 2017

Review of Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2017-778

Cohen et al., Climatology and long-term evolution of ozone and carbon monoxide in the UTLS at northern mid-latitudes, as seen by IAGOS from 1995 to 2013

This paper presents a decadal scale record of ozone and carbon monoxide measurements that is used in the Tropospheric Ozone Assessment Report (TOAR) and will be critical in the evaluation of chemistry climate models that require accurate atmospheric composition for understanding emissions, chemistry, transport and radiative forcing. I

Printer-friendly version

Discussion paper

think the basic methods for climatology and trend analysis are sound. I agree with Referee #1 that more science motivation could be added to the paper and would require only minor revisions.

Regarding O3 trends and sources of variability, the following references could be included:

Lin, M., A. M. Fiore, L. W. Horowitz, A. O. Langford, S. J. Oltmans, D. Tarasick, and H. E. Rieder (2015a), Climate variability modulates western U.S. ozone air quality in spring via deep stratospheric intrusions, Nature Communications, 6 (7105), doi: 10.1038/ncomms8105.

Lin, M., W. Horowitz, R. Payton, A.M. Fiore, G. Tonnesen (2017). US surface ozone trends and extremes from 1980 to 2014: Quantifying the roles of rising Asian emissions, domestic controls, wildfires, and climate. Atmos. Chem. Phys., doi:10.5194/acp-17-2943-2017

Wespes, C., D. Hurtmans, C. Clerbaux, and P.-F. Coheur (2017), O3 variability in the troposphere as observed by IASI over 2008–2016âĂŤContribution of atmospheric chemistry and dynamics, J. Geophys. Res. Atmos., 122, 2429–2451, doi:10.1002/2016JD025875.

Specific comments:

P1, Line 15: Since trends were only computed for the northern mid-latitudes, perhaps this should say: "...to derive trends in the northern mid-latitude UTLS"

P2, Line 20: "It is also important for enhancing the knowledge about the role of O3 in the increasing atmospheric radiative forcing." CO emissions also contribute to increasing RF. Maybe say: "Trends in both gases are also important for assessing changes in atmospheric radiative forcing."

P5, Line 15: Define TOAR acronym

P5, Line 25: Do you ever find double tropopause cases? If so, are these included or filtered out? These can be very common (50-70%) in winter in the N. Midlatitudes [Randel et al., JGR, 2007: doi:10.1029/2006JD007904], but they might be hard to detect with 1°x1° PV.

P7, Line 1: It would be helpful to say that a 95% confidence level corresponds to trends that are > 2-sigma.

P9, Line 19: warm conveyor belts = WCBs?

P12, Line 10: "The discrepancies with the IAGOS climatologies can be due to uncertainties involving the stratospheric signal, i.e. the ozone stratospheric column, the height of the tropopause, and the total ozone column" I don't understand why "total column ozone" is in this list. Don't you mean the differences between the full tropospheric column and only the UT column?

P12, Line 25: "Except for India where few summertime IAGOS data do not allow the comparison" Are there less flights in summer? Should be changed to "Except for India where summertime IAGOS data is limited due to [explanation]

P29,32 Figs 14,15,16,17 caption should state that bars with faded colors (and no error bars) did not have significant trends.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2017-778, 2017.

Printer-friendly version

Discussion paper