Atmos. Chem. Phys. Discuss., 13, C2686–C2688, 2013
www.atmos-chem-phys-discuss.net/13/C2686/2013/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Global ozone–CO correlations from OMI and AIRS: constraints on tropospheric ozone sources" *by* P. S. Kim et al.

Anonymous Referee #1

Received and published: 23 May 2013

I found this manuscript to be well-written, quite clear in its objectives, and it focuses on a topic that is relevant to ACP. I have a couple of major concerns that the authors should address, after which the paper could be suitable for publication in ACP.

My major concern regards the accuracy of the satellite derived ozone/CO correlations and slopes. The authors point to previous studies that show that OMI ozone and AIRS CO agree reasonably well with observations and that the authors have corrected the OMI and AIRS products according to the reported biases. But we all know that globally, or hemispheircally averaged biases mask much larger biases in various regions of the world. Furthermore it seems likely, given the different retrieval algorithms and different ozone and CO sources, that regions with larger than average errors in ozone and CO will result in even greater errors once the two products are used to calculate ozone

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

and CO relationships. The paper has no verification of the satellite derived ozone/CO relationships with observations, which makes me doubt the validity of the study. Fortunately there is a wealth of freely available in situ ozone and CO vertical profiles from the MOZAIC program (http://www.iagos.fr/web/). During 2006-2008 there were ~80 profiles per month at Frankfurt, ~30 per month at Windhoek, Namibia, and ~15 per month at New York and Atlanta. It would be a very straight forward exercise to download these profiles and compare the measured ozone/CO relationships to the retrievals and model. Only then can the authors indicate the accuracy of the retrieved ozone/CO relationships.

One more fairly major comment: Figure 1. What is the explanation for the very sharp gradients in ozone and CO along the US west coast? I can understand how such features would be notable at the surface but these plots are for the mid-troposphere. Furthermore the western US is rarely influenced by deep convection (see figure 9 of Schumann and Huntrieser, Atmos. Chem. Phys., 7, 3823–3907, 2009) so how is this sharp gradient maintained in an area with strong winds blowing in from the Pacific? Even more strange are the greater ozone values above the eastern Pacific than above the western US. While there is offshore flow of US pollution in the lower troposphere, the flow in the mid-troposphere should be from the ocean to the land. This seems to me to be a retrieval artifact, perhaps due to terrain or clouds.

Minor comments:

Page 8903 line 1 Should also include CH4 as an ozone precursor

Page 8903 first paragraph Need one or two general references that describe why ozone is an important trace gas.

Page 8905 line 19 What is meant by co-adding?

Page 8907-8908 For each emission inventory please state the year for which each inventory is valid. What about ship emissions?

ACPD

13, C2686–C2688, 2013

Page 8910 line 1 Should be: "...where data are available ..."

Page 8910 line 11 Should be: "Ozone features include the well-known..."

Page 8919 line 3 I am surprised that GEOS-Chem underestimates Asian CO when a recent paper by Helen Worden shows that lower trop. CO is actually decreasing in east Asia: Decadal record of satellite carbon monoxide observations Author(s): Worden, H. M.; Deeter, M. N.; Frankenberg, C.; et al. Source: ATMOSPHERIC CHEMISTRY AND PHYSICS Volume: 13 Issue: 2 Pages: 837-850 DOI: 10.5194/acp-13-837-2013 Published: 2013

When referencing papers that discuss mixing between polluted and stratospheric air, the following was the first: Mixing of anthropogenic pollution with stratospheric ozone: A case study from the North Atlantic wintertime troposphere Author(s): Parrish, DD; Holloway, JS; Jakoubek, R; et al. Source: JOURNAL OF GEOPHYSICAL RESEARCH-ATMOSPHERES Volume: 105 Issue: D19 Pages: 24363-24374 DOI: 10.1029/2000JD900291 Published: OCT 16 2000

Figure 3 What is the pressure level range for this figure? 700-400 hPa?

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 8901, 2013.