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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The effects of global change upon United States air quality" *by* R. Gonzalez-Abraham et al.

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We would like to thank Meiyun Lin for her thoughtful comments: Te response is below and the revised version of the manuscript is attached.

Comment:

Lin et al (2012a, JGR) has demonstrated the impact of Asian pollution on high-ozone events in Western U.S. surface air, with implications for attaining a more stringent U.S. ozone air quality standard. You might want to add their findings to your literature review. Related to Asian influence, Lin et al (2014, Nature Geoscience) demonstrated the important role of climate variability and circulation changes on the long-range transport of Asian pollution across the North Pacific. The extent to which changes in atmospheric

circulation under future climate scenarios as represented in your models affect variability in the long-range transport of Asian pollution towards the U.S. west coast? I think it would make your paper stronger if you can clearly discuss the above points. Lin, M., A. M. Fiore, L. W. Horowitz, O. R. Cooper, V. Naik, J. Holloway, B. J. Johnson, A. M. Middlebrook, S. J. Oltmans, I. B. Pollack, T. B. Ryerson, J. X. Warner, C. Wiedinmyer, J. Wilson, B. Wyman (2012a): Transport of Asian ozone pollution into surface air over the western United States in spring, Journal of Geophysical Research,117, D00V07, 2012, doi:10.1029/2011JD016961 Lin, M., L.W. Horowitz, S. J. Oltmans, A. M. Fiore, Songmiao Fan (2014): Tropospheric ozone trends at Manna Loa Observatory tied to decadal climate variability, Nature Geoscience, 7, 136-143, doi:10.1038/NGEO2066. 2.

Response:

Lin et al. (2012a, JGR) has been added to the literature review. However, due to the episodic nature of the influence of Asian emissions on U.S. air quality, and the fact that we modeled only five years for each time period, our modeling framework cannot capture changes in interannual variability of long-range transport of Asian emissions.

Comment:

A few studies have noted strong stratospheric influence on western U.S. surface ozone during spring (Langford et al., 2009; Lin et al., 2012b; Langford et al.,2014). Other work has suggested the possible increase of ozone STE in a warming climate (e.g. Hegglin et al., Nature Geosci). You might want to discuss these papers in the Introduction and clarify how your modeling framework represents the stratosphere-to-troposphere ozone transport. If the STE is not represented in your model, you need to clearly state this limitation. Langford, A. O., Aikin, K. C., Eubank, C. S. Williams, E. J. Stratospheric contribution to high surface ozone in Colorado during springtime. Geophys. Res. Lett. 36, L12801 (2009). Lin M., A. M. Fiore , O. R. Cooper , L. W. Horowitz , A. O. Langford , Hiram Levy II , B. J. Johnson , V. Naik , S. J. Oltmans , C. Senff (2012b):

Springtime high surface ozone events over the western United States: Quantifying the role of stratospheric intrusions, Journal of Geophysical Research, 117, D00V22, doi:10.1029/2012JD018151 Langford, A.O., C.J. Senff, R.J. Alvarez II, J. Brioude, O.R. Cooper, J.S. Holloway, M.Y. Lin, R.D. Marchbanks, R.B. Pierce, S.P. Sandberg, A.M. Weickmann , E.J. Williams. An overview of the 2013 Las Vegas Ozone Study (LVOS): Impact of stratospheric intrusions and long-range transport on surface air quality. Atmos. Environ, doi:10.1016/j.atmosenv.2014.08.040, 2014

Response:

CMAQ uses a no-flux vertical boundary condition at the top of the model, and does not simulate stratosphere-troposphere exchange of ozone. STE is particularly important during intrusion events, which occur most often during the spring (Lin et al., 2012b), while the present manuscript is focused on summer seasonal averages of DM8O

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/14/C13396/2015/acpd-14-C13396-2015-supplement.pdf

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 31843, 2014.