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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Tropospheric Ozone Seasonal and Long-term Variability as seen by lidar and surface measurements at the JPL-Table Mountain Facility, California" *by* M. J. Granados-Muñoz and T. Leblanc

M. J. Granados-Muñoz and T. Leblanc

mamunoz@jpl.nasa.gov

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We would like to thank Dr Meiyun Lin for her comments and suggestions. Please, find below the detailed responses.

Comments: 1. Line 80-85: The discussions on the drivers of tropospheric ozone variability are somewhat incomplete. Please consider adding a few sentences to describe the role of climate variability and associated changes in atmospheric circulation patterns in contributing to tropospheric ozone interannual variability and decadal trends, as found in the 40-year ozone record at Mauna Loa Observatory in Hawaii (Lin et al.,

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Discussion paper

2014, Nature Gescience).

Meiyun Lin, 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. In the Introduction section, you might also want to add a few overview sentences on the key role of tropopause folds on interannual variability of free tropospheric and surface ozone over the western US (e.g. Lin et al., 2015a, Nature Communications) The literature review will help in placing your Results Sections 3.2 and 3.3. into context.

Response:

The following sentences have been added to the introduction:

"Additional factors that have been observed to influence tropospheric ozone variability are climate variability and related global circulation patterns such as ENSO or PDO (e.g. Lin et al., 2014; 2015a; Neu et al., 2014). Tropopause folds also play a key role on tropospheric ozone interannual variability, as they influence the ozone budget in the troposphere and can even affect air quality near the surface (e.g. Lin et al., 2015a Brown-Steiner and Hess, 2011; Langford et al., 2012)."

Comments:

3. Line 490-493: Regarding the influence of sampling biases on calculated ozone trends, it seems like that you are discussing the results from Lin et al. (2015b, GRL). But the paper is not included in the list of references.

Meiyun Lin, L.W. Horowitz, O.R. Cooper, D. Tarasick, S. Conley, L.T. Iraci, B. Johnson, T. Leblanc, I. Petropavlovskikh, E.L. Yates (2015): Revisiting the evidence of increasing springtime ozone mixing ratios in the free troposphere over western North America, Geophysical Research Letter, 42, doi:10.1002/2015GL065311

Response:

The paper was missing from the reference list. It is now included.

Comment: 4. Line 500-503: Discussions here are somewhat awkward. Are you talking about long-term trends or seasonal variability? I don't believe anyone has suggested that the negative trends (if any) in wintertime ozone over the western US are due to a decrease in background ozone.

Response: Discussion refers to long term trends. Negative trends were observed at some stations in Cooper et al., (2012) during wintertime, even though most of them were not significant. A significant negative trend is also observed for the median values in this study from 4 up to 10 km during wintertime. The comment on the background ozone decrease has been removed considering all the comments in this respect.

Comment: 5. Line 510: None of the cited references has explicitly discussed the influence from stratospheric intrusions. You should cite other more relevant papers.

Response: The studies by Cooper et al., 2010 and Parrish et al., 2009, provide information about the different regional behavior observed between the western and the eastern US regarding ozone trends. These studies explain the causes for this difference, including both the Asian transport and stratospheric influence affecting predominantly the Western region. References Lin et al., (2012a; 2015a) and Lefohn et al., (2011; 2012) have been included for completeness.

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