

## ***Interactive comment on “Tropospheric column ozone response to ENSO in GEOS-5 assimilation of OMI and MLS ozone data” by M. A. Olsen et al.***

**Anonymous Referee #3**

Received and published: 16 February 2016

### General/Overall Comments

The work focuses on natural phenomena, specifically El Niño Southern Oscillation (ENSO), and its effects on tropospheric ozone with an emphasis on extratropics. The article provides well-rounded background by stressing the importance of separating natural signal from the anthropogenic signal when analyzing tropospheric ozone variability. For the analysis of the tropospheric ozone, the study uses NASA's GEOS-5 data assimilation system (DAS) along with Ozone Monitoring Instrument (OMI) and Microwave Limb Sounder (MLS) on the Earth Observing System Aura satellite. The study also utilizes Global Modeling Initiative (GMT) chemical transport model (CTM) to show that 9 years of ozone assimilation (2005-2013) are consistent with the longer-term tropospheric ozone response. The ENSO is represented by Niño 3.4 index. Outgoing longwave radiation (OLR) data is used as a proxy for convection, which affects tro-

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pospheric ozone variability and in turn is influenced by ENSO. Tropospheric column ozone (TCO) is then presented as monthly mean time series and modeled as a function of Niño 3.4 index time series using multiple linear regression with harmonics. The work concludes that large-scale transport seems to dominate the changes in convective transport thereby affecting ozone throughout much tropics. However, effects of ENSO on TCO are much less pronounced in midlatitudes than in tropics.

Overall the article is well-written and the topic of the investigation is clearly established. The article makes an important point that although the effects of ENSO on TCO are generally small in midlatitudes, they are imperative to consider when modeling is performed studying TCO anthropogenic vs. natural variability. I think the article could be improved by adding a few references regarding spatial characterization of the ENSO influence on TCO. For the future work it may be interesting to look at different layers of free tropospheric ozone and to investigate how they respond to ENSO. I approve this article for publication with a few minor suggestions.

### Specific Suggestions

On line 41 it states, “This study provides the first explicit spatially resolved characterization...” This is a strong statement and probably should be backed up with some kind of reference. The same occurs on lines 509-511.

Lines 56-57 need references.

In lines 66-67, perhaps Thompson et al. 2014 can go to the next paragraph (starting from line 76 and onward) as they actually do not find strong correlation between free tropospheric ozonesonde data and ENSO, while Balashov et al. 2014 do indeed find strong correlation between surface ozone and ENSO.

In line 192, what about a trend in ozone? It may be a good idea to detrend TCO monthly mean time series to see purer ENSO signal in the ozone data.

Perhaps Figures 1 and 6 could be larger?

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Lines 251-253 need references.

Technical Comments

In line 420 remove the word “very.”

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Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2015-958, 2016.