

Interactive comment on “Ozone trends over the United States at different times of day” by Yingying Yan et al.

Anonymous Referee #1

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The authors analyzed the inter-annual variability and trends of daytime, nighttime and daily mean ozone during 1990-2014 over the United States based on air quality monitoring data at about 1000 stations, and also assessed the impacts of anthropogenic emissions versus climate variability on the ozone trends during 2004-2012 by the GEOS-Chem modeling. This work combines observations and global modeling to evaluate the ozone trends and driving factors in the past two decades over US, both diurnally and spatially, and provide useful information about the ozone trends at the non-peak hours. The manuscript is clearly organized and well written, and the interpretation of the observational and modeling results is also fairly well. I recommend that this paper can be considered for publication after the following comments being addressed.

C1

Specific comments:

1. On the “Control” simulation: the model only accounted for the inter-annual variations of emission inventory for NO_x and CO, but ignored that for NMVOCs. The authors argued that the US anthropogenic NMVOC emissions are much smaller than the natural ones and are hence negligible. The effect of the reduction in anthropogenic NMVOC emissions in US on the ozone trends should be evaluated, especially in the urban areas. Furthermore, the changes of the NMVOC emissions in other regions (ca. Europe and Asia) should be also taken into account, as it may influence the subsequent modeling estimation of the Asian contribution to the US ozone trend. At least, sensitivity modeling studies should be done to check if considering the changes of NMVOC emissions in different regions could affect the conclusions of the modeling study.
2. Figure 3: the ozone growth rate during 2004-2012 is much faster than that in 1990-2014, especially during nighttime hours. The authors explain this in Section 5 partly due to the choice of beginning and end years. Is there any other reason for the stronger ozone trend in the recent decade?
3. Section 3: it would be better if the authors can compare the observed ozone trends in US with those from other regions of the world, such as Europe and Asia.
4. Section 4: the analyses revealed the weaker correlations between climate variability and the nighttime ozone anomaly (compared to the daytime and daily average), and between climate variability and ozone anomalies over western US (compared to eastern US). The authors need comment on the possible reasons for the weak relationships between climate and nighttime ozone, and western US ozone.
5. Page 12, Line 30-31: may the authors comment on the significance, quantitatively, of the Asian contribution in comparison with those from US and climate variability?
6. Tables 1-3: provide the unit, ppbv yr⁻¹?
7. Table 4: what do the numbers in this table mean? Correlation coefficient (r or r^2)?

C2

8. Figure 4a: provide p-values for the trends.

9. Page 6, Line 32: delete one “mean”.

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