

We thank Zhe Jiang for their helpful comments. Our responses to the comments (black) are in blue and include page and line numbers where changes were made to the accompanying manuscript.

Response to Zhe Jiang

Silvern et al. (2019) demonstrated a potential influence from the increasing relative contribution of natural sources (e.g., lightning and soil NO_x) on the trends of free tropospheric NO₂ and the retrievals of column NO₂. Their results provide important and useful explanation for the discrepancy between official reported and satellite-based trends of US NO_x emissions. The paper could be stronger, if the following points can be considered:

1) Figure 4a (Silvern et al. 2019) demonstrates a growing discrepancy between EPA's inventory (black line) and AQS surface measurements (green line) since 2011, which is still not well understood. As a possible explanation, the bottom-up analysis with updated statistic and emission factors (Figure 1a, green dashed line, Jiang et al. 2018) matches better with AQS surface measurements.

We amend the text to acknowledge differences between AQS NO₂ and the NEI trend and now include discussion of the bottom up analysis in Jiang et al. (2018) as a possible explanation on page 6 lines 10-18.

2) An important difference between anthropogenic and natural sources is their distinct seasonality, i.e., the seasonality of natural sources is much stronger. Thus, the discrepancy between winter and summer (Figure 5, Silvern et al. 2019) is expected to be the major evidence to support the conclusion.

For Figure 5a (Silvern et al. 2019), the authors described: "OMI NO₂ observations in urban winter show a steady decline and do not exhibit the post-2009 flattening". However, it seems that OMI NO₂ decreased by about 35% in the period of 2005-2009, whereas only about 10% in the period of 2009-2017.

We now point out the difference in the urban winter trend before and after 2009 on page 8 lines 17-19.

I am thankful for the authors' efforts to improve our understanding about the retrieval and interpretation of satellite data, and hope the above comments could be helpful in the revision.

Reference: Z. Jiang et al., Unexpected slowdown of US pollutant emission reduction in the past decade, Proc National Acad Sci 115, 201801191 (2018).