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Comment

# ***Interactive comment on “The impact of satellite-adjusted NO<sub>x</sub> emissions on simulated NO<sub>x</sub> and O<sub>3</sub> discrepancies in the urban and outflow areas of the Pacific and Lower Middle US” by Y. Choi***

**Anonymous Referee #1**

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This paper investigated the applicability of the satellite observed column density of NO<sub>x</sub> as a constraint for the bottom-up emission inventory of NO<sub>x</sub> (NEI2005) to improving CMAQ simulations of NO<sub>x</sub> and O<sub>3</sub> concentrations in surface air over the United States. The method is largely based on the previous ACP paper by the author [Choi et al., 2012], and at this time the author additionally focuses on the analysis of the observed and simulated concentrations of O<sub>3</sub> in surface air over the two urban areas (e.g., LA and Houston) in order to validate the use of the satellite observation to perturb the bottom-up emissions in the model.

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The merit of this study, just as in the previous literature on the top-down estimates of emissions, is to provide adjustment information of the bottom-up emission, which usually lags relative to the present or the period of interest. As mentioned by the author, the old NEI2005 inventory is still widely used although the NEI2008 is available to the public because the latter has not extensively been evaluated yet. This work is also based on the NEI2005 with a few modifications, which primarily update the point sources.

1. Therefore, I wonder how the adjusted NO<sub>x</sub> emission based on the satellite observation compares with the latest emission inventory (NEI2008) in the contiguous US. Please discuss the differences if any or the consistent changes compared to the NEI2005.
2. The model with the top-down emission supports the validity of the adjustment of the bottom-up emission based on the satellite observations in the context of NO<sub>x</sub> concentration in surface air but appears to be inconsistent with the observed O<sub>3</sub> concentrations especially for Houston. Why? This issue needs to be investigated more.
3. Following up the comment above, are there any issues of the top-down estimates due to the uncertainties of the satellite measurements such as AMF, clouds contamination, sampling mismatch between the model and the satellite, etc?
4. Are there any other regions, showing similar responses of the model such as improved agreements for NO<sub>x</sub> but degradation for O<sub>3</sub>? It might be useful to look at other area with high VOC emissions (e.g., southeast US) and examine the sensitivity of the model with respect to the NO<sub>x</sub> perturbation.

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