

Interactive comment on “Impact of updated traffic emissions on HONO mixing ratios simulated for urban site in Houston, Texas” by B. H. Czader et al.

B. H. Czader et al.

bczader@uh.edu

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— We would like to thank the Referee for time and effort put into reviewing this manuscript. Please see below our responses to your comments.

Please check the word “sheds”. Should it be “shed”?

— yes, it should be “shed”, we will modify it.

Section 2 – Methodology Indeed several studies, mentioned in the article, have suggested that 2005-2008 NEI over-estimates NO_x emissions in Houston. The authors simulated air quality for 2013 using the revised 2008 NEI. In theory, the revision of the 2008 NEI accounts for the NO_x emissions reduction that occurred between 2008 and

C9662

2013. Since the base 2008 NEI contains higher NO_x estimates, the revised NEI for 2013 that the authors used in the study still likely to over-estimate NO_x emissions in Houston. Thus, some discussions are needed to indicate such possibility and relate to the over-predictions of NO_x mixing ratios shown in Table 2 and Figure 2-3.

— We will add the following discussion to the manuscript on page 21323, line9:

“Even though in our study we adjusted NO_x emissions to reflect emission reduction between the year 2008 and 2013 some overpredictions may occur since, as pointed by Choi (2014), NO_x rates in the base 2008 inventory might be too high.”

Section 2.1 – Adjusting NO_x and HONO emissions The authors used a newly reported HONO speciation factor. Should the new speciation factor be used for all urban areas or be limited only to Houston? Some discussion will be helpful to air quality modelers.

— We will add the following discussion about that on page 21320 in line 24 after sentence “..tunnel measurements in 2001.”:

“The HONO/NO_x ratio reported by Kurtenbach et al. (2001) is based on measurements performed between 6 am and 2 pm, for both weekdays and weekends where $22\,200 \pm 400$ vehicles were passing on weekdays and $13\,300 \pm 1\,400$ cars passing on weekends. The vehicle fleet was composed of 6.0% heavy-duty trucks, 6.0% commercial vans, 12% diesel and 75% gasoline powered passenger cars, and 1.0% motorcycles. The measurements made by Rappenglueck et al. (2013) reflect high traffic, early morning conditions (4-8 am) on weekdays. The measurements were performed at highway junction in Houston with very high traffic load (about 400 000 vehicles passing daily), which is much larger than that in the tunnel study. The vehicle fleet was represented by 93-95% of gasoline fueled vehicles and 5-7% by diesels during the morning hours. Another difference between these two studies is in vehicle speed, with a typical speed of 50-90 km/h in the tunnel studies and much lower speed during the morning peak traffic hours in Houston.”

C9663

— Also, the following will be added at the end of paragraph in line 27 on page 21320:

“Since the newly reported ratio reflects high traffic conditions during the morning rush hours on weekdays our model sensitivity study provides estimate of the upper bound of the impact of HONO emissions on pollutant levels in urban areas.”

Section 3.2 – HONO Modeling What is average increase in morning OH for the entire simulation? Similarly, what is its impact on average morning ozone for the entire simulation period?

— We will add the following discussion:

“Based on the 1 month of simulated data the average increase in the morning OH (between 6 – 8 a.m. LT) is 14% at the location of the Moody Tower and 3% when averaged over the urban area. The ozone increase is below 1% for both the Moody Tower and the urban area. The average increase in OH during daytime (6 a.m. – 8 p.m. LT) is 7% for the Moody Tower and 1% for the urban area. The increase in ozone is again below 1%”.

Section 4 - Summary OH predictions have not been compared to any observed data. Thus, it cannot be concluded that model under-predicts OH.

— The sentence on page 21326 in lines 22-24 will be re-written as follow:

“This study results could shed light on the underestimated HONO in the morning from global/regional chemical transport model with the typical emission ratio of 0.8% HONO emission out of the total NO_x emissions. In addition, since HONO is the major radical source in the morning (e.g., Perner and Platt, 1979; Harris et al., 1982; Czader et al., 2013), underpredictions of HONO would lead to underprediction of OH radical.”

Need to clarify that total NO_x emissions are not used for speciating HONO emissions; only mobile source NO_x emissions have been used.

— This information is provided in the Methodology section on page 21320, lines 19-21:

C9664

“NEI provides emission rates for nitrogen oxides, during the processing with SMOKE NO_x emissions for mobile sources are separated into 90% NO, 9.2% NO₂, and 0.8% HONO.”

— We will also modify lines 3-4 in the summary as follow:

“In addition, HONO/NO_x emission ratio from mobile sources was increased and its impact on HONO mixing ratios was evaluated.”

Table 1 and 2 Units are not included in the tables.

— we will correct that and add units (ppbv) next to the mean, max. value, bias, and absolute mean error (AME) headers in tables. R and IOA are unitless.

Table 3 It shows “Sim. H”; it will probably be “Sim. NH”.

— yes, it should be “Sim NH”, we will correct that.

Figure 4 Need to specify date and local time in the figure caption.

— we will replace the caption with the following:

“Snapshot of differences in HONO emissions between a case with emission ratio of HONO/NO_x = 0.016 (NH) and default emissions of HONO/NO_x = 0.008 (N) at 7 a.m. LT on September 12, 2013.”

Figure 5 Need to specify date and local time in the figure caption. Figure caption states base HONO emissions but parenthesis shows (N).

— we will modify the caption as follow:

“Differences in HONO mixing ratios between a case with 0.016 HONO/NO_x emission ratio (NH) and 0.008 HONO/NO_x emissions (N) for the surface (left) and the second model layer (right) at 7 a.m. LT on September 12, 2013.”

Figure 7 Need to specify date and local time in the figure caption. Figure caption states differences between the base and increased HONO emissions case. I think case N is

C9665

used, not the base case.

— we will modify the caption as follow:

“OH mixing ratios (left) and differences in OH mixing ratios (right) between the case with 0.008 HONO/NO_x emission ratio (N) and 0.016 NO_x/HONO emission ratio (NH) at noon local time on September 12, 2013.”

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