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Interactive comment on “Modeling nitrous acid and its impact on ozone and hydroxyl radical during the Texas Air Quality Study 2006” by B. H. Czader et al.

Anonymous Referee #2

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The authors presented HONO simulation results using the CMAQ model for the 2006 Houston TexAQS II study. They demonstrated that when HONO formation mechanisms, especially the photo-induced NO₂ to HONO conversion on surface, are considered, the model is able to reproduce many features of field HONO observation, such as temporal variations and vertical distributions. The effects of HONO chemistry on OH and ozone formation have also been investigated. The manuscript is well written, and the results and conclusions presented here are of interest of atmospheric chemistry community. I would recommend the publication of this manuscript in ACP, after addressing the following issues below:

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(1) Vertical mixing/transport is one of the most important processes controlling HONO mixing ratio in the boundary layer, as demonstrated by Wong et al. (2011) and by Figure 9 in this manuscript. I suggest that the authors examine the effect of this process in more details, e.g., on HONO mixing ratio and vertical gradient.

(2) In this model, almost all the HONO is produced on the ground (i.e., except gas-phase sources). Therefore, one should expect that HONO/NO₂ ratio should decrease with altitude during the daytime, as a result of the HONO photolysis and the oxidation of freshly emitted NO to NO₂ during the vertical transport. I am very interested in seeing some simulated daytime HONO/ NO₂ profiles, versus the observed. I remember that the observed HONO/ NO₂ ratio did not decrease but rather increased with height sometimes during the day.

Specific comments:

(1) Page 5862, 1st and 2nd paragraph: citations of Figures 7 and 8 appear before Figure 6. Figure numbering should follow the order of citation in the text.

(2) Figure 6: need Y-axis labels.

(3) Simulation or measurement heights need to be specified in the figure captions in Figures 2, 5, 6, 8 and 9.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 12, 5851, 2012.

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