

## ***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 #1**

Received and published: 28 March 2012

The manuscript by Czader and co-workers modeling HONO for a site in Texas fits clearly into the scope of ACPD/ACP. The paper contains a useful study on HONO sources and the outcome is compared to measured datasets. In the major parts of the manuscript the scientific methods are clearly outlined and the results support the conclusions except issues noted below. In general, it is well written. Suggestions are made below regarding the figures and references. Therefore, I support the publication of a revised paper in ACP after the following issues are addressed.

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### **General comment:**

- In the introduction (Section 2.1) different sources of HONO are discussed but most of the newer (field) work is not referred to: Li et al. ACP 2012; Wong et al. ACP 2012; Wojtal et al. ACP 2011; Sörgel et al. ACP 2011; Yu et al. ACP 2012; Su et al. Science 2011. It might not be necessary to discuss these in detail. However, these provide additional views on the potential HONO sources which should be mentioned.
- The current manuscript tries to address a number of questions: HONO profiles, HONO sources, and the HONO impact on OH and ozone. It contains four time series of HONO and of NO<sub>2</sub> but the profiles are not thoroughly analyzed. The statement “CMAQ could be validated successfully against vertical resolved HONO measurements” in the Conclusions is not clear from the presented model-data comparison. If the authors want to address the profile question I suggest a much more detailed analysis of HONO and NO<sub>2</sub> profiles. In this case, the result of this analysis should also be mentioned in the abstract. However, the paper by Stutz et al. (2010) already showed that there is excellent agreement between DOAS and MC/IC. When looking at the discussion on the sources, I am not convinced that all different HONO, NO<sub>2</sub>, and O<sub>3</sub> time series are required to make the statements of this work. Finally, the discussion on the impact of HONO (based on Figures 5, 8, and 9) refers to one day only not being representative for the measurement period.

### **Specific comments:**

- What is the purpose of Figure 2? The information is not used in the remainder of the discussion. The discussion based on Figures 5, 8, and 9 is one day only.

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- The paragraph on the measurement-model comparison (page 5859) at different altitudes is difficult to follow, since only time series are presented in the Figures 3 and 4. As already stated above an analysis of the altitude profiles needs different figures. Even though it would be nice to have a better analysis of the HONO profile issue, it might not be required for the interpretation of the HONO sources and impact here.
- The authors analysed one day with OH measurements only which was selected for the good fit between model and measurements. In my opinion this cannot be accepted as a criterion: 1. Other days show similar good agreement. 2. 31 Aug 2006 is the highest HONO peak and not representative for the measurement period.

**Technical corrections:**

- Time and dates formats are mixed. Use dd MMM [yyyy] and 24-h time in the entire manuscript and for all figures.
- Explain IRR analysis.
- Figure 1 caption should note measurement altitude MC/IC.
- Please merge Figures 1 and 3. Mention the measurement altitude of MC/IC in the figure caption or legend. See also General comments.
- Figure 5 has different time axes. Merge in panels using one time axis.
- The three panels of Figure 9 should merge onto one page with one time axis. Please label HONO as ppb in the Figure.

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

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