Atmos. Chem. Phys. Discuss., 10, C4493–C4496, 2010
www.atmos-chem-phys-discuss.net/10/C4493/2010/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Measurement of atmospheric nitrous acid at Blodgett Forest during BEARPEX2007" *by* X. Ren et al.

X. Ren et al.

xren@rsmas.miami.edu

Received and published: 27 June 2010

Reply to the Review by Referee #1

We thank Referee #1 providing us valuable review comments that have improved the manuscript. We have included the review comments in italic followed by our responses in blue. In the revision of this manuscript, we will highlight these changes accordingly.

Comment (1): 1. This paper presents excellent agreement between the two techniques LOPAP and CIMS which, however, need some more information on the following details: a) please describe sampling line and instrument set-up of the LOPAP, the inlet used by the CIMS, and the relative inlet mounting positions; b) provide details on the calibration of the CIMS, (what is "proxied"?) and the uncertainty (of e.g. 10 min av-

erages), it should be demonstrated that the agreement between the two techniques is not accidentally; c) (page 7394, l. 20) given the 15% uncertainty of LOPAP, this is indeed an unexpected good agreement, please, comment.

Response: More information about both instruments has been included in the revised manuscript.

a) We have added the description of the inlet for the wet chemistry HONO instrument in Section 2.2.1 as: “Ambient air was pulled through a light-shielded Teflon tubing (OD = 0.375”, and ID = 0.25”, length = 18 m) at flow rate of 12 L min-1, of which 2 L min-1 was fed the HONO instrument housed in a trailer laboratory. The total residence time in the sample line was about 2.8 seconds.” The description of the CIMS sampling inlet has also included in Section 2.2.2. As described in the text already, the inlet height was 14 m for the wet chemistry HONO instrument and 17.7 m for the CIMS, while the average tree height within the daytime fetch was 7.9 m.

b) By “proxied”, we mean that the water dependant HONO calibration was done in the laboratory. In the field because HONO was not calibrated for, online HNO3 calibrations were used to correct for instrumental drift as this was calibrated for every 1.5 hours. These were generally minor changes, within $\pm$10%.

c) Same as the reviewer, we were surprised by the excellent agreement when we firstly put the two datasets together without any prior communication or information exchange on the data and calibration. We are aware of the noise in the CIMS HONO measurements and attribute this to the small fraction (0.5 second every 18 seconds) of the CIMS measurement time dedicated to HONO measurement.

Comment (2): p. 7398-7399: the surface acidity issue appears rather speculative and should be shortened. Though lower than in previous studies, HONO ratios to NO2 are similar to European sites and, accordingly, production processes related to NO2 should yield lower

ACPD

10, C4493–C4496, 2010

Response: We agree with the reviewer that the hypothesis of the lower surface acidity at Blodgett Forest causing the lower HONO levels is not confirmed. We stated clearly that further studies are needed to test this hypothesis. As suggested, we have removed the following sentences from Section 3.3: "The lower soil acidification in Western US than in Eastern US is consistent with the acid precipitation observations by US National Acid Deposition Program (NADP) (http://nadp.sws.uiuc.edu /maps/): lower sulfate (SO42-) and nitrate (NO3-) but higher pH values in the precipitation in Western US than in Eastern US. The precipitation pH in the region of California is basically controlled by the CO2 equilibrium (pH$\sim$5.6) with the influence of high NH3 emissions from farming activities there." On the other hand, the observed fully neutralized aerosols during this study and some recent laboratory studies do point to this direction.

Comment (3): p. 7401, l. 3: Please, be more specific on the "very good agreement", the reference Thomas (2010) is missing.

Response: During the Houston field study in 2009, the HONO measurements with our wet chemistry method agreed to the LP-DOAS measurements within $\pm$20% (r2=0.79) and the HONO measurements by a tunable infrared laser differential absorption spectrometry (within $\pm$15%, r2=0.86). At the end of Section 3.2, we have changed the text as: "In a recent HONO intercomparison (HINT2009) study in Houston, TX where we deployed our wet chemistry HONO instrument, very good agreement was also obtained between our wet chemistry and four different techniques, including LP-DOAS (within $\pm$20%, r2=0.79) and tunable infrared laser differential absorption spectrometry (within $\pm$15%, r2=0.86) (S. Thomas et al., manuscript in preparation, 2010)." Thomas et al. (2010) is still in preparation, so there is no formal citation at this moment.

Comment (4): Figure 3: Please indicate in the caption that J(HONO) was calculated.

Response: We have added the following sentence in the caption of Figure 3: "J(HONO) was calculated based on the TUV model and measured solar radiation (see Section 2.2.3 for details)."

ACPD

10, C4493–C4496, 2010

Comment (5): Figure 4 displays PAN, but the experimental section 2.2.3 only explains measurements of peroxy nitrates (PNs)

Response: PAN was measured based on CIMS by J. Thornton group from University of Washington during this study. We have added the following sentence in the caption of Figure 4: "PAN was measured using CIMS (Wolfe et al., 2009)"

Comment (6): Figure 7: Indicate the integration time of CIMS and LOPAP measurements for the time series

Response: In the caption of Figure 7, we have added: "The integration time is 2 minutes for LOPAP. The integration time is 0.5 s every 18 s and 1-minute averages are shown in this figure."

Technical Corrections: 1. p. 7401, l. 27: twice the word "that"; 2. p. 7402: "Klaffmannn" should be "Kleffmann"?

Response: Both have been corrected.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/10/C4493/2010/acpd-10-C4493-2010-supplement.pdf

---

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 7383, 2010.