

## ***Interactive comment on “Nitrogen oxides in the boundary layer and free troposphere at the Mt. Bachelor Observatory” by D. R. Reidmiller et al.***

**Anonymous Referee #1**

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Review of "Nitrogen oxides in the boundary layer and free troposphere at the Mt. Bachelor Observatory, by Reidmiller et al.

General Comments:

This paper presents a thorough overview of NO<sub>x</sub> measurements from a mountaintop observatory in the northwestern US for 5 seasonal intensives. The measurements appear to be of high quality and are carefully segregated, using time of day, into those representative of the free troposphere (FT) vs. those with a boundary layer influence. Novel meteorological profile measurements are used to justify this segregation. Use of the FT data allows a characterization of the background NO<sub>x</sub> mixing ratios for this region as well as an assessment of Asian influences, including a meteorological analysis, in an averaged sense, of dynamical conditions which favor Asian Long-Range Trans-

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port. Additionally the top 20 high-NO<sub>x</sub> events are examined to determine likely source regions. The treatments of the measurements and data are thorough. The analysis of the observed variations in mean and median NO<sub>x</sub> levels, while adequate for a "data paper" such as this, tends to be somewhat qualitative (see items 7, 11, 12 below), and therefore not entirely convincing. To put this on firmer ground would require a modeling effort that I acknowledge is beyond the scope of the present effort. Overall this is a high quality piece of work, clearly written, and should be published more or less as is, subject to only minor changes.

Specific Comments:

- (1) p. 5753, deep convection and lightning NO<sub>x</sub> occur not only in tropics
- (2) p. 5754, line 16: 15% of emitted NO<sub>x</sub> gets to FT, presumably as NO<sub>x</sub> (not yet PAN). Does a significant portion get converted to PAN in the BL, then to be transported to FT? BL too warm? Depend on season?
- (3) p. 5759: UV Pen-ary lamp? Is mentioned out of the blue. How used? Context?
- (4) p. 5759, line 26: minimum recorded when under repair. Not clear. Might think that "under repair" means not in use, but must be being used while in compromised condition.
- (5) p. 5760: How is detection limit defined?
- (6) Overall the authors present a very thorough description of data reduction procedures and error analysis.
- (7) p. 5765, lines 12-25: Plausibility arguments are given fir why the NO/NO<sub>2</sub> ratio varies as it does, but without any quantitative analysis, the reasons are not very convincing. E.g., what is quantitative effect of snow on J?, what is quantitative effect of being closer to solstice?, etc.
- (8) p. 5766: I have trouble understanding/appreciating the message in Fig. 5. Possible

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to offer more explanation?

(9) p. 5770: An INTEX-B flyby is noted but the region for INTEX-B in Fig. 6 does not overlap with MBO location.

(10) p. 5770: Is a stretch to compare NO<sub>2</sub> from 2007-2008 to NO<sub>2</sub> for same month in 2006, but I guess that is best that can be done. Ranges are comparable but really not a valid (ie, direct) comparison.

(11) p. 5771: Is plausible that warmer Ts had an effect via shorter PAN lifetime, but, again, not quantitative. How much warmer? Is this enough to actually make a difference?

(12) And same applies to wind speed argument. Probably acts in the right direction, but enough to be significant quantitatively?

(13) p. 5777, line 8: 5 found to have a NA influence. Or is  $5+2 = 7$ ? Since the 2 had mixed sources.

Technical Corrections:

(14) p. 5759: Buhr describes

(15) p. 5767, line 12: 5,h

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 5751, 2010.