

## ***Interactive comment on “Detection of pollution transport events southeast of Mexico City using ground-based visible spectroscopy measurements of nitrogen dioxide” by M. L. Melamed et al.***

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### **Reply to Anonymous Referee # 1:**

#### **General Comments**

- p. 4770 line 11: Changed to, “In addition, we show the effectiveness of how DOAS measurements can be used to observe anthropogenic and natural pollution sources that reside above the mixing layer, such as the presence of NO<sub>2</sub> produced from lightning as see on 28 March 2006”
- p. 4770 Line 19: Yes there are other sources of pollution in Mexico City, i.e. C740

biomass burning, biogenic, etc., but the primary sources are transportation, industrial processes and domestic activities.

- p. 4772 line 10: The dimension of the small sized telescope is a 2.54 cm lens with 10 cm focal length. This is now noted in the text.
- p. 4772 line 18: The maximum integration time was set to 75 msec and decreased automatically to prevent saturation throughout the day reaching a minimum integration time of 3 msec. The acquisition program averages 100 spectra before recording the spectra analyzed in this study. The effect of having a maximum integration time of 75 msec means that during the morning and late afternoon, the signal-to-noise ratio is small, thus reducing the detection limit of the spectrometer. The effect of allowing the integration time to vary in order to prevent saturation means the time-resolution of the recorded spectra varies throughout the day. This discussion of the integration time has been added to the manuscript.
- p. 4775 line 9: The retrieved quantity using zenith sky DOAS measurements is the differential slant column density, i.e. the difference in absorption by NO<sub>2</sub> from a background spectrum to a foreground spectrum. One background spectrum was chosen in this study to be able to compare all NO<sub>2</sub> DSCD enhancements to each other during the entire 6-week measurement period. The chosen background is a noontime spectrum taken at a low SZA in order to account for the VCD of the stratospheric NO<sub>2</sub> layer. The differential measurement is therefore due to an enhancement in tropospheric NO<sub>2</sub> or an increased optical path length through the stratospheric layer (which is eliminated when applying an AMF of sec(SZA)) or in the troposphere due to multiple scattering due to clouds and aerosol. The major concern for using one background spectrum for the entire measurement period is possible changes in the spectrometer characteristics (instrument line shape, wavelength calibration and systematic noise) due to changes in tempera-

ture and air density. A pre- and post- analysis of the spectrometer characteristics showed this effect to be negligible to the analysis presented in this study.

- p. 4780 line 7: The maximum total tropospheric NO<sub>2</sub> VCD was changed to 1.7 x 10<sup>-16</sup> molecules cm<sup>-2</sup> in the text.
- p. 4782 line 2: All ppb are changed to ppbv in the text and in figures.
- Figure 2 and 3: The terminology of retrieved optical depth plus the residual is used because the optical depth is not the observed quantity (the solar spectrum is). Therefore, the retrieved optical depth plus the residual is used to show that the residual of the nonlinear least squares fit is minimal to the retrieved optical depth of NO<sub>2</sub> or O<sub>4</sub>.
- Figure 4: The SZA is now included on the graph on the top axis.

### Technical Comments

- p. 4771 line 14: Deleted “to use a team of international researchers”.
- p. 4774 line 9 Figure 4 does precede Figures 2 and 3 in the text. Therefore the order of the Figures has been changed.
- p. 4774 line 22: Changed to 470-505 nm.
- p. 4778 line 10: “to” was inserted after “According”.
- p. 4779 line 2 and 4: “in order” was deleted.

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 4769, 2009.