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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Effect of aerosols and NO_2 concentration on ultraviolet actinic flux near Mexico City during MILAGRO: measurements and model calculations" *by* G. G. Palancar et al.

Anonymous Referee #1

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The paper by Palancar et al. provides an interpretation of spectral actinic flux measurements at Mexico City with TUV model calculations to identify the effects of air pollution under clear sky conditions. It was found that model-to-measurement agreement was improved significantly when the influence of measured local aerosol optical properties and NO_2 concentrations was considered in the model. The conclusions are confirmed by simultaneous ground based irradiance measurements and some aircraft data that also revealed the importance of the aerosol single scatter albedo in the UV range for a prediction of altitude profiles of actinic flux. The paper is well structured and well written and should be published after minor corrections.

General comment

The target quantity mainly used in this study, i.e. spectral actinic flux integrated over a wavelength range 330-420 nm, is somewhat unusual. A more natural choice would have been to calculate $j(NO_2)$ in the first place because the photochemical background for this investigation is clearly stated by the authors. $j(NO_2)$ is also not affected by the ozone column and the influence of NO_2 concentrations on $j(NO_2)$ is obviously more direct. Moreover, the integrated 330-420 nm AF is not purely UV related as indicated by the title and in the abstract. As is evident from Fig. 6 roughly one third of the photon flux densities are from the visible range. If there are reasons why $j(NO_2)$ was not calculated, selecting the UV-A range, e.g. 320-400 nm, would have been more conventional. Also UV-A is hardly affected by ozone columns. The authors should at least show that their target quantity is highly correlated with $j(NO_2)$ independent of NO_2 concentrations and aerosol loads which is probably the case in the solar zenith range considered here. However, my guess is that in this sense 320-400 nm would have been a better choice than 330-420 nm. Anyway this is not a major problem.

Minor comments

Page 19245, line 4: "UV actinic fluxes (AF)" should be more specific, e.g. actinic fluxes (AF) in a wavelength range 330-420 nm. As mentioned above UV does not strictly apply.

Page 19246, line 24: "(AF)" should be deleted here because AF is later used for the integrated quantity.

Page 19251, lines 4 and 7: Replace total, direct and diffuse "voltages" by "spectral irradiances".

Page 19255, line 2: Replace "total" by "spectral".

Page 19255, line 5: Add "spectral" to actinic flux to distinguish from the quantity considered so far.

Page 19252, line 11: Replace “JPL, 2006” by “Sander et al., 2011”.

Page 19256, line 9 and Fig. 6: Why wasn’t the apparent wavelength shift corrected for the SAFS instrument based on the positions of the Fraunhofer lines?

Page 19263, line 12: Remove citation “Jet propulsion laboratory. . .”

Fig. 4: I suggest that the authors add the term “spectral” and use the same units for spectral irradiance and spectral actinic flux, e.g. spectral photon flux densities for better comparability. For a single wavelength this conversion is explicit.

Fig. 9: Captions to a) and c) should be exchanged.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 19243, 2012.