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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ultraviolet actinic flux in clear and cloudy atmospheres: model calculations and aircraft-based measurements" *by* G. G. Palancar et al.

Anonymous Referee #1

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Palancar et al. describe an interpretation of aircraft measurements of actinic flux densities with TUV model calculations and a simplified analytical approach to deal with closed and broken cloud fields. This is a useful attempt so sort out the great complexity associated with cloud influence on actinic flux to eventually improve the quality of photolysis frequencies entering chemistry transport models. The paper is well written and should be published after minor corrections.

Comments

Page 3322, line 6: Avoid decimal places of ozone columns. Such details imply a precision that is neither realistic nor necessary for this work. The same applies for

aircraft positions and altitudes given in section 2.1.

Page 3322, line 13: In the abstract a quantitative statement is missing on the magnitude of the observed enhancements or reductions induced by clouds. Otherwise the only numbers in the abstract give the impression of an almost perfect agreement between modelled and measured data. For example in Fig. 2 total actinic flux is affected by the presence of clouds by at least a factor of two in both directions compared to clear sky conditions.

Page 3326, line 8: There should be a statement on the accuracy of the measurements considering calibration standards and potential drifts during the campaign.

Page 3326, line 24: Please use UTC instead of GMT and UT throughout the text and in Figs. 1, 2.

Page 3332 ff: In Section 4.2 an analytical model for actinic flux received above, within, and below clouds with simplifications is presented. However, the relation of this model to the measured data or the TUV model calculations remains rather vague. Merely the lower limit of 0.5 derived for the slope of the correlations in Fig. 6 was rationalized. If the authors want to promote the use of these formulas they should show that their use yields reasonable estimates, e.g. in terms of a factor Q^{tot}. For the aircraft measurements the necessary parameters are not available, so a comparison is difficult, but what about the TUV calculations that were made for the data in Fig. 7? Because up-welling, down-welling and direct radiation were considered, I assume that the necessary input parameters are available directly (c, μ) or indirectly (A, R, T)?

Page 3337, line 15: I don't understand how Eq. 23 was derived from Eq. 22.

Page 3338, line 3: I don't understand how Eq. 25 was derived from Eq. 24.

Table 1: The selected wavelength range should be repeated in the caption.

Table 2: Use $Q^{\downarrow}$ and $Q^{\uparrow}$ instead of "Downwelling" and "Upwelling".

Figs. 1 and 2: Indicate in the captions that Fig. 1 shows cloud free data and Fig. 2 data influenced by clouds. In addition to aircraft altitude in panel (a) you could plot solar zenith angles in panel (b), because this is the most important input parameter for the model calculations.

Figs. 4 and 5: Perhaps it would be more intuitive to exchange panels (a) and (b) consistent with Figs. 1-3 and to avoid confusion of “up” with the upper hemisphere.

In Figs. 3-7 four different notations or symbols are used for the ratios Q, all different from the symbols used in the text, Q^{tot}, $Q^{\downarrow}$, $Q^{\uparrow}$. The drawing program is certainly able to create arrows pointing up and down.

Fig. 6: The meaning of the colour coding is not clear. I assume it refers to fixed Δx and Δy intervals? Fig. 7 shows that not all data points are represented in Fig. 6?

Fig. 7: This figure is really hard to digest. In particular the positions of the bold numbers appear arbitrary. The dashed upper limit is different from Fig. 6. The exact meaning of the upper limit remains unclear.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 3321, 2011.