Atmos. Chem. Phys. Discuss., 4, S3148–S3150, 2004
www.atmos-chem-phys.org/acpd/4/S3148/
European Geosciences Union

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Model-aided radiometric determination of photolysis frequencies in a sunlit atmosphere simulation chamber" *by* B. Bohn and H. Zilken

B. Bohn and H. Zilken

Received and published: 29 December 2004

We thank referee S. Thiel for his positive assessment. The comments are addressed below.

1. FEP is a remarkable inert and stable material also with respect to weathering. The manufacturer (DuPont) points at experiments showing no measurable change after 20 years of outdoor exposure in Florida. For SAPHIR weathering is secondary because the chamber usually remains covered, except for experiments. Staining is more likely to produce changes in the transmission. We try to prevent this by regular cleaning and address this point in a succeeding paper (Bohn et al., Atmos. Chem. Phys. Discuss,

Full Screen / Esc
Print Version
Interactive Discussion
Discussion Paper

EGU

4, 8141-8170, 2004). A corresponding note will be made in the revised manuscript.

2. The only material we have available is that being used for the construction of SAPHIR. In the case of an exchange of material we are able to check spectral properties in the laboratory for comparison. On the other hand, the industrial FEP production process is expected to be optimised and standardised to produce constant mechanical and optical properties. An indication for this is the good agreement of the measured direct spectral transmittance with the results of Wallner (2000) (Fig. 6).

3. The issue of the wavelength dependence of f^{T} under clear sky conditions has already been addressed in our reply to referee S. Madronich. We repeat our statement here:
An experimental check of the wavelength dependence of direction weighting factors f^{T} under clear sky conditions is difficult for two reasons. Firstly, although local ratios of internal and external spectra as in Fig. 16 can be predicted by the model for clear sky conditions, these ratios are not representative for the whole chamber (as opposed to overcast conditions as explained in Sect. 3.2.3). Secondly, scattering processes are diminishing the calculated differences between shaded areas and areas illuminated by direct sunlight. This effect is time-dependent and also affects the spectral composition of light detected locally making an interpretation of measured ratios difficult on the basis of the current model.
An estimate of the possible error induced under broken cloud conditions was also asked for by referee R. Scheirer. Also here we repeat our statement:
The unknown distribution of sky radiance and possible effects of heterogeneous cloud cover are problems not yet solved. It is difficult to assess the influence of an unknown distribution and we don't think it useful to construct something considered extreme to quantify a possible error. For example, if clear sky conditions were treated as uniform overcast in the model, a relative error of the order 20-30% can be estimated assuming a 50% contribution of direct sunlight. This certainly is an overestimation of possible errors induced by clouds.

ACPD

4, S3148–S3150, 2004

4. A 20–30% reduction of photolysis frequencies within SAPHIR does not pose a serious problem for atmospheric chemistry studies because natural variability is high anyway given diurnal and seasonal variations and the effects induced by clouds.

5. The statement attributing “little small-scale spatial variability” to tropospheric conditions (page 6970, line 6) was deliberately extenuated by the adverb “usually”. We are aware of occasional strong variations under broken cloud conditions. However, unlike for SAPHIR these variations are not the rule under field conditions. As a consequence, steady-state approximations for short-lived species like HO_x are often reasonable assumptions for field data analyses by using locally measured photolysis frequencies and neglecting transport (e.g. Mihelcic et al., J. Geophys. Res. 108, D4, 8254, doi: 10.1029/2001JD001014, 2003).

6. The 5–7% accuracy is estimated for the 300–400 nm range from the accuracy of the calibration standard, the optical characterisation of the detector head and the stability of the instruments under field conditions. We will add this information and refer to the paper by Hofzumahaus et al. (1999).

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 6967, 2004.