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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Constraining the N_2O_5 UV absorption cross-section from spectroscopic trace gas measurements in the tropical mid-stratosphere" *by* L. Kritten et al.

Anonymous Referee #1

Received and published: 10 April 2014

In this study, balloon-borne observations of NO2, NOy partitioning, and O3 in the tropics are used to constrain a 1-D photochemical model in order to infer the N2O5 cross-section (XS) in the 200-260 (UV-C) and 260-350 nm (UV-B/A) wavelength ranges. Best agreement between the simulated and observed diurnal increase of NO2 is found if the N2O5 XS is scaled by a factor of 1.6±0.8 in the UV-C and by a factor of 0.9±0.26 in the UV-B/A, compared to current recommendations. The scaled N2O5 photolysis frequency slightly reduces the lifetime (0.2–0.6 %) of ozone in the tropical mid- and upper stratosphere, and it is found that this scaling has also only a minor impact on global ozone.

This study fits well with the scope of ACP and the manuscript is clearly written and well structured. I recommend it for publication after addressing the following comments:

1/The developed method is applied to only one balloon flight (Teresina, Brazil, 30 June 2005). However, since the launch of ENVISAT in 2002, several balloon flights have been conducted by the Heidelberg Group in the tropics and at mid- and high-latitudes. So, why the authors have not applied their method to these flights using SCIAMACHY limb (O3) and MIPAS (NOy) vertical profiles to constrain their photochemical model in the case of balloon measurements of these species were not available ? This would certainly improve the statistics of the study. Moreover these profiles could also be used to validate the photochemical model output obtained using JPL-recommended and scaled N2O5 XS, which is actually missing in the manuscript.

2/As Referee #2, I would recommend to discuss into more details the impact of the different pathways of the N2O5 photolysis on your results.

Typos:

Page 4705, line 5: 2 and 5 of N2O5 should be in subscript.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 4687, 2014.