

## ***Interactive comment on “Constraining the N<sub>2</sub>O<sub>5</sub> UV absorption cross-section from spectroscopic trace gas measurements in the tropical mid-stratosphere” by L. Kritten et al.***

**Anonymous Referee #2**

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### **1 General comments**

The paper is a useful contribution to ACP but needs revision. It uses NO<sub>2</sub> measurements by balloon-borne DOAS to constrain uncertainties in the photolysis of N<sub>2</sub>O<sub>5</sub>. This is however not clear from the abstract where only MIPAS-B is mentioned explicitly. A section on the comparison of simulated N<sub>2</sub>O<sub>5</sub> with MIPAS-B (or ENVISAT) observations using the original and the modified photolysis rates is missing (the discussion in section 5 is too short). This would make the paper more convincing. Also a discussion of the effects of the different product channels of N<sub>2</sub>O<sub>5</sub> photolysis is missing. Does the

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study always assume a yield of 1 for NO<sub>3</sub>+NO<sub>2</sub>?

### **2 Specific comments**

The abstract needs clarifications and has to be extended with respect to the instruments. The uncertainty by a factor of 2 is in the cited table but from the spectra of absorption cross sections in the literature it appears to be exaggerated. Is it due to uncertainties in product channels?

In the first paragraph of the introduction also the production of ozone via NO+HO<sub>2</sub> or RO<sub>2</sub> below about 30km should be mentioned (with reference). The text has to be improved there.

The quantum yield is mentioned on page 4692 but details are given only 4 pages later. This should be rearranged or on page 4692 at least a sentence should be included. This holds also for the other product channels in R13.

I'm surprised that the simple correction using the ozone ratio in Eqn. 2 is valid without any additional factor at all altitudes. From the chemistry discussed earlier it should be different above and below 30km. Also the mean should be independent of time (index j).

The Schumann-Runge bands are between about 180 and 200nm, a region which is not addressed. Please correct line 10 on page 4696. The contribution of that region to N<sub>2</sub>O<sub>5</sub> photolysis in the upper stratosphere is nonnegligible because of large cross sections.

What is the a priori on page 4699, line 26? Please expand slightly. On page 4702, line 12, appears to be a contradiction to the abstract (typo?).

Scattering from below, for example by clouds, is relevant for UV-A and visible. The

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sentences on top of page 4703 should be improved concerning this. The solar cycle effects are small against other uncertainties if only radiation with wavelength larger than 200nm is considered. Some sentences are misleading here.

How is the total uncertainty in Table 1 calculated? From the numbers it is not the root of the sum of the squares.

### **3 Technical corrections**

Typos: page 4690, line 14; page 4704, line 13.

In the sentence on page 4695, line 16, something must be wrong or missing.

Give reference for Facsimile (page 4696), this appears to be rather old.

The notation for a scaling factor in Eqn. 3 is odd.

Give reference for EMAC (page 4705).

Use 'scaled' instead of 'updated' on page 4706, line 8.

Use steps corresponding to the boxes in the color bars of Figs. 4 and 6.

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