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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Determination of the absorption cross-sections of higher order iodine oxides at 355 nm and 532 nm" *by* Thomas R. Lewis et al.

Anonymous Referee #1

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Lewis et al combine experimental and theoretical work examining the absorption cross-sections of higher iodine oxides (IxOy). The results indicate that most oxides are rapidly removed by photolysis, which has repercussions for formation of iodine containing particle. The experiments are complex as IxOy have to be generated in-situ, the data appears to be of reasonable quality. This review does not address the accuracy of the theoretical work. The manuscript is well written; the authors may consider the following suggestions for improvement.

Main comment:

Actinometry at 355 nm is using NO2 whereas OIO is used at 532 nm. The absorption

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cross-section of OIO at 532 nm is quoted as being “relatively well known” (L174). The cross-sections of I2 are well known as are those of NO2. It is questionable whether an unstable trace-gas, the spectrum of which has only been measured following its transient formation as the product of the IO-self reaction can be termed “well known”. The authors must be more quantitative here. They should properly review (and cite) the limited literature on the OIO cross-section at this wavelength. The same applies to the unity quantum yield of photolysis of OIO. Do all the literature studies agree on this value ? Again, the authors need to review (and cite) the literature and state why they believe the quantum yield is one, rather than simply citing one article in which one of the present authors also contributed.

L31 Presumably the 9-16% ozone depletion from iodine chemistry refers to the marine boundary layer. This should be made clear.

L77 “This is currently an important uncertainty. . .” What does “this” refer to? Perhaps “an important source of uncertainty” is better?

L114 Signal-to-noise ratio $\sim$ 400. S/N measured over what period of time? Is drift in laser intensity not more important than S/N for an absorption cell that has no reference photo-diodes. Limit of detection in OD units would be more useful.

Figure 4. What is the pulse-width of the excitation laser ? Please explain why the depletion of NO2 (presumably in $\sim$10 ns) takes 150 ms until the new plateau is reached. To which expression was the red curve fitted and why was it chosen?

L146 and L147 Laser “shot”, excimer “flash”. Perhaps use the term “pulse” ?

Figure 6 What causes the increase in the IO signal after 1.85 ms.

L259 Please show the trace obtained using the actinometer (OIO). This could potentially go into supplementary information along with the raw data (lack of signal change) for the higher oxides and would would give the reader an idea of the data-quality.

Figure 7 Indicate when the laser was triggered in the I2O3 experiment. Are the red

curves the same function as used in Figure 4 ?

L370 please provide references to the tropical UTLS being a “hotspot” of iodine chemistry. Have there been measurements of IO or higher iodine oxides in this part of the atmosphere?

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