

Interactive comment on “Absolute absorption cross-section and photolysis rate of I₂” by A. Saiz-Lopez et al.

Anonymous Referee #2

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General comments

The authors present new measurements of the absorption cross sections of I₂ and of its photolysis rate. These are followed by calculations of its lifetime in the atmosphere. The data presented initially, which indicated significantly higher cross sections than the generally accepted values of Tellinghuisen, have been corrected downwards following the comments from Tellinghuisen and also Bauer et al., which this reviewer has also read.

Following this correction, the cross sections are now in good agreement. Given that I₂ is a commercially available, thermally stable compound with well studied physico-chemical properties, including an easily measurable vapour pressure, this is no surprise. The good agreement means however, that the new data of Saiz-Lopez et al.

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have little impact on our understanding of the lifetime or role of I_2 in the atmosphere. Calculated photolysis rates were found to agree with the results of experiments in which I_2 was photolysed in the presence of O_3 . Given that the cross sections and quantum yield of I_2 are clearly well known, this result confirms that the radiometer was correctly calibrated and that the spectral distribution of the photolysis lamp is known.

Once properly scaled, the new absorption spectrum presented by Saiz-Lopez et al. will be useful for independent calculation of its photolysis rate in the atmosphere, and for extracting atmospheric I_2 concentrations from measurements of differential optical absorption, which was clearly the major motivation of Saiz-Lopez et al. As indicated in the corrective comment of Saiz-Lopez et al., a revised manuscript, with the new cross-sections (both in the paper and as supplementary information) would remove any ambiguity. For this reason, a revised manuscript is desirable. On the other hand, it is not clear to this reviewer that the re-measurement and, eventually, the confirmation of 30 year old I_2 cross sections amounts to a full ACP publication, although the clear discussion and presentation of several interesting aspects of atmospheric iodine photochemistry probably tip the balance in favour of this. In any case, the following comments should be addressed.

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It is unclear whether the measured cross sections are based on several measurements using different amounts of I_2 , or whether the vapour pressure of I_2 at one temperature only (298 K) was used. If the latter is the case, I find it difficult to accept the present absolute values of the cross-section, and would recommend that the authors scale their spectrum to that obtained by Tellinghuisen at e.g. 500 nm where no resolution effects are found. In addition, I find it worrying that in the comment of Saiz-Lopez et al. reference is made to separate experiments using a grating spectrum. Why was this scaling factor necessary and why was this other spectrometer set-up not mentioned in the original manuscript ?

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