

Interactive comment on “Atmospheric Band Fitting Coefficients Derived from Self-Consistent Rocket-Borne Experiment” by Mykhaylo Grygalashvyly et al.

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Dear Referee,

Thank you very much for your constructive suggestions. We tried to follow your comments and suggestions, but, please, approach with an understanding, that we should search a compromise between your suggestions and suggestions of other reviewers.

Major comments.

It is true that it is necessary to better inform potential readers about volume emission measurements. Now we add such description at lines 115-135 of the revised

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manuscript, where, we hope, all of your questions are highlighted.

Section 3.

We pointed out now directly in Section 3 that we consider combined mechanism in section 4.3 and derive an expression for corresponding fit-function in Appendix (lines 190-192 of the revised manuscript). Now we mention in Sec. 3 that the assumptions about photochemical equilibrium for $O_2(b^1\Sigma)$ and O_2^* are used (lines 155-156, 171-172, and 174-178 of the revised manuscript). We add the notation that the coefficients CO and CO_2 , and consequently k_3 , are assumed to be temperature independent (or dependence is weak) and short discussion of this assumption (lines 183-188 of the revised manuscript).

Line 194-196 (hereafter, line numbers at the beginning as in review), Figure 2. The uncertainties were calculated according with sensitivity analysis. Now we mention this directly in the manuscript and give the references (lines 231-233 of the revised manuscript). The sensitivity analysis allows to estimates uncertainty of target component on the basis of errors of parameters of given component. Advantage of the sensitivity analysis consists that it considers contribution of each parameter to uncertainty of target component at the expense of sensitivity coefficients. In our case, the dependence of target component on parameters is known as well as the errors of these parameters. Thus, calculating all sensitivity coefficients (partial derivatives of target components for each parameter), we define the resulting uncertainty of each target component.

Line 197. Information about ε taking into account both the variance and the error range has been included.

Line 198. The information about mean with error range based on the variance and error range of the individual points is provided.

Line 199-200. The corresponding discussion is corrected. Now we mark that consid-

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ering the large error range, there is no significant altitude dependence and state in the paper that the variability of the data points is much smaller than the errors of the individual points (lines 238-241 of the revised manuscript).

Line 203. This is true. Considering our large errors, we can't really derive any evidence for functional dependence. By demand of 1st reviewer the figure 3 has been deleted, as well as corresponding discussion.

Line 235. We provide an error range based on error propagation from the error and variance of RHS as provided in Figure 3. Now we compare these values directly with the values given by McDade et al. (1986). Possible reasons for the large discrepancy in CO are noted (lines 254-264 of the revised manuscript).

Line 238. We add the notation that the assumption ($K_3N_2 \ll K_3O_2$) is just working hypothesis which is commonly used for analysis of precursor and, currently, there is no any evidence, neither for nor against that. If it is not true any definite conclusion on precursor by known CO₂ is not possible (lines 267-273 of the revised manuscript).

Line 238. The error range for $\alpha\gamma$ has been provided (line 273 of the revised manuscript).

Line 250. We provides $\eta = \alpha\gamma$ as symbol for total efficiency for two-step mechanism and analogously total efficiency for two-step channel at combined mechanism at line 274 of the revised manuscript.

Line 257. We add consideration of uncertainty for total efficiency. At lower limit of uncertainty the result is saved, and considering upper limit, only O₂(5Pi) may serve as precursor (lines 292-294 of the revised manuscript).

Line 268. We provided an error range for CO/CO₂ ratio (line 305 of the revised manuscript).

Line 283. We add recommended discussion (lines 327-333 of the revised manuscript).

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Line 316. Now we note directly in the paper that Figure 7 (now Figure 5) is rather a sanity check than a validation (line 360 of the revised manuscript). Unfortunately we do not have other independent observation in present time. We add a notation about the necessity more independent common volume in-situ measurements to validate this results (lines 372-373 of the revised manuscript).

Line 349. We add error range and made a statement how our values compare to previous of McDade et al. (1986) (lines 383-386 of the revised manuscript).

Line 358, 359. Now we provide the error range for these values (line 394 of the revised manuscript).

Minor comments.

All of your minor suggestions were utilized. The text at lines 32-33 has been corrected. The lines 64-65 were reformulated more carefully. We studied this work now and add into the reference list.

Other changes are related to the recommendations and demands of other referee. Thank you a lot for taking your time to review our manuscript.

With respect, M. Grygalashvyly, M. Eberhart, J. Hedin, B. Strelnikov, F.-J. Lübken, M. Rapp, S. Löhle, S. Fasoulas, M. Khaplanov, J. Gumbel, and E. Vorobeva.

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