

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 a lot for your constructive suggestions. We tried to follow your comments and suggestions. Please, approach with an understanding, that we should search a compromise between your suggestions and suggestions of other reviewers.

Specific comments.

Reviewer write: “1. It seems that there is an imbalance between the description of the three instruments used during the rocket mission. CONE and FIPEX are described

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in more or less detail, whereas for an Airglow Photometer only its functional purpose is mentioned. It is recommended to either shorten the description of the first two or expand the description of the Airglow Photometer.”

We extend the description of the airglow photometer (lines 115-135 of the revised manuscript).

Reviewer write: “2. It is not clear why the theory is divided into two parts. It seems that the Appendix can be combined with the “Theory” section, and one should begin with the first sentence of the Appendix about the assumption of photochemical equilibrium. In this case, it is desirable to discuss the possibility of using the assumption of photochemical equilibrium at night. In addition, despite the well-established term "photochemical equilibrium", for pure night conditions it is more correct to call it "chemical equilibrium".”

We decided move derivation of equation for combined mechanism into Appendix in order to make the paper shorter and better focused. Now we discuss assumption about photochemical equilibrium at night directly in the section “Theory” (lines 174-178 of the revised manuscript). We use term photochemical equilibrium because it is more general and because even at night conditions excited molecular oxygen is a subject of spontaneous emission.

Reviewer write: “3. It is necessary to describe the method of estimating the errors shown in the figures. With such large errors, it is necessary to speak of height dependence of fraction of recombination with caution. In addition, error estimates for the fitting coefficient estimates should also be presented.”

The uncertainties were calculated with sensitivity analysis. We add some references where full description of this method is given (lines 231-233 of the revised manuscript). The discussion of Figure 2 and height dependence has been modified taking into account large error (lines 238-241 of the revised manuscript). The uncertainties of the fitting coefficients for two-step mechanism, as well as for combined mechanism fitting

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coefficients are shown in the revised manuscript.

Reviewer write: “4. More detailed comparison to the McDade et al. (1986) fitting coefficients is desirable taking into account error analysis.”

It is true that it is necessary to better inform potential readers about comparison with coefficients of McDade et al. (1986). Now we add such discussion at lines 254-264 of the revised manuscript (taking into account uncertainties), where, we hope, this subject is highlighted.

Technical corrections.

Reviewer write: “1. Figure captures should be extended. 2. Figure 3 is not correlation. 3. Equations (1) and (A2) are the same. After combing theory section and appendix some equations may be omitted.”

All of your technical corrections were utilized. 1. The captions for all figures are extended. 2. Figure 3 has been deleted by the suggestion of Reviewer 1. 3. Here, we think you mean Eq. 4 and (A2). By the suggestions of Reviewer 1 Eq. 4 (as well as Eq. 2, 5, 7) has been deleted.

Other changes are related to the recommendations and demands of other referee. Thank you a lot for taking the 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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