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Atmospheric Chemistry and Physics Discussions

Interactive comment on "On the dependence of the OH* Meinel emission altitude on vibrational level: SCIAMACHY observations and model simulations" *by* C. von Savigny et al.

Anonymous Referee #3

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Review of "On the dependence of the OH* Meinel emission altitude on vibrational level: SCIAMACHY observations and model simulations" by C. von Savigny, I. C. McDade, K.-U. Eichmann, and J. P. Burrows [acp-2012-42].

This paper reports on differences between the vertical emission rate profiles of hydroxyl nightglow emissions from different vibrational levels derived from Envisat/SCIAMACHY limb-scan observations of several bands.

The study provides detailed observational evidence, a review and comparisons to previous rocket results and a model study of hydroxyl photochemistry to support the conclusion that higher vibrational level peak at higher altitude, by about 0.5km per vibra-

tional level.

The paper is clearly and concisely written, contains appropriate references (with a notable exception of the very recent work by Xu et al. 2012), and the case is convincingly argued that these differences be taken into account when comparing ground based observations from different vibrational bands.

I recommend the paper be published after consideration is given to the comments, corrections and suggestions below.

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Page 5818 line 9 - omit comma

Page 5820 line 24 - nadir

Page 5822 line 8-9 – "the atmosphere can be approximated by a set of 10 homogeneously emitting layers" is a little confusing, suggest "the hydroxy layer can be approximated by . . ." Also, height steps 11 and 12 are used on the following page.

Page 5823 line 12 – How does the atomic oxygen emission at 844.6nm and the N2 band emissions get handled in the spectral average over the OH(6-2) band to yield the y vector?.

Page 5823 line 22 – July 2005 compared to July 2007 in Fig 2 caption

Page 5823 line 26 – is generally higher than

Section 4.1 comparisons – it is appropriate that reference and comparison be made to the recent TIMED/SABER observational and modelling work of Xu et al. [JGR, 117, D02301, 2012). This work may also have some bearing on the reaction rate coefficients and their temperature dependence used in section 5.

Page 5826 line 23 and Table 2 – Another separator is required (after the Evans et al. entries) in Table 2 to distinguish the 8 cases.

Page 5827 line 28- suggest “do not allow accurate determination of the altitude shift”

Page 5828 first para – please provide details of the bands observed and altitude differences identified by OSIRIS and SABER measurements (Xu et al. 2012 ref appropriate here)

Page 5829 line 13 – “e.g.” not required.

Page 5832 line 19 – omit “with”

Page 5832 last para and page 5833 – From observation of the measured emission rate profiles in Fig 2 it is apparent that the altitude differences between vibrational bands are larger on the topside of the layer than on the bottomside. The model results in Figs 6 and 7 with and without atomic oxygen quenching suggest that atomic oxygen quenching is important on the topside of the layer (topside is Fig 6-like), but less so on the bottom of the layer (bottomside is Fig 7-like). Can the model reproduce this behaviour atomic with appropriate modification of atomic oxygen altitude profile and/or rate coefficients? Reference and comparison to Xu et al. 2012 should be made.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 5817, 2012.