

Interactive comment on “Observations of OH-airglow from ground, aircraft, and satellite: investigation of wave-like structures before a minor stratospheric warming” by Sabine Wüst et al.

Anonymous Referee #1

Received and published: 29 December 2018

General comments:

This manuscript describes and analyzes observations of OH airglow emissions from different platforms (particularly from the FALCON aircraft) during a field campaign in Scandinavia in January 2016. The paper is in general well written and easy to follow. Although it does not provide any really new insights into the topic, the manuscript should in my opinion be published. It will probably be complemented by other publications dealing with the same field campaign. I recommend accepting the manuscript subject to minor revisions. Below I offer some (mainly really minor) suggestions for

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improvements.

Specific comments:

Page 1, line 29: 'emphasize' -> 'emphasis'

Page 2, line 12: 'mounted at' -> 'mounted on' ?

Page 2, line 14: 'all other airborne measurements address heights of ca. 20 km and below.'

It's not entirely clear, what this part of the sentence refers to? To other instrumentation on Falcon?

Page 3, line 25: I suggest replacing 'x' in '320 px x 256 px' by '\times' (I assume you use LaTeX?)

Page 3, line 30: '(compare Fig. 7 and 10).'

not sure, how this can be seen in Figures 7 and 10? Do the arrows indicate the flight track? The observed area is sometimes left, sometimes right of the arrows.

Page 4, line 22: 'and upper levels'

It's not entirely clear, what 'upper levels' refers to. It may refer to 'upper atmospheric levels' or 'levels of excitation'. It's most likely the latter. Please specify.

Page 4, line 24: delete comma before '1.04 and 1.06'

Page 4, lines 28 – 30: Perhaps a paper on the validation of SABER temperature observations can be cited here?

Page 6, line 19: 'information are' -> 'information is'

Page 6, line 23: 'the height of 84 km'

Is this the height of maximum VER or a weighted, i.e. centroid altitude?

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Figure 3: It would be good to mention explicitly in the Caption of Figure 3 that the year 2016 is shown.

Page 8, lines 24/25: 'information .. are' -> 'information .. is'

Page 9, line 7: 'flight legs parallel'

Perhaps add, e.g. 'roughly' or 'more or less', because the flight legs do not appear to be exactly parallel to the latitude/longitude circle?

Caption Figure 7: What exactly do you mean with 'Difference images'? This is later explained in the main text - as I found out - but perhaps it can be explained briefly in the caption, too?

Page 11, line 15: 'as well as height and intensity are anticorrelated.'

Regarding the anti-correlation between intensity and emission altitude the papers by Grygalashvyly (2014) and von Savigny (2015) may be cited, too. The first one provides a theoretical explanation for this anticorrelation and the second one shows the relationship for the OH(3-1) band (if I remember correctly), which is of importance to your work.

Grygalashvyly, M., G. R. Sonnemann, F.-J. Lübken, P. Hartogh, and U. Berger (2014), Hydroxyl layer: Mean state and trends at midlatitudes, *J. Geophys. Res. Atmos.*, 119, 12,391–12,419, doi:10.1002/2014JD022094.

von Savigny, C., Variability of OH(3-1) emission altitude from 2003 to 2011: Long-term stability and universality of the emission rate - altitude relationship, *J. Atmos. Sol.-Terr. Physics*, 127, 2015.

Page 13, line 19: 'So, if the vertical movements of atomic oxygen are due to a wave, one can conclude that the wave-induced vertical temperature gradient becomes zero where the brightness is maximal or minimal.'

I don't really understand this argument. Please explain.

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Caption Figure 8: 'The horizontal line marks the wavelength of 15 km.'

There are different horizontal lines. Please specify.

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