

Atmos. Meas. Tech. Discuss., referee comment RC2 https://doi.org/10.5194/amt-2021-134-RC2, 2021 © Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.

## **Comment on amt-2021-134**

Anonymous Referee #2

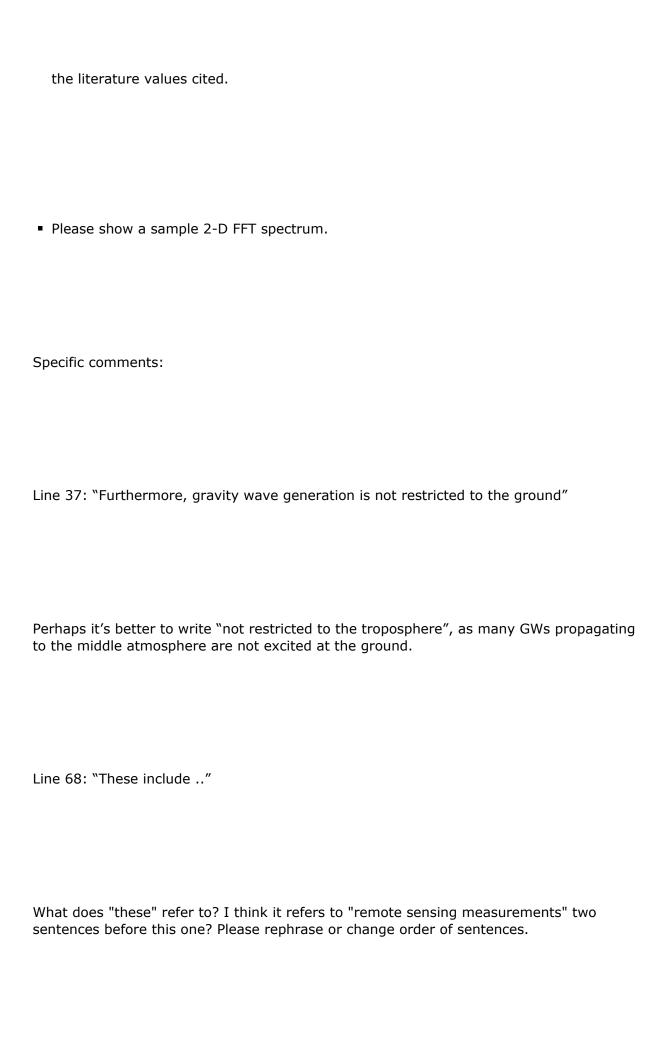
Referee comment on "Gravity wave instability structures and turbulence from more than 1.5 years of OH\* airglow imager observations in Slovenia" by René Sedlak et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-134-RC2, 2021

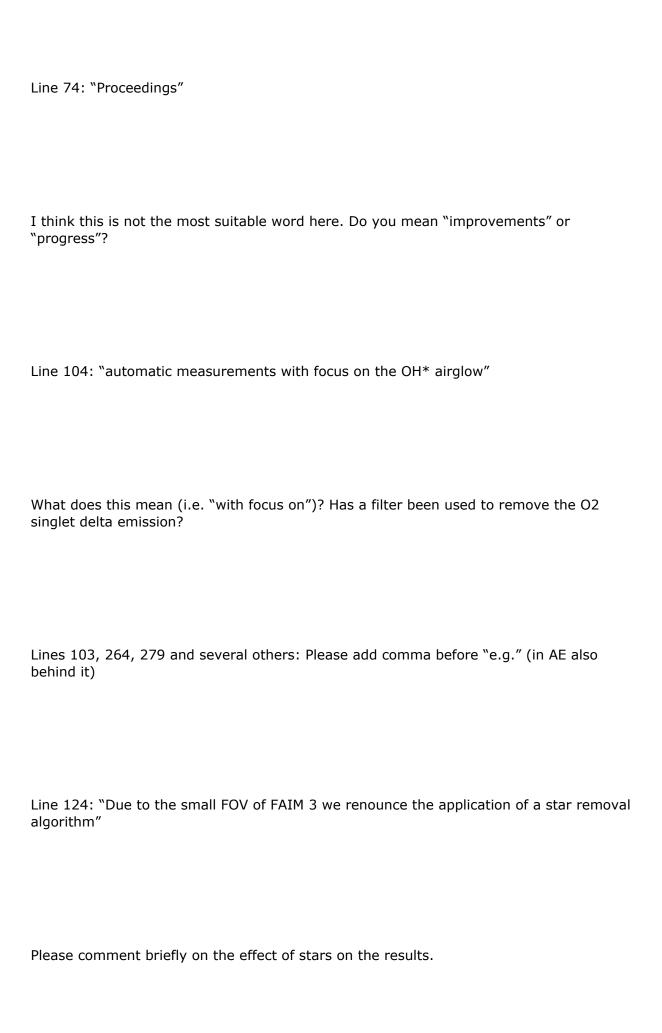
## General comments:

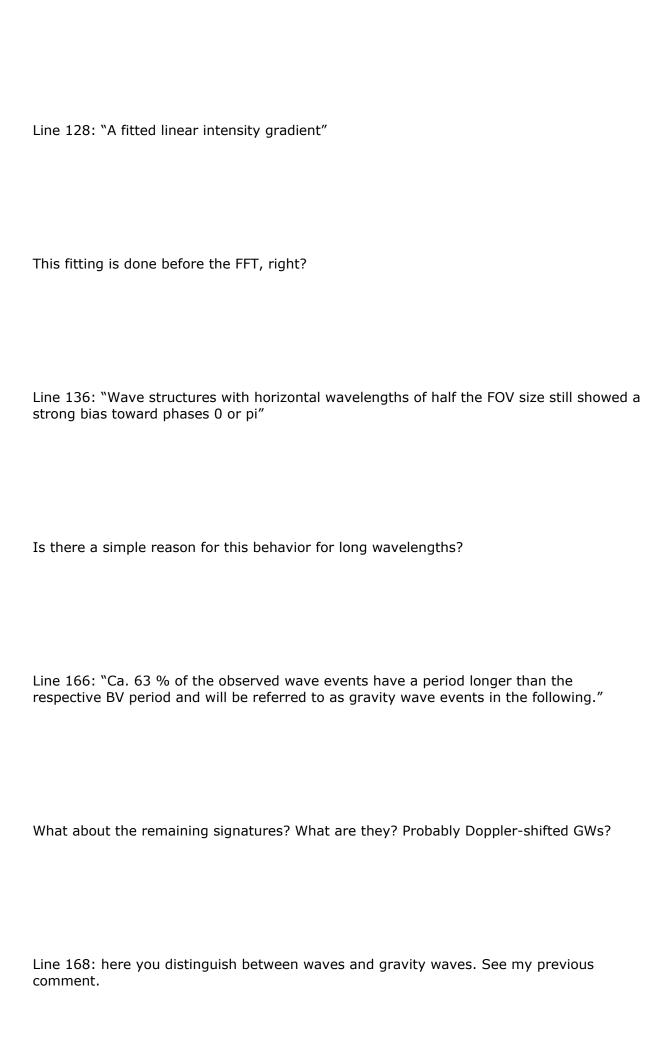
This paper deals with the analysis of wave and vortex signatures in ground-based OH Meinel emission imaging measurements from a central European site. The OH imager used has a high spatial resolution with a pixel width of about 24 m. Wave characteristics are extracted using a 2D-FFT. Eddy diffusion coefficients and energy dissipation rates are calculated from individual rotating vortices based on a concept by Prölss. In my opinion the manuscript is of interest to the scientific community and should eventually be published. I do have, however, several general and specific comment that I ask the authors to consider.

The general comments are:

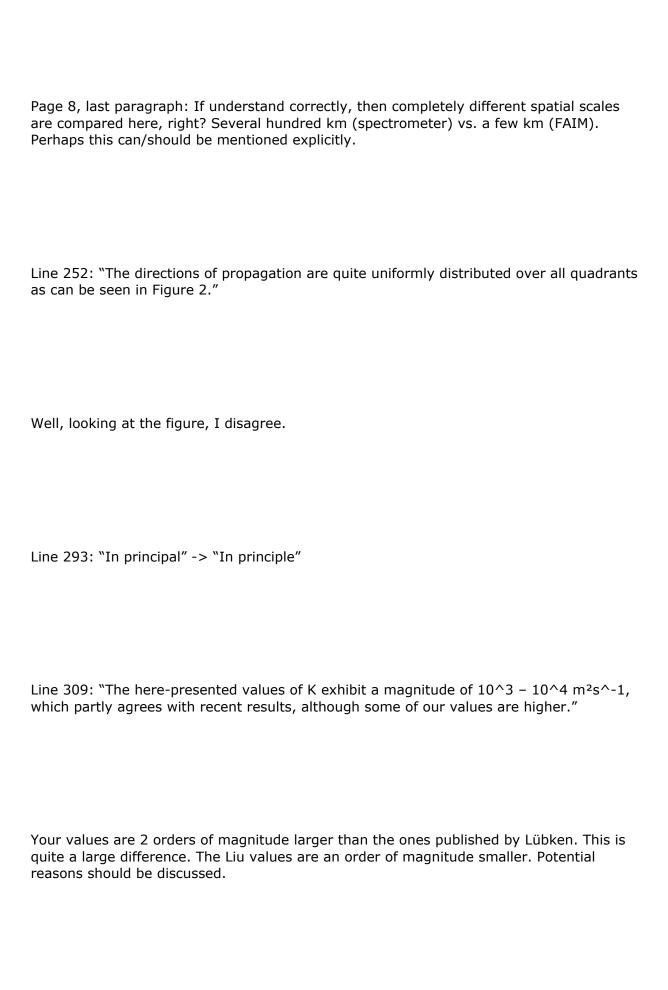
■ I have some concerns about the concept of Prölss (see also the specific comments at the end). The idea is that the mixing occurs at time scales of half a rotation of the cylinder. This time directly affects the derived eddy diffusion coefficient. However, the rotation will not be over after half a rotation but will continue and the vortex will disintegrate into smaller vortices etc. It may well by that the assumption that the mixing occurs at time scales of half a rotation leads to a systematic underestimation of the effective mixing time and hence to an overestimation of the eddy diffusion coefficients. This may also explain why your values of K are systematically larger than











Regarding the Prölss-concept to derive K: I'm not sure, whether this concept applicable to measurements capturing the rotating structures at different stages of the evolution of the structures? The cascade will go from a large eddy to many smaller eddies and I'm not sure what effect is makes, if the structure is analyzed at different times?
Line 330: "Given that our analyzed episodes are typical representatives of turbulent wave breaking, dynamical heating by gravity wave dissipation would deliver the same effect within few minutes as does chemical heating during an entire day."
One should keep in mind that the chemical heating is quasi-global and not intermittent in space and time, whereas the dynamical heating is probably quite local. The heating rates only apply to the air volumes affected by the turbulent motion. It would be interesting to estimate what fraction of the global MLT region experiences events (and how many) on a given day.
Line 393: "We find an isotropic distribution of directions of propagation"
Looking at the figures, it is not really isotropic, is it?
Line 347: "and agree mostly with earlier results from rocket and lidar measurements and simulations."

I disagree. The Lübken values are 2 orders of magnitude smaller (rocket) and the cited lidar values one order of magnitude. Please revise this statement.

Appendix A: I checked the derivation and it seems to be OK. But I have one general question: The model assumes that the mixing occurs on time scales of one half rotation. However, the rotation will go on and after one full cycle the original state is reached again (assuming a rigid cylinder). And this will go on several more cycles until the vortex disintegrates to smaller vortices. In reality this is of course much more difficult, but I think the model may underestimate the effective mixing time and hence overestimate the turbulent diffusion coefficient. Perhaps this is the reason why your estimates are larger than the other ones?

And a minor comment on the appendix: The term "side gas" is quite unusual and I don't know what it means to be honest. Is this a problem with the translation from German? I suggest to use another term.