Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., editor comment EC1
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Comment on amt-2021-310

Robert Sica (Editor)

Editor comment on "Estimating the uncertainty of middle-atmospheric temperatures retrieved from airborne Rayleigh lidar measurements" by Stefanie Knobloch et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-310-EC1, 2022

Unfortunately the revisions required for this manuscript are sufficient enough to warrant it being rejected. The Referees and I have left significant comments we believe are necessary to address in a revised manuscript, as well as correction of what appears to be a significant error in the calculation of the ozone correction (see Referee 's report). Upon addressing these concerns I encourage you to resubmit the manuscript.

My comments on the initial submission follow.

I don't think the level of scholarship in this version of the manuscript is sufficient, as some similar and significant previous Rayleigh lidar work with significant overlap to this manuscript is not discussed. In my References below are two very important papers for you to discuss and compare your results. The Leblanc et al work is a detailed assessment of the traditional analysis and has detailed uncertainty calculations you should refer to in your work. The Sica and Haefele work describes an optimal estimation based method for retrieving temperature. One advantage of this method is issues like SNR cutoffs are defined quantitatively by the retrieval and don't requiring guessing about SNR like in the traditional method.

The other reference papers are a few selected works my group has done on gravity waves using the Purple Crow Lidar which should be cited and discussed. There have been other significant studies with higher power Rayleigh and sodium lidar systems you should discuss as well; I leave it to you to track these down.

Minor comments on the submission.
Line 83: you should write background as B(z); if you require a simplifying assumption it could be then assumed constant, but it is not constant in general on many systems.

line 86: typo, "E.g." starts a sentence instead of continues the sentence.

bottom of page 5: if I read what you are doing correctly you are using a temperature consistent as opposed to a density consistent seed; in other words in the former case you take a seed temperature and in the later you normalize the density to be consistent with the assumed temperature (because pressure is what is relevant). Perhaps you could make this point clearer to the reader and explain why you picked it?

line 422: you don't mention your result is only true for non-paralyzable system, why are paralyzable systems not discussed? Please include both, and if you want to only discuss one say why.

References

1. Important Rayleigh T work
Leblanc, T. et al. (2016), Proposed standardized definitions for vertical resolution and uncertainty in the NDACC lidar ozone and temperature algorithms -- Part 3: Temperature uncertainty budget, Atmospheric Measurement Techniques, 9(8), 4079-4101, doi:10.5194/amt-9-4079-2016.

Sica, R. J., and Haefele, A. (2015), Retrieval of temperature from a multiple-channel Rayleigh-scatter lidar using an optimal estimation method, Applied Optics, 54(8), 1872-1889, doi:10.1364/AO.54.001872.

2. A few Gravity Wave papers

Sica, R. J. (1999), Measurements of the effects of gravity waves is the middle atmosphere using parametric models of density fluctuations. Part II: Energy dissipation and eddy diffusion, Journal of the Atmospheric Sciences, 56(10), 1330-1343.

Sica, R. J., and Russell, A. T. (1999), How many waves are in the gravity wave spectrum?, Geophysical Research Letters, 26(24), 3617-3620.

Sica, R. J., and Russell, A. T. (1999), Measurements of the effects of gravity waves in the middle atmosphere using parametric models of density fluctuations. Part I: Vertical wavenumber and temporal spectra, Journal of the Atmospheric Sciences, 56(10), 1308-1329.

Sica, R. J., and Thorsley, M. D. (1996), Measurements of superadiabatic lapse rates in the middle atmosphere, Geophysical Research Letters, 23(20), 2797-2800.

The Purple Crow Lidar (system description)
Sica, R. J. et al. (1995), Lidar Measurements Taken with a Large-Aperture Liquid Mirror.1. Rayleigh-Scatter System, Applied Optics, 34(30), 6925-6936.