

Atmos. Meas. Tech. Discuss., author comment AC2
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Reply on RC2

Alberto Sorrentino et al.

Author comment on "A Bayesian parametric approach to the retrieval of the atmospheric number size distribution from lidar data" by Alberto Sorrentino et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-152-AC2>, 2021

We thank the reviewer for their comments. We will modify the manuscript in order to take them into account.

In the meantime, here are few thoughts on the main points raised by the reviewer.

We will clarify the mathematical aspects of the problem better. Indeed, as suggested by the reviewer, the problem is generally under determined, with the only exception being when one looks for a monomodal distribution: in this case, one has three unknowns and 5 data points, i.e. the problem is over determined.

We agree that 5% of noise is too small for typical lidar signals, however, averaging in time and space can help to increase the signal-to-noise ratio [see also comment to Reviewer 1]. The level of noise on input data does deteriorate the retrieval; however, the use of a parametric model for the number size distribution reduces the impact of noise compared to methods that work with "generic" shapes, which tend to be affected more by noise than methods working with parametric models. Of course, more noise implies more uncertainty on the estimated parameters. We reckon a thorough study of the impact of noise is however out of the scope of the present manuscript, as it takes a substantial amount of space, and will be the topic of future studies.

Finally, it is true that estimating the RI is a tricky point, and requires careful modeling and powerful algorithms to provide, possibly, multiple solutions compatible with the data. This is also part of future work.