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Atmospheric Measurement Techniques Discussions

Interactive comment on "Ground based lidar and microwave radiometry synergy for high vertically resolved thermodynamic profiling" *by* M. Barrera-Verdejo et al.

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The optimal estimation methodology has proven to be a very useful approach to retrieve atmospheric profiles by combining different sensors. It is nice to see that this methodology can also be applied successfully to combine passive microwave and raman lidar observations. I consider the manuscript as very useful to the science community as it quantities the added value of this instrument combination and clearly depicts the main caveats. In particular, the data set of the HOPE campaign is very well suited for this assessment because it features a large number of radiosonde ascents as verifying reference. Further enhancements of the algorithm like e.g. a refined forward

operator may provide some additional improvement, but I am convinced that they will not change the overall assessment of this paper. Moreover, the results of this paper will be very useful as benchmark for future algorithm development.

I have some comments, which may help to strengthen the manuscript:

- Quantifying the lidar error is one of the most important ingredients of the scheme. Maybe you should explain this issue in more detail. In particular, why have you chosen a sharp cut-off the lidar profiles at low and high altitudes? What do you think of increasing the lidar uncertainty at these edges resulting in a smooth fadeout of lidar information in the retrieval?

- The summarizing parts of the study give vertically averaged estimates of the error reduction by different approaches. Please explain what kind of vertical average you have applied – arithmetic average with height, density weighted, . . .?

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