

Interactive comment on “Estimating drizzle drop size and precipitation rate using two-colour lidar measurements” by C. D. Westbrook et al.

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Thanks for the helpful comments – these are addressed below:

The Marshall-Palmer distribution is not valid for drizzle. That the results do not match is therefore no surprise.

We agree that the Marshall-Palmer distribution was derived based on measurements for higher rainrates originating from melting snow, and is likely poor for drizzle. Based on this comment, and a similar comment by referee 2, we have added a note to this effect “Note that the Marshall-Palmer distribution was derived for millimetre-sized raindrops produced by melting snowflakes, rather than drizzle produced by collision-coalescence”. The comparison is still worthwhile however, since many numerical

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weather models apply the M-P distribution to drizzle.

In many papers drizzle is described with a log-normal distribution. Suppose this is used in the technique, will the results change much?

It is true that a number of studies have used a log-normal, rather than a gamma/exponential distribution for drizzle drops. We hope that future work where the lidar measurements can be combined with Doppler radar observations will allow us to pin down what the shape of the distribution is – we have added the following sentence in the conclusions “In this paper we have used cloud radar returns as an independent test of the 2-colour lidar technique. In future work we hope to combine the lidar measurements with Doppler radar measurements to further constrain the shape of the drop size distribution and reduce the uncertainties in the derived drizzle rates”

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