Atmos. Meas. Tech. Discuss., 3, C552–C553, 2010
www.atmos-meas-tech-discuss.net/3/C552/2010/

Atmospheric Measurement Techniques Discussions

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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Received and published: 28 May 2010

Thanks to the referee for these helpful comments. The detailed points are addressed below:

896/13 Has alpha been defined earlier in the paper?

Yes: it is defined two sentences earlier.

899/18 Is this correctly stated? Absorption depends on total mass not just size.

To clarify here, we have changed the text to say: ". . . is dominated by tiny cloud droplets which, because of the short path length within the drop, do not significantly absorb the backscattered rays of light at either wavelength"

899/24 "Liquid cloud .." – probably meant to distinguish from aerosol cloud, but common usage now tends towards condensate, which in this case is understood to be liquid

To clarify, we have changed this to "Returns from the cloud layer". We prefer this over "condensate", in order to make the distinction between the cloud layer (where no retrieval is possible) and the drizzle drops falling beneath.

901/26 Why is there agreement within 2dB for case II versus +/-5dB in case I? Is it because of the better fit of size distribution in the model? How far off can other cases go?

This is an interesting point. In part it may be a collocation issue (as noted in the text) – to make the scatter plot in case I it is necessary to interpolate the observations on to the same grid which introduces (artificial) scatter, especially for the drizzle in case I which was quite inhomogeneous. Simply plotting the pair of time series at one gate in case II which had a rather smoother drizzle field is less prone to this problem. Further study of other cases is in progress.

902 It may be good to remember than the M-P distribution was developed for rain resulting from melted snow. Of course it is also applied to other situations, but it is not surprising that the fit for drizzle is poor.

Agreed – this comment was also made by referee number 3. 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."

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 891, 2010.