

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

### **Anonymous Referee #1**

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This excellent paper introduces a novel dual wavelength lidar backscattering technique for retrieving the characteristic drop size of drizzle, and hence other parameters such as liquid water content and rain rate. The theory is introduced, a simple retrieval method is described, and dual wavelength lidar measurements and retrievals are shown for two case studies. Important error sources, such as the width of the drizzle drop size distribution and aerosol backscattering, are thoroughly considered and quantified. Other potential issues, such as non-sphericity of drizzle drops, are also considered. The simple retrieval method is appropriate for a first article about this topic. The data and retrievals shown for the two case studies are very appropriate. An important aspect of the paper is the validation of the lidar retrievals by comparing lidar retrieved and measured radar reflectivity.

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In summary, the paper is highly original, introduces an important new remote sensing technique, and is very clearly written. Simply put, the paper is nearly perfect, and I have no significant criticisms.

Here are two suggestions that may or may not improve the paper:

1. The lidar calibration error could be propagated to errors in the retrievals.
2. There could be discussion of whether another active measurement (radar or a third wavelength lidar) could be used to reduce retrieval uncertainties due to the gamma distribution width parameter  $\mu$ .

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

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