1.6 RECONSTRUCTION OF THE DRIZZLE MODE OF THE RAINDROP SIZE DISTRIBUTION: AN APPROACH USING DOUBLE-MOMENT NORMALISATION

T. H. RAUPACH[1], M. THURAI[2], V. N. BRINGI[2], A. BERNE[1]
[1]École Polytechnique Fédérale de Lausanne, Switzerland
[2]Colorado State University, Fort Collins, CO, USA
tim.raupach@epfl.ch

The raindrop size distribution (DSD) describes the microstructure of liquid precipitation. Bulk rainfall variables of interest can be derived as weighted moments of the DSD, and the DSD is thus fundamental to studies of rainfall microphysics, as well as processes that occur on larger scales such as radar retrieval of rainfall properties.

It is well known that commonly used disdrometers do not measure well the small-drop end of the DSD spectrum, meaning that most disdrometer measurements are inaccurate or missing below a minimum drop size of about 0.5 mm. Recent work by Thurai et al. (*J. App. Met. and Clim., 56, 2017*) used collocated measurements from 2D-video-disdrometer (2DVD) and an optical array probe (Meteorological Particle Spectrometer, MPS) to measure a more complete DSD down to a minimum drop size of 0.05 mm. The spectra measured using this technique exhibited peaks of small drops in a "drizzle mode" for diameters less than about 0.7 mm, often separated from the rest of the DSD by a "shoulder" region. The drizzle mode and shoulder region are not well captured by often-used disdrometers, yet influence important rainfall parameters such as the total drop concentration and shape parameters of DSD models.

In this study we investigate whether the drizzle mode and shoulder region of the DSD can be "reconstructed" from truncated DSD measurements made using ordinary disdrometers. To do so we use the double-moment normalisation technique of Lee et al. (*J. App. Met., 2004*), in which the DSD is represented as a combination of two of its statistical moments and a shape function that is assumed to be invariant. We determine which two DSD moments are best measured by "incomplete", truncated DSDs. We fit a generalised gamma model to the shape function, using "complete" DSDs made up of combined 2DVD and MPS measurements. Using this shape function and moments measured by an ordinary disdrometer, this technique shows promising potential to reconstruct the drizzle mode of the DSD even when it is outside the measurement range of a given instrument. The effects of the reconstruction on bulk rainfall variables are examined.