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Stochastic modeling of rainfall microstructure

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Detailed knowledge of the discrete microstructure of rainfall is a conditio sine qua non to understand, quantify and predict several environmental processes, both occurring in the atmosphere and at the land surface, e.g. aerosol scavenging, rainfall interception and soil erosion. At the same time, the microstructure of rainfall determines the relation between the macroscopic observables estimated using ground-based and spaceborne remote sensing techniques and the variable of interest for many hydrometeorological applications: rain rate. The microstructure of rainfall has typically been parameterized in terms of a raindrop size distribution. However, it has been recognized for many years that the parameters of raindrop size distributions are highly variable, both in space and in time. One approach to deal with this inherent variability is to treat the raindrop size distribution as a probability density function with random parameters, governed by stochastic processes in space and/or time. We present several examples of this approach in the realm of microwave remote sensing of rainfall, both using weather radars and microwave links.