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From discrete to continuous - rainfall observations over a range of scales

R. Uijlenhoet

Hydrology and Quantitative Water Management, Wageningen University, The Netherlands (Remko.Uijlenhoet@wur.nl)

Rainfall exhibits a tremendous variability over an enormous range of scales, from the individual raindrop to the entire globe. At large space and/or time scales, rainfall can be safely regarded as a continuum. At smaller scales, however, the continuum hypothesis breaks down and the rainfall field turns out to have a discrete nature, i.e. it consists of a collection of individual particles. For certain applications the continuum hypothesis can be safely employed, e.g. in hydrology. For other applications, the discrete nature of rainfall is fundamental to understand, quantify and predict processes, e.g. in aerosol scavenging, rainfall interception and soil erosion. In yet other applications, it is the relation between the continuum and the discrete which is essential. For instance, relations between the macroscopic observables encountered in many rainfall remote sensing techniques (e.g. radar) strongly depend on the microscopic properties of rainfall. We present analyses of in situ and remotely sensed rainfall observations over a range of scales, from the discrete to the continuous, to investigate the relation between the micro- and the macroscopic properties of rainfall.