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A multi-platform perspective of precipitation measurement and estimation

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The times when precipitation was measured only by using traditional rain gauges located at accessible sites (points), mostly over land surfaces, have long gone by. The inherent spatial and temporal variability of this meteorological parameter is very well known and the need to account for these has led to the invention and development of a wide spectrum of instruments that are now at our disposal. The large variety of instrumentation available, their placing and operation, as well as their temporal and spatial coverage characteristics, justify the designation of precipitation as a “multi-platform measurable element”.

The most common ground based platform is the rain gauge which simply accumulates the collected precipitation, thus measuring its amount actually reaching the ground; variations of this platform exist that cover a large spectrum and a great deal of effort was put in the estimation of accuracy of measurements and in the comparison of the measuring instrumentation. The family of ground based platforms now includes the disdrometer which is used to measure the drop size distribution and velocity of falling hydrometeors. Recently, under-the-sea acoustic platforms have been added.

Remote sensing techniques improve our knowledge of precipitation distribution, especially over areas of scarce gauge measurements. High-resolution satellite-based precipitation estimates add to the range of precipitation platforms but ground measurements remain indispensable for calibrating, correcting and adjusting such satellite derived estimations.

The weather radar comprises another widely used remote sensing platform for estimating precipitation, providing a quite high spatial and temporal resolution. Initially, reflectivities from ground based radars were transformed into estimates of rain rates; the radar technology was subsequently incorporated onboard orbiting satellites to pro-

vide rain rate estimates from space. The recent success of TRMM, for example, has led to an international co-operation for the expansion of the satellite radar retrieved precipitation regimes: a constellation of precipitation radar bearing satellites will in the near future provide a global coverage.

The broadening of the available platforms for precipitation measurement and estimation has inevitably led to numerous techniques attempting to compare these platforms. Examples are the radar corrected estimates of precipitation with ground based rain gauge measurements, the “calibration” of satellite estimates with ground measurements or with gauge corrected ground based radar estimates etc.