1.30 LONG-TERM ANALYSIS OF REFLECTIVITY-RAINFALL RATE RELATIONSHIPS USING DISDROMETER DATA

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Accurate precipitation rates constitute an essential input data for many hydrometeorological applications as a hydrological model based on precise rainfall estimation will reduce the uncertainty in the simulations of hydrological processes. There are different instruments available to measure precipitation; the rain gauge is the most worldwide used device as, despite the relative simplicity of this instrument, a description of the temporal distribution of rainfall (a very important characteristic) especially for large periods of time can be obtained. The advances in optical and electronic technologies have allowed the development of a variety of instruments based on different principles which can measure some other precipitation characteristics. In particular, the disdrometers can describe (among other variables) the size, shape, and fall velocity of precipitation particles, and in particular they measure the drop size distribution (DSD), which can be used to calibrate the Z-R relationship used to estimate rainfall rates (R) from radar reflectivity measurements (Z). In this work, long-term records of disdrometer measurements are analysed to examine the relation between the rainfall rate (R) and the reflectivity (Z). Up to ten years of data from two impact-type JossWaldvogel disdrometers located in the Chilbolton Facility in the UK were processed and then validated using rain gauges. The rainfall rate and the reflectivity were derived using the information available from disdrometers in order to determine parameters (a and b) of the power-law relationship $Z=aR^b$. Specific criteria were applied to the data as low-values of rainfall rate may affect the power-law regression. Four different settings in the calculation of power-law model parameters were applied to analyse the variability of the estimated values, allowing to assess the reliability of the linear and least-squares regression methods. As the Z-R relationships can be influenced by local weather, affecting the estimated-radar precipitation, the seasonal variability of the Z-R relationships is also analysed. The results indicate that the selection of the regression method has an impact in the estimated parameters of the Z-R equation.