Monitoring rainfall erosivity in the Sparacia experimental Area by an optical disdrometer

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**Abstract**

The rainfall kinetic energy has an important role in water soil erosion processes and it can be determined by the knowledge of both drop size distribution (DSD) and falling velocity of the drops. The paper shows the results obtained by the DSDs measured by an optical disdrometer installed at the Sparacia experimental station in the period May 2015 - January 2020. At first, the measured DSDs, that are recorded with a 1 min sampling time, are used to test the applicability of Gamma and Weibull theoretical distributions. Then, the dataset of DSDs and the falling velocity estimated by the relationship suggested by Ferro (2001) are used to obtain the rainfall kinetic power. To better highlight the relation between kinetic power and intensity, the DSDs are also aggregated into rainfall intensity classes, having different amplitudes.

The kinetic power values are initially used for testing the applicability of the kinetic power-rainfall intensity relationships proposed by Wischmeier and Smith (1978), applied in the Universal Soil Loss Equation (USLE), Brown and Foster (1987) (RUSLE), and McGregor et al. (1995) (RUSLE2). Then, the reliability of theoretical relationships for estimating the kinetic power by rainfall intensity and a characteristic diameter (median volume diameter or mean diameter) are verified. The above tests are carried out for both single and aggregated DSDs. Finally, for each rainfall event, the kinetic energy obtained by DSDs measured during the event is compared with those obtained by the above literature relationships to establish the most reliable equation at event scale.

All the results obtained by DSD measurements carried out at Sparacia are compared with those obtained in Palermo (Italy) and El Teularet (Spain) using the same optical disdrometer in previous investigations. In particular, the differences on DSDs characteristics and on the relation kinetic power – intensity are analyzed in detail.