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Seasonal variation of drop size distribution: influence on rainfall kinetic energy

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The rainfall kinetic energy (RKE) influences erosion processes to a high degree. The most prominent example is soil erosion (Wischmeier and Smith 1958) but also the erosion of the leading edges of turbine blades of wind turbines is related to rainfall kinetic energy (Bech et al. 2018). Based on drop size distribution (DSD) measurements of disdrometers, the RKE can be calculated directly. It is known that DSD and therefore RKE vary during an event but there are fewer studies on the seasonal variation of these parameters. To estimate seasons with higher or lower erosion potential, it is important to know more about the seasonal behaviour of DSD and RKE.
For our analysis we used five years of quality controlled Thies disdrometer data. The disdrometer was installed in connection with the Danish hydrological observatory project – HOBE (Jensen and Illangasekare 2011) in the western part of Denmark.
The results show that the mean concentration of drops and RKE are higher in summer and autumn and lower in winter and spring. Furthermore, the data indicates that drops with a diameter larger than 1 mm are more frequent in the seasons June to August (JJA) and September to November (SON). Whereas the concentration of drops decreases with increasing diameter for all seasons, RKE reaches a maximum at a mean drop diameter between 1.125 and 1.625 mm depending on the season. In the season December to February (DJF) raindrops with a mean diameter of 1.125 mm provide most kinetic energy. In contrast, raindrops with a mean diameter of 1.625 mm are responsible for most of RKE in the season June to August (JJA).
With these results, we conclude that the potential of erosion is higher in summer and autumn because of higher concentration of raindrops, higher percentage of larger raindrops and therefore higher RKE.

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