



Wind effects on disdrometer measurements at different elevations along a meteorological mast

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Disdrometers positioned at different elevations above the ground experience different wind conditions, with increasing wind velocity as the elevation increases and possibly changing wind direction. On the contrary, bulk properties of the rainfall process, such as the rainfall intensity, are not expected to change along the vertical within a limited elevation gain.

In this work, high resolution data collected over 2.5 years on a meteorological mast located at Pays d'Othe wind farm, 110 km South-East of Paris France is used. More precisely, data from an OTT Parsivel2 disdrometer, with 30 s observation time step, and a Thies Clima 3D sonic anemometer at 100 Hz, located at roughly 40 m, are used. The same setting is replicated at 80 m.

In previous research (Chinchella et al., 2025), the expected wind-induced bias of the OTT Parsivel2 disdrometer was numerically quantified using computational fluid dynamics simulation. Adjustments are here applied to raw disdrometer data depending on the measured wind speed and direction. Not only updated rain rate is provided but also the whole DSD enabling to study a few key features such as mean diameter or total concentration.

The disdrometer measurements (rain rate and DSD) at the two heights are compared before and after the correction. In a first step standard scores such as RMSE, normalized bias or Nash-Sutcliffe efficiency are used. In a second step, Universal Multifractal (UM) features are compared to get results valid, not only at a few selected scales, but across a wide range of scales. UM is a parsimonious mathematically robust framework, relying on the physically based notion of scale invariance inherited from the governing Navier-Stokes equations. It has been widely used to characterize and simulate geophysical fields extremely variable over wide range of scales such as rainfall, with the help of only 3 parameters.

This study enables to discuss the effect of the wind correction with increasing wind on the same location. It also enables to quantify the influence of wind on disdrometers measurements and retrieved UM features, an effect that has been neglected in previous investigations.

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References

Chinchella, E.; Cauteruccio, A.; Lanza, L.G. Impact of Wind on Rainfall Measurements Obtained from the OTT Parsivel2 Disdrometer. *Sensors* 2025, 25, 6440. <https://doi.org/10.3390/s25206440>.