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Comparison of measured raindrop size distributions in Denmark

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Wind turbine blades are not only exposed to high wind speeds but also to large temperature differences, UV light and precipitation events with high rain intensities. Such precipitation events in combination with high tip speeds influence highly the erosion of the leading edges of wind turbine blades (Bech et al. 2018). Furthermore, it appears that the leading edge erosion (LEE) occurs faster at offshore than at onshore located turbines in North-Europe. To analyze the influence of precipitation on this dissimilar temporal LEE behavior, comparisons of the raindrop size distribution (DSD) are needed.
In spring 2018, two Parsivel2 disdrometers have been installed on the west coast of Denmark to get an impression of the conditions offshore. For comparison, another Parsivel2 has been installed at an up-country side in Denmark. We will present an analysis of the DSD using the measurements of the first year and point out similarities and differences between the different locations. We are especially interested in the DSD of frontal systems coming from the west, as they first pass the disdrometers at the coast and later on the disdrometer at the up-country side. Furthermore, we will calculate the rainfall kinetic energy (RKE) as it is an important energy source for the LEE. We will compare the RKE of different seasons and events to estimate the erosion potential for LEE due to rainfall.

Reference

Bech, J. I., Hasager, C. B., and Bak, C.: Extending the life of wind turbine blade leading edges by reducing the tip speed during extreme precipitation events, Wind Energ. Sci., 3, 729-748, https://doi.org/10.5194/wes-3-729-2018, 2018.