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A novel water droplet size parameter for calculation of icing on power lines

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Abstract: Collision efficiency is an important parameter for an icing prediction model. It mainly depends on wind velocity, conductor diameter and water droplet diameter. However, water droplets have a spectrum of sizes, which makes the task of calculating the overall collision efficiency time consuming. Therefore, some representative droplet sizes have been used, such as the median volume diameter. In this paper, a novel representative droplet diameter is presented for the calculation of the collision efficiency. The results are compared with those using the median volume diameter and the entire droplet size spectrum. The results show that this parameterization provides a more stable approximation than the median volume diameter when the collision efficiency changes, and is more appropriate when the collision efficiency is small. Mathematical explanation for this is given, and the limitation of this method is discussed.

Key words: ice accretion; collision efficiency; water droplet diameter; size spectrum; median volume diameter

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