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Objective Classification of Convective and Stratiform Rain Type in Bavaria Using Thies Disdrometer Measurements of Rain Microstructure

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Classification of rain type into convective and stratiform is an important prerequisite to investigate the association between rain properties and the weather conditions on local and large scales. This classification is also important to improve the accuracy of rain rate estimation by radars. Some classification methods suggest using pairs of rain microstructure parameters such as the median volume diameter D0, the intercept N0, rain intensity R, shape μ and slope Λ of the fitted gamma distribution to rain drop size distribution. All of these parameters can be measured by disdrometers. However, large differences in their values occur when using different disdrometer types. This makes the suitability of using the same classification methods for different types of disdrometers doubtful. We test the classification performance of a selection of methods when applied on Thies disdrometer measurements of rain microstructure. We also investigate the possibility of improving the classification performance by applying different machine learning predictive models.
Clear convective and stratiform intervals were selected out of one year of Thies disdrometer measurements in Fuerstenzell in the southeast of Germany. The already available classification methods performed poorly when applied to this dataset, even after modifying the decision boundary for optimized separation performance. To achieve better classification, a collection of rain microstructure features were selected based on low inter-correlation and high prediction power for rain type. These features were then used in different predictive models. The newly suggested models outperformed all the available methods which were restricted in terms of predictors and linear decision boundary.