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Preparation of a filter to correct drop size distributions of Parsivel disdrometer based on the particle speed limitation

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The disdrometer is an instrument which measures the droplet size distribution, this measurement can be used to estimate the rainfall intensity (mm/h), radar reflectivity ($mm^6.m^{-3}$) close to ground and concentration of droplets ($m^{-3}.mm^{-1}$) for each diameter class. The most common are the impact disdrometer (Joss-Waldvogel) and optical disdrometer (Parsivel and Thies). The optical disdrometer has a light beam and when the rainfall particle passes through this beam, the received signal decreases. The extent of this reduction is related to the particle size and duration of reduction is related to the fall velocity. The Joss-Waldvogel Disdrometer measuring the raindrops size distribution through an electromechanical spectrometer, where the drops levied on an area of 50 cm^2. The comparison between three different disdrometers Krajewski et al. (2006) was performed during the DEVEX experiment (Disdrometer EValuation EXperiment). To performance evaluation of each disdrometer were done comparing rain rate, drop size distribution and particle velocity data. The comparison results indicate that in general all the instruments showed satisfactory performance. However, small differences were observed between the disdrometer data, especially during intense precipitation events, with a significant overestimation of Parsivel in precipitation rate. In his study the same comparison was performed and also an overestimation has been observed for the field experiments of the CHUVA Project. This difference may be associated to the fact that large rain particles when precipitate, collide with the instrument and is subdivided into several smaller droplets, causing high levels of concentration in small diameters classes. When this occurs the droplets pass through the beam at a speed greater than that expected for these small broken droplets. In this study the Joss-Waldvogel disdrometer was used as reference and a filter was developed with the purpose of eliminating inconsistent data measured by Parsivel in order to bring similar concentration of rain drops values from different types of disdrometers. Results are presented for two disdrometers, a Joss-Waldvogel and a Parsivel, installed in IEAv site during the CHUVA Project, at Vale do Paraíba - SP, which occurred from 30 October 2011 to 18 March 2012. Based on these data we calculated the average speeds and standard deviations for each class of diameter. A filter was developed using the expected fall speed for each droplet size and only droplets sizes. In the domain of the expected terminal velocity and the standard deviation for each class of diameter were considered to compute the concentration. We have tested several intervals as function of the

standard deviation. After application of the test factor to the standard deviation value of 1.6 was chosen, since with this factor, the mean concentration curve Parsivel followed well the behavior of the average concentration of the Joss-Waldvogel, for most classes.