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Raindrop size distribution observations with Parsivel and Micro Rain Radar (MRR) over Sumatra

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The variability in the observed drop size distribution (DSD) or its integrated parameters is attributable to two main sources: instrumental effects and natural (diurnal, intraseasonal and seasonal) variability [1]-[2]. The aim of the present study is to compare the performances of various instruments, based on different measuring principles, in the rainfall-rate (R) and DSD estimates. It is also to investigate the variability of the DSD over Sumatra, Indonesia.

We collect the precipitation data by using Parsivel, Micro Rain Radar (MRR) and Optical Rain Gauge (ORG). The Parsivel disdrometer is a laser optical device which - in theory - can measure the size and fall speed of hydrometeors. The size category goes up to 25 mm, with 32 size classes of varying diameter intervals, and the velocity category
goes up to 20m/s, again with 32 classes, and again with varying velocity intervals. Parsivel provides several parameters such as rainfall rate and DSD. The instrument at Koto Tabang (Sumatra) has been installed since January 2012. In the present study, MRR data is used to classify the precipitating systems and to retrieve the microphysical parameters. The DSDs are parameterized by normalized gamma distribution [2]

Figure 1 shows an example of rainfall rate (R) time series for rain event on 11 January 2012. In general, R of ORG and Parsivel is in good agreement ($r\hat{}2 > 0.9$). On the other hand, MRR provides lower R than ORG and Parsivel. The difference in R between MRR and ORG/Parsivel is significant during heavy rain which is probably due to strong rain attenuation in the frequency of MRR (24 GHz) in this condition. Detailed analysis regarding the comparison between the instrument performance and the variability of the DSD over Sumatra will be presented in the meeting.

[1] Marzuki, Randeu, W.L., Schoenhuber, M., Bringi, V.N., Kozu, T., Shimomai, T., 2010. Raindrop Size Distribution Parameters of Distrometer Data With Different Bin Sizes, IEEE Trans. Geosci. Remote Sens. 48, 3075–3080.

[2] Marzuki, Randeu, W.L., Kozu, T., Shimomai, T., Schoenhuber, M., 2011. Raindrop axis ratios, fall velocities and size distribution over Sumatra from 2D-Video Disdrometer measurement, Atmospheric Research., doi: 10.1016/j.atmosres.2011.08.006.

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