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Comparison Studies on the Observation of Raindrop Size Distribution in Strong Precipitation Frontal Case in Northern Taiwan

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In the nighttime of 11th June 2012, a mature Mai-Yu front passed through northern Taiwan. The leading edge of front associated with southwesterly flow produced strong precipitation in a short time. The extreme rainfall event caused multiple areas flooding. In order to investigate the characteristic of drop size distribution (DSD) accompanied with this heavy rainfall event, we used an impact type Joss-Waldgovel disdrometer (JWD), a laser-optical OTT Parsivel disdrometer (Parsivel) and a two dimensional video disdrometer (2DVD) collocated at NCU, and we also used three JWDs in FeiCui, NanGang and XiaYung to investigate the frontal precipitation.

In the weak precipitation period, we found the concentration of small raindrops would be underestimated because the velocity detected by Parsivel is faster than the real situation. But we also made sure that before the strong precipitation happens, the three type disdrometers (JWD, 2DVD and Parsivel) operate consistently.During strong precipitation period, we found a significant DSD variation characteristic. As a convective cell passes, the concentration of medium to large drops increases in Parsivel, while decreases in JWD. Due to the limitation of instrument, Parsivel tended to overestimate the concentration of medium to large drops in the strong rainfall intensity. Comparing the rain drops concentration with the rain rate varies with time, Parsivel showed a good agreement but JWD even did not get the most significant characteristic as the strongest rainfall occurred. The rain rates of JWD and Parsivel varied in the same trend, but compared the rain rates with the rain gauge observation in the 10 m tower at NCU, both of them showed obvious underestimation. We suspected the limitation of instrument made the rain rate underestimated.