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Observing Extreme Rainfall Events at Fine Timescales

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The Computational Hydrometeorology Lab in National Taiwan University (NTU CompHydroMet Lab) recently launched a rainfall monitoring network, with a special focus on observing extreme storm events, such as typhoons and thunderstorms, over the south area of Taipei. Due to the topographic effect and the constant humidity brought by the sea breeze, together with the high temperature, south Taipei is a hotspot for the occurrence of thunderstorms in summer. The monitoring network constitutes a collocated pair of an OTT Pluvio S and an OTT Pluvio L weighing rain gauges, as well as two 'unconventional' rain sensors – an OTT Parsivel2 disdrometer and a Lufft WS100 radar precipitation sensor. These rain sensors are co-located within a 10 x 10 m2 area, providing rainfall estimates at high temporal resolutions, ranging from 10 seconds to 1 minute.

Since the launch of the monitoring network in March 2021, the monitoring network has collected rainfall data for two typhoons and a number of thunderstorms, with the highest peak intensity at 245.6 mm/h. The measurements are generally consistent between four sensors; in particular, those from two weighing gauges are of the highest consistency. In addition, a preliminary comparison shows that the high-intensity rainfall measured by weighing gauges and disdrometer are in high agreement. This suggests that weighing gauges –which were widely used as a verification gauge for the tipping bucket gauges in the operational context– can provide reliable rainfall measurements with high accuracy, including capturing extreme rainfall.

As compared to other sensors, WS100 tends to underestimate rainfall at high intensities. However, it is more sensitive to low-intensity rainfall than others; and, similarly to the disdrometer, it provides reflectivity data and requires less maintenance. The cause of underestimation is currently under investigation, which could potentially be improved through the calibration of the current algorithm with weighing gauges' measurements.

At the next stage of the work, these ground measurements will be compared with the coincidental three-dimensional radar data product from the Central Weather Bureau (CWB), Taiwan. The radar data product from CWB is available at approximately 1.2 km spatial resolution and 10-min intervals. The comparison result will be presented, and the potential of using the monitoring network to support the correction of radar data will be discussed.