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A laboratory assessment of the measurement accuracy of weighing type rainfall intensity gauges

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In recent years the WMO Commission for Instruments and Methods of Observation (CIMO) fostered noticeable advancements in the accuracy of precipitation measurement issue by providing recommendations on the standardization of equipment and exposure, instrument calibration and data correction as a consequence of various comparative campaigns involving manufacturers and national meteorological services from the participating countries (Lanza et al., 2005; Vuerich et al., 2009). Extreme events analysis is proven to be highly affected by the on-site RI measurement accuracy (see e.g. Molini et al., 2004) and the time resolution of the available RI series certainly constitutes another key-factor in constructing hyetographs that are representative of real rain events.
The OTT Pluvio2 weighing gauge (WG) and the GEONOR T-200 vibrating-wire precipitation gauge demonstrated very good performance under previous constant flow rate calibration efforts (Lanza et al., 2005). Although WGs do provide better performance than more traditional Tipping Bucket Rain gauges (TBR) under continuous and constant reference intensity, dynamic effects seem to affect the accuracy of WG measurements under real world/time varying rainfall conditions (Vuerich et al., 2009). The most relevant is due to the response time of the acquisition system and the derived systematic delay of the instrument in assessing the exact weight of the bin containing cumulated precipitation. This delay assumes a relevant role in case high resolution rain intensity time series are sought from the instrument, as is the case of many hydrologic and meteo-climatic applications.

This work reports the laboratory evaluation of Pluvio2 and T-200 rainfall intensity measurements accuracy. Tests are carried out by simulating different artificial precipitation events, namely non-stationary rainfall intensity, using a highly accurate dynamic rainfall generator. Time series measured by an Ogawa drop counter (DC) at a field test site located within the Hong Kong International Airport (HKIA) were aggregated at a 1-minute scale and used as reference for the artificial rain generation (Colli et al., 2012).
The preliminary development and validation of the rainfall simulator for the generation of variable time steps reference intensities is also shown. The generator is characterized by a sufficiently short time response with respect to the expected weighing gauges behavior in order to ensure effective comparison of the measured/reference intensity at very high resolution in time.

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