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A laboratory evaluation of the influence of weighing gauges performance on extreme events statistics

Matteo Colli (1,2) and Luca Lanza (1,2)

(1) Università di Genova, DICCA, Genova, Italy (matteo.colli@unige.it), (2) WMO/CIMO Lead Centre on Precipitation Intensity, Italy

The effects of inaccurate ground based rainfall measurements on the information derived from rain records is yet not much documented in the literature. La Barbera et al. (2002) investigated the propagation of the systematic mechanic errors of tipping bucket type rain gauges (TBR) into the most common statistics of rainfall extremes, e.g. in the assessment of the return period T (or the related non-exceedance probability) of short-duration/high intensity events. Colli et al. (2012) and Lanza et al. (2012) extended the analysis to a 22-years long precipitation data set obtained from a virtual weighing type gauge (WG). The artificial WG time series was obtained basing on real precipitation data measured at the meteo-station of the University of Genova and modelling the weighing gauge output as a linear dynamic system. This approximation was previously validated with dedicated laboratory experiments and is based on the evidence that the accuracy of WG measurements under real world/time varying rainfall conditions is mainly affected by the dynamic response of the gauge (as revealed during the last WMO Field Intercomparison of Rainfall Intensity Gauges).
The investigation is now completed by analyzing actual measurements performed by two common weighing gauges, the OTT $Pluvio^2$ load-cell gauge and the GEONOR *T-200* vibrating-wire gauge, since both these instruments demonstrated very good performance under previous constant flow rate calibration efforts. A laboratory dynamic rainfall generation system has been arranged and validated in order to simulate a number of precipitation events with variable reference intensities. Such artificial events were generated basing on real world rainfall intensity (RI) records obtained from the meteo-station of the University of Genova so that the statistical structure of the time series is preserved.
The influence of the WG RI measurements accuracy on the associated extreme events statistics is analyzed by comparing the original intensity-duration-frequency (IDF) curves with those obtained from the measuring of the simulated rain events.

References:

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