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The impacts of inhomogeneous spatial distributions of rain gauging networks highlighted with X-band radar data

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The higher frequency of intense precipitation events makes water management and precipitation risk important issues especially for urban areas. The literature is full of engineering solutions to work with either very local rain gauge networks as the main rainfall input data or as calibration to C-band weather radars.

In this presentation, the Bièvre catchment located in the southwest of Paris region, modelled with the semi-distributed hydrological model InfoWorks CS, was used to construct a network of virtual rain gauges located in the centre of mass of each sub-catchment. Then, with the help of rainfall data from the X-band radar operated at Ecole des Ponts with a resolution of 250 m in space and 3.4 min in time, scaling (fractal and multifractal) analyses were performed over a selected area of 8 km x 8 km.

The obtained results suggest that inhomogeneous distributions of rain gauging networks lead to only partial information on the rainfall fields. In fact, the statistics of measured rainfall is strongly biased by the fractality of the measuring networks. This fractality needs to be properly taken in to account to retrieve the original properties of the rainfall fields, in spite of the radar data calibration. Additionally, a proper rainfall data re-normalization is needed when comparing gauged rainfall with the radar data, and consequently when quantifying the impacts of space-time variability within hydrological modelling.