

Improving the measurement of rainfall

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GRANDLYON

LYON: BEFORE PREPARED

In the middle of 1980s, the Greater Lyon installed a network of tipping bucket rain gauges to measure rainfall events in its territory, aiming to better design, operate and model its sewer systems. Currently, the network comprises approximately 30 rain gauges (Fig. 1 below) over 51,500 ha. Data has been recorded in a 6 minute time step time series.

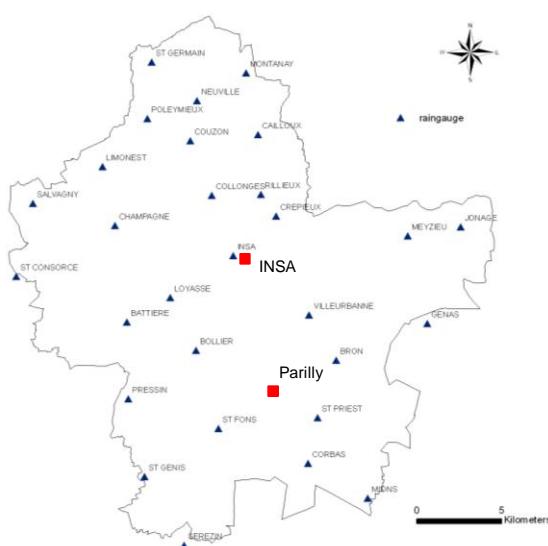


Figure 1 : Network of rain gauges in the Greater Lyon, France

The rainfall database is used with the Canoe sewer modeling software tool, with a specific application estimating spatially-distributed rainfall over the whole Greater Lyon territory for long-term simulations, aiming to simulate floods and CSO discharges.

Improving modeling results depends mainly on two conditions:

- i) field monitoring to calibrate and verify model outputs, and
- ii) a dense spatially-distributed rainfall information.

The second condition cannot be satisfied with the existing rain-gauge network, despite its density.

Thus, from 2007, C-band radar images from Meteo France have been used to improve the knowledge pertaining to spatial rainfall distribution and to better account for its heterogeneity in models. Radar images are used off-line and the correlation between rain gauge data and radar images has been investigated and coupled with modeling.

Figure 2 shows an example of comparison of rainfall spatial distribution for the 14 July 2001 event, obtained from both the network of rain gauges (ordinary kriging – top image) and the C-band radar images (after correction and kriging – bottom image).

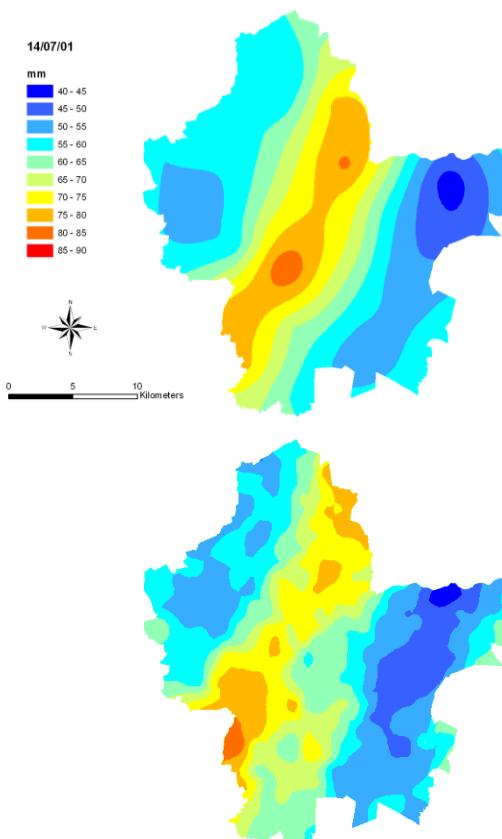


Figure 2 : 14 July 2001 event measured by rain gauges (top) and C-band weather radar (bottom)

LYON: BE PREPARED

The Meteo France C-band radar is located 40 km north-west of Lyon. The resolution of the images is 1 km x 1 km with a measurement radius of approximately 250 km.

This long range is helpful for early warnings and tracking of rainfall movements over long distances, but may be insufficient to evaluate and simulate local discharges and water levels at the scale of 50 - 300 hectares, which is the scale of many urban sub-catchments where operation and control may be implemented.

In order to improve the measurement and knowledge of rainfall, the Greater Lyon, in collaboration with INSA and DHI in the frame of the PREPARED FP7 project, tests and evaluates a small X-band radar.

This LAWR 25 X-band radar has a resolution of 100 m x 100 m, 250 x 250 and 500 x 500m and a radius of 25-30 km.

After a temporary installation (July 2011 to April 2012) on the roof of the LGCIE building at INSA Lyon (see Figure 3), the LAWR 25 radar was moved to the top of the Greater Lyon Parilly water tower (Figure 4), in order to obtain better images covering a larger part of the Greater Lyon territory and of the rain gauge network and to reduce fixed echoes (see locations on Fig. 1).



Figure 3 : Provisionary installation of the LAWR 25 radar on the roof of the LGCIE building at INSA (photo JLBK)



Figure 4 : Future location of the LAWR 25C radar at the top of the Parilly water tower (photo Greater Lyon + Google Earth)

Images provided by the LAWR 25 radar (see Figure 5) will be analysed and calibrated jointly with rain gauges information and C-band radar images, to assess how higher resolution rainfall information may improve the estimates and modeling of discharges and water levels at the small scale of urban sub-catchments. Improved measurement of rainfall will also be a key element for the implementation of a real time control system in the future.

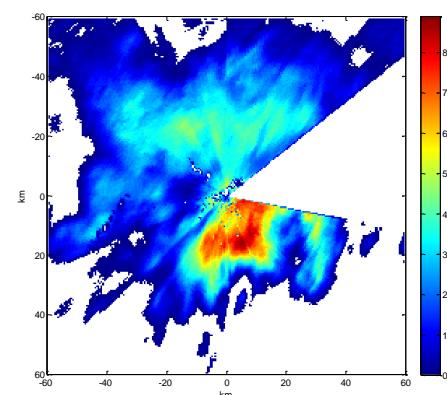


Figure 5 : Image from the LAWR 25 radar in Lyon (01 Sept. 2011)

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