Evaluation of the Met Office super-resolution C-band radar rainfall product over London

S. Ochoa-Rodriguez[1], C. Sandford[2], K. Norman[2], L.-P. Wang[3], S. Jewell[2], M. Akerboom[1,4], C. Onof[1]*

*[1]Imperial College London (*sochoaro@ic.ac.uk); [2]Met Office, UK; [3]KU Leuven, BE; [4]TU Delft, NL*

This project has received European Regional Development Funding through INTERREG IV B.

Investing in Opportunities

INTERREG IVB

1. WHY HIGH RESOLUTION RAIN DATA?

High resolution rainfall estimates are required for urban hydrological applications in order to well represent the **high spatial variability, fast runoff processes and short response times of urban catchment**s. As part of the RainGain project and with the purpose of meeting the stringent requirements of urban-scale hydrological applications, **a high spatial resolution (100 m/5 min) radar rainfall product has been developed and trialled** over the Greater London Area.

2. SUPER-RESOLUTION C-BAND RADAR PRODUCT

The UK Met Office (UKMO) operates a network of 18 C-band radars across the UK. These radars are **normally operated in "long-pulse"** mode and provide QPEs at resolutions of 500 m and 1 km in space and 5 min in time. Higher spatial resolution or "**super-resolution" (100 m / 5 min) QPEs** over the **Greater London Area** were generated using data from two dual polarisation C-band radars (**Fig.1**) operating in **"short-pulse"** mode with a pulse length of 0.5 microseconds (75 m) and half power beam width of 1 degree. QPEs from each radar were interpolated onto a 100 m resolution grid every 5 minutes, and the use of advection and rain-gauge merging techniques to improve rainfall accumulation estimates are being investigated [1,2].

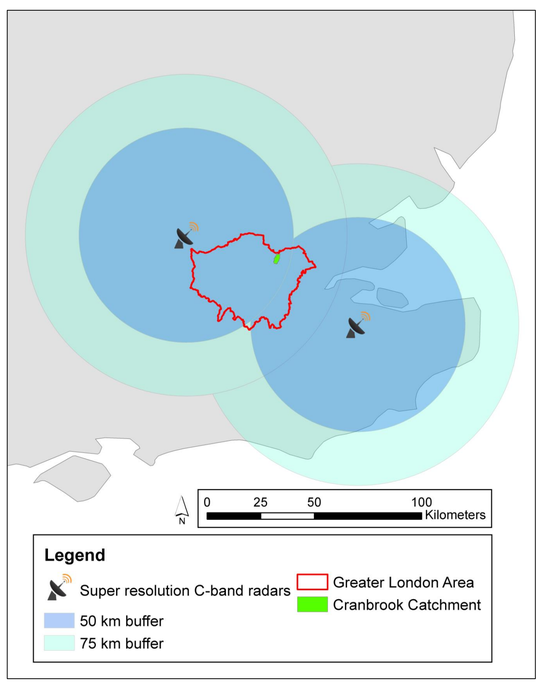

Fig. 1: UKMO C-band radars used to generate super-resolution QPEs

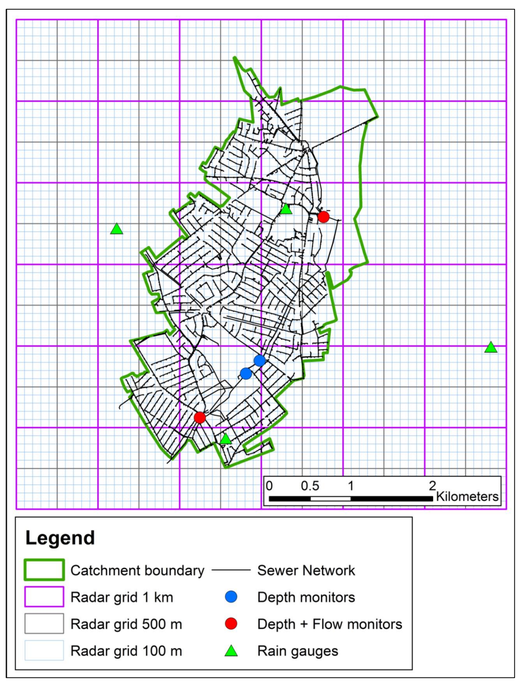

Fig. 2: Pilot area Cranbrook catchment: Sewer network and monitoring system

3. PILOT AREA AND DATASET

The quality and added value of the super-resolution QPEs for urban hydrological applications were evaluated using as case study 4 summer storms observed in the Cranbrook catchment (8.5 km^2; NE London, **Fig.1**), for which local rain gauge (RG) and runoff records, and a hydraulic model were available (**Fig.2**).

4. RESULTS

- The super-resolution product can well capture storm dynamics and small scale rain structures (**Fig.3**), providing more detail than the traditional products.
- Quantitatively, super-resolution QPEs perform well, both in terms of accumulations and instantaneous rainfall rates (**Table 1 & Fig. 4**). However, similar to the traditional products, the super-resolution product shows a tendency to underestimate high rainfall rates (**Fig. 4**).
- The higher spatial resolution of the super-res. QPEs often leads to better reproduction of urban runoff **(Fig. 3d)**

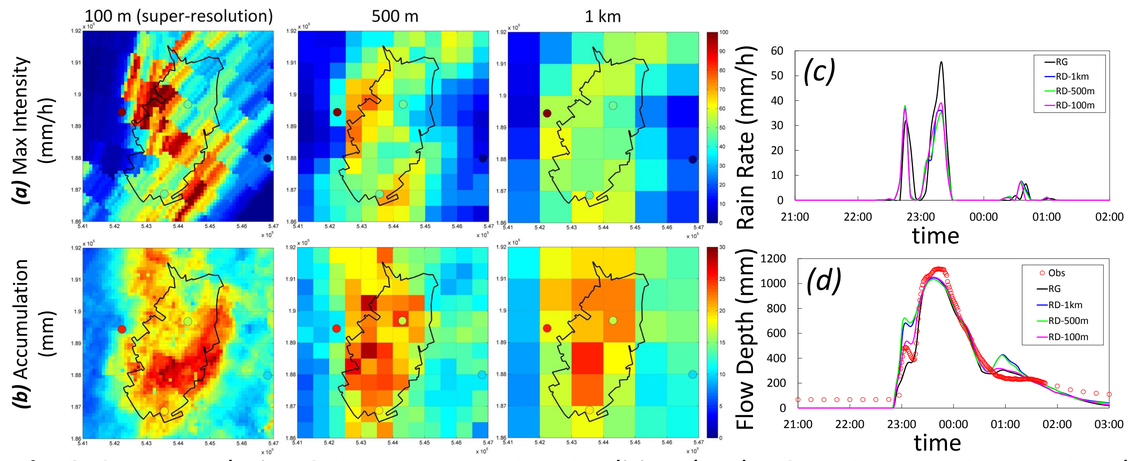

***Fig. 3:** Super resolution QPEs (100 m/5 min) vs. traditional radar QPEs (500 m – 1 km/5 min) and local rain gauges (RG) during intense event on 03/07/2015: (a) Max. Intensity; (b) Event accumulations; (c) Areal average rain rate profiles; (c) Simulated vs. observed water depths*

Event	Duration (h)	Accumulations (mm)			
		Rain Gauge	RD-1km	RD-500m	RD-100m
20/06/15	4	12.00	10.56	10.86	10.53
03/07/15	5	18.15	15.54	15.01	15.30
24/07/15	26	30.40	25.46	26.26	26.90
24/08/15	20	23.85	17.35	17.52	17.13

***Table 1:** Areal average radar & rain gauge accumulations (all storm events)*

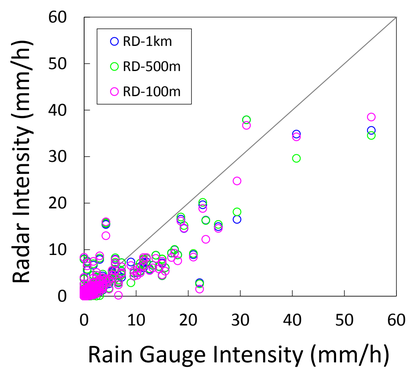

***Fig. 4:** Areal average radar-rain gauge intensity scatterplots (combined results of all storm events)*

5. CONCLUSIONS

The super-resolution C-band radar product shows great potential to provide high-resolution high-accuracy QPEs suitable for urban hydrological applications. Further testing is required to confirm initial findings.

[1] Jewell, S. A. & Gaussiat, N. (2015). An assessment of kriging-based rain-gauge-radar merging techniques. *Quarterly Journal of the Royal Meteorological Society*.
[2] Sandford, C. (2015). Correcting for wind drift in high resolution radar rainfall products: a feasibility study. *Journal of Hydrology* (In Press).