Geophysical Research Abstracts
Vol. 19, EGU2017-18050, 2017
EGU General Assembly 2017

Calibration and validation of a small-scale urban surface water flood event using crowdsourced images

Daniel Green (1), Dapeng Yu (1), and Ian Pattison (2)

(1) Loughborough University, Department of Geography, Loughborough, United Kingdom (d.green@lboro.ac.uk), (2) School of Civil & Building Engineering, Loughborough University, Loughborough, United Kingdom

Surface water flooding occurs when intense precipitation events overwhelm the drainage capacity of an area and excess overland flow is unable to infiltrate into the ground or drain via natural or artificial drainage channels, such as river channels, manholes or SuDS. In the UK, over 3 million properties are at risk from surface water flooding alone, accounting for approximately one third of the UK's flood risk. The risk of surface water flooding is projected to increase due to several factors, including population increases, land-use alterations and future climatic changes in precipitation resulting in an increased magnitude and frequency of intense precipitation events.

Numerical inundation modelling is a well-established method of investigating surface water flood risk, allowing the researcher to gain a detailed understanding of the depth, velocity, discharge and extent of actual or hypothetical flood scenarios over a wide range of spatial scales. However, numerical models require calibration of key hydrological and hydraulic parameters (e.g. infiltration, evapotranspiration, drainage rate, roughness) to ensure model outputs adequately represent the flood event being studied. Furthermore, validation data such as crowdsourced images or spatially-referenced flood depth collected during a flood event may provide a useful validation of inundation depth and extent for actual flood events.

In this study, a simplified two-dimensional inertial based flood inundation model requiring minimal pre-processing of data (FloodMap-HydroInundation) was used to model a short-duration, intense rainfall event (27.8 mm in 15 minutes) that occurred over the Loughborough University campus on the 28th June 2012. High resolution (1m horizontal, +/- 15cm vertical) DEM data, rasterised Ordnance Survey topographic structures data and precipitation data recorded at the University weather station were used to conduct numerical modelling over the small (< 2km2), contained urban catchment. To validate model outputs and allow a reconstruction of spatially referenced flood depth and extent during the flood event, crowdsourced images were obtained from social media (Twitter) and from individuals present during the flood event via the University noticeboards, as well as using dGPS flood depth data collected at one of the worst affected areas.

An investigation into the sensitivity of key model parameters suggests that the numerical model code is highly sensitivity to changes within the recommended range of roughness and infiltration values, as well as changes in DEM and building mesh resolutions, but less sensitive to changes in evapotranspiration and drainage capacity parameters. The study also demonstrates the potential of using crowdsourced images to validate urban surface water flood models and inform parameterisation when calibrating numerical inundation models.