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High resolution weather data for urban hydrological modelling and impact assessment, ICT requirements and future challenges

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Hydrological analysis of urban catchments requires high resolution rainfall and catchment information because of the small size of these catchments, high spatial variability of the urban fabric, fast runoff processes and related short response times. Rainfall information available from traditional radar and rain gauge networks does no not meet the relevant scales of urban hydrology. A new type of weather radars, based on X-band frequency and equipped with Doppler and dual polarimetry capabilities, promises to provide more accurate rainfall estimates at the spatial and temporal scales that are required for urban hydrological analysis. Recently, the RAINGAIN project was started to analyse the applicability of this new type of radars in the context of urban hydrological modelling. In this project, meteorologists and hydrologists work closely together in several stages of urban hydrological analysis: from the acquisition procedure of novel and high-end radar products to data acquisition and processing, rainfall data retrieval, hydrological event analysis and forecasting.

The project comprises of four pilot locations with various characteristics of weather radar equipment, ground stations, urban hydrological systems, modelling approaches and requirements. Access to data processing and modelling software is handled in different ways in the pilots, depending on ownership and user context. Sharing of data and software among pilots and with the outside world is an ongoing topic of discussion. The availability of high resolution weather data augments requirements with respect to the resolution of hydrological models and input data. This has led to the development of fully distributed hydrological models, the implementation of which remains limited by the unavailability of hydrological input data. On the other hand, if models are to be used in flood forecasting, hydrological models need to be computationally efficient to enable fast responses to extreme event conditions. This presentation will highlight ICT-related requirements and limitations in high resolution urban hydrological modelling and analysis.

Further ICT challenges arise in provision of high resolution radar data for diverging information needs as well as in combination with other data sources in the urban environment. Different types of information are required for such diverse activities as operational flood protection, traffic management, large event organisation, business planning in shopping districts and restaurants, timing of family activities. These different information needs may require different configurations and data processing for radars and other data sources. An ICT challenge is to develop techniques for deciding how to automatically respond to these diverging information needs (e.g., through (semi-)automated negotiation). Diverse activities also provide a wide variety of information resources that can supplement traditional networks of weather sensors, such as rain sensors on cars and social media. Another ICT challenge is how to combine data from these different sources for answering a particular information need. Examples will be presented of solutions are currently being explored.