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MULTI-SCALE URBAN FLOOD FORECASTING: FROM LOCAL TAILORED SYSTEMS TO A PAN-EUROPEAN SERVICE

Pluvial urban flooding, caused by extreme rainfall intensities in combination with a large fraction of impervious surface and a limited capacity of storm water sewer systems, is a major societal hazard already today. The problems are further anticipated to increase in the future, when higher intensities are expected in a warmer atmosphere containing more precipitable water. Developing systems for urban flood forecasting and early warning is therefore a key requirement for keeping cities secure and sustainable with respect to flooding hazards and mitigating their impacts. Accurate urban flood simulation and forecasting require a very short time step (minutes) and a very high spatial resolution of both rainfall input (hundreds of meters) and the description of the urban environment (meters). Designing, constructing and maintaining such locally tailored urban flood forecasting systems is very resource-demanding and difficult to achieve in many parts of Europe and the world. A potential way to generate meaningful flood forecasts in cities without local systems may be to develop large-scale hydrological forecasting systems towards higher resolutions and better descriptions of the urban environment. Even with less accuracy than in local systems, urban flood forecasts from largesystems may be useful for end-users if well interpreted and presented. In this project, we will perform development and hindcast experiments of urban flood forecasting systems in three European cities: Rotterdam, Aalborg and Helsinki. These cities fulfil the requirements in terms of highresolution observations and urban models (3Di, Robek-Urban, MIKE, SWMM) for state-of-the-art local urban flood forecasting systems. Meteorological observations and forecasting systems will be developed to obtain the most accurate description possible of high-intensity rainfall and its evolution. An existing Pan-European hydrological forecasting model, EHYPE, will be developed for improved performance in urban areas by using a new model structure based on new land-use data sources as well as increased resolutions in time and space. Coordinated experiments with model versions representing different resolutions and data types will be performed and analyzed. A key aspect of the project is active end-user involvement. Eight endusers, representing three key categories (national authorities, local managers and commercial users), have committed to the project and will be involved from start to finish in order to ensure the most useful outcome possible. Key issues concern the forecast lead time and spatial resolution. How early in advance must a flood alert be issued and with what spatial level of detail in order to be useful for different end-user categories? To which degree are these requirements attainable in different forecasting systems? What is the value of larger-scale forecasts in cities without local system? Innovative means of interpreting, processing and communicating the forecasts to provide an added value from the end-users? Perspective will be developed. Key scientific outcomes are new knowledge about small-scale precipitation extremes and their predictability and about the limitations of urban flood forecasting at different scales. In terms of practical solutions, new and improved operational tools for urban flood forecasting in Europe will be developed.