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High resolution hydrological modeling with measured precipitation data for the city of Amsterdam

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Assessing measures to reduce flooding in densely populated urban areas require a high level of detail to properly analyse the hydrological response to precipitation events. This means detailed data (for example elevation and landuse) and fast models that can cope with this level of detail. This also indicates the value of having a similar level of detail in precipitation data. We present an approach in which Dutch National Rainfall Radar data are combined with a new approach to hydrological modeling called 3di. This is illustrated for a case in the city of Amsterdam to assess the effects of precipitation events and the possibilities for suitable measures in the public space to reduce the effects of flooding.

Dutch National Rainfall Radar is a consortium of water authorities and the industry and scientific experts/universities/research centers to improve the available radar data in the Netherlands. This is achieved by making a composite of the radar stations in The Netherlands together with German and Belgian radar stations. In addition, the composite image is calibrated with local rainfall stations.

3Di is a novel approach to calculate the hydrological response of catchments as a function of properties, such as surface elevation and land use. Because of the ability of the model to take the detail of the elevation and land-use (both 0,5x0m5 meter) into the calculations, this model allows for a very detailed modeling of the hydrological response of urban areas to precipitation events. In addition, the model is extremely fast and allows for real-time and interactive changes in the geometry, making it a very powerful tool to assess the effects of measures in the public space for reducing flooding.

We illustrate this approach for a case for the city of Amsterdam, a densely populated, low-lying city in The Netherlands. The obtained level of detail allows to study which houses are flooded, which roads remain available for emergency services etc. The model is used to show the effects of popular measures, such as the use of green roofs and additional unpaved areas. It is also used to assess the robustness of the hydrological urban system to climate change.