Geophysical Research Abstracts
Vol. 18, EGU2016-17113, 2016
EGU General Assembly 2016

High resolution modeling of a small urban catchment

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Flooding is one of the most complex issues that urban environments have to deal with. In France, flooding remains the first natural risk with 72% of decrees state of natural disaster issued between October 1982 and mid-November 2014. Flooding is a result of meteorological extremes that are usually aggravated by the hydrological behavior of urban catchments and human factors. The continuing urbanization process is indeed changing the whole urban water cycle by limiting the infiltration and promoting runoff. Urban environments are very complex systems due to their extreme variability, the interference between human activities and natural processes but also the effect of the ongoing urbanization process that changes the landscape and hardly influences their hydrologic behavior. Moreover, many recent works highlight the need to simulate all urban water processes at their specific temporal and spatial scales. However, considering urban catchments heterogeneity still challenging for urban hydrology, even after advances noticed in term of high-resolution data collection and computational resources. This issue is more to be related to the architecture of urban models being used and how far these models are ready to take into account the extreme variability of urban catchments.

In this work, high spatio-temporal resolution modeling is performed for a small and well-equipped urban catchment. The aim of this work is to identify urban modeling needs in terms of spatial and temporal resolution especially for a very small urban area (3.7 ha urban catchment located in the Perreux-sur-Marne city at the southeast of Paris)

MultiHydro model was selected to carry out this work, it is a physical based and fully distributed model that interacts four existing modules each of them representing a portion of the water cycle in urban environments. MultiHydro was implemented at 10m, 5m and 2m resolution. Simulations were performed at different spatio-temporal resolutions and analyzed with respect to real flow measurements. First Results coming out show improvements obtained in terms of the model performance at high spatio-temporal resolution.