Geophysical Research Abstracts
Vol. 15, EGU2013-3934, 2013
EGU General Assembly 2013


# Distributed simulation of long-term hydrological processes in a medium-sized periurban catchment under changing land use and rainwater management.

Mériem Labbas (1), Isabelle Braud (1), Flora Branger (1), and Sven Kralisch (2)

(1) Irstea, Hydrology-Hydraulics, Villeurbanne Cedex, France (meriem.labbas@irstea.fr), (2) Department of Geoinformatics, Hydrology and Modelling, Friedrich Schiller University of Jena, Jena, Germany

Growing urbanization and related anthropogenic processes have a high potential to influence hydrological process dynamics. Typical consequences are an increase of surface imperviousness and modifications of water flow paths due to artificial channels and barriers (combined and separated system, sewer overflow device, roads, ditches, etc.). Periurban catchments, at the edge of large cities, are especially affected by fast anthropogenic modifications. They usually consist of a combination of natural areas, rural areas with dispersed settlements and urban areas mostly covered by built zones and spots of natural surfaces.

In the context of the European Water Framework Directive (2000) and the Floods Directive (2007), integrated and sustainable solutions are needed to reduce flooding risks and river pollution at the scale of urban conglomerations or whole catchments. Their thorough management requires models able to assess the vulnerability of the territory and to compare the impact of different rainwater management options and planning issues. To address this question, we propose a methodology based on a multi-scale distributed hydrological modelling approach. It aims at quantifying the impact of ongoing urbanization and stormwater management on the long-term hydrological cycle in medium-sized periurban watershed. This method focuses on the understanding and formalization of dominant periurban hydrological processes from small scales (few ha to few km2) to larger scales (few hundred km2). The main objectives are to 1) simulate both urban and rural hydrological processes and 2) test the effects of different long-term land use and water management scenarios. The method relies on several tools and data: a distributed hydrological model adapted to the characteristics of periurban areas, land use and land cover maps from different dates (past, present, future) and information about rainwater management collected from local authorities.

For the application of the method, the medium-scaled catchment of Yzeron (France) is chosen. It is subjected to a fast progression of urbanization since the eighties and has been monitored for a long time period. The fully-distributed hydrological model J2000, available through the JAMS modelling framework, was found appropriate to simulate the water balance of the Yzeron catchment at a daily time step. However, it was not designed especially for periurban areas, so its structure and parameters are under adaptation. Firstly, as hydrological responses in urban areas are quicker than in rural areas, a sub-daily time step is necessary to improve the simulation of periurban hydrological processes. Therefore, J2000 was adapted to be run at a hourly time step. Secondly, in order to better take into account rainwater management, an explicit representation of sewer networks is implemented in the J2000 model whose periurban version is called J2000P. It receives urban rainwater coming from impervious surfaces connected to a combined sewer system and delivers this water to the treatment plant or directly to the river in case of sewer overflow device outflows. We will present the impact of these modifications on the simulated hydrological regime.