Geophysical Research Abstracts
Vol. 14, EGU2012-2183, 2012
EGU General Assembly 2012

Evaluating the influence of rooftop connectivity on the rainfall-runoff processes by means of (wind-driven) rainfall simulation.

J.M.G.P. Isidoro (1,2), J.L.M.P. de Lima (1,3), J. Leandro (1,4)

(1) IMAR – Marine and Environmental Research Centre – IMAR-CMA, Portugal, (2) Department of Civil Engineering, Superior Institute of Engineering, University of Algarve, Faro, Portugal (jisidoro@ualg.pt), (3) Department of Civil Engineering, Faculty of Science and Technology, University of Coimbra, Coimbra, Portugal (plima@dec.uc.pt), (4) Department of Civil Engineering, Faculty of Science and Technology, University of Coimbra, Coimbra, Portugal (leandro@dec.uc.pt)

The urban growth implies an increase in the impermeable area, namely through the construction of buildings, with consequences on the morphology of urban areas. The latter, mainly defined by the construction land plots, the street network and the buildings geometries, is an important factor for the rainfall-runoff process in urban areas. Rooftop connectivity, a feature related to buildings geometry, is very likely to have a strong impact on this process. To study the impact on highly urbanized areas under the occurrence of wind-driven rainfall and storm movement, a set of laboratory experiments was carried out using a rainfall simulator and a physical model of a hypothetical urban area.

The 30 simulated storm scenarios presented in this paper include static and dynamic (upstream and downstream moving) storms, and no-wind and wind-driven rainfall for five rooftops arrangements with different connectivity. The simulations show that rooftop connectivity, storm movement and wind-driven rainfall have an important effect on urban runoff. Modifications on the shape of the hydrographs obtained at the physical model outlet were observed for the different scenarios, namely on the peak discharges, the runoff base times and the rising limb of the overland flow hydrographs.

The lowest peak discharges and the longest runoff base times were obtained for the clustered rooftop connectivity. Wind-driven rain reduced peak discharges and rising limb's slopes, thus increasing runoff base times. These effects caused by wind-driven rain were more evident for the static and downstream moving storms.