Geophysical Research Abstracts
Vol. 12, EGU2010-800, 2010
EGU General Assembly 2010

The use of a scale model to study the hydrologic response of urban areas for different building densities

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The hydrological response of urban areas to the combined action of wind and rain is still not well understood. To improve our understanding of this response, exploratory laboratory simulations were conducted using a 1:100 scale physical model of a high density urbanized area with high-rise buildings. The 4 m2 scale model had a 10% slope. More than one-hundred runs were conducted with different precipitation settings static and moving storms in upstream and downstream directions, with and without wind) and density of buildings. These factors are particularly important when analyzing the ocurrence of flash floods, in which peak discharges and the spatial and temporal extent of overland flow are two of the most important variables. The laboratory experiments described in this poster show that the construction density, spatial and temporal distributions of rainfall, resulting from wind and storm movement, have a clear influence on the overland flow processes in urban areas. The results of the laboratory simulations show that there are distinct hydrological responses to storms over areas with different density of high-rise buildings. The increase of urbanization promotes higher peak flow and longer base time, and changes the shape of the hydrographs (e.g. reduces the slope of the rising limb). In the laboratory experiments those surface flow characteristics were attenuated by the occurrence of strong wind during rainstorms due to higher lateral interception by the buidings.