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Storm kinematics in urban area based on high resolution raingauge data analysis

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This paper presents a comparative analysis between rain-gauge storm tracking techniques in order to achieve a better knowledge of the rainfall dynamics over an urbanized area. The temporal and spatial distribution and kinematics of short term rainfall are recognized as one of the most important reasons in error production in rainfall-runoff on urban catchments. The uncertainty due to rainfall variability can greatly affect urban drainage modelling performance and reliability thus reducing the confidence of operators in their results. Modelling representations of urban catchments and drainage systems are commonly adopted for surface flooding forecasting and management (alert propagation, flood-proofing, risk prevention) and an adequate knowledge of rainfall spatial and temporal variability should be considered as a fundamental step for a robust interpretation of the physical processes that take part in urban areas during intense rainfall events. The starting basis of such studies is usually given by a network of high resolution raingauges disseminated inside and around the examined urban area. One of the raingauge techniques used is based on simulating the storm motion by visualizing the sequence of the rainfall patterns obtained using raingauge data and on spatial correlation. The storm speed and direction are obtained using the raingauge method by tracking the advance of the maximum rainfall intensity in time and space. A second method is based on the identification, for each gauge, of the time of occurrence of some significant features such the time of onset of a storm or the time of peak. A third method is based on the classical idea of space-time autocorrelation function; this function describes the way in which the correspondence between the rainfall patterns at two points in space-time reduces as the distance between two points is increased. For the aims of the present study, a rainfall gauge network was displaced in Palermo, Italy. Ten automatic raingauges of tipping-bucket type were in-

stalled over the urban area whose extension is about 30 km2. The time resolution of the gauges registration is one minute while the volume resolution is 0.1 mm per tipping. An accurate analysis of the results of this comparison between the techniques has been carried out and, since the city of Palermo is not covered by any meteorological radar, the analysis of storm dynamics will allow for creating a system monitoring hydrometeorological conditions which operates on time basis using the information coming from the raingauge network as forecast triggers.