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# Fully distributed model to assess and manage runoff processes in peri-urban watersheds

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Nowadays, a deeper knowledge of the extreme runoff generation requires more inclusive and interactive understanding of its numerous determining factors. This includes not only a better estimation of meteorological extremes under changing climate conditions, but also a better evaluation of infiltration and saturation excesses, of subsurface return flows, as well as, of human impacts on surface runoff.

This communication presents a physically based and spatially distributed numerical model that simulates the quantity of runoff and the quantity of rainwater infiltrated into unsaturated soil layers from any temporally-spatially varied rainfall event at any point of the peri-urban watersheds.

Our model simulates water flow in the entire land based phase of the hydrological cycle from rainfall to river flow, via various flow processes such as, overland flow, infiltration into soils, evapotranspiration from vegetation, groundwater flow and drainage into pipes via road gulley. Fully dynamic exchange of water between all major hydrological components is included in the model (e.g. surface water, soil water and groundwater).

It is a fully distributed numerical model. The spatial and temporal variation of meteorological, hydrological, geological and hydrogeological data across the model area is described in gridded form for the input as well as the output from the model. Moreover, to evaluate the necessary precipitation inputs for given durations and a given return period to our model, we use a multifractal frequency analysis. This method has the advantage to rely on a few robust exponents that are physically meaningful and can be evaluated on discontinuous and/or low frequency samples. Thus, the study peri-urban watershed will be represented in more detail than the traditional lumped approach where hydrologic parameters are averaged over the urban subbasin.

Using GIS, we visualise the resulting runoff processes together with the evolution of water table levels for the two case studies: a county contiguous to Paris (France) and in the Panola Area (USA). Comparisons with natural catchments with low urban development illustrate the impact of climate change and urbanisation on extreme runoff characteristics.