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Modelling of interactions between urban surfaces and atmosphere

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The present study is focussed on modelling of water film depth on urban surface with various geometry and texture.

It presents a physically based "Surface-Atmosphere Interaction" model that predicts water depth on urban surface during and after precipitation events. The model calculates the partition of rainfall into evaporation, infiltration, surface storage and runoff, and simulates spatial and temporal variations of water film depth according to various climate conditions, surface geometry and texture. It computes energy and water fluxes from the surface in response to meteorological forcing and simulates water film depth and surface temperature variations during and after a rain. The model was designed to represent the main physical process involved in the coupled water and energy balances.

Model's sensitivity analysis to variations (or uncertainties) on its main input parameter was coupled to a multiobjective calibration process. The analysed parameters represent geometrical or physical properties of the urban surface and pavement layers. The multiobjective methodology is based on a statistical Monte Carlo description of feasible parameter domains and on an iterative Pareto algorithm. A validation of the model was carried out with in situ both water depth and surface temperature measurements. Root mean square difference between model results and measurements is around to 0.1mm for water film and less than 1˚C for surface temperature.