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A multi module physically based model for the evaluation of the effect of the land use changes

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In the context of the growth of the cities, the urbanized areas occupy more places in the riskier area of flood. As more and more people live in these peri-urban areas and are vulnerable to the flood risk. The understanding of this risk asks the question of the modeling of the flood.
In this way, the Multi-Hydro model was developed and improved at the Ecole des Ponts ParisTech. This model consists into a coupling between four modules (relying on existing open source and widely validated physically based model): one for the rainfall scenario generation, one for the surface processes, one for the subsurface processes and one for the load of the sewer system. This model uses some GIS data as the elevation, the land use, the soil description and the sewer system description. Considering the great amount of data needed for the model occurring, the overland water depth couldn't be relies on the survey data. However, the behavior changes of a catchment face of the land use changing can be evaluate by the analysis of the risk map and an advanced statistical analysis.
Thus, the Multi-Hydro model was applied on two different area of the Paris area: the city of Villecresnes and the city of Chennevière-sur-Marne. The first one is a small catchment of 0.712 km^2 where the flood comes only from the rainfall. The second one is largest (5 km^2) and can be additionally flooded by the Marne River. These two catchments are simulated with two kind of elevation: a "raw" elevation coming from the field survey and a "modified" elevation in function of the land use. In this last case, the elevation is increased for the houses places and decreased in the road places. The location of the water is controlled by the topography in the first case but it's controlled by the location of the houses in the second case. The comparison of these case studies can provide a good evaluation of the importance of a good representation of the modeled area.