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Open source 3D visualization and interaction dedicated to hydrological models

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Climate change and surface urbanization strongly modify the hydrological cycle in urban areas, increasing the consequences of extreme events such as floods or draughts. These issues lead to the development of the Multi-Hydro model at the Ecole des Ponts ParisTech (A. Giangola-Murzyn et al., 2012). This fully distributed model allows to compute the hydrological response of urban and peri-urban areas. Unfortunately such models are seldom user friendly. Indeed generating the inputs before launching a new simulation is usually a tricky tasks, and understanding and interpreting the outputs remains specialist tasks not accessible to the wider public. The MH-AssimTool was developed to overcome these issues.

To enable an easier and improved understanding of the model outputs, we decided to convert the raw output data (grids file in ascii format) to a 3D display. Some commercial paying models provide a 3D visualization. Because of the cost of their licenses, this kind of tools may not be accessible to the most concerned stakeholders. So, we are developing a new tool based on C++ for the computation, Qt for the graphic user interface, QGIS for the geographical side and OpenGL for the 3D display. All these languages and libraries are open source and multi-platform. We will discuss some preprocessing issues for the data conversion from 2.5D to 3D. Indeed, the GIS data, is considered as a 2.5D (e.i. 2D polygon + one height) and the its transform to 3D display implies a lot of algorithms. For example,to visualize in 3D one building, it is needed to have for each point the coordinates and the elevation according to the topography. Furthermore one have to create new points to represent the walls. Finally the interactions between the model and stakeholders through this new interface and how this helps converting a research tool into a an efficient operational decision tool will be discussed. This ongoing research on the improvement of the visualization methods is supported by the KIC-Climate Blue Green Dream project.