Hydraulic behaviour of a gully under drainage conditions: numerical vs. experimental

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ABSTRACT

Drainage systems have been extensively used to provide some degree of protection during flooding. There are however few studies that attempt to characterize the flow-exchange between the surface and below ground. Due to the flow complexity found in gullies, State-of-the-Art Dual-Drainage models use simplified formulas to simulate gullies. These formulas depend on discharge coefficients that need to be determined either through numerical or experimental modelling. To simulate the flow in a gully, the Open Source toolbox OpenFOAM™ was used, modelling a gully with LxWxD: 0.6 x 0.3 x 0.3 [m] in a channel with 0.5 meters width and 8 meters length. The outlet is a free fall circular pipe with 0.08 [m] diameter. The numerical simulation was validated with experimental data. For the hydraulic characterization several parameters were analysed: hydraulic head, velocity and pressure profiles for the middle plane of the simulation, and in and out flows. Specific coefficient formula for Dual-Drainge models are proposed for flows ranging from 0.020 to 0.060 [m^3/s].

KEYWORDS

Urban drainage, gully, numerical modelling, CFD, OpenFOAM™.