Modeling and computation of combined free surface and pressure water flow in networks by local Lax-Friedrich and related upwind techniques

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For the simulation of water flow in large networks a combined modeling approach for free surface and pressure flow is considered. The numerical solution is based on a finite volume discretization in space and a standard method for time integration. Beside the local Lax-Friedrich ansatz some other related decomposition techniques are developed for a suitable upwinding. The focus is on well-balanced schemes which preserve stationary solutions. The methods are tested on a set of eight problems including the different types of flow.