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Physical modelling of pressurized flushing of non-cohesive sediment

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The idea of using lightweight (low-density) materials, having density lower than natural sand but higher than that of water, as sediment in physical hydraulic models has been around since decades and has been practised by different hydraulic laboratories around the world. Those laboratories have their own scaling criteria and study methodologies based largely on their own experiences with such models. There is still a lack of common scaling criteria for designing a lightweight model and for quantitative interpretation of results from such models.

For this reason, two sets of laboratory experiments were carried out in identical setups, one with a lightweight (low-density) material at Hydraulic Laboratory of NTNU, Norway and another with natural sand at Hydraulic Laboratory of Hydro Lab, Nepal. Each set of experiment were carried out by varying flushing discharge, reservoir water level, thickness of sediment deposit layer and opening height of bottom orifice.

This study focuses on the analysis of the experiments with sand. The results lead to a non-dimensional formulation of the scour cone depth, width, length and volume. The new formulation is comparted to data from literature of similar studies and showed good agreement..