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Numerical simulation of sediment flushing in reservoirs with TELEMAC

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As the awareness and need of using sustainable energy sources are increasing through the global society, it makes the developers and investors to take bigger steps towards improving these technologies and to overcome difficulties that come with them. Hydropower development is one of these possible ways, with a huge potential. However, with huge potential comes a lot of challenges. From this point of view, a core problem can be the sedimentation processes. Experience shows sediment is a factor that needs to be taken into consideration when planning or maintaining power plants. We have to consider the impact the designed structure can make on the sedimentology of the downstream or even plan flushing practices for the maintenance period. Hence, the knowledge of these processes is inevitable.
In this paper, the free and open-source TELEMAC-MASCARET software package (specifically the Telemac-3D and Sisyphe moduls) was used to test its adaptability for pressurized sediment flushing scenarios, which were carried out in a physical model of the Department of Civil and Environmental Engineering at the Norwegian University of Science and Technology in Trondheim. TELEMAC has already been widely tested by users in various riverine cases, but reservoir flushing has not yet been analysed with the tool. The goal of this paper was to fill this gap and to prove that the model is capable to simulate sudden morphological changes in a schematized reservoir when flushing is performed. The results showed that the typical cone shape erosion of the fine sediment deposition at the upstream side of the flushing gate could be reproduced, together with the locally strongly varying flow features. The numerically simulated morphological changes showed good agreement with different physical model scenarios, however, the sensitivity on numerical model parameters was also found.