Modelling granular landslides impacting reservoirs: a case study

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Granular landslides impacting reservoirs usually generate large water waves and active sediment transport, of which enhanced understanding is critical for public safety and reservoir management. Here, a recent coupled two-dimensional double-layer shallow water hydro-sediment-morphodynamic (SHSM) model is applied to investigate granular landslides impacting reservoirs. The model is first benchmarked against laboratory experiments of landslide-generated waves in both two and three dimensions. Then, it is applied to study a real landslide that is potentially to impact a reservoir. The wave amplitude and run-up as well as depositional area of the landslide are numerically resolved under different scenarios. Most notably, the results show that the landslide-generated waves would not overtop the dam, and the impacts are so constrained as not to damage the dam. Also, the deposition of the landslide would not block the intake and the emptying culvert of the hydropower station. Extended numerical tests reveal that the amplitude of generated wave correlates closely with the entry impacting velocity of the landslide, while it is dependent on the initial landslide volume, friction coefficient and particle size.