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Experimental comparison of tsunami generated by viscoplastic and granular slides

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Tsunami induced by subaerial landslides threatens coastal areas. The waves have mostly been studied in the laboratory using sliding blocks or granular media hitting a water body, but none of these materials makes it possible to understand how sliding mass' cohesion affects the wave dynamics.

The present study provides an experimental comparison of the tsunami generated by viscoplastic and granular slides. As viscoplastic material, we used a stable polymeric gel called Carbopol Ultrez 10, whose rheological behavior is captured by a Herschel-Bulkley model. As granular material, we used soft water balls, 15 mm in diameter, with a density close to that of Carbopol. In these experiments, we monitored the evolution of the free surface and the sliding mass using a high speed camera. The maximum wave amplitude, wave height, wave energy and wave length, as well as the sliding mass driving the leading wave formation are analyzed for the two materials.

To compare the tsunami generated by viscoplastic and granular slides, the parameters in the granular slide test are correlated with those pertaining to the viscoplastic slide test. The results reveal that viscoplastic slides generate larger waves than granular slides, while granular slides generate longer waves than viscoplastic slides.