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Simulating Submarine Slope Instability Initiation using Centrifuge Model Testing

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COSTA is addressing the questions of why seafloor slope failures occur where they do, and with what frequency they occur. The original program has been recently complemented by COSTA-Canada (http://www.costa-canada.ggl.ulaval.ca/). One of the 6 tasks involves the study of the initiation of slope instability through numerical and centrifuge modelling.

This paper presents the progress with this sub-task and reviews previous centrifuge studies related to submarine slop failure. Centrifuge modelling simulated the failure of a 16^{o}, 8.8m high loose sand submerged slope in CANLEX. Surcharging the slope crest caused the model slope to liquefy and flow with deep-seated lateral movements to an angle of 7^{o}. The initiation of submarine slope instability has also been attributed to triggers such as earthquakes, erosion, oversteppening, wave loading, gassy soils and sedimentation. Centrifuge modelling has been used to simulate most of these loading conditions in similar boundary value problems, including

1. The VELACS (Verification of Earthquake Liquefaction Analysis by Centrifuge Studies) program included simulations of lateral spreading of submerged slopes due to earthquake effects.
2. Wave loading simulation has induced seafloor liquefaction and mobility, and.
3. Continuous rapid sedimentation simulation induced persistently high pore pressures that may result in subsoil instability.

Key words: Submarine slope stability, centrifuge modelling