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DISSERTATION TITLE: *Risk Analysis of Earthquake-Induced Submarine Landslides in Deepwater Sites*

I denne avhandlingen er det undersøkt utviklingen av skråningsstabilitet i et dypvannsområde før, under og etter et jordskjelv, ved å utvikle alternative prosedyrer for å kvantifisere reduksjon av jordmotstand på grunn av sykliske degradering og udrenert kryp. I tillegg kvantifiseres påvirkning av kontrasterende jordgrenser i jordsmonnet for å indusere risiko ved skråningen. Den klassiske determinis-tilnærmingen til skråningsstabilitet ble supplert med en probabilistisk tilnærming for å estimere fare og risiko knyttet til svikt i undersjøiske skråninger. Det er foreslått en ny tilnærming til å kvantifisere den seismiske skråning feilfrekvensen, med spesiell vekt på beregningen av den årlige sviktsannsynlighet (AFP). Studien har også utviklet sårbarhetskurver for offshore konstruksjoner utsatt for rusk flyt, med formål å kvantifisere de direkte konsekvensene under risikoanalysen.

Among the variety of geohazards in deepwater sites, the failure of submarine slopes on the continental shelf and continental slope is one of the most significant hazards that may impact the marine environment, the economic sector, and threaten human live in coastal areas. The most frequent trigger of submarine slope failures is linked to seismic activity by itself, or in combination with preconditioning factors, also known as slow triggers, such as soil boundary interfaces (e.g. weak layers)

The research was focused on studying the evolution of the slope stability in a deepwater site before, during and after an earthquake event, by developing alternative procedures to quantify the reduction of the soil resistance due to cyclic degradation and undrained creep. Additionally, quantify the influence of contrasting soil boundaries in the soil profile to induce slope failure. The classical deterministic approach to slope stability was complemented with a probabilistic approach to estimate the hazard and risk associated to the failure of submarine slopes. Therefore, it was suggested a new approach to quantify the seismic slope failure frequency, with special emphasis in the estimation of the annual failure probability (AFP). The study also developed vulnerability curves for offshore structures exposed to debris flow impact, aiming to quantify the direct consequences during the risk analysis.

The analyses implied that the direct risk after the earthquake event is about one order of magnitude greater than during the earthquake event. Consequently, the analysis of slope stability at different stages of the seismic event may provide valuable information in choosing the appropriate risk management option.

