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A ROLE OF A TRIGGER MECHANISM IN A PREDICTION OF SUBMARINE LANDSLIDE CONSEQUENCES ON A NEARBY INFRASTRUCTURE

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Submarine landslides are the underlying cause of some of the most devastating natural disasters. They may cause the disappearance of entire regions along the shoreline, generate tsunami waves, and destroy the offshore infrastructure. The already existing and future planned gas transportation infrastructure along the continental slopes requires a better understanding of the processes that result in subsea landslides in order to improve our ability to predict, assess, and mitigate their potential hazards.

In the present study, we explore the effect of landslide trigger mechanisms on potential impact forces on the nearby offshore infrastructure. While some essential field data may be missing or impossible to collect, by changing possible geometric conditions (e.g., bathymetry, potential weak zones) and soil mechanical properties, it is possible to assess the upper and the lower bounds of potential consequences of the landslide events and define how important each missing parameter is.

The process of landslide evolution involves large deformations and movements of the soil. In such problems, the traditional Lagrangian finite element approach, typically implemented for problems in soil mechanics, suffers from excessive element distortions and, therefore, cannot be adopted to analyze the above phenomenon. In the present work, the computational framework adopts an Eulerian approach [1-2]. In the Eulerian approach, the material is free to move through the mesh, which is fixed in space. Consequently, the problem of excessive element distortions becomes irrelevant. Several advanced continuum approaches to treat large deformation problems in soil mechanics exist; however, the main advantage of the Eulerian framework is that it is widely available within commercial codes, such as Abaqus, Ansys, LS-Dyna, etc., accessible to engineers.

We demonstrate the role of the slope failure trigger mechanism in predicting the potential impact forces on subsea infrastructure through several landslide scenarios.

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