

Particle simulation of sliding mud-water interaction

†*Khoa Le-Cao¹, Nancy Chan Hui Ching², Khoo Boo Cheong¹ and Nhan Phan-Thien¹

¹Department of Mechanical Engineering, National University of Singapore, Singapore.

²Offshore Engineering Laboratory, Fugro Southeast Asia Group, Singapore

*Presenting author: mpeleck@nus.edu.sg

†Corresponding author: mpeleck@nus.edu.sg

Abstract

The objective of this research is to numerically investigate interactions between a mud fluid (i.e., clay-rich mixture) and water. It is apparent from the experimental data that mud mixtures are not a pure yield stress fluid [1, 2]. Owing to the inter-particle interactions, there exists a network microstructure which may be ruptured by sufficient applied stresses and then rebuild at a minimal stress level. A fluid mechanics mixture model coupling the Navier-Stokes equation and a structural kinematic model (for modelling the microstructure evolution) is employed to study water waves causing by the sliding mud. The results are acquired computationally using Smoothed Particle Hydrodynamics (SPH) method - a Lagrangian discretisation of governing equations which is an efficient tool for numerical simulations of complex moving boundary [3]. For verification, a lab-scale experiment concerning sliding clay mixtures has been implemented. A good agreement between numerical prediction and experimental results is achieved for the development of generated waves (Figure 1).

Keywords: **Structural kinematic model, Numerical simulation, Rheology, SPH**

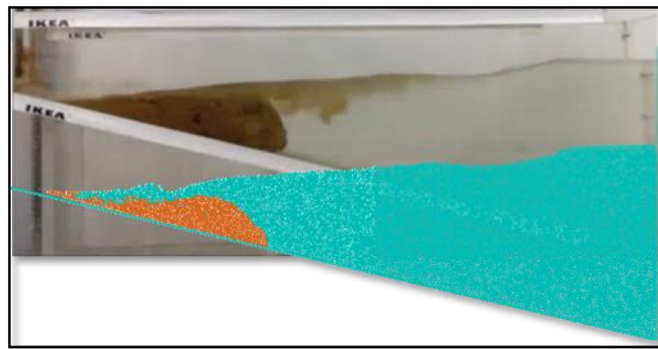


Figure 1. Snap shot at $t=1.25s$ of slide profile calculated with SPH (dots) and lab-scale experiment. A bentonite mixture of 5% wt represents the sliding mud.

References

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