Sandbox experiments of submarine landslide caused by water film in low permeability layer

*Shogo Kawakita[1], Daisuke Asahina[2], Keiji Kitajima[3], Mitsukazu Nakanishi[3]

1. Graduate School of Science & Technology, Nihon Univ., 2. National Institute of Advanced Industrial Science and Technology, 3. College of Science & Technology, Nihon Univ.

Submarine landslides can be serious geohazards since they potentially cause tsunamis and damage seafloor infrastructure. Submarine landslides can be larger in scale than landslides on land. Direct measurements/observations of submarine landslides at deep seafloor still remain a challenging task. Kokusho et al. (2000) proposed a water film effect and its mechanism on lateral flow with less frictional resistance to explain a driving force of large-scale submarine landslides

In this study, we conducted laboratory experiments to understand the relationship between sand liquefaction and lateral flow by water film, and investigate the influence of water film formation on lateral flow of upper layer. In general, it is difficult to observe the formations of liquefaction and lateral flow at the same time. This is because sand particles of sloping layer model start to move when vibration is applied, and inclination disappears before liquefaction. To solve this problem, we devised a mechanism to prevent the flow of the lower layer by providing a weir plate in inside the soil tank. This mechanism enables to distinguish and observe the movement of sand by the liquefaction and the lateral flow by the water film.

The results obtained in this study clearly show three stages: first, the lower layer was liquefied; then pore water was stored below the low permeability layer; and finally, the lateral flow was occurred by the water film effect. The experimental results show that there was no clear correlation between the increase in the angle of sloping layer and the travel distance or the maximum flow velocity. We also discuss the relationship between the layer angle and the location of sand boil. The location where sand soiling occurred moved to the upper side of the slope as the layer angle become larger.

[Reference]

Kokusho, T.: Mechanism for water film generation and lateral flow in liquefied sand layer, Soils and Foundations, Vol.40, No.5, p 99-111, 2000.

Keywords: Submarine Landslides, Pore Water Pressure, Water Film, Lateral Flow

