# Rapid and Long Runout Landslides with Three Types of Liquefaction Caused by Earthquake

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## Abstract

Liquefaction is a major mechanism of rapid and long runout landslides caused by earthquake. Because of the two features of rapid and long runout, it is always the major target for landslide risk assessment and countermeasures.

In this report, the behavior and forming condition of three types of liquefactions will be discussed for the purpose of landslide disaster mitigation.

The first type of liquefaction occurs when the sliding zone soil in a fully saturated and loose condition. A case study was conducted in Kataragai landslide, which was triggered by 2018 Western Shimane earthquake. Several ponds were located on the top of a refilled slope for environment protection.

The second type of liquefaction is proposed by Kyoji Sassa as "sliding surface liquefaction". It occurs in dense sandy soils with high potential of grain crushing. Nikawa landslide is studied as an example for this type.

The third type of liquefaction was found when we studied the landslides in Atsuma-cho, which were triggered by 2018 Eastern Iburi earthquake. Liquefaction occurred in the weathered pyroclastic deposits, which is located above the groundwater level. Because hydrated halloysite exists in the sliding zone soil, the volumetric water content is high, and the density is low. Liquefaction occurred even when there was no free water inside. Fig.1 is a monitoring result for this case.

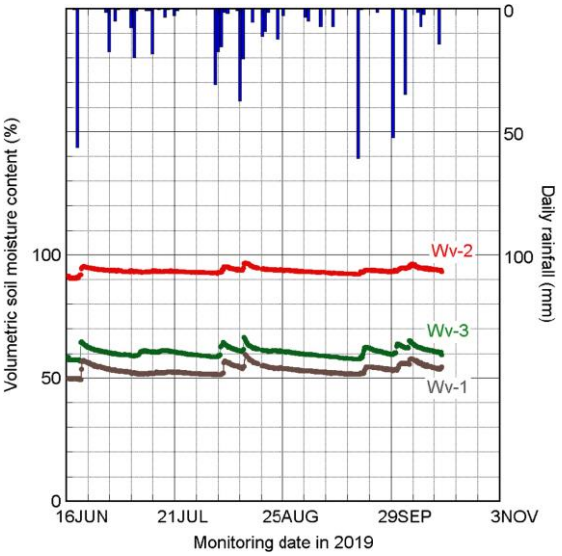


Fig. 1 Example of half page figure.

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## References

Wang, F, et al. (2021) Hydrated halloysite: the pesky stuff responsible for a cascade of landslides triggered by the 2018 Iburi earthquake, Japan. *Landslides*, 18, 2869–2880.