

Lateral spreading of mountains behind the Yui landslide in the epicentral area of the Tokai earthquake

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Lateral spreading of mountains is not only a degradation process itself but also it could become the background of a catastrophic landslide that occurs at its spreading rims. We found gigantic lateral spreading behind the Yui landslide area, which is located along the Pacific Sea coast in the epicentral area of the expected Tokai earthquake, central Japan. The Yui landslide area is located on a socially very important place, where are major lifelines connecting east and west Japan: Tokaido railway, Tokaido Shinkansen, and Tomei highway. The Yui landslide area comprises many landslide units and has been causing many catastrophs.

The lateral spreading is characterized by NS-trending multiple ridges and linear depressions as long as 1 to 2 km and up to 60 m deep. These features are observable on the aerial photographs and are clearly identified by using airborne laser scanner. Mountains subjected to the lateral spreading is 3 km wide in EW and 6 km long in NS and are 250 to 500 m high above sea level. These morphological features suggest that the NS trending ridges spread laterally to EW and their central parts settled down like the way by which horsts and grabens are made. The ridges are underlain by Miocene beds consisting of the alternating beds of mudstone and sandstone in the lower part and of sandstone and conglomerate in the upper part. The spreading ridge occupies the axial part of a NS-trending syncline, which has a half wave length longer than 2 km and comprises minor folds with a wavelength on the order of hundred meters. This structure, synclinorium, suggests that there could be décollements along the enveloping surface of the minor folds and that the lateral spreading could have a low-angle slip surface along the enveloping surface of the minor folds.

There are many landslides along the side slopes of the laterally spread ridges and they have been moving many times by rainstorms and also by earthquakes. The movements are recorded since 1781, but the history long before has not been clarified. We sampled plant fragments from the deposits in a depression at the head of a landslide along a linear depression. They were dated by using C-14, of which results suggest that major movement of landslides and possibly lateral spreading might occurred 3100, 2600, and 2200 BC, which may correspond to the occurrence of large earthquake. The lateral spreading may have occurred intermittently and destabilized their side slopes, which could have slid during earthquakes and rainstorms.

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