

# Deep-seated catastrophic landslides induced by large earthquakes along the Nankai and Sagami troughs

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We examined 32 landslides induced by large earthquakes along the Nankai and Sagami troughs and we made field investigations for 11 landslides and found their geological causes. They were induced by the 684 Hakuho, 1707 Hoei, 1854 Ansei Tokai, 1854 Ansei Nankai, or 1923 Kanto earthquake. One of the most outstanding landslide types was of pyroclastic fall deposits induced by the 1923 Kanto earthquake: those landslides occurred rather gentle slopes and had high mobility. We confirmed 3 landslides (Shinseiko, Nebukawa, and Nebukawa station) of this type and probably other 7 landslides could be of this type. One landslide horizon accommodating a sliding surface was the Tokyo Pumice about 65 ka, which covers wide area in Kanagawa and Tokyo area, suggesting future potential landslides. We have recognized many older landslides of this type on LiDAR images.

Another type of landslides was toppling failure of slate, Neogene sedimentary rocks, and Mesozoic accretionary complexes. We confirmed 6 such landslides of this type (Kanagi, Oya, Shirotoriyama, Shichimenzan, Ikeyama, and Nakagochi). Ikeyama landslide may be a complex of toppling and sliding. Oya and Shirotoriyama landslides made landslide dams, which breached later and severe damage downstream. Kanagi and Ikeyama landslides could have occurred in combination with large earthquakes and following rainstorms.

Another typical example of earthquake-induced landslides was buckling failure of stratified rocks: alternating beds of sandstone and mudstone and mixed rocks at Ishigami and conglomerate at Shimobe. Buckling type landslide was found only two locations, but it has been induced by many other earthquakes. Shimobe landslide probably made a landslide dam because the deposits have a mound on the opposite side.

There occurred many rain-induced landslides in the outer belt of southwest Japan, and we have found many of them can be attributable to thrust faults with large brittle crushed zones, which may be a different setting from those of earthquake-induced landslides.

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