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Landslides distribution with the source fault, case of the Zenkoji earthquake, 1847

Bateer Hasi[1*], Akira Nakamura[1], Ishii Yasuo[1], Maruyama Kiyoteru[1], Hara Yoshifumi[1]

[1]Erosion and Sediment Control Research Gr

This study focused on the Zenkoji earthquake (M7.4) in 1847, central Japan. We analyzed the earthquake-induced landslides distribution with the source fault and epicenter, and relationship between the geology and landslide occurrence. The landslides map in the study area is made by aerial photographic interpretation and field investigations based on the inventory map of Saito et al. (1999) and Central Disaster Management Council (2007). The location of source fault (reverse fault, dip northwest) and epicenter used in this study were cited from ADEP (2005) and Usami (19 96), respectively.
We analyzed the relationship between landslides distirbution and source fault, by using distance form surface projection of earthquake source fault (hereafter call source fault) to landslides. The analyzed result showed that landslides distributed within 23 km from the source fault. The landslides number tend to decrease with increasing of the distance form the source fault, 83 were included within 0-5 km, 58 were within 5-10 km and 20 were within 10-15 km from the source fault. Most of the landslides (88.6%) occurred on the hanging-wall of the source fault with larger scale compared to that on the foot wall. Meanwhile, the scale of landslides tends to decrease with distance from the source fault. These results suggested that distribution of earthquake-induced landslides is possibly affected by hanging-wall/foot wall effect of the earthquake (Abrahamson & Somerville, 1996). However, the landslides occurred within 47 km from the epicenter, but the tendency of landslides number decrease with the distance from epicenter is not clear. These results showed that earthquake-induced landslides are likely to be strongly affected by source fault than the epicenter. These results are coincided with the result of the Chuetsu earthquake and Chuetsu-offshore earthquake induced landslides in nearby regions (Has et al.,2009).
The landslide area ratio in each geological component (landslide area/geological component area) showed higher ratio in sandstone-mudstone alternation component (2.73%) and in sandstone component (2.06%) compared to that of mudstone component (1.26%). Also, the landslide area ratio calculated within 5 km bands extend from the source fault, showed a tendency of higher value in close distance from the source fault. Theses results suggested that earthquake-induced landslides are likely to be affected strongly by source fault compared to that of geological component.
Based on the result of earthquake-induced landslides are considered to be strongly affected by source fault compared to the epicenter, the landslide concentrating area could be estimated by using source fault model for inland reverse fault earthquake.

Keywords: earthquake, landslide, Zenkoji earthquake, recerse fault, earthquake source fault, hanging-wall