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Distribution of trigger and relationship between trigger and geology of deep-seated landslides

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In the Shimanto accretionary complex in the southwest Japan, most of the recent deep-seated landslides (DSLs) were induced by heavy rainfall over 1000 mm in a few days. In contrast, in the areas of Neogene sediments in the northeast Japan, recent DSLs were induced by strong seismic motion larger than six on the Japanese earthquake damage scale. These facts imply that the regional characteristics exist in the factors that induces DSLs (i.e., rainfall or earthquake), and that these factors are related strongly to the geological features of DSL sites. We therefore studied the regional characteristics of rainfall and earthquake on the basis of the distribution maps of rainfall probability, active faults and earthquake epicenters in Japan.

The processes of DSLs induced by two factors and the geological influences on them are summarized as follows. In the Shimanto accretionary complex in the southwest Japan, DSL induced by heavy rainfall is more likely compared with that by earthquake. This is because of the higher precipitation in the relevant area and the convergence of seepage water into the cracks of potential slip surfaces formed by rock creep. Earthquake-induced DSL is unlikely because active faults in this region are few and the mountainous basement is relatively hard. On the other hands, in the Neogene sediments in the northeast Japan, rainfall-induced DSL is unlikely because of the lower precipitation and the divergence of seepage water due to porous media. Earthquake-induced DSL is likely because earthquake stimulates greater ground motion in the Neogene sediments and the mountainous basement is relatively soft.

Keywords: deep-seated landslide, trigger, geology, heavy rainfall, strong earthquake