

Rock avalanches controlled by a thrust fault and river incision in an accretionary complex of the Shimanto Belt

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The purpose of this study was to clarify the geological and geomorphological background of rain-induced rock avalanche occurred in the Shimanto accretionary complex. We performed the detailed geological survey for the area of 5.4 km² in the middle of the Kii Mountains in Japan. In this area, the two large rock avalanches (Akatani and Akatani-east, both have the volume over 10⁶ m³) induced by the heavy rain of Typhoon Talas in 2011. Using the 1 m DEMs made before and after the landslides, we performed the detailed geological survey and geomorphological analysis of deep-seated gravitational slope deformation. We investigated the distribution of the thrust faults with the incohesive brittle fracture zone in the mountain slopes and the inner structures of these thrusts. And, we performed the mineralogical analysis, permeability test and direct shear test to know the material features of the gouge. Around the Akatani landslide we investigated the faults distribution in the slope by boring data.

As a result, we found out that the two large rock avalanches have the main sliding surfaces corresponding to the same thrust (we named the Kwarabi thrust) with the clayey brittle fracture zone with the maximum width of 6 m. Two landslides slid under the condition of wedge failure consisting of the Kwarabi thrust and some high-angle faults. It is estimated that the gravitational deformations started at the timing when the depth of the Kwarabi thrust under the slope toe reached the threshold value. The Kwarabi thrust has the clayey crushed materials to the surrounding rock mass, and form the discontinuity of ground water, and prevent the ground water flows, and builds up the pore water pressure in the heavy rain.

Keywords: rock avalanche, thrust, river incision, accretionary complex, gravitational slope deformation, rain