

Temporal changes in erosion rates and patterns in Ichinosawa subwatershed of Ohyakuzure landslide, central Japan

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Erosion of hillslopes has been active within the area of Ohyakuzure landslide since its formation in ca. 300 years ago, and the Abe River is characterized by a vast amount of sediment input from the landslide. Although many portions in the landslide have been controlled by landslide prevention strategies and vegetation on hillslopes is being recovered, hillslope erosion and debris flows frequently occur in uppermost steep subwatersheds in the landslide area. Ichino-sawa catchment is a typical one among such subwatersheds. In the catchment, freeze-thaw weathering of fractured bedrock on hillslopes (shale and sandstone) in winter to spring season provides abundant sediment onto channel beds, which act as a source of debris flows frequently occurring by heavy rainfalls (Baiu rain front and typhoons) in summer season. Although detailed monitoring of debris flows and related topographic changes have long been performed in a field scale, high-resolution assessment of erosion patterns and rates at a catchment scale has been limited due to the inaccessibility of steep slopes therein. Here we examine topographic changes in the Ichinosawa catchment using a time series of high resolution DEMs for 5 years (from 2005 to 2010) obtained by repeated airborne laser scanning (ALS). The 5-year mean basin-averaged annual erosion rate in the Ichinosawa catchment is roughly estimated to be ca. 0.1 m/y. Spatial patterns of erosion and deposition show clear contrast between channel beds and hillslopes, indicating that, as an inter-annual trend, erosion dominates on hillslopes whereas the sediment particles tend to be stored in channel beds. Relationships between the temporal changes in rates and patterns of erosion/deposition and morphometric parameters in the catchment are also examined.

Keywords: airborne laser scanning, debris flow, GIS, erosion, geomorphometry