

Sediment dynamics after the 1973 landslide event in mountain watersheds of Hokkaido, Japan

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When landslide or debris flow occurs due to heavy rainfall in a watershed, sediment movement becomes apparent instantaneously and locally in the form of a landslide disaster. On the other hand, not all of the produced sediment flows out at once, but part of the sediment is temporarily stored in the lower part of slopes or in river channels, and then moves and propagates downstream due to rainfall and other floods. These sediments stored in a watershed will be debris-flowed during the subsequent large-scale flooding, promoting sediment disasters again, and there is concern about effects of abnormal reservoir sedimentation at downstream storage dams. Therefore, to understand sediment dynamics after landslide event is important in terms of watershed management. In this study, we created a multi-period digital surface models (DSM) before and after the occurrence of a sediment production event, and clarified sediment dynamics on a scale of several decades from comparison with time-series hydrological data and vegetation invasion into river channels. Study sites are three mountain watersheds in Kotani' ishi, Hokkaido, Japan, where multiple landslides occurred due to heavy rainfall event in 1973. The DSM was created by Structure-from-motion (SfM) using archive data of aerial photographs taken during nine periods from 1972 to 2008 and results of a field survey conducted in 2020. As a result of the investigation, although there was no noticeable movement of stored sediment for at least 35 years after the landslides, relatively large-scale sediment movement that caused riparian disturbance during flooding since 2009 has occurred. These results indicate that the constant sediment movement of the stored sediment is not remarkable, but that the sediment may cause large-scale sediment movement even after several decades since the occurrence of landslides.

Keywords: sediment movement, structure-from-motion (SfM), aerial photographs, decadal and longer time scales, landslide event, sediment disaster