Frequency distribution of the deep-seated rapid landslide area in different events in the same region

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Deep seated rapid (catastrophic) landslide (hereafter DCL) often trigger debris flow and sometimes generate a landslide dam, and have sometimes had serious impacts on humans. Therefore, it is important to predict the scale of DCL to prevent and mitigate disasters due to DCL.
The scale of DCL should be strongly controlled by geological and geomorphological settings. Thus, in this study, it can be propose a hypothesis that the scale of DCL should be comparable to the past DCL in the same region. We tested this hypothesis using DCL inventories in Fuji river basin in Yamanashi and Totsu river basin in Nara, Japan. We prepared a map of ancient DCL scars through the interpretation of stereoscopic aerial photographs and evaluated the timing of each DCL occurrence by using multi-temporal DCL inventory map and various sets of aerial photographs. Then, we compiled 3 events and clarified the relationship between landslide area and frequency of DCL. Also, we identified shape of rock creep using high resolution slope map made by LiDAR data and clarified the relationship of area and frequency of rock creeps.
As a result, we found the similar scale characteristic in DCL of Fuji river basin for all events, although the landslides occurred in 1982 were slightly smaller compared to the rest of the event. In Totsu river basin, the scale characteristic of DCL occurred in 1911 and 2011 had almost similar trend. These results supported our hypothesis that there is the site-specific relationship between landslide area and frequency of DCL. Moreover, the scale of rock creep and DCL were almost similar, except DCL of 1982 in Fuji river basin. Long-lasting, small-scale mass movements called gravitational mass rock creeps sometimes lead to deep catastrophic sliding. So, it can be thought that the scale of DCL might be determined at the stage of long-lasting, small-scale mass movements before landslide occurrence, supporting the hypothesis that the scale of DCL should be controlled by geological and geomorphological settings.
These suggest that the scale of the future DCL will be equivalent to the scale which have occurred in the past in the same basin and it have might be related to the scale of rock creep.

Keywords: deep seated rapid landslide, landslide area, rock creep, LiDAR data, aerial photograph

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