

Immunity to slope failures from distribution of slope failures induced by the 1945 Makurazaki typhoon and the 2018 heavy rainfall occurred in the southern part of Hiroshima Prefecture, southwestern Japan

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Abstract

The immunity to slope failure is the concept that once slope failure occurs, slope failure does not recur until the soil layer recovers. It is adequate to examine whether two slope failures occurred on the same slope or not in order to verify whether the immunity to slope failures is maintained during a certain period. Two heavy rainfall the 1945 Makurazaki typhoon and the 2018 heavy rainfall occurred in the southern part of Hiroshima Prefecture, southwestern Japan in the almost same region. The aim of this study is to reveal the distribution of slope failures induced by the Makurazaki typhoon and to verify whether the immunity to slope failures is maintained during the Makurazaki typhoon and the 2018 heavy rainfall. Based on the interpretation of aerial photograph, it is revealed that the number of slope failures induced by the Makurazaki typhoon was 3,787. It is considered that the occurrence of slope failures and the amount of precipitation may be related. Areas of high slope failure density overlap in both the Makurazaki typhoon and the 2018 heavy rainfall. Thus, the immunity does not exist, or the effective period is shorter than 73 years on a mountain or watershed scale. However, 113 slope failures were caused with the 2018 heavy rainfall on the same slope where slope failure occurred with the Makurazaki typhoon, and the slope failure which recurred was only 1.4% of the whole slope failures. In addition, the length of the slope failure caused with the 2018 heavy rainfall on the same slope where slope failure occurred with the Makurazaki typhoon was shorter than that of the Makurazaki typhoon. These results suggest that the surface soil on the slope where slope failure occurred with the Makurazaki typhoon did not recover sufficiently during the period of 73 years up to the 2018 heavy rainfall, and that the immunity to the slope failure was maintained.

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