Effect of past human activities on the 2009 shallow landslide hazard in the Houfu District, western Japan

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The heavy rainfall on 21 July 2009 has triggered numerous shallow landslides on the mountains in the Houfu District, western Japan. Effects of geographical factors on the landslide such as topography, vegetation and rainfall amount were evaluated by using machine learning algorithm (random forest and decision tree classifiers).
Vegetation height was the most important factor. Many landslides were occurred in sites with thin vegetation cover, such as young planted conifer forest and open forest accompanied by fern meadow that was believed to be induced by artificial burning.
Many shallow landslides initiated in the narrow valleys filled by granitic sand. The radiocarbon age of the valley fill deposit was Cal AD 1200 - 1600yrs, suggesting that serious erosion and sediment yield prevailed since the 13th period. Buffer zone analysis of the landslide indicates that many landslides occurred on slopes 10 - 30m apart from the past denudated hills. Distribution of soil thickness indicated that reworked material in valley head hollows produced by past human-induced erosion has played an important role in the 2009 landslides.
These evidences indicated that effects of past human activities such as burning and land degradation played important roles in the shallow landslides in this area.

Keywords: shallow landslide, land degradation, hageyama, radiocarbon age, machine learning

