An attempt to construct slope hazard map based on geomorphologic and geologic characteristics of past slope failures

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Although slope hazard maps expressing the susceptibility of the occurrence of sudden slope failures are strongly required in mountainous countries, there are many difficulties to construct such maps. One method is to utilize the statistical information on the distribution of slope failures at the past. This may be effective in the area where numerous slope failures were precisely recorded. Then, the authors attempt to construct a susceptibility map indicating the probability of the occurrence of slope failures on the basis of geomorphologic and geologic characteristics at many locations, where slope failures occurred at the 1983 San'in heavy rainfall disaster.

Analysis was made for a mountainous area in Misumi area, Shimane, Japan, where most of slopes are composed of Mesozoic schistose rocks with plutonic rocks, both of which are remarkably weathered. Slopes are mostly steep, whereas partially gentle. Based on the aerial photography just after the disaster, slope failures tend to appear in not only steep slopes slightly concaved, also just below a remarkable low relief surface. Therefore, the depth below the surface was also taken into account in the analysis.

The DEM with 10 meter mesh was used as geomorphologic information, which was made from a published topographic map in the scale 1:25,000. As a result, the probability of the occurrence of slope failures R increases gradually with slope angle t(theta), and it takes a maximum value at t=40 degrees. Moreover, regarding the curvature of the slope, the probability R takes a maximum value at the curvature c=0.5 - 0.75. In addition, regarding depth d from the low relief surface, R decreases exponentially with the depth as R (d) =2.83exp (-0.036d).

Combining these variables, t, c ,d , a probability function R in terms of variables t, c ,d , that is R(t, c ,d) was obtained statistically. Among these variables, the depth d below the low relief surface is consequently effective information. No distinct differences are recognized between schistose rocks and plutonic rocks. Based on this probability function and geomorphologic information digitized for any area, a susceptibility map can be constructed.