Study on the prediction of the large shallow landslides areas using Airborne Electromagnetic Survey, hydrological investigation and water quality investigation

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In recent years, the investigations of deep-seated catastrophic landslides and volcano using airborne electromagnetic survey have been carried out. And, the study on prediction of sediment disasters occurrence areas gradually progresses. On the other hand, recently, many shallow landslides disasters including Hiroshima in 2014, Izu-Oshima island in 2013 and Nachi river basin in 2011 were occurred. If we can predict the collapse occurrence slopes by using airborne electromagnetic survey, we can easily decide the priority of the constructions of sabo dams and make the evacuation systems. In this study, we nominated Nachi river basin where large shallow landslides were occurred in 2011 for an example and examined the difference of the resistivity characteristics of collapse and non-collapse slopes from the result of the airborne electromagnetic survey.First, we arranged the relationships between geological features and resistivity distribution. Because Nachi river basin is parted in the area of Kumano Acidic Rocks (granite porphyry) and the area of Kumano Group (sandstone mudstone alternative rock), we considered whether these were distinguishable by the resistivity distribution. Next, we put the collapse slopes on the map of the resistivity distribution and examined the resistivity of the collapse slopes. Final, we paid our attention to the pattern of resistivity contour lines and the rate of change in the resistivity. We examined the difference of them about collapse and non-collapse slopes of Nachi river basin.Kumano Acidic Rocks (granite porphyry) had high resistivity and Kumano Group (alternated sandstone and mudstone layers) had low resistivity. As a result, we can express geological borders very well by airborne electromagnetic survey. In addition, we understood that the most of the collapse slopes were distributed near the geological border. From this, it is thought that collapses were occurred by the difference in geological properties of the plumb direction. About the difference of the collapse and non-collapse slopes, we found that the collapse slopes have vertical pattern of resistivity contour lines against the slope directions. And we found that the areas of the large rate of change in resistivity are disappeared at the upper parts of the collapse slopes about the collapse slopes. On the other hand, about the non-collapse slopes, we found that the resistivity contour lines were parallel with the slope directions and the areas of the large rate of change in resistivity are continued at the upper parts of the slopes. The resistivity contour line shows the structure of geological features. Because the resistivity contour lines of the collapse slopes are vertical, the geological structures of the collapse slopes are vertical and it is thought that Kumano Acidic Rocks (granite porphyry) penetrates Kumano Group (alternated sandstone and mudstone layers) vertically. In addition, when geological structure is vertical, infiltrated water is hard to flow to the slope lower part, and it is thought that water level under the ground is easy to rise and the slope is easy to be collapsed. It is thought that the areas of the large rate of change in resistivity expresses water level under the ground. Because the areas of the large rate of change in resistivity are disappeared in the collapse slopes, it is thought that drainage abilities were low. Above all, in the risk evaluation of the shallow landslides, it is thought that we can evaluate the water levels under the ground and the drainage abilities of the groundwater by using the airborne electromagnetic survey.

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