Study on the extracting dangerous area for shallow landslides in the Nachi River basin using the airborne electromagnetic survey

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In the Nachi River basin, the disaster caused by Typhoon Talas in September 2011 caused shallow landslides and debris flows, and large damage were occurred in the downstream area. For this reason, in order to prevent similar damage from now on, it is important to extract slopes with high risk of shallow landslides in the basin. As a method of extracting the slopes with the risk for shallow landslides, a method to evaluate the degree of the risk from the slope gradient and the soil strength has been proposed in the past research. Although these methods have the merit that it is possible to simply calculate the dangerous slopes by calculations, there is a demerit that the underground information such as the geological structure and the water level is hardly reflected. Others include boring survey, electrical prospecting, and elastic wave exploration. Although these methods have the merit of obtaining underground information, there is a disadvantage that not only can information of a narrow area be obtained but also the cost is high. Therefore, the authors propose the airborne electromagnetic survey as one of the methods to solve these problems. The purpose of this research is to develop the technology to extract the slopes with the risk for the shallow landslides from the resistivity distribution in the shallower range than the underground 100m by the airborne electromagnetic survey in a wide area.

As features of the airborne electromagnetic survey, it is possible to estimate the vertical change of the underground geological structure, and can estimate the height of the groundwater level. Therefore, in this research, we conducted the airborne electromagnetic survey in 2012 in the Nachi River Basin (13.4km^2). Then, from 2016, in order to verify the results of the airborne electromagnetic survey, we chose two points where longitudinal distribution of resistivity value is greatly different and conduct the boring survey and investigate the change of the groundwater level. We examined the difference in the resistivity distribution between where it is easy to collapse and where it is not likely to collapse.

From this study, it is pointed out that the area where the resistivity value greatly changes is distributed in the basement as a feature of the collapsible slopes in the Nachi River basin. In the case of the Nachi River basin, these areas are presumed to be the geological boundary between granite porphyry (Kumano acidic rocks) and sedimentary rock (Kumano group). Depending on the direction and the angle of the geological boundary, the sedimentary rock has a property that it is difficult for water to pass through, so the flow of water on the slope is hindered and the slope may collapse. For this reason, it was suggested that the underground geological structure has a great influence on the flow of water, and the risk of the shallow landslide is influenced.

Keywords: Airborne electromagnetic survey, Shallow landslide, Boring survey

