Clarifying Hydrogeological Structure of Deep Catastrophic Landslide Using Airborne Electromagnetic Survey, Spatial Patterns of Stream Flow and Drilling Investigation

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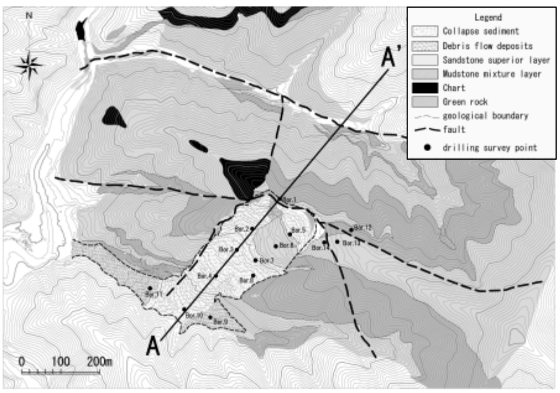
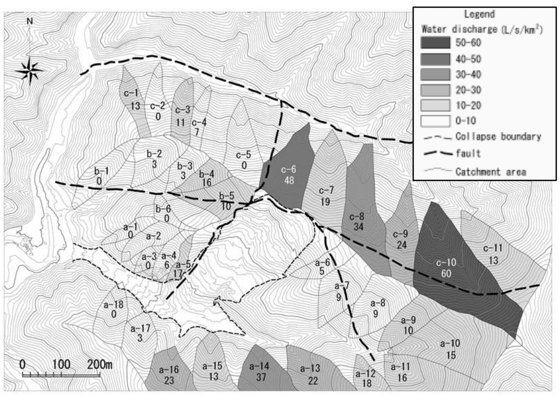
INTRODUCTION

For deep catastrophic landslides that caused due to rainfall by Typhoon Talas struck the Kii Peninsula in September 2011 various surveys and studies have been completed in each of affected areas. In this study, based on the resistivity distribution by the airborne electromagnetic survey and , we examined hydrogeological structure and the slope extraction method of a high potentially deep catastrophic landslide.

INVESTIGATION METHOD

Geological structure was clarified by drilling investigation and surface exploration. Specific discharge which is divided by the catchment area of the water flowing out of the swamp basin is affected by surface geology and shape configuration, and the geological structure.





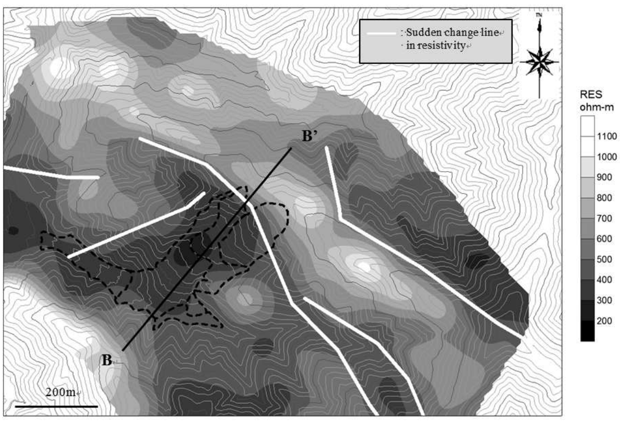


Fig.1a Geological map (upper left)
Fig.1b Specific discharge distribution map (upper right)
Fig.1c Resistivity distribution map view of the surface by airborne electromagnetic survey (lower left)

The airborne electromagnetic survey will help to determine the geological situation through three-dimensional resistivity distribution underground. The airborne electromagnetic survey is effective for a wide range of regions, and is effective for the investigation of a mountain region where difficult to access.

The Kitamata district is one of the deep catastrophic landslides place, is the geology of mudstone mixed rock subject. Although it has the geological structure of plunge with a low angle, it becomes locally dip slope by the bedding plane and schistosity plane of an argillaceous rock. According to the LiDAR topographic map and aerial photographs before the collapse, clear linear depressions are seen in the summit area. We can guess that the slope had been gradually deformed by gravity.

RESULT

By comparing the geological map and specific discharge distribution map, apparent differences can be seen in the specific discharge in upstream and downstream across the fault in the basin that are adjacent to the fault of the east-west direction and the north-south direction. It is estimated that the presence of the fault has affected the hydrogeological structure directly or indirectly. The mountain stream is an undercurrent, accurate measurement of the specific discharge is not performed in the collapsed slope. Since the spring water in many place and paddy field remains, it is expected that the flow rate ratio is large.

Comparing the geological section and the resistivity section, it can be seen that there is a relation between the existence of fault and sudden change of resistivity. Therefore, there is a possibility that the existence of fault can be estimated by the way mentioned above. Furthermore, by combining the extraction of the slope based on the topographical analysis such as creep slope terrain interpretation and estimation of location of fault, it is possible to clarify slopes prone to undergo gravitational deformation and catch the groundwater from outside basin.

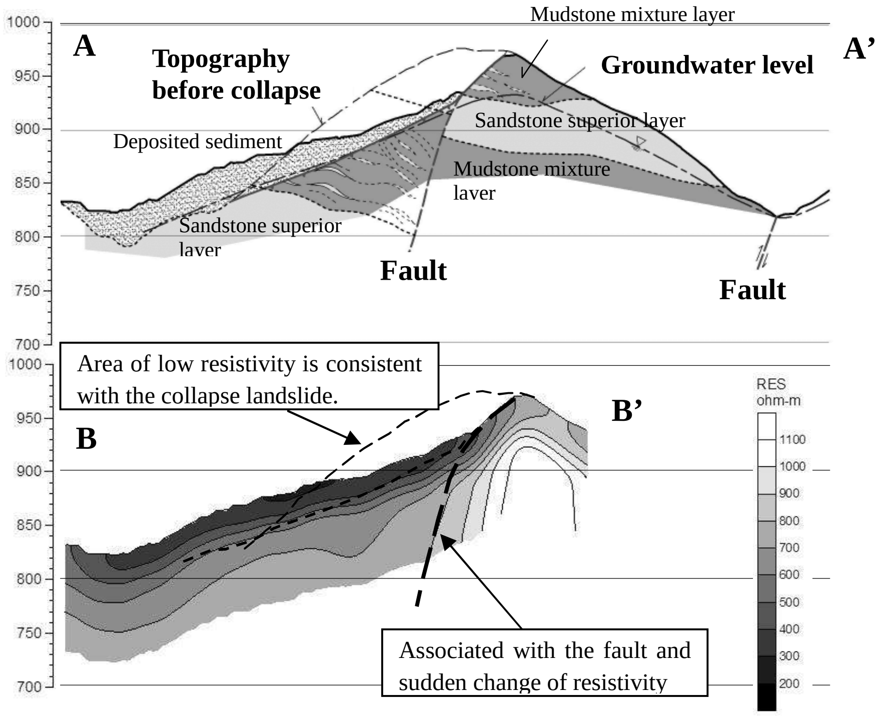


Fig.2 Geological cross-section of the landslide (upper) and resistivity cross-section (lower)

Keywords : deep catastrophic landslide, hydrogeology, fault, airborne electromagnetic survey, resistivity