

Study on the prediction of the deep catastrophic landslide using the Airborne Electromagnetic Survey

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Recently, the deep catastrophic landslides were occurred frequently including the disaster of the Kii peninsula by typhoon 12 in 2011. The risk evaluation is demanded to be carried out the measures that we can assume at the both sides of the method constructing sabo dams and evacuation method. Recently, the airborne electromagnetic survey is performed a close-up to evaluate the risk of them. Merits of the airborne electromagnetic survey include that a geological feature border in conjunction with the deep catastrophic landslides having possibilities to become clear, hydrological properties may become clear. On the other hand, there is the uncertain element such as the decision method of the ratio resistance level of the geological feature border and the groundwater not being clear. In this study, we have arranged the results such as in the airborne electromagnetic survey, a geological survey, the hydrological investigations for the points where the deep catastrophic landslides were occurred and where airborne electromagnetic survey was carried out so far. The study areas are Byutano river basin (is about 4.4km²), Fujikawa river basin (about 3.7km²), Himekawa basin (about 15.2km²), and Kumano river basin (about 10.1km²). In these areas, in the past, the deep catastrophic landslides were occurred and the airborne electromagnetic surveys were carried out.

First, we have examined ratio resistance properties every area by the airborne electromagnetic survey. The range of the ratio resistance level to appear in the area for showed 1-2400 Ω -m in 1-1200 Ω -m, the Kumano river basin in the Himekawa river basin whereas it was 1-400 Ω -m in Byutano river basin and the Fujikawa river basin, and the distribution of the ratio resistance level knew that there was a difference by a geological feature and an area. And we have found that there were three patterns of the distributions of the resistance when we have paid our attention to the ratio resistance pattern of the plumb directions from the surface of the slope at the point with the fear of the deep catastrophic landslides to the deep part. From this, the depth that a ratio resistance level changes in the plumb direction may become the fundus of the deep catastrophic landslide. Boring investigations were carried out in Byutano river basin, Fujikawa river basin, Himekawa river basin, and a weathering department and the geological feature border of the virginity part are authorized by the observation of the boring core. The ratio resistance level corresponding to this geological feature border indicates 100 Ω -m in Byutano river basin, 70 Ω -m in Fujikawa river basin, and in Himekawa river basin indicates 500 Ω -m, 680 Ω -m, 1000 Ω -m.

From these, it was confirmed that the ratio resistance level to correspond to appearance frequency and the geological feature border of the ratio resistance level varied according to an area and a geological feature. Therefore, it is necessary to carry out the risk evaluation of the deep catastrophic landslide after carrying out a boring investigation in addition at a representative point when we carry out the airborne electromagnetic survey, and having arranged a geological feature and the relations of the ratio resistance level.

In addition, at the deep catastrophic landslide point of Kumano river basin, consecutive low ratio resistance zones and the low ratio resistance zone of the plumb direction are common to the valley part from the ridge and are confirmed and agree with the groundwater situation by the hydrological investigation. We need to accumulate data about the ratio resistance structure in conjunction with the deep catastrophic landslide and want to examine the extracting method of the point with the fear of the deep catastrophic landslide, an estimate method of the collapse depth and collapse volume in future.

Keywords: Airborne Electromagnetic Survey, deep catastrophic landslide