INVESTIGATION ON SLIP SURFACES OF THE SLOW MOVING LANDSLIDE BY SURFACE DISPLACEMENT MONITORING

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Identification of the geometry of slip surface of a landslide is one of the most important subjects in analyzing the landslide mechanism. As the nature and the properties of the slip surface are the governing factors of the rate of mass movement, precise estimation of the slip surface is an essential requirement in landslide studies. Various methods are adopted by the landslide researchers to estimate the depth of the slip surface and, those involve surface displacement monitoring, electrical resistivity sounding, shallow seismic profiling etc. Relatively expensive methods such as boring, Pipe strain gauge, inclinometer and multi layer extensometer can also be used.

The slow-moving creep type landslide in Saga Prefecture of Japan was continuously monitored for determining the movement direction and rates. Frequent surveying of several monitoring points on the landslide body was carried out for nearly 2 years. The results revealed that the movement rate varies within a short range and generally, 6 cm/day could be considered as the average. However, just after each prolonged heavy rainfall, the movement rates increased drastically and later on reduced within few days. Analysis of the cumulative rate of movement revealed that the trend of 5.92 cm/day was sustained throughout the period of monitoring.

The slip surfaces could be effectively determined using the surface displacement monitoring. The slip surface was identified at the depth of 21m at the middle of the moving mass found to be extends from the already exposed section at the head area up to the toe of the slide. The entire movement of the slide is facilitated along the existing fault planes. Considering the rate of movement, the landslide could be categorized as a slow moving creep type slope failure on a weathered rock.

Analysis of the horizontal and vertical movement data of the monitoring points revealed that the directions and the magnitude of movements vary through-out the sliding mass. Combining with the geological and structural investigation as well as the 3-D analysis of the survey data could be effectively utilized in determining the geometry of the slip surface including the depth and shape. Information obtained on the slip surface was well correlated with the geology of borehole drilled on the middle portion of the landslide and by the pipe strain gauge installed subsequently.