VERY LOW FREQUENCY ELECTROMAGNETIC OBSERVATIONS IN THE HIGH ALTITUDE REGION OF NORTH SIKKIM, INDIA

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Landslides are very common in the high altitude Himalayan territory. Major roads in Himalaya often get blocked due to heavy landslide and remain closed for long time. Lantakhola is one of the oldest landslides in north Sikkim highway which is active since long time. Rock types on either sides of the landslide are different and it is believed that MCT is passing through this landslide. Permanent solutions of these landslides are required to keep the highway open. Delineation of subsurface structures below the landslide is very important to arrive at a definite conclusion about how to avoid landslide. This can only be accomplished by geophysical survey. However, it is very difficult to find suitable ground over high slopes in these areas to carry out geophysical survey specially electrical and electromagnetic.

Very low frequency electromagnetic survey is performed over Lantakhola landside in northern Sikkim highway to depict the subsurface fracture/slipping zone through which landslide takes place. Even though very limited numbers of VLF transmitters are available worldwide, it was possible to pick up the VLF signal from a number of VLF station at this high altitude mountainous terrains. High conducting zones are delineated from VLF observations. This conducting zone is also correlated with the low resistive zone delineated using gradient resistivity profiling. These anomalies confirm that there is no stable ground up to a large depth below the Lantakhola slide. Therefore, Lantakhola slide will remain active in future. Slope study of the landslide over a five year interval reveals that slope is gradually increasing. Resistive structures depicted on either side of the landslide zone can be correlated with the stable ground. A bridge through these two locations could solve the Lantakhola problem permanently. However, such bridge will also vulnerable because it may hit by falling massive boulders.

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