A complex geo-scientific strategy for landslide hazard mitigation – from airborne mapping to ground monitoring

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Several methods have been tested to investigate and survey landslide areas after the big landslide event in Sibratsgfäll. The resulting optimise strategy consists of the combined application of airborne electromagnetics, ground geoelectrical measurements and geoelectrical monitoring combined with hydrological and geological mapping and geotechnical modelling. It will be pointed out that interdisciplinary communication and discussion was the primary key to access this complicated hazard situation.

A short period of heavy precipitation and the rapid melting of snow in spring of 1999 initiated a catastrophic landslide on the South-flank of the Rubach Valley near Sibratsgfäll in the federal state of Vorarlberg (Austria).

As a follow up of this catastrophic landslide a strategy to deal with similar events was worked out based on the evaluation of applied measures. It turned out that airborne geophysical measurements are a valuable tool especially in the pre-hazard phase to get a quick overview of the geological situation, to detect areas susceptible to a high sliding risk, to assist the follow up geological and hydrological mapping program and to optimise planning of further (ground)-geophysical surveys. Within a second step ground geoelectrical surveys were used for advanced understanding of the internal structure of the landslide. The location of survey lines was planned according to the resistivity pattern derived from the airborne electromagnetic survey. Based on these findings and on the results of the geo-hydrological mapping program, boreholes have been drilled to calibrate the geoelectrical results and to determine the geotechnical parameters of soil samples. Additionally geophysical logging and hydrophysical logs have been performed. Based on all of these results a geotechnical subsurface model was set up and parameters and conditions of safety and failure were calculated. Finally a multi parameter monitoring network was set up and maintained now for four years. Especially the development of an innovative, high speed geoelectrical monitoring system and the final results of monitoring will be highlighted.