



Geotechnical Investigations and Measurements on the Gradišče Landslide, W Slovenia

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Slow earth flows and shallow landslides are frequent instability phenomena in flysch sediments. In 2000, a shallow landslide was initiated in the weathered flysch sediments on a moderately steep hillslope (up to 35°) above the valley of the Vipava River, W Slovenia, threatening the village of Gradišče. Since 2001, the Gradišče landslide has been investigated using different geodetic and geotechnical equipment. The measuring system installed in the area consists of several piezometers, inclinometers, and fixed geodetic stations. After the initial geological prospecting of the area in 2001 with the aim of establishing of a local geological map, altogether 9 boreholes were drilled and 7 of them were equipped in order to monitor the landslide in the period from March 2001 to March 2002. In this period geodetic measurements of fixed points on the landslide gave surface movements of the order of 1 cm/year. After a two year break, in April 2004 systematic measurements were taken up again and over 15 measurements in regular intervals of generally two months have been performed so far. Additionally, rainfall data from two rain gauges located near the landslide were compared with the measured displacements of the landslide and the measured levels of groundwater in piezometers.

Earth material from boreholes was investigated in soil mechanics laboratory, and material properties were determined. Some of the boreholes were used as inclinometers in order to determine sliding planes in the slope. The upper sliding plane was determined at the depth between 2 and 3 m, and the lower sliding plane was located to exist at the depth of approximately 8 m. In order to stabilise the slope and to protect the existing houses in the village, as the final mitigation measure a 165-m supporting wall made of reinforced concrete piles driven to soils was proposed.