

3D recent geodynamics monitoring of the Western Carpathians

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The Slovak Republic covers a major part of the Western Carpathians. This region is well known by the occurrence of natural hazards like slope deformations (especially landslides), erosion, soil (loess) collapsibility, earthquakes, active faults and floods. Detection of very slow movements (displacements) along active faults needs a specific measurement or monitoring techniques. The TM-71 extensometer is a device capable to detect micro-displacements in three dimensions. It works on the principle of moiré's pattern (optical interference) which records displacement as a fringe pattern on superposed optical grids that are mechanically connected to opposite crack faces. Data are obtained in three Cartesian coordinates (x – across joint/crack enabling to measure compression or extension of a joint/crack width, y – horizontal (shear) displacement along crack and z – vertical (shear) displacement calculated from recorded interference patterns). This measuring device is very accurate (displacement up to ± 0.01 mm, rotation up to $\pm 0.01 \pi/200$) and has been broadly and successfully applied in Slovakia since 2000. On the other hand, the first gauge has been monitoring since 1973 in the Malá Fatra Mts. Recent monitoring network of the TM-71 extensometers covers 28 devices installed at 25 locations (caves, tunnels, quarries). First three sites have been

created in the frame of the COST Action 625 international project between 2000 and 2002. Installations at Vyhne and Banská Hodruša mining tunnels were covered by the international project CADSES INTERREG IIIB SISMA (2005–2006). Majority of the TM-71 crack-gauges was installed in collaboration with Czech partners from the Institute of Rock Structure and Mechanics (Academy of Sciences of Czech Republic, Prague) along active faults inside selected caves distributed all over the Slovak territory between 2004–2008 and 2010–2011. Western located devices (Malé Karpaty Mts.) are operated by Czech partners in the frame of EU TecNet project. Other monitoring sites are covered by national project entitled “Partial monitoring system of geological factors of Slovakia – Tectonic and seismic activity” which is managed by the ŠGÚDŠ and funded by the Ministry of the Environment of the Slovak Republic.

Long-term monitoring results from some TM-71 sites (Branisko highway tunnel – 2000, Demänová cave of Liberty – 2001, Ipeľ investigation tunnel – 2002, Banská Hodruša and Vyhne mining tunnels – 2005, Driny Cave – 2005) revealed the recent tectonic activity. Registered micro-displacements are in good coincidence with the recent stress axes determined by the structural, geodetical and geophysical methods.