

Deformations and global forces: Seismic and Hydrostatic Leveling records in the « Mont Terri » rock laboratory (Switzerland)

Edi Meier (Switzerland), Rudolf Widmer-Schnidrig (Germany) and Christophe Nussbaum (Switzerland)

Key words: Deformation measurement; Engineering survey; Mine surveying; Broadband seismometer, hydrostatic leveling system, high-precision ground deformation, long-term stability, vertical displacement, synchrotron, Earth tides

SUMMARY

The Mont Terri rock laboratory is a research facility in the Jura Mountains of Switzerland. Investigations are being carried out in the ‘Opalinus Clay’ rock formation, which is a potential host rock for a future deep geological disposal of radioactive waste. The rock laboratory has been excavated from the safety Gallery of the Mont Terri motorway tunnel. In 1998, Gallery 98 was excavated parallel to the safety gallery. At the southern end of Gallery 98, a fault zone intersects the rock laboratory. This zone is called the Main Fault, and reveals a decametric displacement that took place during the folding and thrusting of the Jura mountains about 10 Ma years ago. It is not known yet whether the Main Fault is still active. A feasibility study, using the best commercially available monitoring instruments, was performed to investigate possible movements. A 50m long hydrostatic leveling system (Type PSI-SLS) was installed across the fault zone together with a broadband seismometer (STS 2.5). The combination of both instruments allows recording submicron-displacements within a large frequency range up to quasi steady state deformations. The global gravity forces due to Sun and Moon (expressed as Earth tides) and the micro-seismicity due to the waves in the Atlantic Ocean generate larger “noise” signals than the nearby motorway. This regular background noise is well known and can be used as a perfect calibration signal