Zeitschrift: Eclogae Geologicae Helvetiae
Herausgeber: Schweizerische Geologische Gesellschaft
Band: 85 (1992)
Heft: 3: Symposium on Swiss Molasse Basin

Artikel: Geodetic measurements in Northern Switzerland and neighbouring regions
Autor: Müller, W.H.
DOI: https://doi.org/10.5169/seals-167048

of measurements are available from the Wellenberg area south of the Molasse Basin where Nagra is currently carrying out site investigations. The overcoring data were gathered in the area between Basel, Zürich and Luzern and are restricted to shallow boreholes. The direction of the maximum horizontal stress determined by this method is about N 150° E. Additional data are available from breakout studies in 13 wells. Six wells are located northwest of Zürich, four in the area between Luzern and Bern, two near Lausanne and one northeast of Zürich. These studies show a change of stress orientation with depth. In addition there seems to be a relation to the following units: molasse basin sediments, permo-carboniferous trough and crystalline basement. The stress direction inferred for the basement closely corresponds to the results derived from fault plane solutions of earthquakes. We observe a direction of about N 145° E which is in good agreement with the mean orientation of the stress field in Western Europe. Different orientations are seen in the permo-carboniferous trough (N 160° E) and in the Molasse Basin south of the folded Jura Mountains. Here an orientation more or less in N-S direction is predominant.

South of the Molasse in the Wellenberg area (between Stans and Engelberg) hydrofrac measurements indicate a stress direction of N 135° E. These investigations also allow the determination of the stress magnitude. The horizontal stresses were measured up to a depth of about 1100 m. It was shown that the maximum horizontal stress (SH) is about 2 * SV (vertical stress). The minimum stress (Sh) is approximately equal to SV.

Geodetic Measurements in Northern Switzerland and neighbouring regions

By W. H. MÜLLER
Nagra, CH-5430 Wettingen

The following geodetic measurement campaigns were carried out as part of Nagra's neotectonic investigation programme in Northern Switzerland:

- Analysis of levelling measurements in Northern Switzerland (NTB 84-17)
- Extension of the above campaign to cover an area of the Southern Black Forest and an adjacent region to the east as far as Lake Constance (NTB 88-05)
- Geodetic measurements in the Hauenstein Tunnel and over the Hauenstein Pass
- GPS (Global Positioning System) network for Northern Switzerland (Wiget et al. 1991)

Analysis of levelling measurements in Northern Switzerland: For the area between Wildegg and Baden in the northeastern part of the Folded Jura, the results of the analysis indicate uplift velocities between 0.1 and 0.4 mm/a (height changes relative to a reference point at Laufenburg). In the same region, but to the north of the Folded Jura, the measurements show a more or less exclusive tendency towards subsidence.

Extension of the above campaign to cover a larger area of the Southern Black Forest and an adjacent region to the east as far as Lake Constance: This study indicates uplifts

(relative to the reference point at Laufenburg) at the rate of about 0.3 mm/a in the Black Forest (Höllental). Between Neustadt and Waldshut there are relative tendencies towards subsidence, with velocities up to 0.3 mm/a. The area Donaueschingen – Tuttlingen – Stockach is characterised by subsidence, with velocities of more than 0.5 mm/a.

Levelling measurements along the Hauenstein Tunnel in the years 1986 and 1988: These measurements indicated uplift velocities of up to 1.5 mm/a in the vicinity of the main overthrust of the Folded Jura. Such high values are otherwise only known from the Alps. Since these high values could not be explained satisfactorily, a new measuring campaign was carried out in 1990. It consisted of (I) repetition of the high-precision levelling measurement and a linear measurement (zero-measurement) in the Tunnel and (2) a new high-precision levelling measurement over the Hauenstein Pass.

To date, results are available only for the high-precision levelling measurement in the Tunnel. The high uplift rates measured in the 86/88 campaign were not confirmed to the extent expected by the 1990 campaign.

GPS network for Northern Switzerland: A GPS (Global Positioning System) network consisting of 25 reference points has been established in the region of the Southern Black Forest, the Folded Jura and the Molasse Basin, in order to study kinematics in more detail. An initial double conducted measurement campaign in autumn 1988 covered the whole network. Distances of 10 km are measured with a precision of 1 to 3 mm. It is planned to carry out follow-up campaigns every four years.

REFERENCES

GUBLER, E., SCHNEIDER, D. & KELLERHALS, P. 1984: Bestimmung von rezenten Bewegungen der Erdkruste mit geodätischen Methoden. Nagra Techn. Bericht NTB 8417, Nagra, Wettingen.

MÄLZER, H., RÖSCH, H., MISSELWITZ, I., EBERT, M. & MOOSMANN, P. 1988: Höhenänderung in der Nordschweiz und im Südschwarzwald bis zum Bodensee. Nagra Techn. Bericht NTB 88-05, Nagra, Wettingen.

WIGET, A., GUBLER, E. & SCHNEIDER, P. 1991: GPS-Präzisionsnetz zur Bestimmung von rezenten Krustenbewegungen in der Nordschweiz. Vermessung, Photogrammetrie, Kulturtechnik 8/91.

What is the Federal Office of Energy doing in the Swiss Molasse Basin?

By A. BAER
Bundesamt für Energiewirtschaft, CH-3003 Bern

In the Swiss Molasse Basin, the Federal Office of Energy is looking after the interests of the country in three different fields. It is controlling the work of the Nagra, the cooperative for radioactive waste disposal, it is financially but modestly helping Swisspetrol in its exploration for gas and oil, and it is financially supporting the use of geothermal heat. Perhaps more importantly, it is trying to make sure that information obtained in any one of these programmes is made available to the others.