

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

**Artikel:** Present state of stress in the Swiss Molasse Basin  
**Autor:** Blümling, P. / Hüsches, S. / Fejerskov, M.  
**DOI:** <https://doi.org/10.5169/seals-167047>

### **Nutzungsbedingungen**

Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften auf E-Periodica. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. Das Veröffentlichen von Bildern in Print- und Online-Publikationen sowie auf Social Media-Kanälen oder Webseiten ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. [Mehr erfahren](#)

### **Conditions d'utilisation**

L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. La reproduction d'images dans des publications imprimées ou en ligne ainsi que sur des canaux de médias sociaux ou des sites web n'est autorisée qu'avec l'accord préalable des détenteurs des droits. [En savoir plus](#)

### **Terms of use**

The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. Publishing images in print and online publications, as well as on social media channels or websites, is only permitted with the prior consent of the rights holders. [Find out more](#)

**Download PDF:** 17.04.2026

**ETH-Bibliothek Zürich, E-Periodica, <https://www.e-periodica.ch>**

deformation during the folding of the Jura Mountains and the Chaînes Subalpines in the Pliocene.

#### REFERENCES

- DEICHMANN, N. 1987a: Focal depths of earthquakes in northern Switzerland. *Annales Geophysicae*, 5B, (4), 395–402.
- 1987b: Seismizität der Nordschweiz 1983–1986. Nagra NTB 87-05, Baden.
- 1990: Seismizität der Nordschweiz 1987–1989, und Auswertung der Erdbebenserien von Günsberg, Läufelfingen und Zeglingen. Nagra NTB, 90-46, Baden.
- DEICHMANN, N. & BAER, M. 1990: Earthquake focal depths below the Alps and northern Alpine foreland of Switzerland. In: *The European Geotraverse Interogative Studies* (Ed. by FREEMAN, R., GIESE, P., MUELLER, ST.), 277–288. European Science Foundation, Strasbourg.
- FRÖHLICH, A. 1991: Seismotektonik der Westschweiz, unter Berücksichtigung der Bebenenserien von Freiburg (1987), Romont (1988) und Boltigen (1989). Diplomarbeit, ETH-Zürich.
- JIMENEZ, M. J. & PAVONI, N. 1984: Focal mechanisms of recent earthquakes 1976–1982 and seismotectonics in Switzerland. *Proc. IASPEI General Ass. 1983 Hamburg* (Session 12: European Geodyn., Seismicity and Seismic Hazard), (Ed. by STILLER, H. & RITSEMA, A.), 77–84.
- MAYER-ROSA, D. & GARCIA, M. 1986: Improved hypocentral parameter determination using secondary regional phases. *Rev. de Geofisica* 42, 175–184.
- PAVONI, N. 1977: Erdbeben im Gebiet der Schweiz. *Eclogae geol. Helv.* 70, 351–370.
- 1980: Crustal stresses inferred from fault-plane solutions of earthquakes and neotectonic deformation in Switzerland. *Rock Mech. Suppl.* 9, 63–68.
- 1984: Seismotektonik Nordschweiz. Nagra NTB 84-85, Baden.
- 1987: Zur Seismotektonik der Nordschweiz. *Eclogae geol. Helv.* 80, 461–472.
- PAVONI, N. & MAYER-ROSA, D. 1978: Seismotektonische Karte der Schweiz 1 : 750000. *Eclogae geol. Helv.* 71, 293–295.
- ROTH, PH. 1986: Untersuchungen über den gegenwärtigen Deformations- und Spannungszustand der Erdkruste im Gebiet der Schweiz mit Hilfe von Nahbeben-Stationsdiagrammen. Dipl. ETH Zürich (unpublished).
- 1990: Aktuelle Seismizität und Seismotektonik in den östlichen Schweizer Alpen. PhD-thesis ETH Zürich.
- SAMBETH, U. 1984: Seismotektonische Untersuchungen im Gebiet des Genfer Beckens. Dipl. ETH Zürich (unpublished).
- SAMBETH, U. & PAVONI, N. 1988: A seismotectonic investigation in the Geneva Basin, southern Jura Mountains. *Eclogae geol. Helv.* 81, 433–440.
- Swiss Seismological Service, Schweizerischer Erdbebendienst, CH-8093 Zürich: Montly Seismic Bulletins, Annual Reports.

## Present state of stress in the Swiss Molasse Basin

By P. BLÜMLING<sup>1)</sup>, S. HÜSGES<sup>2)</sup>, AND M. FEJERSKOV<sup>2)</sup>

<sup>1)</sup> Nagra, CH-5430 Wettingen

<sup>2)</sup> Geophysikalisches Institut, Universität Karlsruhe, D-7500 Karlsruhe

Stress measurements in the Swiss Basin are carried out with different techniques but their number is very limited. Data exists from fault plane solutions of earthquakes, overcoring measurements and breakout studies in deep boreholes. Results from hydraulic fracturing experiments do not exist for the Swiss Molasse Basin but a number

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