Geophysical Research Abstracts
Vol. 14, EGU2012-7443, 2012
EGU General Assembly 2012

The Helvetic nappes in the boundary area between Eastern and Western Alps

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In the context of a deep geothermal potential study for Vorarlberg several balanced cross-sections on a crustal scale were constructed between the Rhine valley in the west and the Kleinwalser valley in the east. The construction of these cross-sections was based on surface geology, drillings as well as on reinterpreted seismic lines.

The general geological architecture of the examined area can be described as a typical foreland fold-and-thrust belt, comprising the tectonic units of the Subalpine Molasse, (Ultra-)Helvetic, Penninic, and Austroalpine nappes. Along the south-dipping listric Alpine basal thrust these units overthrusted the autochthonous Molasse. The Subalpine Molasse is multiply stacked, forming a triangle-zone (MÜLLER et al. 1984). A well-defined seismic feature is the European basement together with its autochthonous cover, slightly dipping southward from about 3500m BSL to approx. 6500m BSL in the south. Furthermore a discontinuous double reflector, interpreted as the base of the Helvetic nappe complexes (approx. at 5000m BSL in the southernmost parts), could be identified.

The internal structure of the Helvetic nappe stack could hardly be resolved. The assumed hinterland dipping duplex-structure of the Helvetic nappes results from surface and borehole-data. However, there are at least two Helvetic nappes needed to fill the available space. The deeper one, mostly labeled “Hohenemser nappe” (WYSSLING 1985), was probably overthrusted by the superficially exposed “Säntis nappe”. In the western part the Cretaceous cover units of the “Hohenemser nappe” seem to be completely detached from the older strata. In the southern part of the Säntis nappe (below the “Bregenzer Wald”) we suspect a Dogger basin (cut across by well VBG Au1) which is bordered by two steep lateral ramps, accompanied by tear faults in the hanging wall.

Based on our sections, the shortening within the Helvetic nappes has been calculated using the Cretaceous “Kieselkalk” and the Jurassic “Quinten Limestone”. It amounts to approx. 50%, which is consistent with the shortening in cross-sections from eastern Switzerland (e.g. SCHMID et al. 1997, TRÜMPY 1969).

References:

MÜLLER, M., NIEBERDING, F. & WANNINGER, A. (1988): Tectonic style and pressure distribution at the northern margin of the Alps between Lake Constance and the River Inn. – Geologische Rundschau, 77/3, 787-796.

SCHMID, S.M., PFIFFNER, O.A. & SCHREURS, G. (1997): Rifting and collision in the Penninic zone of eastern Switzerland. In: Pfiffner O.A. et al. (eds.), Deep Structure of the Alps, Results from NFP 20, 160-185.

TRÜMPY, R. (1969): Die helvetischen Decken der Ostschweiz: Versuch einer palinspastischen Korrelation und Ansätze zu einer kinematischen Analyse. - Eclogae geol. Helv. , 62/1, 105-138.

WYSSLING, G. (1985): Palinspastische Abwicklung der helvetischen Decken von Vorarlberg und Allgäu. - Jb. Geol. B.-A., 127/4, 701-706.