

Recent thrust tectonics in the frontal part of the Eastern Alps: an approach based on integrated subsurface data

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Although the convergence between Adria and Europe is still active, only little evidence for active thrusting was detected in the frontal part of the Eastern Alps. Information on active faulting and focal mechanisms is limited due to low seismicity. The present study is focused on the easternmost sector of the Molasse Basin and the Flysch Unit in Upper Austria, where numerous hydrocarbon exploration wells were drilled by RAG (Rohöl-Aufsuchungs Aktiengesellschaft) during the last decades.

Orientations of the maximum horizontal stress were obtained from borehole image logs (BHI), showing a consistent N-S trend in the study area. These results comply with trends detected in the German part of the Molasse Basin (Reinecker et. al., 2010); however, the active tectonic regime is uncertain. The studied wells were drilled in the in the Flysch and Helvetic Units in the frontal part of the Alps or in the Imbricated Molasse, and in many cases reach the underlying basement of the Bohemian Massif. The detailed analysis of image logs, in particular of drilling induced features and natural brittle structures, identified several perturbations of the stress field along the depth profiles of individual wells, that can be associated to major thrust faults.

At the eastern edge of the study area, abundant stress perturbations are detected near the base thrust of the Flysch Unit and at the main detachment of the Imbricated Molasse, suggesting that these thrust faults are at least locally active. Integration of the BHI results with 3D seismic data confirms that most of the deformation in the Molasse was accommodated before the Burdigalian, but subordinate deformation is recorded in younger sediments (Hall and Innviertel Fm.). In the same area, terraced sediments of middle Pleistocene age are reported to be offset by the frontal thrusts of the Northern Calcareous Alps and the Flysch Nappes (van Husen, 1999), which would confirm recent thrust faulting.

The reactivation of thrusts in the eastern part of the Molasse could be triggered by a structural high of the underlying crystalline basement that is progressively rising towards the NE, and is outcropping just 18 km NE of the study area. Several out-of-sequence thrusts are observed in the frontal part of the Eastern Alps, involving mostly the Helvetic and Flysch Nappes, but also the Northern Calcareous Alps and the Molasse. These structures are particularly abundant east of the study area, where the Bohemian Massif is exposed just 6 km away from the front of the Alps.

References

Reinecker J., Tingay M., Müller B. and Heidbach, O. (2010): Present-day stress orientation in the Molasse Basin. *Tectonophysics* 482, 126-138.

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