Geophysical Research Abstracts
Vol. 20, EGU2018-12801, 2018
EGU General Assembly 2018


# Present Day Stress Field in the frontal part of the Eastern Alps (Austria) from Image Log Data

Nicola Levi (1), Kurt Decker (1), Mario Habermueller (1), Edoardo Piani (2), Ulrike Exner (3), Alan Reingruber (3), and Wilma Troiss (3)

(1) University of Vienna, Geodynamics and Sedimentology, Austria (nicola.levi@univie.ac.at), (2) RDG E&P GmbH, (3) RAG Exploration & Production GmbH

The present study focuses on the analysis of the current geodynamics in the northern Eastern Alps and their foreland by investigating recent stresses and active deformations.
The present-day tectonics in the Alps results from the convergence between the European and Adriatic plates, which amounts to about 2 to 5 mm/year. While the processes compensating present-day shortening in the Southern Alps (fold-thrusting and strike-slip faulting) and the Central Alps (lateral extrusion, strike-slip and normal faulting) are fairly well understood, little information is available from the northern part of the Eastern Alps and their foreland (Molasse Basin). The Molasse and Eastern Alps are characterized respectively by low to moderate seismicity, which indicate active deformations. In the Eastern Alps some fluvial sediments (middle Pleistocene) are offset by the Alpine Front, and so far this is the youngest evidence of active thrusting. Very little in-situ stress data are available for the Molasse sector in Austria.
In the study area RAG (Rohöl-Aufsuchungs Aktiengesellschaft) has drilled more than 1000 boreholes for hydrocarbon exploration. Image logs (mostly FMI and FMS tools) of about 150 wells are made available for the characterization of the present day stress field. From this dataset 60 wells have nearly vertical trajectories. The studied wells are distributed along the frontal part of the Eastern Alps and in the Molasse Basin, and cover the full succession of tectonic units, i.e. allochthonous and imbricated Molasse; Flysch and Ultrahelvetic; Northern Calcareous Alps. Furthermore, several wells have reached the underlying basement rocks of the Bohemian Massif and its autochthonous Mesozoic sedimentary covers.
Image logs are capable of detecting the orientation of geological structures at depth (bedding, fractures, faults, drilling induced features, etc.) at high resolution. The azimuth of borehole breakouts and drilling induced fractures detected on the image logs can be used to infer the orientation of the maximum horizontal stress (SHmax), provided that the well is nearly vertical. In the study area SHmax is principally oriented close to N-S, roughly perpendicular to the front of the Eastern Alps, which agrees with the similar orientations observed in the Bavarian sector of the Molasse Basin. In several wells, mostly located close to the Alpine Front, localized perturbations of the in-situ stress orientation are observed, which could indicate the occurrence of active tectonics. The detailed analysis of the corresponding image log data allows to identify the structure that is associated to the stress anomalies. Both low and high angle faults are found to be related to localized stress perturbations. The low angle faults strike parallel to the fold-and-thrust belt, dipping to the South, and are interpreted as potential thrust faults propagating into the foreland. This finding could confirm that occurrence of localized active thrusting.
The identification of stress anomalies and active faulting is of crucial interests not only for the hydrocarbon industry, but also for the geothermal exploration, as it helps minimizing the risk of drilling hazards induced seismicity.