Preliminary Results of Applying Dipmeter Data to Structural Study of the Carboniferous Fold-Thrust Belt Underlying the Fore-Sudetic Homocline, SW Poland

Paweł ALEKSANDROWSKI[4], Marian KIEŁT[2], Leszek KUROWSKI[4], Krzysztof MASTALERZ[3], Stanisław MAZUR[4], Józef NOWAK[1] and Piotr PASEK[1]

[1] *P.O.G.C. – Geofizyka Kraków, Poland*
[2] *P.O.G.C. – Geofizyka Toruń, Poland*
[3] *Pracownia Geologiczna "Explora", Wrocław, Poland*
[4] *Uniwersytet Wrocławski, Poland*

An attempt has been made to apply directional data acquired with a six-arm dipmeter Halliburton SED in a number of oil wells to study the structural geology of the Carboniferous fold-thrust belt composing the uppermost part of the basement below the Fore-Sudetic homocline. A collection of dipmeter data from c. 40 wells was delivered by the Polish Oil and Gas Company. The data were numerically processed using standard input parameters appropriate to slightly deformed, well stratified rocks, proved to be noise-dominated and of little potential in interpreting relatively highly strained and lithologically homogeneous Carboniferous flysch rocks. Therefore, an attempt to re-process the data, using more appropriate computing parameters selected by the interpreting team, was made by Geofizyka Kraków on a few data sets from a number of wells. In particular, one of the newly discovered gas fields near Kościan (SSW of Poznań) was structurally studied using reprocessed dipmeter data. It was established that clastic Carboniferous rocks generally showed a homoclinal attitude over an area of several tens of km2 and dipped to the NE at an angle of 30–50°. One of the wells, studied in detail, revealed that the homoclinal attitude of strata (average dip 40–50° NE to ENE) was overprinted with folds up to 50 m in size, with NW–SE-trending axes, shallow-dipping axial planes and NE polarity. The fold style interpreted from the dipmeter data was confirmed by the study of drill cores, which contained numerous hinges of metre-scale recumbent folds, with local gently dipping axial-plane or fan cleavage, particularly well developed in the overturned limbs of the folds. The cleavage turned to be discernible also in the dipmeter record. The core and stratigraphic data from the studied gas field show that the Carboniferous succession occurs in normal position there, except in the lower limbs of the recumbent folds. Borehole geophysical data, locally supported by core observations, allowed the recognition of several trachyandesite dykes, dipping to the SW at moderate to steep angles. The insufficient quality of the dipmeter data correlation results did not allow an identification of most possible faults/thrusts in the well; the few identified fault planes dip to the SW. In regional context, the recognized recumbent NE-verging folds can be alternatively explained either as due to gravitational collapse associated with domino-style faulting of the Carboniferous complex, or, as originally upright folds re-orientated due to intense uplift and tilting on the northern slope of the NW–SE-trending Wolsztyn–Leszno high. This high probably represents a Late Carboniferous strike-slip pop-up of metamorphic basement. Reprocessed dipmeter data in a number of wells from other areas of the Fore-Sudetic homocline revealed the NW–SE to WNW–ESE structural trend of local folds, i.e., analogous to that predominating in the Variscan West Sudetes.

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The Sudetic Marginal Fault, SW Poland, in the Light of Morphometric Studies

Janusz BADURA[1], Witold ZUCHIEWICZ[2], Adam GÓRECKI[3], Waldemar SROKA[4], Bogusław PRZYBYLSKI[1] and Marta ŻYSZKOWSKA[3]

[1] *Lower Silesian Branch, Polish Geological Institute, al. Jaworowa 19, 50-122 Wrocław, Poland*
[2] *Institute of Geological Sciences, Jagiellonian University ul. Oleandry 2A, 30-063 Kraków, Poland*
[3] *Institute for Land Reclamation and Grassland Farming, Regional Research Centre – Wrocław, ul. Kraińskiego 16, 50-153 Wrocław, Poland*
[4] *Institute of Geological Sciences, University of Wrocław, Pl. Maxa Borna 9, 50-204 Wrocław, Poland*

The Sudetic Marginal Fault (SMF) is one of the most clearly marked tectonic zones of Europe, more than 300 km long, of which 200 km are represented by a well-pronounced morphotectonic scarp. Despite its morphological distinctness, the evolutionary history of this fault has not been fully recognized. Based on indirect evidence, it can be inferred that this structure