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Structural characterization of the metamorphic basement from north Dobrogea promontory (Romania) by using geophysical well logs

Abstract

Metamorphic processes, leading to mineralogical and structural changes of the rocks in response to physical (pressure, temperature) and chemical conditions, can be associated with the development of sin-metamorphic or post-metamorphic fractures. The post-metamorphic ones are directly related to tectonic stress. In addition, tectonic stress may cause the reorientation of minerals on a direction perpendicular to the stress direction, generating foliations (schistosity).

This paper presents a structural analysis of the pre-Alpine metamorphic basement and its relations with the sedimentary cover by using geophysical data recorded in an exploration well located in the North Dobrogea Promontory (Romania). The analysis was based on Quad-Combo wireline logs, spectral gamma ray, sonic cross-dipole and borehole electrical imaging data. The imaging analysis allowed the identification and characterization of metamorphic foliations, sedimentary bedding, natural fractures and the determination of tectonic stress orientation. A brittleness index was computed by means of elastic parameters derived from density and sonic compressional and shear logs. Also, a fracture intensity characterization by using fracture area per volume of rock was conducted. The integration of geophysical logs with mud logging and drilling data allowed us to carry out a detailed analysis of the metamorphic basement in the studied area.