Paper Number: 4827

Complex petrophysical investigation of pannonian-miocene shales – preliminary results of acoustic anisotropy measurements

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Since fine grained siliciclastic rocks comprise approximately 50 percent of the sedimentary basins [1]. Successful imaging of subsurface features in the earth depends on a knowledge of the behaviour of wave propagation through overlaying strata [2]. Due to preferred orientation of clay minerals shales are known to have a significant anisotropy [3, 4].

The biggest problem of routine dynamic acoustic measurements is the subjectivity of determination of arrival time. This is especially true in the case of shear wave detection. Earlier, precise measurement of wave velocities in a Hoek cell took a long time. At the present, our company achieved a breakthrough in realizing routine measurements under pressure and in making the interpretation process objective via hardware and software development. The so received waveforms and their interpretation enable the production and comparison of measurement results in an objective and repeatable way.

This constitutes the basis of measurements with high accuracy that require the observation of small changes (eg. indirect measurements of in-situ stress field in the case of Vertically Transverse Isotropic media). The authors performed a complex investigation of Hungarian Lower Pannonian miocene shales, which included complete pore structure characterization, acoustic velocity and permeability measurements respectively.

Pulse transmission method was used to determine the acoustic velocities and small scale dynamic elastic properties as a function of confining pressure in the range of 0-700 bar.

The purpose of this work is the interpretation of his complex measurement program and the preliminary results.

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