Velocity Anisotropy from Core Measurements, VSP and Sonic Logs Analysis in a Single Well Study in NE Alberta

Judith Chan[1] and Douglas R. Schmitt[1]

[1]Institute for Geophysical Research, Department of Physics, University of Alberta, Edmonton, Alberta, Canada (judithc@ualberta.ca)

Abstract

The presence of fractures and textures of the subsurface rocks can cause imaging problems in the conventional seismic processing routine because of seismic anisotropy. Problems arise from the directional dependence of wave propagation that was unaccounted for in the original isotropic velocity model. To quantify the degree of seismic anisotropy in the subsurface, one method is by estimating the anisotropic parameters from laboratory measurements performed on a core sample. However, with the limited cores available from our borehole of interest in NE Alberta, additional field measurements of the walk-away vertical seismic profile (VSP) and sonic scanner were performed to obtain anisotropy measurements for the rest of the borehole. This case study examines the result of seismic anisotropy from three different types of data, which indicates the presence of intrinsic anisotropy at various depth intervals.

References Cited

Birch F (1960) The velocity of compressional waves in rocks to 10 kilobars (Part I). J Geophys Res 65:1083-1102.

Birch F (1961) The velocity of compressional waves in rocks to 10 kilobars (Part II). J Geophys Res 66:2199-2224.

Chan J, Schmitt DR (2013) Integration of seismic and log data of a deep borehole in the basement rocks of northeastern Alberta. Geoconvention 2013, Calgary, Alberta, Canada, May 6-13, 2013.

Kebaili A, Schmitt DR (1996) Velocity anisotropy observed in wellbore seismic arrivals: Combined effects of intrinsic properties and layering. Geophysics 61(1):12-20. doi:10.1190/1.1443932.

Kebaili A, Schmitt DR (1997) Ultrasonic anisotropic phase velocity determination with the Radon transformation. J Acoust Soc Am 101 (6):3278-3286. doi:10.1121/1.418344.

Schlumberger (2005) Sonic Scanner. Schlumberger Marketing Communications, Houston, Texas, 7 pp.

Thomsen L (1986) Weak Elastic-Anisotropy. Geophysics 51 (10):1954-1966. doi:10.1190/1.1442051.