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The estimation method of anisotropy coefficient of shear wave velocities

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Abstract

© SGEM2018. Cross-dipole acoustic logging traditionally uses to study the anisotropy of the formation acoustic properties. The method is based on comparing the velocities of fast and slow shear waves and calculating the anisotropy coefficient. In the anisotropic formation, the flexural wave is splitting into two modes. The amplitude of cross-components XY and YX will be non-zero and significant in the anisotropic zones of the formation. There are several approaches to assessing the presence of anisotropy in a formation. As a criterion can be used: the difference in the energy of the cross-components (minimum and maximum), the difference in arrival times of fast and slow waves, and the value of the anisotropy coefficient as well. The purpose of the research was the development of the processing method for the anisotropy coefficient estimating using the four-component waveform data. Alford rotation was used to calculating the projecting of source waveform data to the needed angle and get fast and slow waveforms. The base of the offering method is the calculation of the time shift magnitude between each separate channel of waveforms. The increase in the amount of displacement with increasing channel number was obtained. This indicates that the fast and slow waves have different speeds. The slope of the hodograph, constructed from the magnitude of the shift, makes it possible to estimate indirectly the difference between the velocities of the two waves, i.e. identify zones with anisotropy. The results obtained are in good agreement with the traditional method of calculating the anisotropy coefficient using slowness (or velocities) of fast and slow shear waves. This technique can be used for anisotropy zones presence estimation and does not require knowledge of the velocity values.

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Keywords

Anisotropy coefficient, Fast and slow shear waves, Sonic logging

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