

ESTIMATION OF ANISOTROPY PARAMETERS BY USING THE CRS

APPROXIMATION

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A number of multiparameter operators have been proposed in offset-midpoint coordinates to improve the quality of seismic image. The method of common reflection surface (CRS) by Jäger et al., (2001) and the multifocusing (MF) method by Landa et al., (2010) are developed for approximation of reflection traveltime surface. Three CRS attributes R_{NIP} , R_N and β introduced by Hubral (1983) have a physical interpretation and form the basis for many applications. We analyze the CRS approximation for a circular reflector embedded into anisotropic medium and investigate the effect of anisotropy on the P-wave CRS attributes and, consequently, their inversion into the model parameters. By analyzing these behavior, we can estimate both structure and anisotropy parameters.

For given midpoint position m_0 , the traveltime squared can be approximated by the classical CRS equation,

$$T_{CRS}^2(\Delta m, h) = A_0 + A_1\Delta m + A_2\Delta m^2 + B_2h^2, \quad (1)$$

where h is half-offset, $\Delta m = m - m_0$, and the series coefficients A_0 , A_1 , A_2 and B_2 depend on the model parameters and m_0 . Considering the isotropic model, the parameters V_0 (velocity), R (radius of a circular reflector) and z_0 (center of a circular reflector) can be defined by using the coefficients in equation (1). To define the CRS attributes in anisotropic or vertically heterogeneous media, we use the generalized moveout approximation (Fomel and Stovas, 2010) to specify the group velocity function. By neglecting the difference between the incidence and reflection group angles, we use the same geometric relations as for isotropic model but with angle-dependent velocity.

If the model is isotropic, the estimates for model parameters do not depend on the midpoint position m_0 . In case of anisotropy (vertical heterogeneity), the estimated model parameters vary with m_0 . We show that from this variation, both structural and anisotropic parameters of the model can be estimated.

References

- Fomel, S. and Stovas, A., 2010. Generalized nonhyperbolic moveout approximation. *Geophysics*, **75**, U9-U18.
- Hubral, P., 1983. Computing true amplitude reflections in a laterally inhomogeneous earth. *Geophysics*, **48**, 1051-1062.
- Jäger, R., Mann, J., Höcht, G. and Hubral, P., 2001. Common-reflection-surface stack: Image and attributes. *Geophysics*, **66**, 97-109.
- Landa, E., Keydar, S. and Moser, T. J., 2010. Multifocusing revisited: Inhomogeneous media and curved interfaces. *Geophysical Prospecting*, **58**, 925-938.