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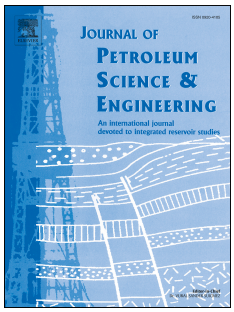

Third-order AVO inversion for lamé parameter based on inverse operator estimation algorithm

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Third-order AVO inversion for Lamé parameter based on inverse operator estimation algorithm

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Abstract: Various linearized Zoeppritz approximations are often used in the forward modeling of amplitude variation with offset (AVO). However, they are usually limited by the elastic parameters with weak properties contrast. The high contrast situations between layers will cause big errors when linear approximate equations are used. Given this problem, the more precise third-order Zoeppritz approximate equation for velocity and density is derived in this study. Parameter sensitivity analysis illustrates that the third-order approximate equation for velocity and density is not favorable for nonlinear AVO inversion because the equation is extremely insensitive to S-wave velocity. In consideration of the sensitivity of elastic parameters and the poor inversion results, we derived the third-order approximate equation for Lamé parameter. A direct inversion method (Named as inverse operator estimation algorithm) is further used for nonlinear AVO inversion. The L1 norm constraint is considered to improve stability and efficiency during the nonlinear inversion process. The suitability and feasibility of the equation and inversion method can be demonstrated by the synthetic examples. Field data examples show that the inversion results have a good agreement with logging curves.