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Accurate Acoustic Impedance and True Reflectivities in Teapot Dome Dataset

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Summary

The acoustic impedance (AI) is an important tool for quantitative interpretation of seismic reflection data, and particularly for determining the lithological properties and identifying fluid-filled and porous zones. However, inversion of reflection seismic records for AI encounters two difficulties: 1) limited bandwidth of seismic data and instabilities ("drift") of AI scaling, and 2) limited knowledge of the low-frequency AI. To account for the above difficulty #1, the Seismic Inversion by Interpolated-Log Calibration (SILC) method (Morozov and Ma, 2009) offers a simple and reliable way to obtain the AI pseudo-log volumes accurately scaled by using well-log data. In this study, we apply this approach are to the well-known dataset from the Teapot Dome project in Wyoming, U.S.A. To address the above difficulty of AI inversion #2, we also derive the low-frequency AI derived from stacking velocities obtained during seismic data processing. In addition, empirical velocity-density relations are obtained from the well-log datasets and utilized in SILC AI inversion. Constraining the AI inversion by using both seismic-processing velocities and data from multiple well logs gives a more accurate and complete characterization of the study area. In addition, the SILC method allows using the well-log calibration to derive true-amplitude reflectivity within the Teapot Dome dataset.

References

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