

Bedding Plane Slippage and Fault Activation Captured by Cross-well LFDAS Monitoring During Hydraulic Fracturing

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Joseph Mjehovich is a Geophysicist at IFDATA, specializing in the research and development of distributed fiber-optic sensing for reservoir characterization and well design diagnostics. He will speak on Thursday, July 25, 2024. The topic is “Bedding Plane Slippage and Fault Activation Captured by Cross-well LFDAS Monitoring During Hydraulic Fracturing.”

Abstract

Understanding the development of fractures in complex unconventional reservoirs is essential for determining appropriate development strategies. This study highlights the capability of cross-well Low-Frequency Distributed Acoustic Sensing (LFDAS) for monitoring horizontal hydraulic fractures in unconventional reservoirs. Using LFDAS, we monitored strain signals during hydraulic fracturing in a horizontal well in the Sichuan basin, southern China. The observed elliptical strain patterns, distinct from those of vertical fractures, indicate the development of hydraulic fractures along horizontal planes. Additionally, we detected polarity flips at the fracture tip locations, which suggest a shear component alongside tensile fracture opening. We also observed characteristic strain signals active across multiple fracturing stages, interpreted as shear deformation due to sliding fault activation. Our geomechanical simulations support these findings, linking the strain signals to bedding plane slippage and natural fault reactivation. This novel application of LFDAS provides new insights for optimizing hydraulic fracturing strategies and managing risks related to induced seismicity. Our findings underscore the importance of advanced monitoring techniques for enhancing

reservoir characterization and ensuring operational safety in complex fracturing environments.

Biography

Joseph Mjehovich is a Geophysicist at IFDATA, specializing in the research and development of distributed fiber-optic sensing for reservoir characterization and well design diagnostics. His work focuses on advancing the analysis and interpretation of cross-well fiber-optic measurements and integrating the company's research and workflows into real-world field projects. Joseph holds a Master of Science in Geophysics from the Colorado School of Mines, where he contributed as a research associate in the Reservoir Characterization Project (RCP) Consortium. His research included quantitative analysis of fiber-optic sensing data to better understand the driving mechanisms of hydraulic fracture development. Additionally, Joseph explored the application of distributed acoustic sensing for near-surface seismic surveys to aid earthquake hazard site classification.