Distinguishing Natural Reactivated Fractures from Hydraulic Induced Fractures using Microseismic Event Analysis

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Abstract

Microseismicity induced during the stimulation treatment of a tight gas reservoir were mapped using a shallow buried array acquisition method. Though the events mapped from the monitoring project described in this study formed well-defined, distinct, parallel trends of microseismicity, the trends were not parallel to the regional maximum horizontal stress direction as indicated both by the source mechanisms and by a crossed-dipole sonic log interpretation. The linear event trends are interpreted to have formed from reactivation of natural fractures that strike at an angle to the maximum horizontal stress in the reservoir. Although the fractures were filled with calcite, they provided a plane of weakness along with failure occurred preferentially during the treatment. This result has important implications for interpretations of stress from source mechanisms and from in-situ reservoir stress interpreted from cross-dipole sonic logs, and illustrates the importance of being able to predict the impact of natural fractures on the stimulation treatment.