Schlumberger

Moment Tensor Inversion

Microseismic advanced processing services

APPLICATIONS

- Unconventional reservoir stimulation analysis
- Reservoir characterization of fracture networks

BENEFITS

- Improves completion analysis and effectiveness
- Better determines well spacing and effective drainage volume
- Provides new and intuitive visualization technique for nonexperts

FEATURES

- Accurate modeling of seismic amplitudes in anisotropic medium
- Unique and proprietary anisotropic moment tensor inversion (MTI) decomposition and visualization
- Integration with Petrel* E&P software platform and Mangrove* reservoir-centric stimulation design software workflows
- Intuitive graphical display of results

Extract more information from microseismic surveys

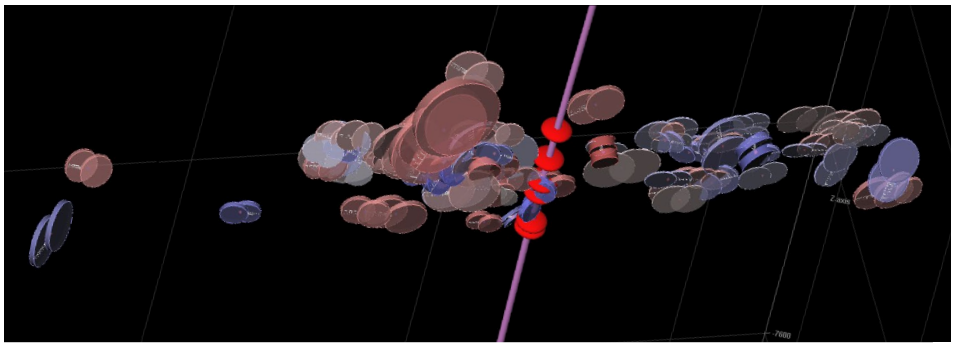
Moment tensor inversion (MTI), an advanced seismic processing technique, describes the inelastic deformation, or cracking, of the source region that generates the microseismic signal. After radiation patterns are attained using downhole or surface arrays, MTI processing analyzes the radiation pattern of seismic amplitudes to determine the fracture plane and sense of slip—distinguishing shear and tensile-opening modes of fracturing.

MTI enhances microseismic interpretation of fracture geometry by including analysis of fracture planes for each microseismic event, supplementing the interpretation of microseismic sources. MTI is particularly useful in characterizing discrete fracture networks and validating geomechanical fracture models from Mangrove software within the Petrel E&P software platform so it can be further analyzed and integrated into geoscience and engineering workflows.

Determine geomechanical response

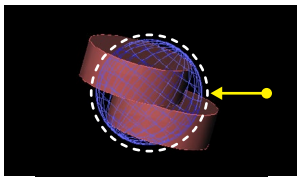
MTI provides very useful information on the geomechanical response of a reservoir to hydraulic-fracture injection. In principle, MTI gives a partial description of how a fracture system—pre-existing, created, or augmented through growth—responds to treatment. This microseismic analysis can provide statistics on fracture orientation, volume creation, and, by inference, proppant placement. MTI illuminates complex fracture interaction and improves the understanding of failure mechanisms during fracturing treatments providing a framework for building and interpreting geomechanical models.

The addition of MTI results to a comprehensive reservoir characterization and complex fracture model will aid design and evaluation of the hydraulic fracture staging and perforation clusters on individual wells. In conjunction with reservoir simulation models, it helps improve planning of well spacing based on the production and drainage of these complex shale reservoirs.



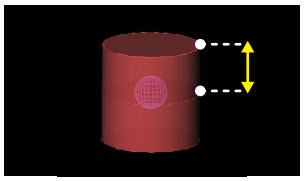
A unique and intuitive display of moment tensor results represents the source mechanisms for one stage of microseismic events in an expansion, opening, and slip (EOS) glyph.

Expansion



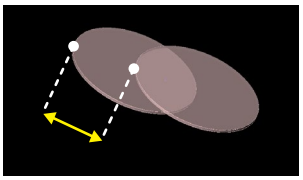
The wireframe depicts isotropic pressure change converted to volume where red represents expansion and blue represents contraction.

Opening



The thickness of the disks depicts the amount of opening (red).

Slip



Slip in the fracture plane is depicted by the orientation of the disks and the displacement between disk centers.

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