Improve production from unconventional reservoirs with rich and reliable fracture imaging

Spectraseis helps improve the productivity of your stimulation program, using integrated surface and borehole data acquisition and wave-equation event imaging to deliver accurate and reliable fracture information.

We use elastic forward modeling to design the optimal acquisition geometry, incorporating your program objectives into the survey design.

Our surface and borehole acquisition systems use low impact wireless recording technologies and are safe and easy to permit, even in sensitive environments.

The result is high quality data you can depend on to answer the key questions driving well completion decisions.

Microseismic data you can trust

Optimizing array geometries is one of the most powerful ways to improve data quality and increase the value of microseismic data to the interpreter.

By applying elastic forward modeling of acquisition geometries, including fracture source parameters and propagation effects, Spectraseis determines the most effective survey design and equipment selection to answer the key questions driving well completion decisions.

Our three-component, broadband nodes record the complete ground motion from 0.1-1000 Hz with ultra-high sensitivity and low noise floor performance 100x greater than leading conventional geophones.

The broad bandwidth and low noise floor captures more microseismic events at a greater distance than standard geophones, enabling more accurate fracture description.

Three-component acquisition in the borehole and at the surface records the complete elastic wave field from the fracturing of reservoir rocks, allowing for richer fracture characterization and post-frac reservoir fluid system evaluation.

Reach out to Spectraseis before your next completions program to understand how our technologies can improve your performance.

Achieve better imaging with broadband 3-C microseismic data
Why Spectraseis?

Spectraseis provides the industry’s most reliable microseismic monitoring solutions, derived from cutting-edge innovations in surface and borehole recording arrays, data processing and imaging.

- A strong HSE track record
- Integrity and efficiency in data processing
- Auditable workflows
- No black boxes
- High-caliber, experienced technical and account management teams
- Continuous technical advancement supported by top-tier industry and university partners
- Ten years of experience working with broadband passive seismic data

Spectraseis is an experienced partner to major IOC and NOC operators and independents, with a decade of proven operating performance in the most demanding oilfield environments in North America and around the world.

Whether the challenge is extreme heat or cold, remote desert or a densely populated urban area, Spectraseis has experience planning, permitting and executing high-quality data acquisition to rigorous HSE standards.

Our surface and borehole acquisition systems are designed to be safe and easy to permit, with a light operations footprint ideally suited for environmentally sensitive areas.

No matter what your requirements are, Spectraseis has the solution.

Accurate and reliable fracture imaging with TRI elastic data processing

Spectraseis’ patented Time-Reverse Imaging (TRI) method delivers rich fracture characterization and improved reliability, eliminating the assumptions and simplifications of ray-based techniques through full elastic migration of microseismic data.

- Robust, data-driven workflow mitigates acquisition artifacts, noise contamination, and false positives
- Reduces processor bias and improves efficiency
- Delivers a confidence estimate for each imaged event
- Allows direct retrieval of the fracture moment tensor
- Provides an understanding of fracture direction and connectivity

Spectraseis accelerates full elastic wave-equation imaging with proprietary algorithms and techniques to get the most out of NVIDIA’s latest Fermi GPUs.

Our superior results and computational times for complex analysis put Spectraseis at the forefront of microseismic data processing in the industry.

Reliable fracture imaging allows integration of well completion information with subsurface geological and geophysical information.
Rich fracture analysis from full wave 3-component recordings

The results of any geoscience data analysis are only as good as the quality and integrity of the recorded data set. Capturing the most complete wavefield in time, space and frequency maximizes the value of microseismic monitoring data.

Single component data recordings delivered by conventional reflection seismic recording systems ignore a large portion of the information radiated by microseismic events. The S-waves triggered by microseismic events are often the strongest signals recorded in microseismic data. They are normally observed on the horizontal components of a 3-component (3-C) receiver and are weak or completely absent on the vertical component.

Assuming a Vp/Vs ratio of 2, the maximum energy of an S-wave phase (SH or SV) radiated by a shear event is 8 times larger than the maximum amplitude of the associated P-wave (Aki and Richards 2002), but a single component system probably won’t record it.

A standard requirement in borehole microseismic and VSP applications, 3-C recording is essential in both borehole and surface microseismic surveys because only 3-C data embodies the full three-dimensional wavefield.

3-C instruments also facilitate polarization analysis to distinguish easily between the different wave modes. Classification of the recorded signals into vertically polarized P-waves and horizontally polarized S-waves is crucial to avoid imaging false positives from misinterpreted modes.

From TRI event image to focal mechanism: the 3-D pattern in the TRI image domain is compared with theoretical radiation patterns to determine the event’s source mechanism and orientation. (a) 3D TRI image of the microseismic event (b) P-wave radiation pattern of double-couple source (c) Focal mechanism of the shear event
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