# Land Seismic Acquisition


WesternGeco

# Land seismic acquisition

Today, onshore seismic acquisition faces numerous challenges. Seismic crews require substantial human and capital resources. Surveys are often situated in areas with difficult terrain or significant surface infrastructure, leading to complicated operational logistics.

The demands on modern land seismic data quality have also increased. Full-azimuth (FAZ) and long-offset geometries, coupled with broadband frequency response with good signal-to-noise ratios, are increasingly important for reliable inversion.

*WesternGeco land seismic crew base camp in the dunes of the United Arab Emirates.*


Productivity
Reliability
Flexibility
Broadband
Integration
Imaging to inversion

# UniQ land seismic acquisition platform

*Geophone accelerometer (GAC) digital sensor for point-receiver surveys.*

The UniQ* land seismic acquisition platform is a cost-effective and proven system that has been deployed in nine countries and has delivered nearly 1 million channels of data to date. It is compatible with both digital and analog sensors.

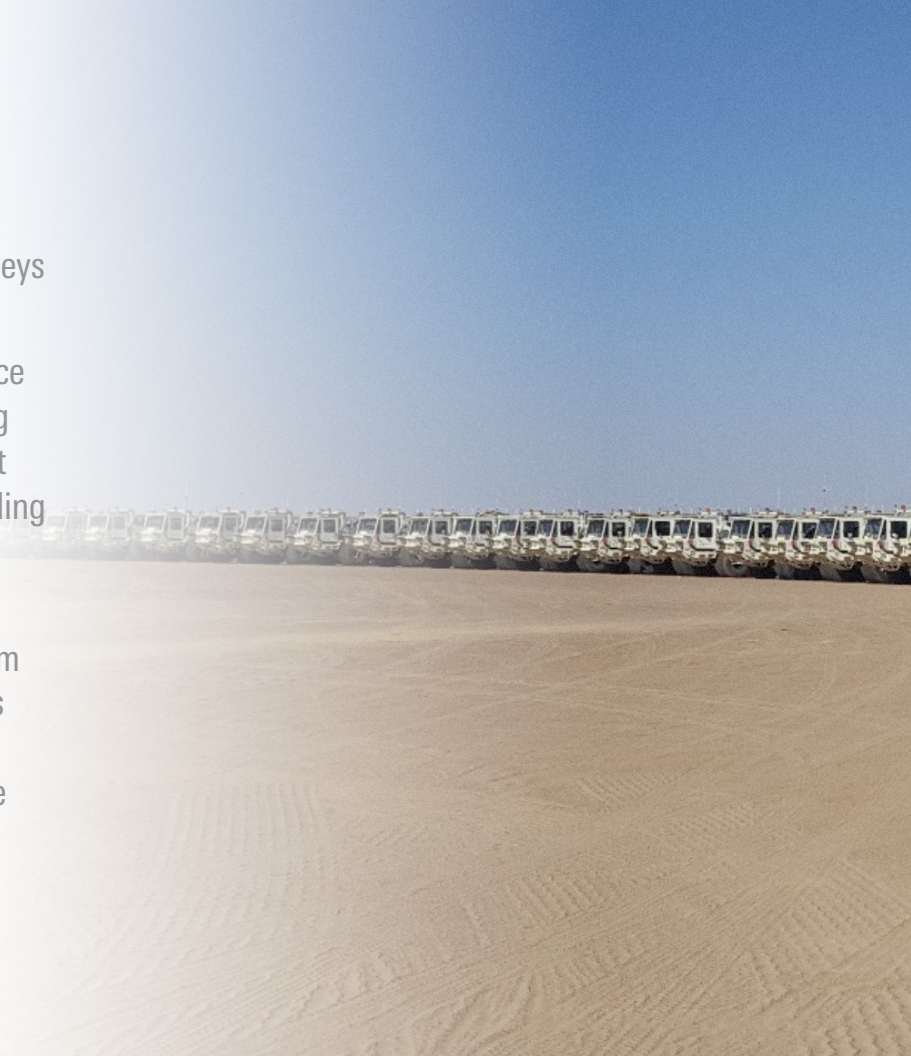
The UniQ platform is highly flexible, designed to optimize productivity and minimize technical downtime. This continuous acquisition platform is fully compatible with all simultaneous source techniques.

# Productivity

Cost-effective full-azimuth and long-offset surveys require high-productivity field crews.

**Sources:** The MSS* managed spread and source technique is coupled with continuous recording to coordinate massive vibrator fleets. The result is greatly increased source productivity, exceeding 20,000 vibration points (VPs) per day on recent surveys.

**Receivers:** The ultrahigh-capacity UniQ platform supports unlimited channel count. This enables dense coverage across large areas for efficient spread management. To date, over 250,000 live channels have been deployed, recording more than 6 terabytes of data per day.

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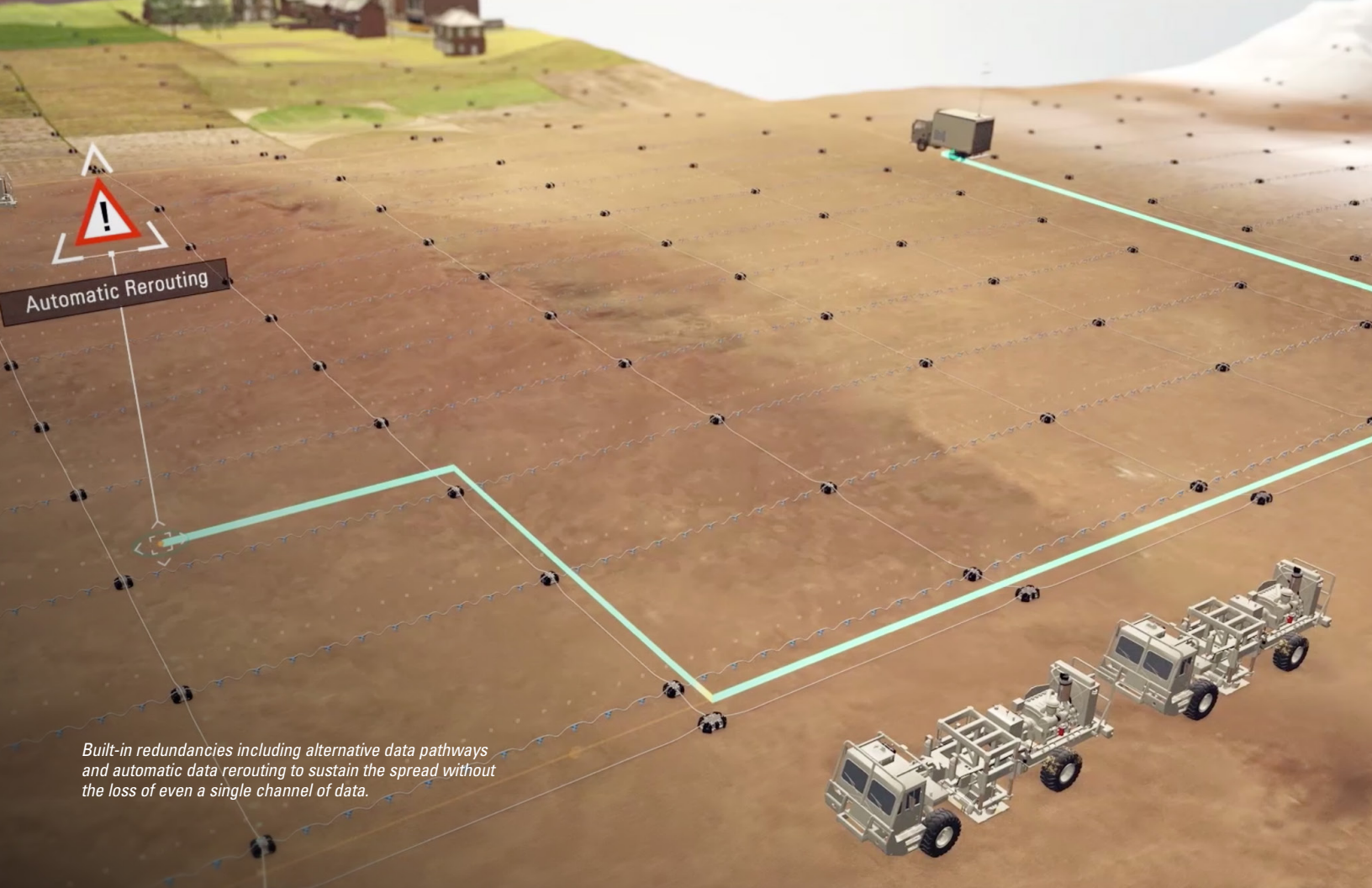



*Built-in redundancies including alternative data pathways and automatic data rerouting to sustain the spread without the loss of even a single channel of data.*

# Reliability

System reliability is required to realize operational gains. The UniQ platform has an impressive track record of success, with over 43,000 $km^2$ of high-density 3D seismic data acquired since 2010.

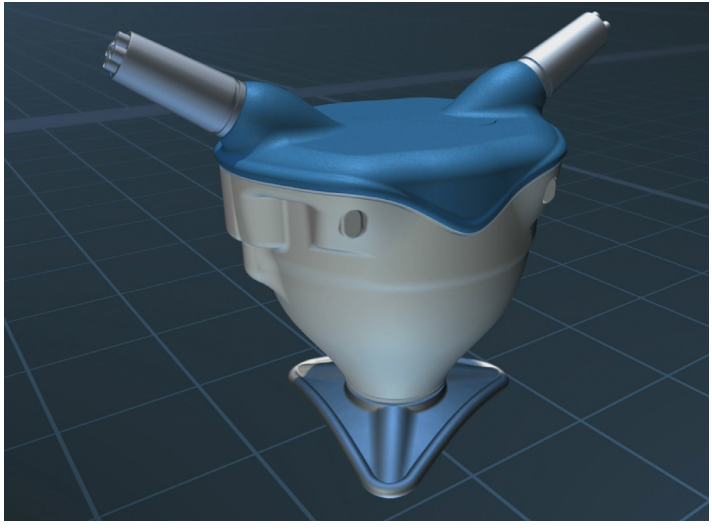
Today, average technical downtime is less than 1.5% for a 200,000-channel crew. This is enabled by the robust cable-based network that forms the backbone of the UniQ platform. Communication redundancy and automatic real-time data rerouting maintain production in the event of physical disruption to one part of the spread.

# Flexibility

The UniQ platform is modular and easily scalable, allowing for plug-and-play expansion to support large projects and crews.

This also provides flexibility in the choice of acquisition geometry to meet the specific geophysical requirements and economic constraints of your survey. The ultrahigh channel count supports all modern high-density FAZ survey designs.

The UniQ platform is compatible with both geophone accelerometers and analog geophones.



*Single-sensor GAC, one of the receiver types that can be plugged into the UniQ platform.*


*Recording truck for conducting data acquisition and quality control and directing deployment of the vibrator trucks.*

*WesternGeco proprietary MSS managed spread and source system combined with GACs to enable continuous broadband acquisition.*

# Broadband acquisition

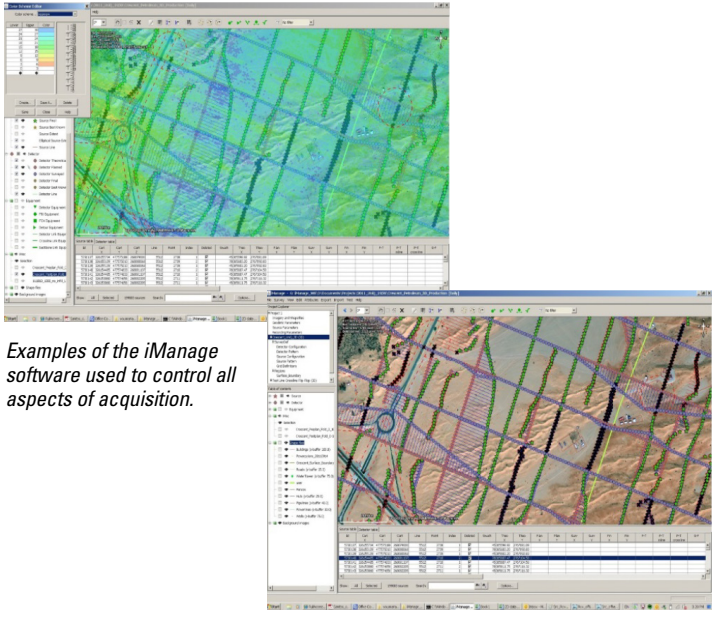
Successful broadband seismic products start with the right acquisition technology.

The vibrators are designed to maximize the benefits of MD Sweep* maximum displacement sweep methodology. The maximum low-frequency output is crucial in delivering improved results for inversion workflows and imaging both deep targets and beneath high-velocity and highly absorbing formations. GACs provide a flat, uniform response across the seismic spectrum.

Together, these technologies deliver high power, with low signal distortion and broad seismic bandwidth.

Point-source/point-receiver (PSPR) deployment avoids amplitude distortions due to array forming, improves signal fidelity with azimuthally invariant recording, enables fully radial geometries, and maximizes vertical and lateral resolution.

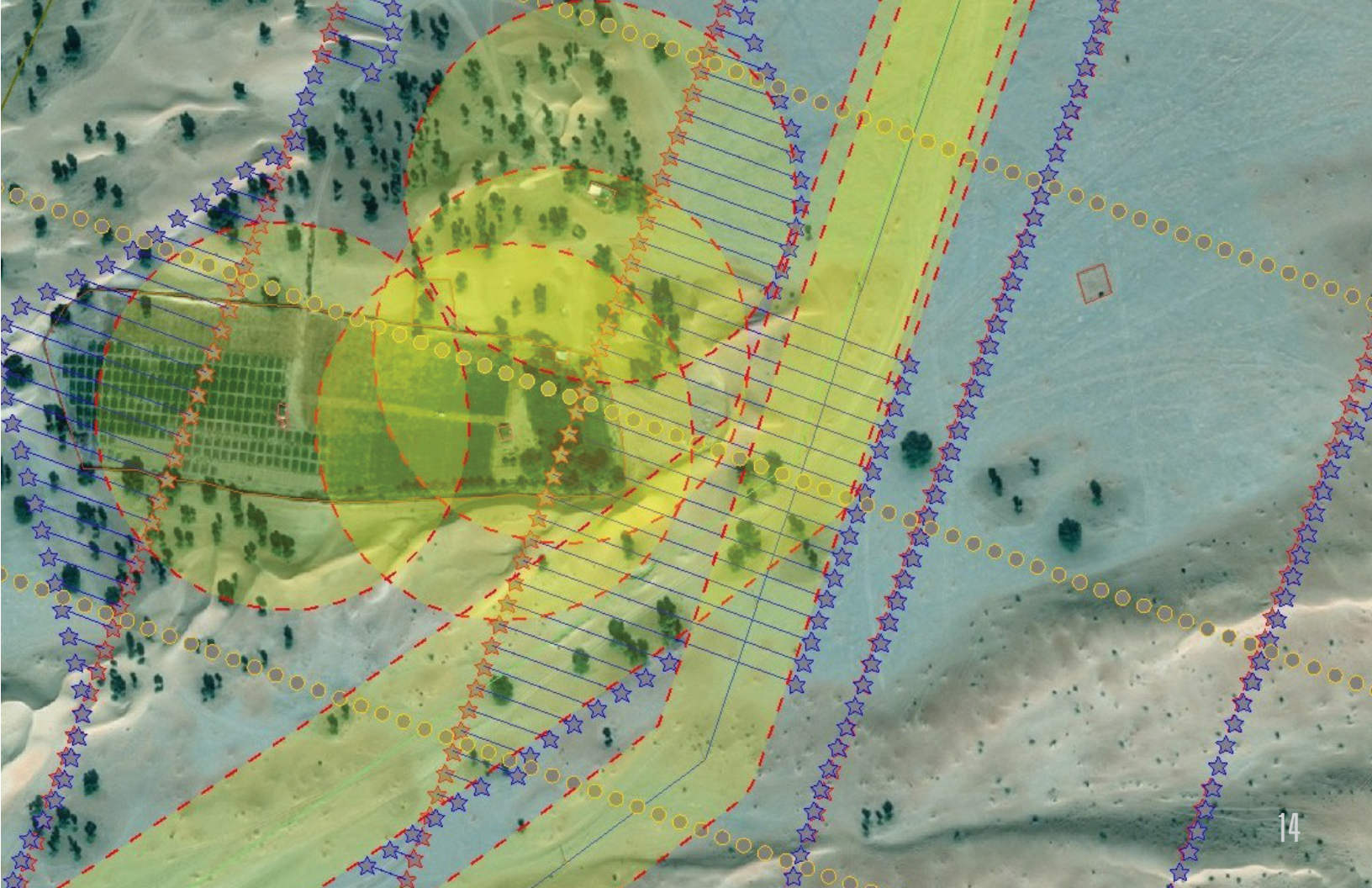
# Integration



*Examples of the iManage software used to control all aspects of acquisition.*

System components, including broadband sources and sensors, are chosen to meet the unique design requirements of the project. The UniQ platform, with its inherent scalability, combines high productivity with reliability and flexibility in the field using the iManage* acquisition planning and management software.

The powerful and scalable infield geophysics capacity is matched with production goals to prepare data for subsequent imaging, inversion, and interpretation.

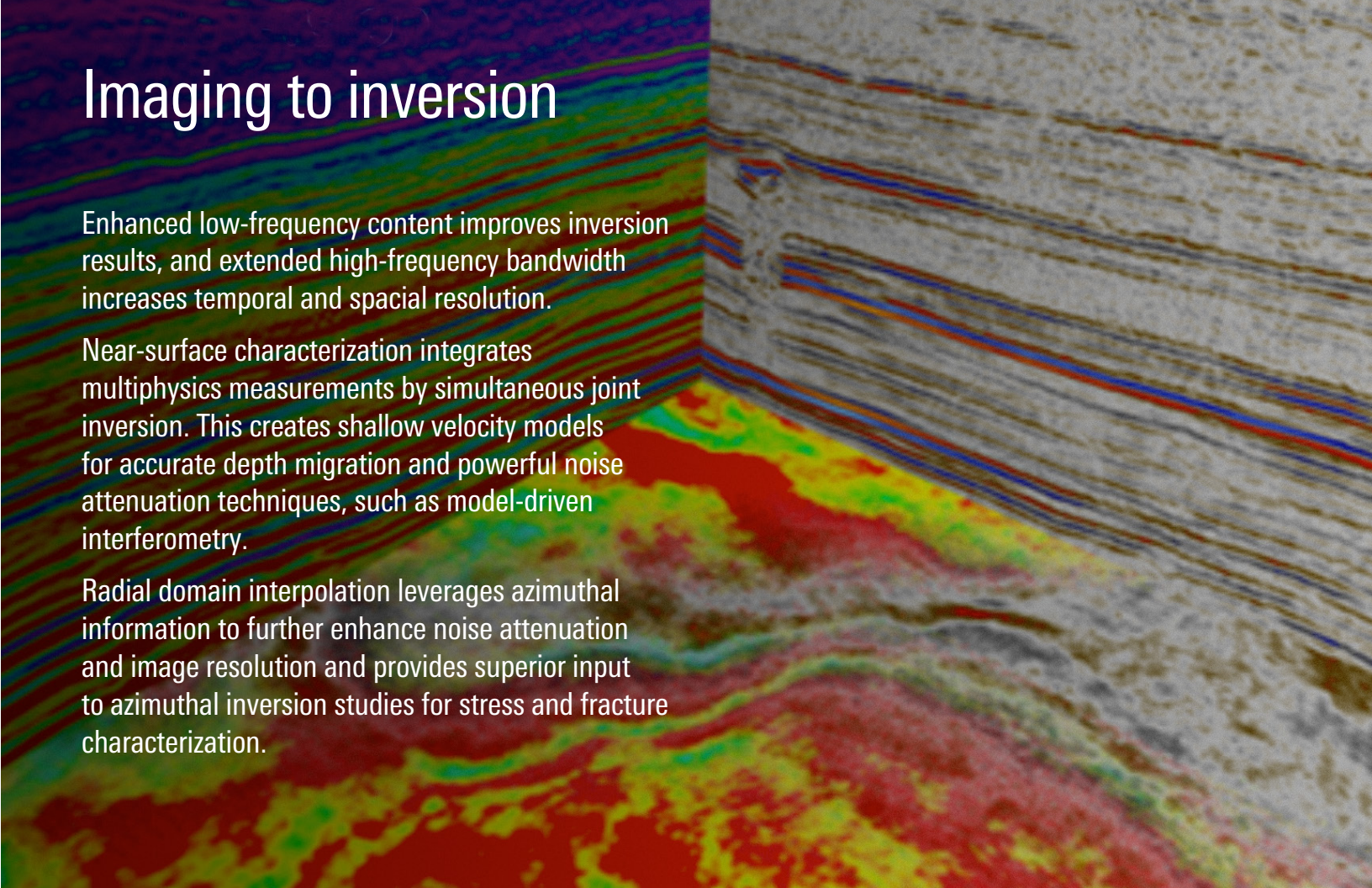


# Imaging to inversion

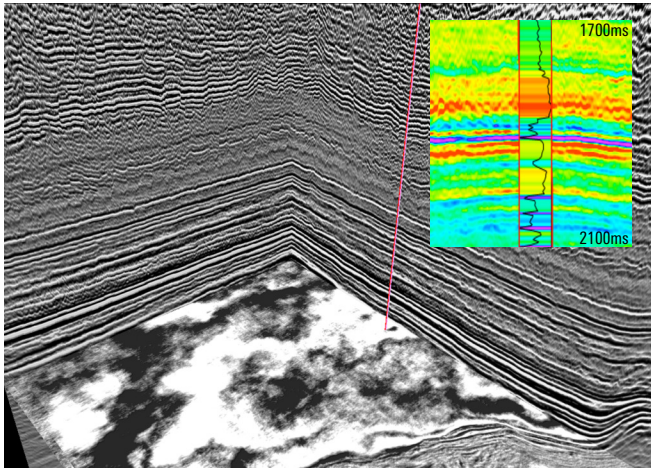
Enhanced low-frequency content improves inversion results, and extended high-frequency bandwidth increases temporal and spacial resolution.

Near-surface characterization integrates multiphysics measurements by simultaneous joint inversion. This creates shallow velocity models for accurate depth migration and powerful noise attenuation techniques, such as model-driven interferometry.

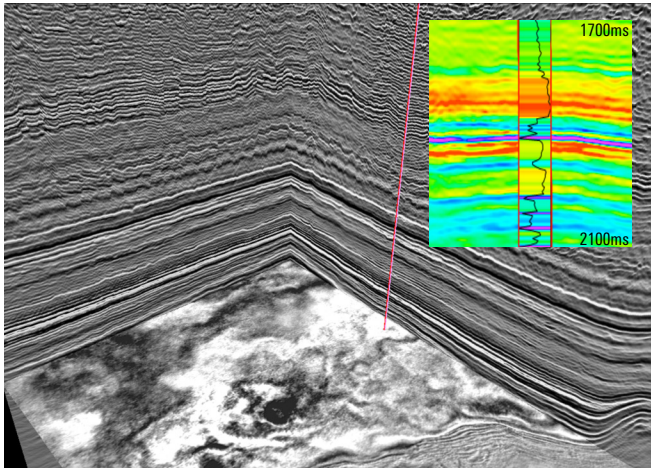
Radial domain interpolation leverages azimuthal information to further enhance noise attenuation and image resolution and provides superior input to azimuthal inversion studies for stress and fracture characterization.



Standard Processing Approach

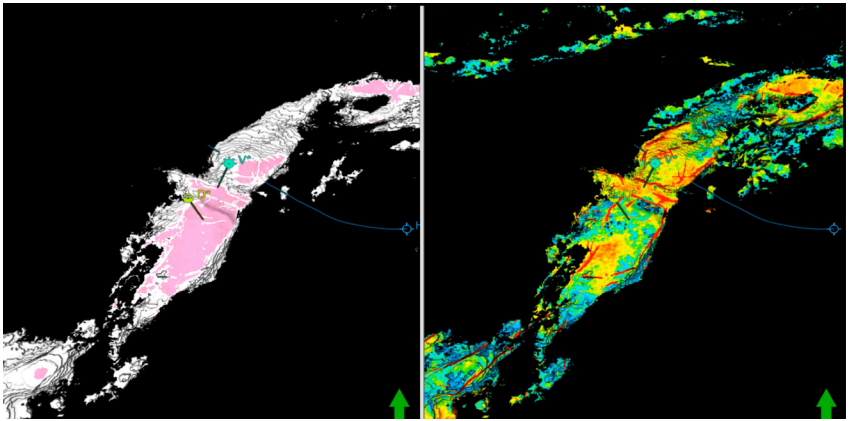



Azimuth-Preserving Workflow with Radial Domain Interpolation




*The necessity of careful offset and azimuth handling for maximum value from a UniQ platform full-azimuth broadband land seismic survey. The image on the left shows a standard processing approach using offset vector tiles (OVT). On the right, an azimuth-preserving processing workflow was applied including radial domain interpolation. This image shows improved fine-scale resolution and, crucially, the match with the well is improved to increase confidence in the inversion products.*

# Case study: Confidence in production decisions



*On the left: The lithology showing sand geobodies in white, with pink shading representing hydrocarbons. On the right: Fracturing indicating higher fracture density with hotter colors. Data courtesy of PetroChina Southwest Oil and Gasfield Company (SWOGC) and CNPC Sichuan Geophysical Company (SCGC).*

The UniQ platform was used successfully to enhance reservoir characterization in a challenging environment over the Sichuan basin, China.

Integrated acquisition, processing, imaging, and inversion helped characterize the tight, thin, and fractured reservoirs.

Full-azimuth point-source/point-receiver acquisition, coupled with amplitude variation with offset and azimuth (AVOAZ) inversion, generated volumes of reservoir stratigraphy and fracture networks. The resulting models closely correlated with existing well information, providing greater confidence in development and production decisions.

The UniQ land seismic acquisition platform combines productivity, reliability, and flexibility—delivering high-quality broadband datasets for today's most advanced high-density full-azimuth survey designs.

**Your Success. Our Focus.**

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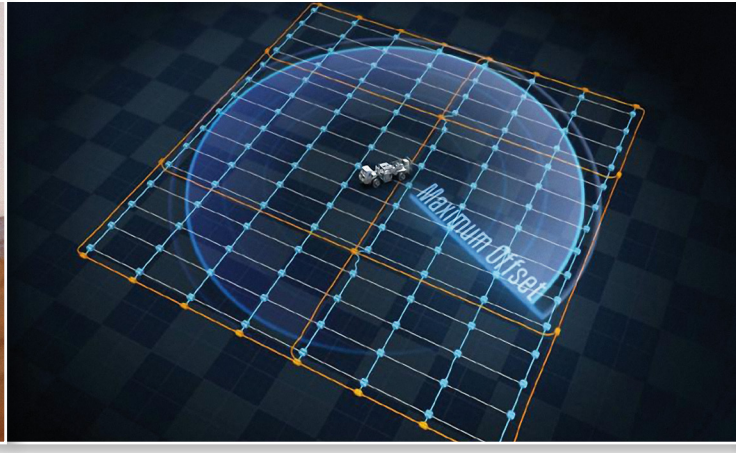


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