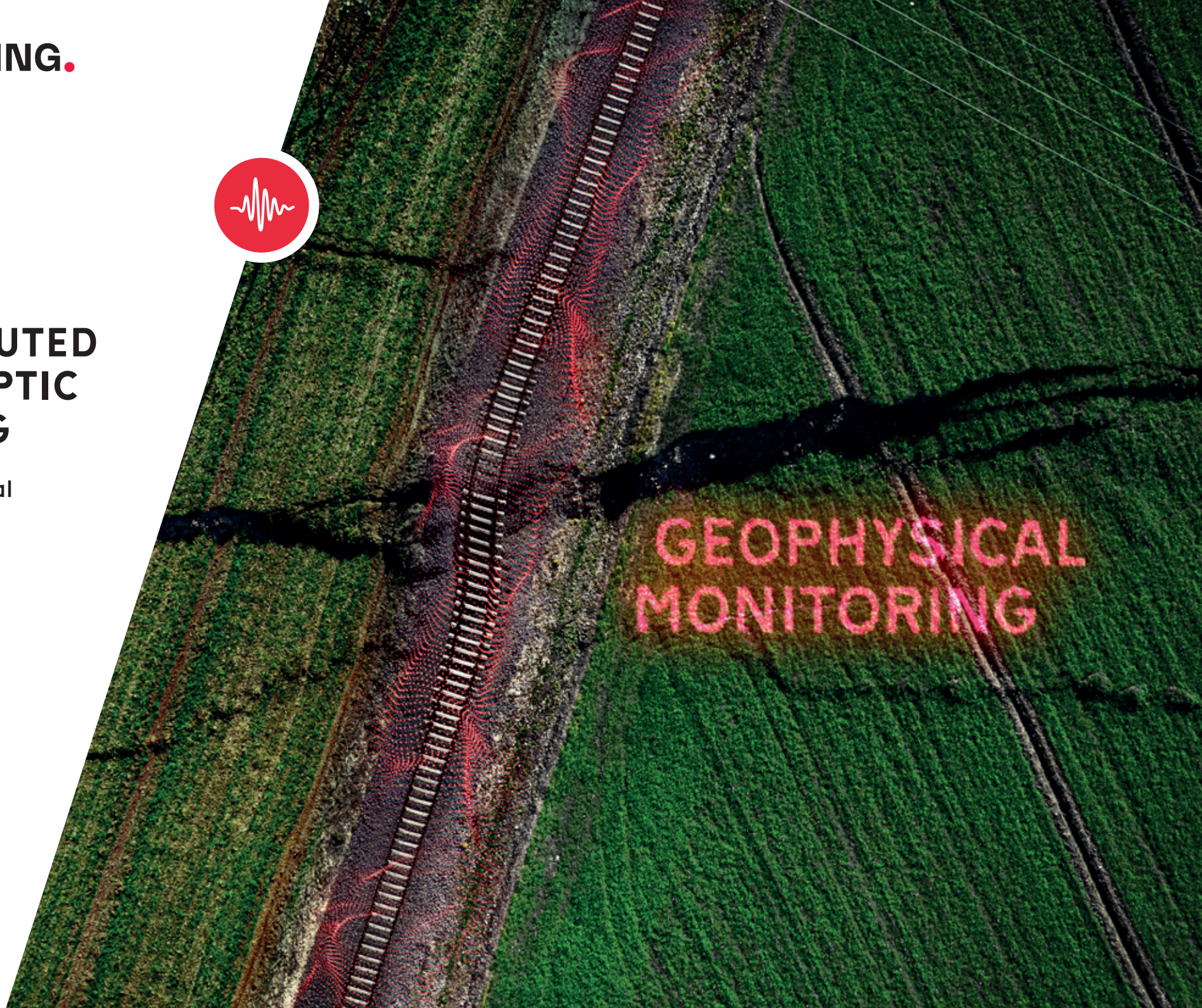
APSENSING.

DISTRIBUTED FIBER OPTIC SENSING

for Geophysical Applications



THINKING AHEAD

APSENSING.

Your Trusted Partner

for Geophysical Applications

AP Sensing is a trusted partner in geophysical monitoring, providing **reliable solutions designed for long-term, wide-range monitoring.** Our products stand for quality, reliability, and high performance, utilizing the latest technology. We ensure optimal performance even in the most extreme conditions.

AP Sensing was founded on the **heritage of HP (Hewlett-Packard)**, the market leader in fiber optic testing and measurement for over 40 years. With thousands of installations, our Distributed Fiber Optic Sensing (DFOS) technologies are known for their **outstanding quality, reliability, and performance.**

- Quality
- Reliability
- Performance

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Solutions That Fit Your Needs

Our Expertise

With over a decade of experience, we have deployed systems worldwide, tailored to meet diverse monitoring needs.

Recent innovations in fiber optic sensing have revolutionized geophysical monitoring, enabling **advanced, high-resolution measurements in extreme conditions.** These technologies are now driving progress in renewable energy applications, natural hazard monitoring, and critical infrastructure projects, where reliable and efficient sensing solutions are essential.

AP Sensing's Distributed Fiber Optic Sensing (DFOS) solutions deliver reliable, long-term, and wide-range monitoring. Designed for challenging environments, our systems excel in **hard-to-reach underground installations and extreme conditions, including mines, deserts, boreholes, and subsea power cables.**

Advantages

- **Continuous, high-resolution data collection:** DFOS enables uninterrupted monitoring over long distances
- **Real-time, reliable insights:** DFOS provides accurate, real-time data on subsurface conditions
- **Enhanced hazard detection:** A valuable complement to conventional methods, improving the accuracy of hazard detection and subsurface mapping
- **Resource efficiency:** Allow repurposing of existing telecom fibers for geophysical monitoring, maximizing resource utilization

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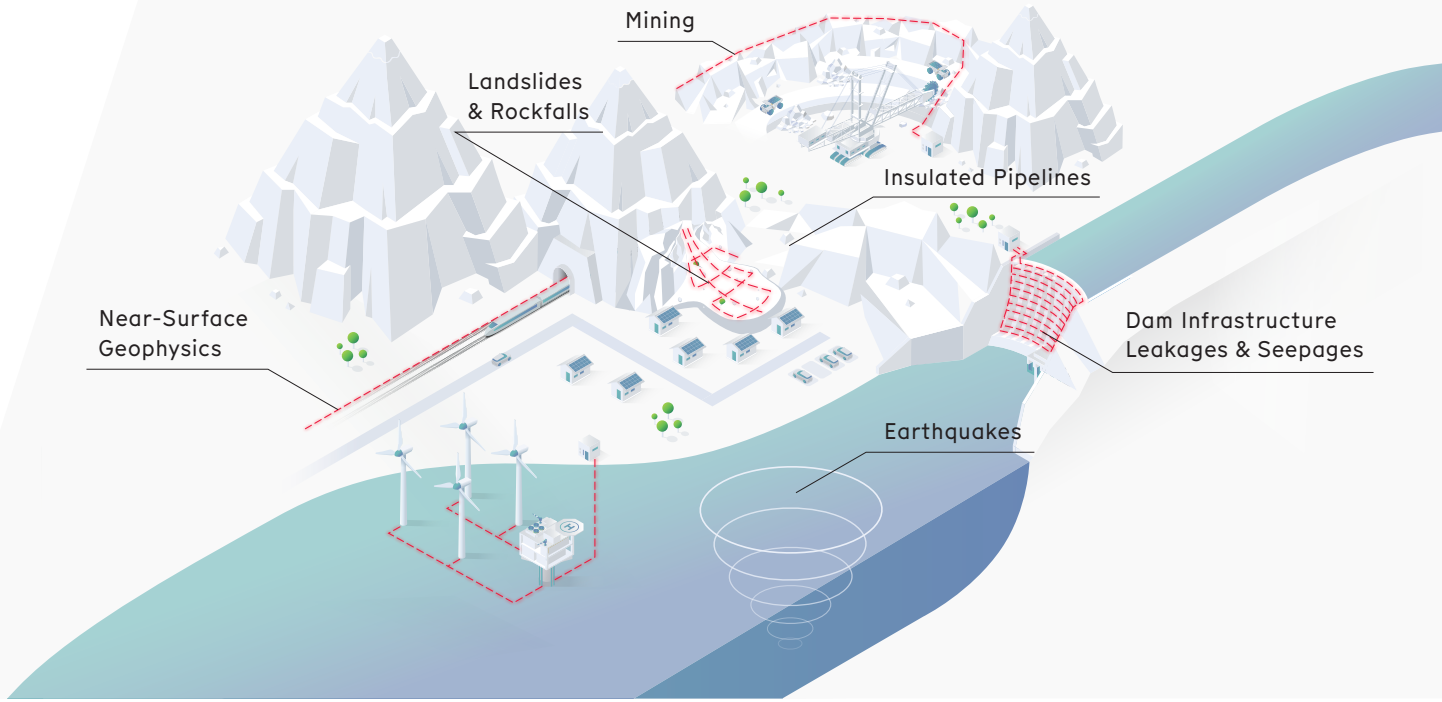
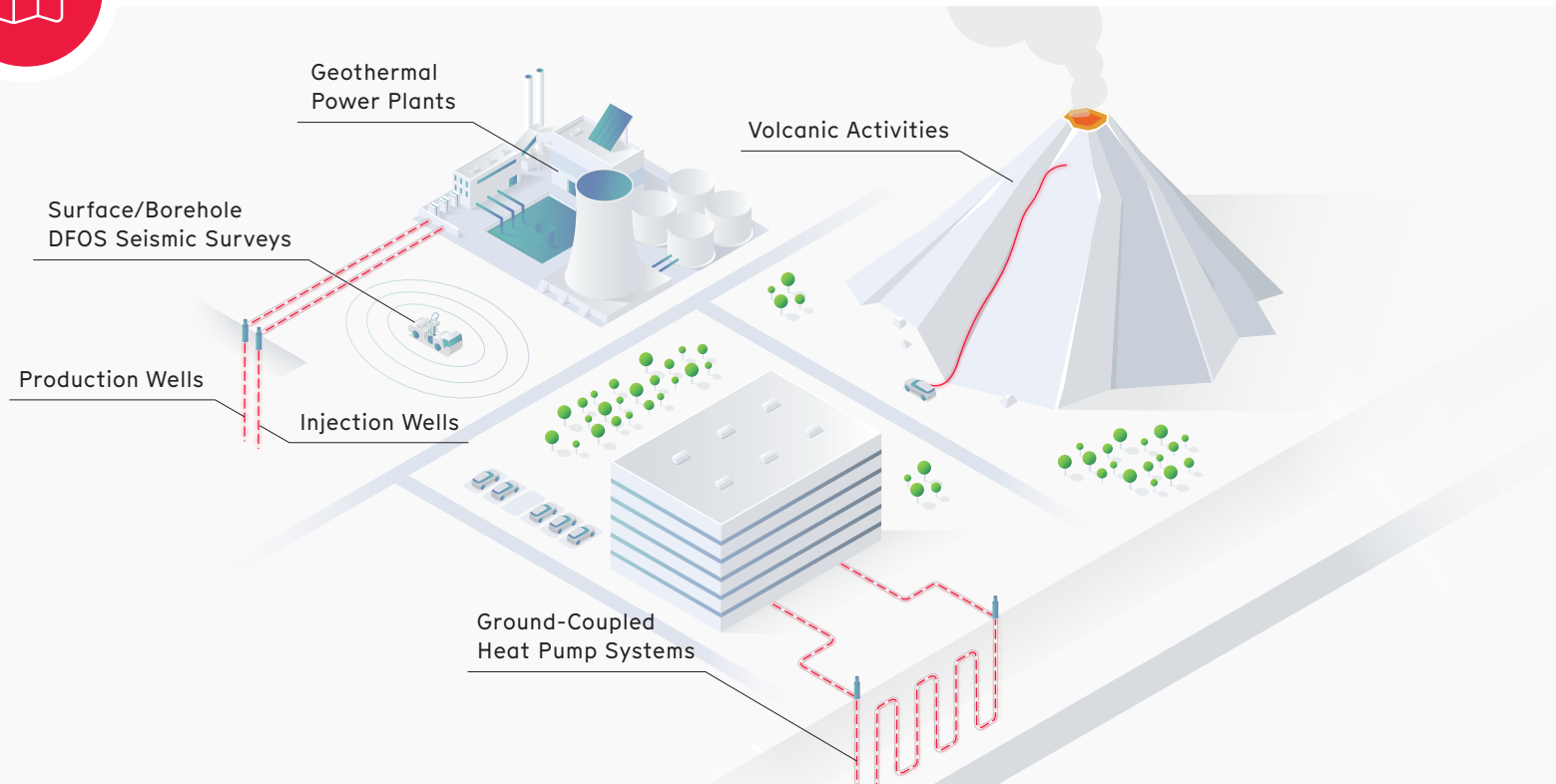
Where to Use Our Solutions

Existing Fiber Infrastructure and Newly Installed Fibers

Applications

- Surface seismic monitoring
- Borehole seismic applications
- Mining operations monitoring
- Dam and levee infrastructure monitoring
- Geohazards monitoring, incl.:
  - Earthquakes
  - Landslides and rockfalls
  - Volcanic activity
- ...and many other critical applications





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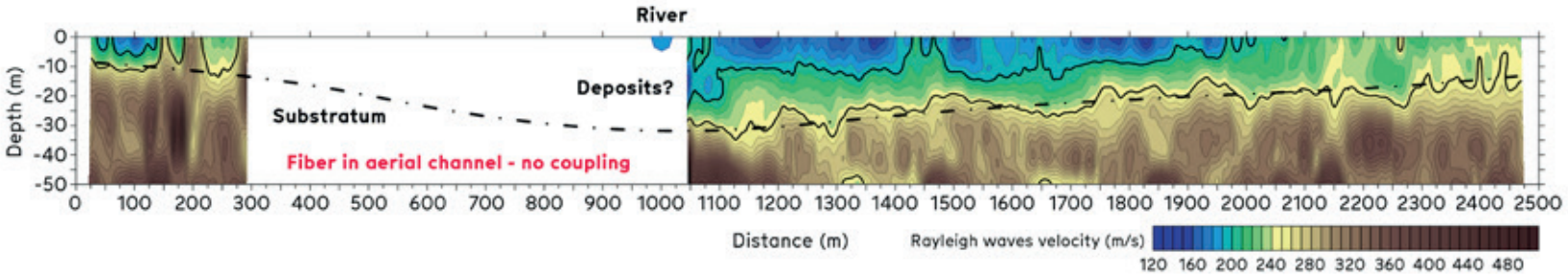
Transforming Subsurface Imaging

Seismic Surveys with DAS

DAS technology offers a transformative approach to seismic surveys, providing high-resolution imaging of subsurface structures. This innovation significantly **enhances data reliability and improves risk assessment**. DAS can operate as a standalone survey method or complement conventional seismic approaches, offering versatility across various applications.

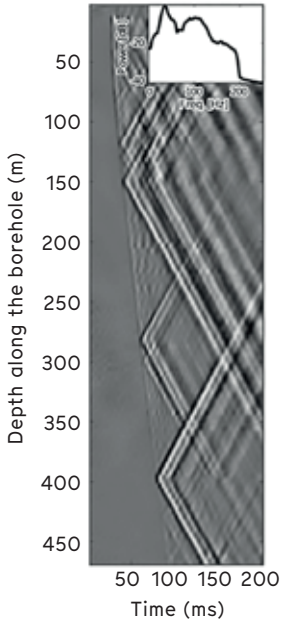
Surface Seismic Applications: For surface seismic imaging, DAS excels across a range of depths and use cases. It is highly effective for shallow subsurface imaging, such as identifying potential geological hazards along railway tracks or in mining environments. DAS is equally valuable for imaging deeper structures, including submarine sediments, providing insights into complex geological formations.

Borehole Seismic Applications: DAS is widely utilized in upstream O&G operations for various types of Vertical Seismic Profiling and microseismic monitoring. It plays an important role in geothermal energy projects and Carbon Capture and Storage (CCS) initiatives, enabling effective underground CO2 plume tracking. DAS also finds applications in mining operations, where accurate imaging supports resource extraction and safety planning.



Shear wave velocity profile beneath the railway, derived from DAS data on dark telecom fiber

Raw shot gathering from the DAS data on helically wound cable in the borehole



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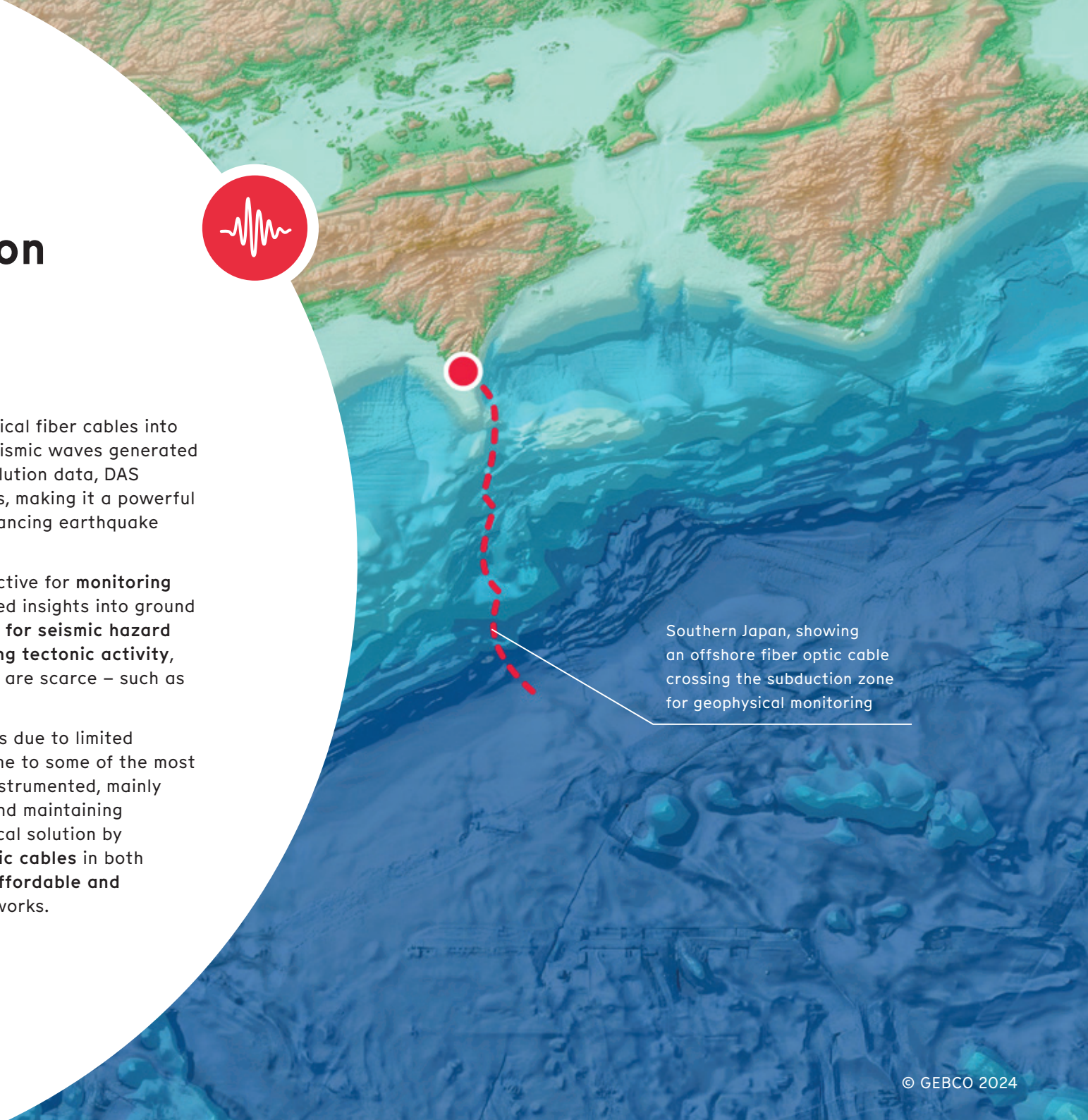
Earthquake Detection and Monitoring

with DAS

DAS is an innovative solution that transforms optical fiber cables into continuous sensor arrays capable of recording seismic waves generated by earthquakes. By providing real-time, high-resolution data, DAS captures critical information about seismic events, making it a powerful tool for improving seismic event analysis and enhancing earthquake early warning systems.

In earthquake detection applications, DAS is effective for **monitoring seismic activity over large areas**, offering detailed insights into ground motion. It is valuable in both **urban environments for seismic hazard assessments** and in **remote regions for monitoring tectonic activity**, including areas where traditional seismic sensors are scarce – such as subduction zones.

Remote locations often face significant challenges due to limited seismic station coverage. Subduction zones – home to some of the most powerful earthquakes – are particularly under-instrumented, mainly because of the high costs involved in deploying and maintaining offshore seismic instruments. DAS offers a practical solution by **leveraging existing telecommunication fiber-optic cables** in both onshore and offshore regions, providing a more **affordable and efficient alternative** to conventional seismic networks.



DFOS for Earth Structure Integrity

Monitoring of Dams and Levees

Geophysical monitoring with DFOS provides valuable insights into hydrological processes and structural behaviour in dam and levee systems.

DTS enables high-resolution temperature sensing to **detect seepage and subsurface flow variations**, while DAS captures strain and acoustic signals related to **deformation, microseismicity, or internal movements**. DTSS further enhances interpretation by combining temperature and strain data for integrated assessment.

Together, these DFOS technologies support **early detection of anomalies** and contribute to safer, more effective infrastructure monitoring.

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Maximum Safety and Protection

Geophysical Monitoring with DFOS

DFOS delivers advanced solutions for geophysical monitoring, safeguarding critical infrastructure. DFOS can operate as standalone systems, integrate with traditional sensors, or complement them for comprehensive insights.

DFOS enables high-resolution subsurface imaging, providing **accurate detection of geological structures and potential risks**. Its ability to monitor environmental changes and structural behaviour in real time makes it a powerful tool for **assessing and maintaining infrastructure integrity**.

With features like high spatial resolution, real-time data acquisition, and compatibility with other technologies, DFOS supports early warnings and long-term health monitoring. Enhance your infrastructure safety with scalable, cutting-edge DFOS solutions.

Instrument Features

DAS:

- **Flat frequency response up to Nyquist (±0.2 dB):** Enhanced measurement accuracy for precise signal reconstruction
- **Noise floor reduced by 20 dB (factor of 10) at low-frequency range:** Improved sensitivity and accuracy for detecting subtle temperature variations and acoustic events.
- **Variable Gauge Length & Pulse Width:** Configurable to different distances and applications for improved measurement versatility.
- **Supersampling:** Benefits of the highest possible pulse rate while maintaining the data rate within the desired bandwidth

DTS:

- **High spatial resolution (down to 0.5 m):** Enables precise mapping of temperature gradients for detailed thermal profiling
- **Temperature resolution (<0.1 °C):** Ensures reliable detection of even minimal temperature variations
- **Configurable Measurement Time:** Allows optimization of measurement speed and resolution based on specific application needs
- **Longest measurement range** of up to 80 km.

DTSS:

- Single-ended design – no loop required
- High optical budget ensures outstanding measurement performance
- Resistant to hydrogen darkening of optical fibres in harsh downhole environments
- Laser Class 1M with low optical output for safe operations

Your Reliable System Provider

Your Best Choice

AP Sensing is your **long-term partner** for various geophysical monitoring applications utilizing DFOS. **We listen to your challenges and strive to provide the best DFOS solution for your project.** Our comprehensive offering meets your geophysical monitoring needs with precision and reliability.

AP Sensing provides a **flexible package** that includes DFOS systems to meet your specific geophysical monitoring needs.

To ensure successful project execution, our international project teams consist of multidisciplinary, highly skilled, and passionate engineers and field support who combine their experience and expertise to deliver on our commitments.

Temperature

Acoustic

Temperature and Strain

APSENSING.

Our Mission

To Ensure Your Success

Why Choose AP Sensing?

- Industry-leading DFOS technology and solution
- Experienced, dedicated team for engineering and project management
- Range of certified sensor cables to fit every need
- Intelligent alarm management software: SmartVision
- Easy integration through flexible protocols and interfaces
- Industry's most comprehensive list of certifications and product tests
- Highest quality and longest product life
- World-class service, support, and training
- Global presence with expert regional partners

Supportive

Global

Competent

THINKING AHEAD

AP Sensing

Who We Are

Drawing on our HP (Hewlett-Packard) heritage in optical testing, we have established ourselves as **the leading solution provider for Distributed Fiber Optic Sensing (DFOS)**.

We are committed to delivering **well-designed, comprehensive solutions** to our customers. Our global team of **highly qualified employees and regional partners** are passionate about supporting our customers.

Our motto, '**Thinking Ahead**', expresses **our passion and willingness** to be prepared for **excellent project execution and smooth operation**.

At AP Sensing, we recognize that we can only be successful when our customers and partners are successful. Therefore, we take a **respectful and proactive role** in all our commitments.

With the industry's most complete set of tests and certifications, **AP Sensing helps you comply with relevant security standards** and ensures environmental and employee safety.

APSENSING.

The industry's most complete set of **tests & certifications**

Innovative & comprehensive **solutions**

Key enabler to protect lives & the environment

Notable **responsibility** & sustainable **approach**

Agile approach to customers' needs

Extensive expertise in DFOS

Dedicated & **passionate employees**

THINKING AHEAD

HP (Hewlett-Packard) **heritage**

Numerous **successful projects** worldwide

Intelligent **alarm management software & AI**

Global leader with regional partners

Highest quality & longest product life

Asset protection in the most challenging environments

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Partner

made in Germany

Passion for Plants.
For every unit sold, AP Sensing plants 100 trees.