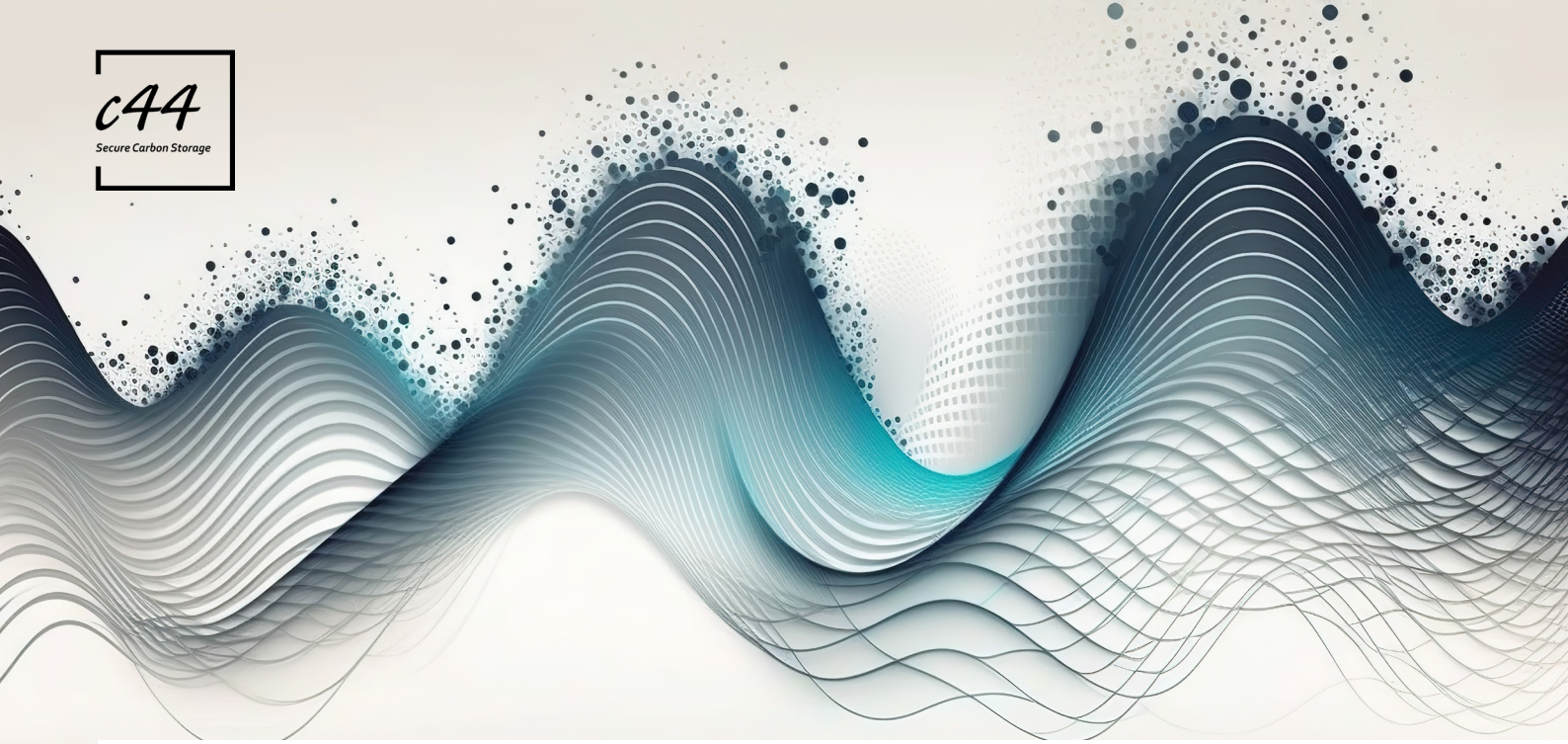
c44
Secure Carbon Storage



MICROSEISMIC
MONITORING FOR CARBON STORAGE

Microseismic monitoring is a seismic technique for tracking the subsurface behavior of carbon dioxide (CO_2) during carbon capture and storage (CCS) projects. CCS involves the capture of CO_2 emissions from industrial sources, such as power plants or refineries, and the long-term storage of that CO_2 underground in geological formations like depleted oil and gas reservoirs or saline aquifers.

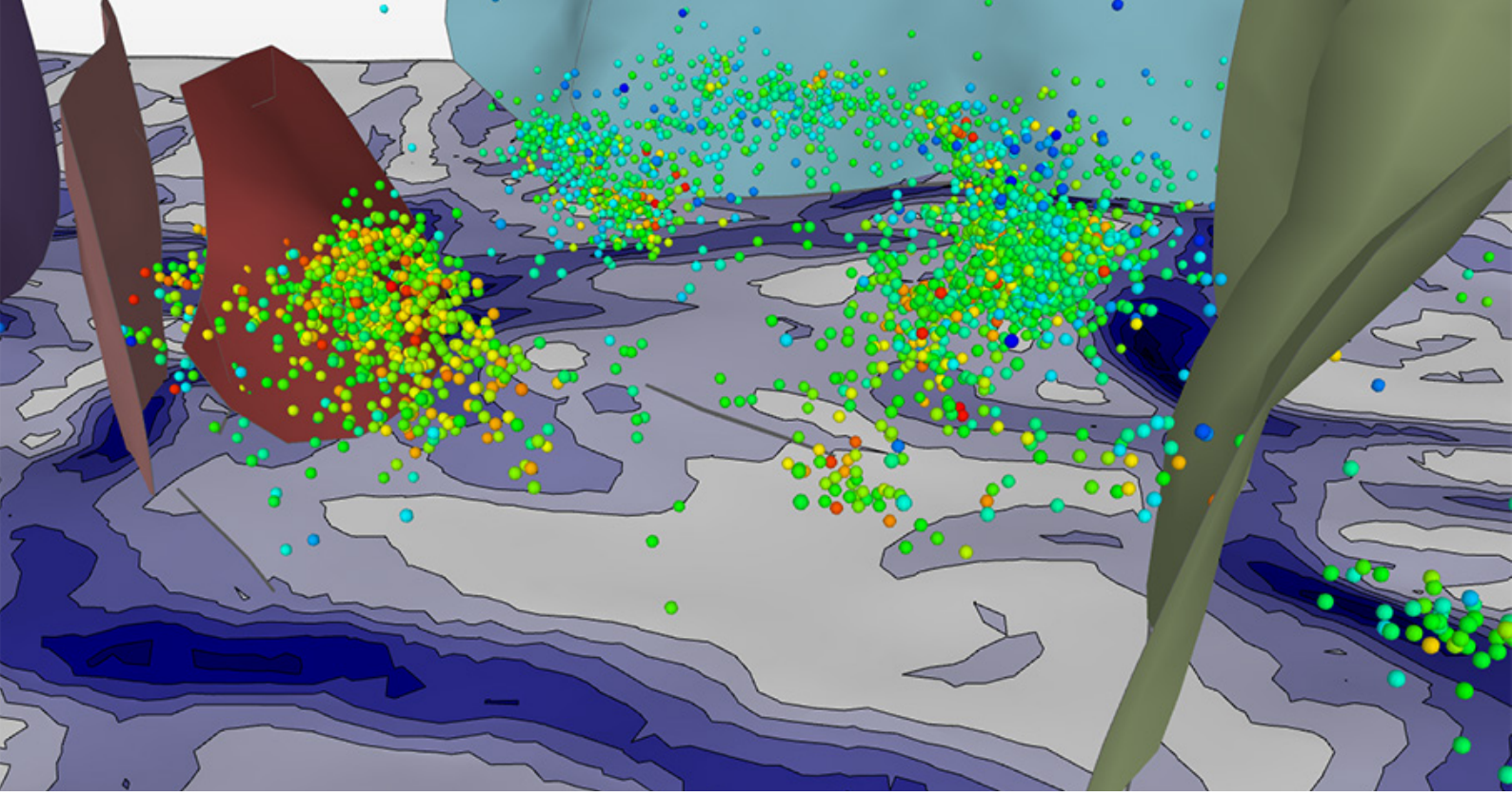
Microseismic monitoring utilizes an array of sensitive seismic sensors placed at the surface or in shallow boreholes to detect and locate small seismic events that occur within or in the vicinity of the storage reservoir. These microseismic events are typically caused by the changes in formation pressure and stress in response to the injection and migration of the injected CO_2.

Reservoir Characterization
Microseismic data can provide valuable insights into the structure, properties, and behavior of the storage reservoir. This helps operators better understand the geological conditions and assess the overall suitability and safety of the storage site.

Injection Monitoring
Microseismic monitoring can track the real-time movement and distribution of the injected CO_2 plume within the reservoir. This allows operators to optimize injection rates and volumes to ensure efficient and secure storage.

Integrity Assurance
Microseismic data can detect any unexpected deformation or fracturing of the reservoir and surrounding sealing formations. This helps identify potential leakage pathways and assess the long-term integrity of the storage site.

Regulatory Compliance
Regulatory bodies often require comprehensive monitoring programs, including microseismic monitoring, to demonstrate the safe and effective storage of CO_2 over the lifetime of a CCS project.



SERVICE OFFERINGS

Services

Network planning and optimization

- Optimize number and location of seismic stations
- Detection threshold analysis
- Establish pre-injection microseismic activity as baseline for monitoring

Real-time data ingestion, curation, and processing

- Automated data curation and processing
- Event detection and localization
- Anomaly alerting and reporting

Event analysis and further interpretation

- Detailed analysis of events with respect to injection activities
- Interpretation of events with respect to CO_2 plume position, pressure distribution and CO_2 containment

Value for your project

Cost efficiency

- Optimized monitoring system
- Automated, cloud-based processing, event detection and data storage
- Establish pre-injection microseismic activity as baseline for monitoring

Risk mitigation

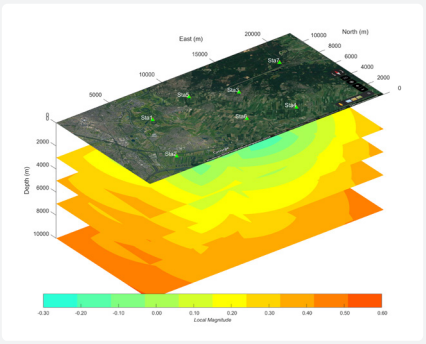
- Early identification of induced seismicity outside expected region or along faults
- Adjustment of operational parameters if unexpected seismic activity is detected

Expert support

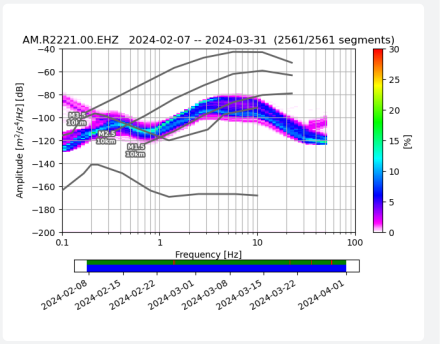
- Deep expertise in microseismic monitoring
- Experience from CCS and geothermal projects

MICROSEISMIC
PLANNING AND PROCESSING

- Optimize number and location of stations according to surface constraints and sources of noise

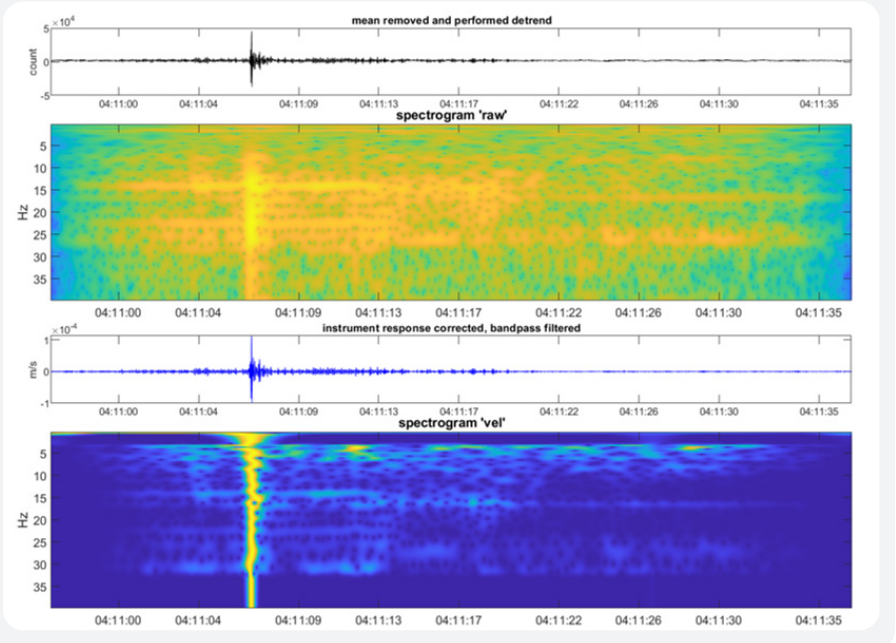


Use detection threshold analysis to optimize the seismic network



Analyze noise level to assess data quality of stations

- Proven and automated processing steps for data curation, event detection and localization



Microseismic monitoring is typically conducted in conjunction with other monitoring techniques, such as surface and downhole pressure and temperature measurements, satellite and aerial imaging, and soil gas monitoring. Together, these various monitoring methods provide a robust and comprehensive assessment of the CCS project's performance and environmental impact.

As CCS technology continues to evolve and more large-scale projects are deployed, microseismic monitoring will remain a critical tool for ensuring the safe and effective storage of captured CO_2 for decades to come.

Carbon Guardian has extensive experience in microseismic monitoring for geothermal and CCS projects. Our optimization process for design of monitoring system utilizes state of the art processing algorithms and advanced technologies to analyze and interpret detected events.

CO_2 sequestration is a necessary tool to reduce climate gas emissions. We want to derisk CO_2 sequestration and lower its cost in order to maximize stored CO_2 volumes contributing to achieving global net-zero goals and constraining global warming

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