GEOSTOCK SANDIA
ENTREPOSE

A-MINDS
ANALYSIS AND MITIGATION OF INDUCED SEISMICITY

A scientifically advanced solution for the analysis and mitigation of potential risks derived from induced seismicity phenomena in subsurface industrial activities.

MAIN FEATURES

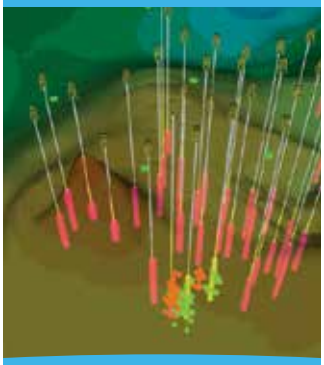
Combination of leading subsurface engineering and cutting-edge earthquake science.
Enhanced real-time monitoring of subsurface operation through microseismic networks and analyses.
Sophisticated statistical-mechanic-type theoretical framework for the analysis of induced seismicity.

Alert systems based on sound scientific understanding.
Comprehensive adaptive methodology tailored-made for optimal performance.

WHY?

Induced seismicity from subsurface industrial activities is a **growing concern** and in an increasingly safety-aware environment, industry is required to provide answers. Understanding the processes that generate seismic activity is currently at the frontier of knowledge and needs to be addressed **to develop robust decision support tools that will help optimize operation processes.**
Building on its fifty year's of experience in underground operations, Geostock has set up **a task force of scientists and engineers** and has developed a robust and comprehensive solution.

KEY BENEFITS



Robust identification of the presence or absence of induced seismicity.

Improved understanding of potential risks.

Optimized design and safety of subsurface operation.

Improved environmental and safety information.

Scientifically robust answers to the public and administrations.

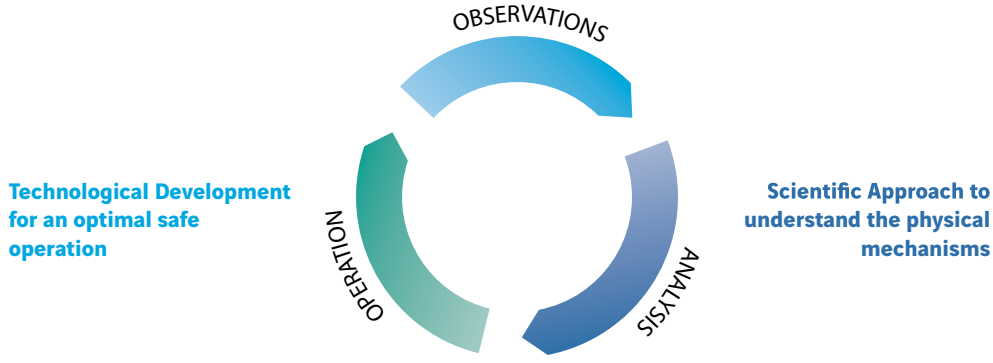
WHAT IS A-MINDS?

A-MINDS is a new sophisticated solution for the analysis and mitigation of induced seismicity that entails:

The combination of a wide range of geophysical, geological, rock mechanics and reservoir engineering observations and measurements.
The design and deployment of high-resolution observation networks.

Sophisticated cutting-edge earthquake science analyses: earthquake catalogue declustering, earthquake interaction analyses (nucleation and coalescence), rank ordering statistics, discrete scale invariance, continuum-discrete modeling approach (single-fault rate and state dynamics in poro-elastic media).

A-MINDS is run in a feedback loop between a scientific approach and technological developments to assist in the safe operation of subsurface facilities.



A COMPREHENSIVE TAILORED OFFER

A-MINDS is a global method with a modular approach that progressively adapts to the evolving requirements of each case. Following a tailored initial assessment, scientifically informed decisions guide the evolution of the approach that can include microseismic monitoring, geo-engineering and advanced scientific analyses.

- **Characterize accurately** if industrial activity produces induced seismicity
- **Show** should this happen that induced seismicity poses no threat and **operations can continue safely**

INITIAL ASSESSMENT

Compile existing data
- Earthquake catalogues
- Geo-tectonic assessment

Initial analyses
- Statistic and mechanistic
- Seismic hazard analysis

MICROSEISMIC NETWORK

- Real-time monitoring
- Good quality catalogue
- Source mechanisms

GEO-ENGINEERING

- Hydrogeology
- Rock mechanics
- Structural geology
- Reservoir engineering

SCIENTIFIC ANALYSIS

- Stochastic time series analysis
- Hydro-mechanical continuum-discrete modeling approach
- Robust early-warning system

SCIENTIFICALLY-INFORMED DECISIONS
ROBUST DECISION SUPPORT TOOLS TO OPTIMIZE OPERATION PROCESSES

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