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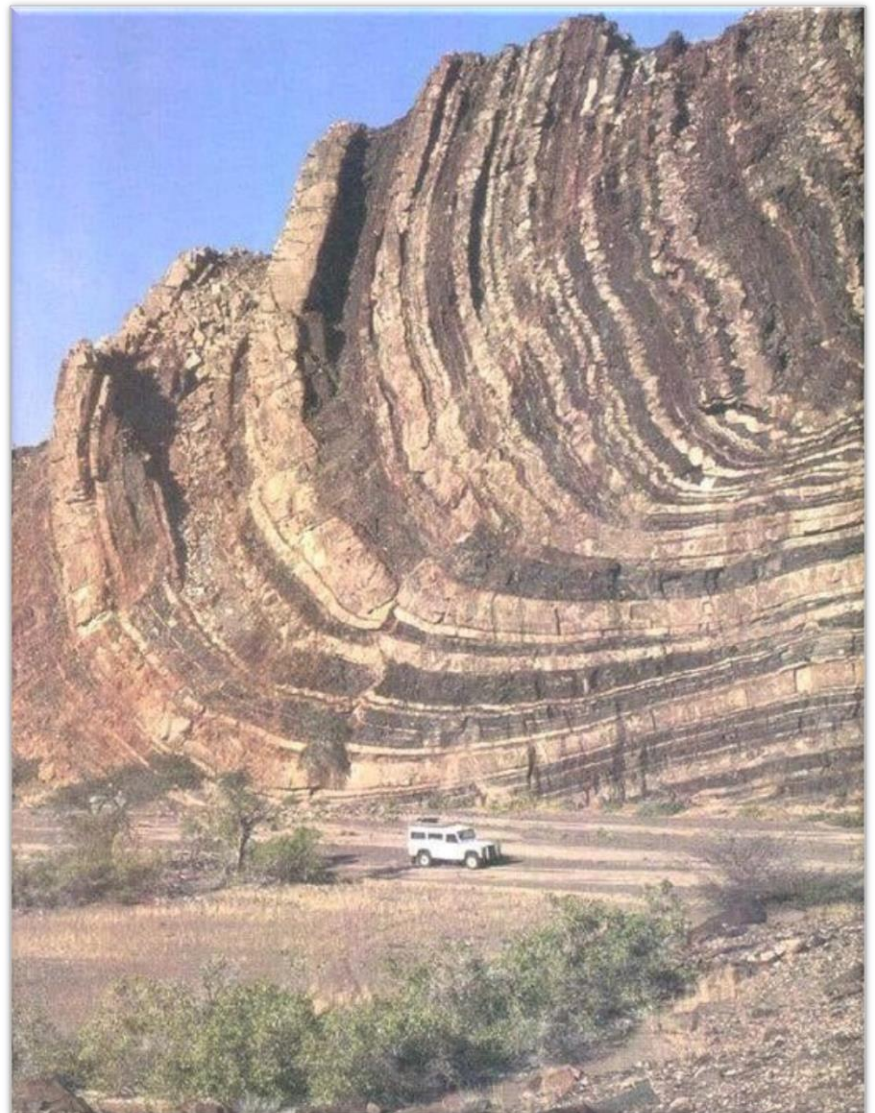
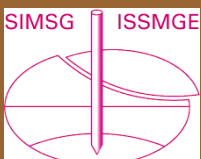


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& ΓΕΩΤΕΧΝΙΚΗΣ
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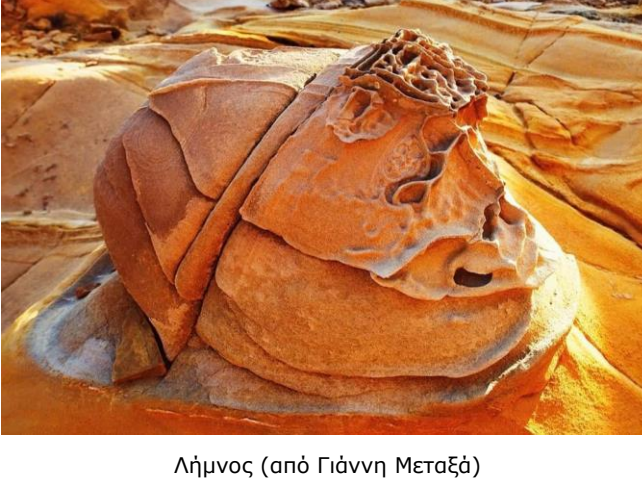


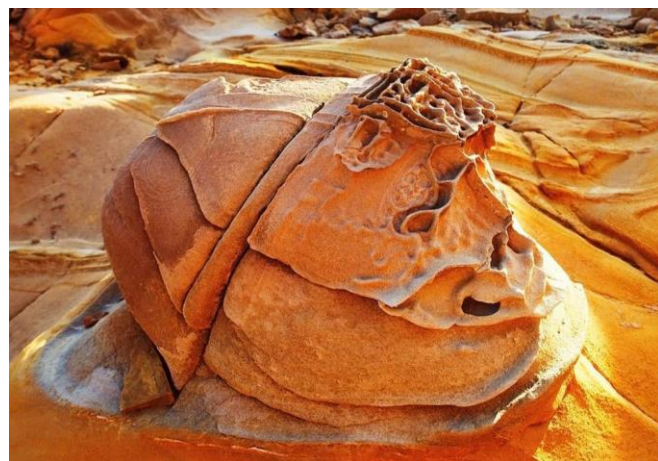
Chevron fold in the Lower Ugab valley in Namibia

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Japan (Civil Engineering Discoveries LinkedIn)

Switzerland's battle to replace the old and cracked Spittellamm dam, located in the Bernese Oberland, by a new dam

Theo van Adrichem

Introduction

On June 20th of this year, I visited the old and new Spitalamm dam, located in the Bernese Oberland in Switzerland. Prior to my visit, and as a civil and structural engineer interested in large (hydropower) construction projects, I conducted prior research.

Due to the great interest in my previous post about the Tseuzier dam (located in canton Wallis in Switzerland), I am now sharing my research results here.

When you hike through the breathtaking Grimsel region in the Bernese Oberland, you see more than just a scenic landscape. You are looking at a powerful piece of Swiss engineering: the new Spitalamm dam.

The Backbone of Swiss Energy

Hydropower is to Switzerland what cheese is to raclette: essential. More than 57% of electricity comes from hydropower plants. Hydropower Oberhasli (KWO) plays a leading role in this, operating thirteen plants and eight reservoirs.

Water is stored during wet periods and released when energy demand peaks. In this way, KWO functions as a battery for the country – perfectly aligned with the Energy Strategy 2050.



From Pioneering Work to Future-Building

The original Spitalamm dam was built between 1925 and 1932. At the time, it was groundbreaking: a 114-meter-high arch-gravity dam – one of the first in Europe. But after a century, time began to take its toll.

In 2015, the decision was made: to replace it entirely. In June 2019, construction began on a double-curved arch dam directly in front of the old structure.

Why a New Dam Was Needed

The old dam no longer met current earthquake standards, showed signs of aging, and had developed cracks. Strengthening it would have been technically and economically complex. The new dam now offers:

- High seismic resistance
- Future expandability
- A lifespan of over one hundred years

Old vs. New: The Difference Cast in Concrete

Although the old and new dams are the same height (113–114 m), the differences are striking in terms of type of dam (Old: gravity dam, New: Double-curved arch dam), concrete used (Old: Traditional gravel mix, New: Concrete with fly ash & recycled aggregate), and foundation (Old: Unreinforced, New: Seismically optimized)

Smart Concrete: Heat Under Control

Massive concrete construction produces a lot of heat during hardening which can result in thermal cracking, hence, amongst others, the following measures were taken: Fly ash partially replaced cement → less heat production. Large aggregate (up to 125 mm) to reduce the cement use.

Sustainable from Base to Crest

A small environmental footprint was left by the construction because of:

- Aggregates sourced from local quarries/former landfills.
- On-site concrete production: minimal transport required.
- Concrete with 13,000 tons of fly ash, saved tons of CO₂.
- Ecological monitoring ensured protection of biodiversity and water during construction.

Visit my website <http://tvaprojectservices.com>

(LinkedIn)

Bridging the Gap: How DIGGS DATA PROCESSING is Democratizing Geotechnical Data Exchange

Breaking down silos between Excel spreadsheets, SQL databases, and industry-standard DIGGS XML files

Nicholas Miller, P.E.

In the world of geotechnical engineering, data is everything. From soil boring logs to laboratory test results, the information gathered from subsurface investigations forms the foundation—quite literally—of every infrastructure project. Yet for decades, this critical data has been trapped in various formats, scattered across incompatible systems, and locked away in organizational silos. Data allows you to reduce costs, reduce risk, reduce uncertainty, increase profitability, and create better, safer, more cost-effective infrastructure, but only when it can be accessed, shared, and utilized effectively.

Enter DIGGS DATA PROCESSING, an open-source solution that targets data management, so practitioners have everything they need to make impactful decisions at their fingertips.

The Problem: Islands of Information

Anyone who's worked in geotechnical engineering knows the frustration. Project data lives in Excel spreadsheets on individual laptops. Laboratory results arrive in various formats that can't be easily imported. Historical boring logs are stored as pdfs in unknown locations or Gint files no one knows how to open. When it's time to share data with consultants, regulators, or other stakeholders, teams often resort to PDF exports or manual re-entry—a process that's both time-consuming and error-prone.

Data Interchange for Geotechnical and Geoenvironmental Specialists (DIGGS) is a data exchange standard developed through the cooperation of organizations, academics, and industry, designed specifically to solve this problem. It is anticipated that DIGGS will save state and federal agencies, and other public and private organizations millions of dollars. Savings will be realized through a combination of avoided drilling and laboratory testing costs, and efficiencies afforded by the availability of geotechnical data for multiple projects in a standard format.

But there's been a gap: while DIGGS provides the standard, many practitioners still struggle with the technical implementation. That's where DIGGS DATA PROCESSING comes in.

The Solution: A Bridge Between Worlds

[DIGGS DATA PROCESSING](#) is an open-source project developed in collaboration with the Geo-Institute of ASCE that serves as a comprehensive bridge between the tools geotechnical engineers already use and the industry-standard data formats they need to adopt. At its core, it's a dataflow system that seamlessly connects three critical components:

- **Excel interfaces** for familiar data entry and visualization
- **SQLite databases** for robust data storage and querying
- **DIGGS 2.6 compliant XML** for standardized data exchange

What makes this project remarkable isn't just its technical capabilities, it's how thoughtfully it's designed around real-world workflows.

Built for Real Workflows

The developers of DIGGS DATA PROCESSING understand

that adoption of new technologies in engineering requires more than just technical capability—it requires integration with existing processes. The system follows a practical three-step workflow:

Step 1: Start Where You Are Generate standardized Excel templates that include all the necessary sheets for comprehensive geotechnical projects: Project details, borehole information, test methods, samples, field and final stratigraphy, rock coring data, and laboratory results including gradation, consolidation, strength testing, permeability, and more.

Step 2: Centralize and Organize Convert populated Excel files into normalized SQLite databases that eliminate data redundancy, ensure referential integrity, and provide powerful querying capabilities—all while maintaining the flexibility that geotechnical data demands.

Step 3: Share and Archive Export data as DIGGS 2.6 compliant XML files that can be shared with any organization or imported into any DIGGS-compatible system. The exported files include proper XML namespaces, schema validation, units of measure for all measurements, and complete observation wrappers for test data.

But the system is equally powerful in reverse: import existing DIGGS XML files, work with them in familiar databases and spreadsheet environments, then re-export with enhanced compliance and validation.

Open Source and Community-Driven

One of the most compelling aspects of DIGGS DATA PROCESSING is its commitment to open-source development. In an industry where proprietary software often creates vendor lock-in and limits innovation, this project takes a different approach. The entire codebase is freely available on GitHub, encouraging community contributions and ensuring that improvements benefit everyone.

The timing couldn't be better. The 2025 DIGGS Code Jam brought together vendors and developers across the geotechnical data management space to put the DIGGS schema to the test, highlighting both the potential and the challenges of widespread DIGGS adoption. All vendors successfully imported DIGGS files and generated mostly accurate reports. However, only one vendor out of seven was able to complete a full round-trip of the dataset, demonstrating the critical need for tools like DIGGS DATA PROCESSING that prioritize compliance and validation.

The project is under active development, with regular updates addressing both user feedback and evolving industry standards. Its modular architecture, built on the Abstract Factory design pattern, makes it easy for developers to contribute new processors, extend functionality, and adapt the system to emerging needs.

Technical Excellence Meets Practical Design

While DIGGS DATA PROCESSING is built for practical use, it doesn't compromise on technical quality. The system includes:

- **Comprehensive data validation** that removes invalid entries, ensures proper units of measure, and validates foreign key relationships
- **Industry standard compliance** with ASTM standards (D1586 for SPT, D4318 for Atterberg Limits), USCS and AASHTO classification systems
- **Robust error handling** and user-friendly feedback for troubleshooting

- **Cross-platform compatibility** with both command-line and GUI interfaces

The project also includes a standalone desktop application with a professional interface, drag-and-drop support, real-time progress tracking, and the ability to create enterprise-ready executables that require no Python installation.

Integration Into Current Workflows

One of DIGGS DATA PROCESSING's greatest strengths is how easily it integrates into existing organizational work-flows. For companies already using Excel for data collection, the transition is almost seamless—they can continue using familiar interfaces while gaining the benefits of standardized data management and exchange.

For organizations with existing databases, the system can import DIGGS XML files from other sources, allowing teams to work with external data in their preferred environment before re-exporting with enhanced compliance.

The backend of the software can be run independently from the executable interface through the command line interface making it easy to integrate DIGGS DATA PROCESSING into automated workflows, while the GUI application provides an accessible option for occasional users or those who prefer visual interfaces.

The Future: AI and Advanced Analytics

Perhaps most exciting thing is what DIGGS DATA PROCESSING enables for the future. AI, machine learning, and data mining are driving this revolution, but data is the fuel that is powering it. Geotechnical engineers have a unique opportunity to leverage these same capabilities, but they must first begin managing data effectively and using data interchange to communicate the data to other organizations.

The development roadmap for DIGGS DATA PROCESSING includes integration with machine learning platforms and design software, positioning it as a foundation for the next generation of geotechnical analysis tools. When data is properly structured and standardized, it becomes possible to:

- **Train AI models** on historical geotechnical data to improve site characterization and reduce uncertainty
- **Automate routine analyses** like soil classification and design calculations
- **Integrate with design software** for seamless transfer from investigation to analysis to design
- **Enable predictive analytics** that can identify potential construction issues before they occur

Getting Started

For organizations ready to modernize their geotechnical data management, DIGGS DATA PROCESSING offers multiple entry points:

- **Researchers and developers** can clone the repository and contribute to ongoing development
- **Organizations** can implement the system gradually, starting with Excel template generation and progressing to full database integration
- **Individual practitioners** can use the desktop application for project-specific data management and sharing

The project includes comprehensive documentation, sample data, and templates that make it easy to get started regardless of technical background.

A Community Effort

DIGGS DATA PROCESSING represents more than just a software tool—it's part of a broader movement toward open, standardized data management in geotechnical engineering. By providing free, accessible tools that implement industry standards along with the easily accessible SQLite format, projects like this help level the playing field and ensure that best practices in data management aren't limited to organizations with large IT budgets.

The project welcomes contributions from the community, whether that's code contributions, bug reports, feature requests, or simply sharing experiences with implementation. This collaborative approach ensures that the tool continues to evolve to meet real-world needs.

Conclusion: Building the Foundation for Tomorrow

In an industry built on understanding what lies beneath the surface, DIGGS DATA PROCESSING is helping to uncover the hidden value in geotechnical data. By bridging the gap between familiar tools and industry standards, it's making it easier for organizations of all sizes to adopt best practices in data management and exchange.

As the geotechnical engineering community continues to embrace digital transformation, tools like DIGGS DATA PROCESSING will play a crucial role in ensuring that transformation is inclusive, standardized, and built on solid foundations. The future of geotechnical engineering isn't just about better drilling techniques or more sophisticated laboratory tests—it's about unlocking the collective knowledge embedded in decades of subsurface investigations.

DIGGS will revolutionize the way data is shared and transferred for geotechnical engineering. With DIGGS DATA PROCESSING, that revolution is already underway, one Excel spreadsheet and one SQLite database at a time.

For any questions on implementation or comments on how to improve, feel free to reach out to me on LinkedIn at <https://www.linkedin.com/in/geotech-nick>

Ready to get started? Visit the [DIGGS DATA PROCESSING GitHub repository](#) to download the latest version, explore the documentation, and join the growing community of contributors. Whether you're looking to standardize your organization's data management or contribute to the future of geotechnical data exchange, there's never been a better time to get involved.

(ASCE / Geo-Institute, 22 Jul 2025, <https://www.geoinstitute.org/news/DIGGS-data-processing>)

How big is the largest possible earthquake?

The amount of energy released in an earthquake is controlled by how much of the crust breaks. The good news is, we're not likely to see a magnitude 10.



Khokana village in Kathmandu, Nepal, after a damaging earthquake. While the largest earthquakes release massive amounts of energy, even small temblors can do a lot of damage when they hit populated areas with buildings prone to collapse. (Image credit: Alison Wright, Getty Images)

On May 22, 1960, a devastating earthquake hit southern Chile. For 10 minutes, the ground shook so violently that people were unable to stay on their feet. Cracks opened in roads, and buildings collapsed. One man, quoted in a U.S. Geological Survey (USGS) report about surviving the quake and its subsequent tsunami, initially thought the Cold War had escalated into nuclear Armageddon.

The Valdivia earthquake, named after the town closest to its epicenter, was roughly a magnitude 9.5, the largest ever recorded before or since. But could quakes get bigger?

The answer, geoscientists say, is yes. However, the chances of a much larger quake are low. While a quake larger in magnitude than 9.5 could occur, it would require an enormous chunk of crust to break all at once — the movement of a fault both enormously deep and extraordinarily long. There aren't many places on Earth where that could happen, said Wendy Bohon, an earthquake geologist and science communicator. A 9.5 magnitude quake is probably right around the upper limit for what the planet can generate, Bohon told Live Science, and a magnitude 10 is extremely unlikely.

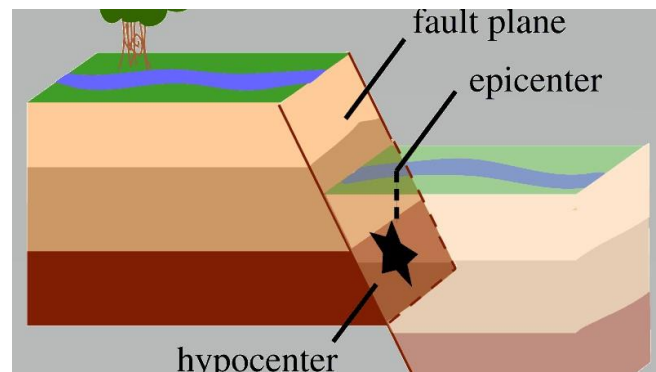
"It's great for Hollywood, but it's not realistic for the Earth, thank goodness," Bohon said.

Magnitude is a measurement of the amount of energy released in an earthquake. It's slightly different from how intense an earthquake feels, which can be influenced by someone's distance from the epicenter and the conditions of the ground. The same quake will feel stronger to someone standing on loose soil and sand than to someone standing on firm bedrock, Bohon said.

A quake's magnitude is dependent on the total area of a fault that breaks. This, in turn, depends on how deep the fault goes down into the crust and how long, horizontally, the segment is that breaks. There are physical limits to how big an area can break. The deepest faults are at subduction zones, where one tectonic plate pushes under another. Go deep enough, though, and the rocks are so warm that they're hot and gooey; instead of breaking, they bend. While quakes can sometimes occur as deep as 500 miles (800 kilometers) below Earth's surface, according to the USGS, most deep quakes don't generate much shaking at the surface; it's the ones in the upper few tens of kilometers of crust that are most dangerous to people.

The faults most capable of setting off large, damaging earthquakes are dipping faults in subduction zones, said Heidi Houston, an earthquake geologist at the University of Southern California. These dipping faults, so named because they're at an oblique angle rather than vertical, have the largest areas of rocks that can get stuck against one another, building up stress and then finally breaking.

"It's really the size of the dipping fault plane that is the biggest control on the maximum earthquake size, and those fault planes can get bigger in the subduction zone setting," Houston told Live Science.



A normal dip-slip fault showing the fault plane, or the area of a fault that breaks to cause an earthquake. (Image credit: USGS)

But there are also limits the length of a fault segment that can break. Even subduction zone faults don't break all at once, Bohon said. Typically, something gets in the way — a seamount (an undersea mountain), perhaps, or a change in the type of rock or the geometry of rock that makes one segment of a fault more resistant to stress than its neighbor.

Another factor feeding into earthquake magnitude is how much the fault moves, or slips, Houston said. As a rule, smaller areas of breaking fault slip less than larger ones. So, while a magnitude 5 quake can slip a few centimeters — a distance not likely to break the ground above — a magnitude 9 might slip 66 feet (about 20 meters) or more. The 1960 Chile quake actually increased the area of the country because of the way the ground stretched, Sergio Barrientos, a seismologist at the University of Chile who lived through the quake, told NPR in 2016.

Understanding magnitude

The earthquake magnitude scale can inadvertently obscure the difference between very large earthquakes. The scale isn't linear, but logarithmic: For every unit it goes up, the ground motion increases 10 times and the energy released goes up 32 times. Bohon likes to use the metaphor of breaking a bundle of spaghetti. If breaking one strand of spaghetti is the equivalent of a magnitude 5 earthquake, you'd have to break 32 strands to release the energy of a magnitude 6 quake. On this spaghetti scale, a magnitude 7 is like 1,024 strands breaking, a magnitude 8 is like 32,768 strands, and a magnitude 9 is like 1,048,576 strands.

As this example shows, the difference between a magnitude 8 and a magnitude 9 quake, in terms of energy released, is a lot more than the difference between a magnitude 5 and a magnitude 6. Thus, nudging up an earthquake's magnitude from 9.5 to 9.6 takes a lot bigger of an area fault breaking than going between a magnitude 5.5 and 5.6.

Due to uncertainty in the measurements, there is still scientific debate about whether the 1960 Chilean quake was exactly magnitude 9.5, Houston said. But to drive home the point about the massive differences in the size of seemingly

small numbers on this end of the magnitude scale, a magnitude 9.5 quake is more than twice as strong as the next-largest quake ever recorded, a magnitude 9.2 that hit Alaska's Prince William Sound in 1964, Houston said.

There are, of course, planetary catastrophes that could theoretically lead to much more massive earthquakes: a collision with an asteroid, for example. (Some scientists think the end-Cretaceous asteroid impact that killed off the nonavian dinosaurs 66 million years ago triggered earthquakes with double-digit magnitudes, though pinpointing the size is tricky.) On timescales of billions of years, Earth could certainly see such a disaster, Houston said. But the chances of something larger than the mid-9s in magnitude within a human life span are very low, she said. The largest ancient quake that has been estimated based on geological evidence was also in Chile, approximately 3,800 years ago, and likely also measured about 9.5 in magnitude, according to 2022 research.

And size isn't always the most important factor in how deadly an earthquake is, at least not for humans, Bohon said. Smaller quakes have caused many, many deaths, just by virtue of hitting populated regions and areas with buildings prone to collapse. Whereas the 9.5 magnitude earthquake in Chile killed around 2,000, a quake with an estimated magnitude of 8 is thought to have killed some 830,000 people in Shaanxi, China, in 1556. In 2005, a magnitude 7.6 earthquake killed an estimated 79,000 people in Kashmir, and in 2010, a magnitude 7.0 quake killed approximately 220,000 people in Haiti. Even the 1994 Northridge earthquake, a mere magnitude 6.7 that occurred on a fault no one had even noticed before, killed 57 people, injured thousands, and caused billions of dollars' worth of damage because it impacted Los Angeles.

"So many potential faults could have damaging earthquakes," Bohon said. "But people only think about the big one."

(Stephanie Pappas / LIVESCIENCE, January 30, 2023, <https://www.livescience.com/largest-earthquake-possible>)

Why do earthquakes happen far away from plate boundaries?

It's well known that earthquakes can rock fault-filled places like the U.S. West Coast. But why do earthquakes happen in the middle of tectonic plates?



Volunteers restock the shelves at Millers Market, which was damaged by the magnitude 5.8 earthquake that struck the Northeast U.S. on Aug. 24, 2011. This earthquake, with an epicenter in Mineral, Virginia, happened far away from tectonic plate boundaries. (Image credit: Scott Olson / Staff via Getty Images)

It's commonly assumed that earthquakes occur only near the boundaries of tectonic plates, and roughly 90% of earthquakes do happen in these areas. These boundaries include, for example, the San Andreas Fault, which runs roughly along the west coast of California, where the North American and Pacific plates meet.

But not all earthquakes occur along plate boundaries. For example, an earthquake near New Madrid, Missouri in the winter of 1811 was thousands of miles from the nearest fault, yet the magnitude 7.2 to 8.2 quake violently shook the region, triggering a series of powerful aftershocks collectively called the 1811-1812 New Madrid earthquakes.

So how was this possible? How do earthquakes happen far away from plate boundaries?

First, as a point of comparison, it's important to understand the way conventional earthquakes form along boundary lines. These areas experience more earthquakes because Earth's interior — namely, the mantle — move the planet's tectonic plates, causing them to split apart and collide. The cracks in between these plates, called faults, are fragile. So, when stress starts accumulating at these weak points, plates can break, sending a shudder through the planet. This is what we feel as earthquakes, explained Attreyee Ghosh, a geophysicist at the Centre for Earth Sciences at the Indian Institute of Science in Bangalore.

But every once in a while, a shudder can happen in the middle of a tectonic plate. Scientists call this an intraplate earthquake. Exactly why it happens remains much of a mystery, said Christine Powell, a geophysicist at the University of Memphis. She and other scientists have studied places with a high concentration of intraplate earthquakes, called intraplate seismic zones. These zones exist, for example, in parts of the central and eastern United States. After researching these areas, experts have some theories as to why temblors may occur in unexpected places.

One possible explanation is that intraplate earthquakes may be caused by old glaciers, a 2001 study proposed. Around 20,000 years ago, much of North America was covered under a giant ice sheet, and the ground was weighed down considerably. As the ice sheet melted, the ground slowly rose, so the earthquakes may be the result of this adjustment. Evi-

dence for this theory, however, is sparse. "The orientation of the earthquake axis and the glacial isostatic adjustment doesn't match," Ghosh said.

Another idea is that intraplate earthquakes are occurring around old faults on the insides of tectonic plates. For billions of years, Earth's crust has split apart and come back together, and old wounds leave scars. When forces propagate through to the plates' interior and put too much stress on these old faults, they may get reactivated, Ghosh said.

The complicated composition of Earth's crust and interior could also be a factor. Sometimes, remains of an ancient slab of rock gets stuck in the middle of a plate, causing instability, as posited by a 2007 study in *Geophysical Research Letters*. Pipes of hot fluids could add pressure, resulting in movement on the planet's surface, Powell said, who co-authored a [study](#) on this upwelling in 2016.

Hydraulic fracturing, or fracking — the act of injecting water, sand and chemicals into underground rocks to extract oil or gas — can trigger earthquakes, too. Wastewater fluid from these operations are injected into deep wells, which can seep into cracks, lubricate old faults and cause seismic activity, according to a 2013 review in *Science*. For instance, fracking was tied to a number of earthquakes in Ohio in 2015.

Scientists are trying to get a better understanding of these complexities with data from projects such as EarthScope, which use sensors to capture the dynamics underneath Earth's crust. Powell recalls that, when the project first started, some scientists didn't think the sensors would find anything that could lead to the generation of earthquakes except for within the West Coast, where the plate boundary was. But the project "really opened our eyes to what is going on inside our Earth here," said Powell, who is based in Tennessee. "It was a remarkable experiment."

It's important to understand intraplate earthquakes because they pose a considerable risk for people who live in these seismic zones. The three earthquakes in New Madrid, Missouri in 1811-1812 caused considerable destruction, even altering the course of the Mississippi River and causing it to temporarily run backward. A magnitude 5.8 quake in Virginia shook Washington, D.C. in 2011, damaging monuments and cathedrals.

"Nobody thinks about earthquakes in the central and eastern U.S.," Powell said. "We must be prepared. You have to be aware that earthquakes can happen in these places."

(Alice Sun / LIVESCIENCE, May 13, 2024, <https://www.livescience.com/planet-earth/earthquakes/why-do-earthquakes-happen-far-away-from-plate-boundaries>)

Scientists find hidden mechanism that could explain how earthquakes 'ignite'

How does creeping stress ignite a cataclysmic earthquake? A new study has answers.



Earthquake damage to a road in Turkey. A new model suggests a period of "aseismic" movement occurs before an earthquake fault ruptures. (Image credit: yasharu/Getty Images)

A period of slow, creeping movement without any shaking may be a necessary prelude to earthquakes, a new study suggests.

The research, which was on the fundamentals of how materials rupture, focused on cracks snaking through sheets of plastic in a laboratory. But the experiments revealed some basic physics of how fractures work — particularly how a buildup of friction at the interface of two bodies transforms into a sudden rupture. And those findings do apply to real-world earthquakes, said study author Jay Fineberg, a physicist at The Hebrew University of Jerusalem.

"The material composing the contacting plates will not matter," Fineberg told Live Science. "The same physical process will take place in both cases — the explosive spring of the bent plates will release in the same way."

Earthquakes form when two tectonic plates moving against one another get stuck, allowing the fault to build up stress. "The plates are increasingly stressed by the forces trying to move them, but are stuck at the brittle part of the interface that separates them," Fineberg said. This brittle section, which doesn't deform in response to stress, has a finite thickness and is what breaks during a quake.

"The fracture process doesn't happen all at once. First, a crack needs to be created," Fineberg said. When that crack reaches the borders of the brittle interface, that crack accelerates rapidly to speeds close to the speed of sound. That's what makes the earth shake.

"The question is how does nature create the crack which then becomes an earthquake?" Fineberg.

Fineberg and his colleagues investigated the question with a mix of theoretical math and laboratory experiments. They reproduce earthquake-like fractures in the lab with blocks made of a thermoplastic called polymethyl methacrylate, better known as plexiglass. The researchers clamp sheets of plexiglass together and apply a shear, or sidelong, force, similar to those found at a strike-slip fault like California's San Andreas Fault. Though the materials are different, the mechanics of the fracture are the same.

Once a crack starts, it acts like a one-dimensional line ripping through the material. Fineberg and his team had previously shown that before the crack forms, though, the material develops a kind of precursor phase called a nucleation front.

These nucleation fronts — the seeds of cracks — move through the material, but much more slowly than standard cracks. It wasn't clear how this seed could rapidly transition into a fast-moving fracture.

Fineberg and his colleagues were perplexed about how this could be. With a combination of lab experiments and theoretical calculations, they realized that they needed a math update: The nucleation fronts need to be modeled in 2D, not 1D.

Instead of thinking of a crack as a line separating broken from unbroken material, Fineberg said, imagine the crack as a patch that starts within the plane where two plexi-glass "plates" meet. The energy it takes to break new material at the border of the patch is linked with the patch's perimeter: As the perimeter grows, so does the energy it takes for new material to crack.

That means the patch moves slowly and doesn't yet cause a rapid fracture that would create the seismic waves and subsequent shaking motion associated with an earthquake. While the rapid acceleration of a standard, rapid crack, releases kinetic energy into the surrounding material, the slow movement of the initial patch doesn't release any kinetic energy into its surroundings. Therefore, its movement is known as "aseismic."

Eventually, though, the patch expands outside of the brittle zone where the two plates meet. Outside this zone, the energy it takes to break new material no longer grows with the size of the broken region, and instead of a balance of energy, there is now excess energy that needs somewhere to go.

"This extra energy now causes the explosive motion of the crack," Fineberg said.

The findings, published Jan. 8 in the journal *Nature*, show how a slow creep before a crack can transition rapidly to an earthquake, he said. Theoretically, if one could measure aseismic movement before a rupture — on a fault line, for example, or even in a mechanical object like an airplane wing — it might be possible to predict a break before it happens. This may be complicated in real-world faults, many of which undergo aseismic creep over long periods of time without releasing any earthquakes.

Nevertheless, Fineberg and his team are now trying to detect signs of the transition from aseismic to seismic in their laboratory materials.

"In the lab, we can watch this thing unfold and we can listen to the noises that it makes," Fineberg said. "So maybe we can uncover what you can't really do in a real fault, because you have no detailed information on what an earthquake is doing until it explodes."

(Stephanie Pappas / LIVESCIENCE, January 19, 2025, <https://www.livescience.com/planet-earth/earthquakes/scientists-find-hidden-mechanism-that-could-explain-how-earthquakes-ignite>)

Volcano-tectonic interaction at Santorini. The crisis of February 2025. Constraints from geodesy

Pierre Briole, Athanassios Ganas, Anna Serpetsidaki,
François Beauducel, Vassilis Sakkas, Varvara Tsironi,
Panagiotis Elias

SUMMARY

In February 2025, a strong seismic crisis occurred 35 km northeast of Santorini, an active volcano located in South Cyclades, Greece, a region of distributed extensional active faulting. The Global Navigation Satellite System (GNSS) data shows an inflation of the volcano since August 2024. We model it with a magma source of $7.7 \times 10^6 \text{ m}^3$ located 3.1 km under the north-central floor of the caldera, near the inflation centre of 2011–2012. After 2025 January 24, the seismic activity, until then localized within the caldera, shifted off-shore Santorini and increased with eight $M_w \geq 5$ events and ground motion exceeding 5 mm at Syros at 110 km from the epicentres. The GNSS data is consistent with a model of dislocation involving a south-east dipping normal fault located between the Kolumbo submarine volcano and the Anydros islet, 18 km long, 12 km wide, with a tip at 7.5 km depth and $\sim 3 \text{ m}$ of slip. The $\sim 17.5 \times 10^{18} \text{ Nm}$ corresponding seismic moment, much greater than the $\sim 1.5 \times 10^{18} \text{ Nm}$ of the recorded earthquakes, reveals the probable occurrence of a slow-slip earthquake of equivalent magnitude 6.8. This event might have been triggered by a small dyke injected from the inferred source beneath Santorini. However, the subsidence recorded at Santorini and Anydros is incompatible with the hypothesis of a large dyke injected beneath Kolumbo–Anydros.

1. INTRODUCTION

Santorini is an active stratovolcano located in the South Cyclades, Greece. It developed inside a NE–SW oriented graben $\sim 80 \text{ km}$ long located between the islands of Santorini, Anafi, Amorgos and Astypalaia (Fig. 1), opening at a rate of $\sim 4.5 \text{ mm yr}^{-1}$ through a combination of normal and dextral movement along faults (Briole *et al.* 2021). The latest major earthquake to occur on those faults is the $M > 7$ Amorgos earthquake of 1956 (Okal *et al.* 2009).

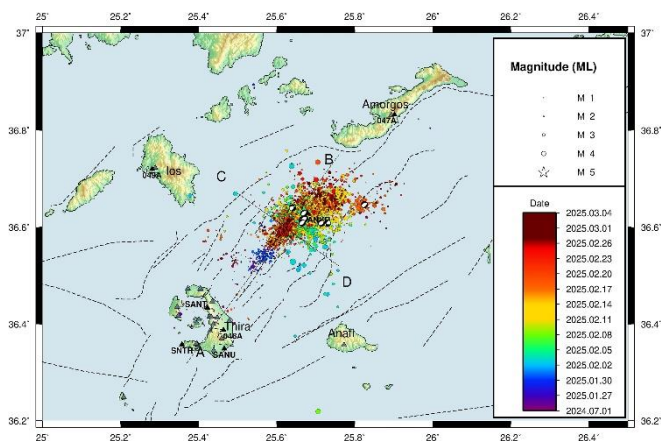


Figure 1. Relocated seismicity from 2024 July 1 to 2025 March 4 and focal mechanisms (from the National Observatory of Athens catalogue <https://bbnet.gein.noa.gr/HL/>) of the eight events of $M_w \geq 5$. The colours indicate the dates of the events. Black and grey triangles indicate GNSS and seismological stations, respectively. Dashed lines indicate active faults from the NOA faults database ([10.5281/zenodo.13168947](https://zenodo.org/record/13168947)).

On 2024 September 20, a small seismic crisis began beneath Santorini, continuing at low rate within the caldera until 2025 January 24, then shifting north-eastwards between the Ko-

lumbo submarine active volcano (Chrapkiewicz *et al.* 2022) and the Anydros islet, near the southeastern termination of the 1956 earthquake (Leclerc *et al.* 2024), where most of the earthquakes occurred (Fig. 1; Figs S1 and S2, Supporting Information). The crisis culminated between 2 and 18 February with eight $M_w \geq 5$ events.

Here, we analyse the data from twelve Global Navigation Satellite System (GNSS) stations (Fig. 1; Table S1, Supporting Information): four located on Santorini, including two operating in 2011–2012 (Parks *et al.* 2012) and used in previous work (e.g. Lagios *et al.* 2013), seven on neighbouring islands, and one installed on Anydros on 2025 February 12. We present below the data, methodology and conclusions, and more information is available as supplementary material, which list is provided at the end of this letter.

2. INFLATION OF SANTORINI SINCE SUMMER 2024

Fig. 2 and Fig. S3 (Supporting Information) show the coordinates time-series calculated using the Canadian Spatial Reference System Precise Point Positioning (CSRS-PPP) software. The stations onshore Santorini show a slow inflation beginning during summer 2024, then a phase of rapid deformation from around 27 January to 24 February, and a third phase under way at the time of writing this letter.

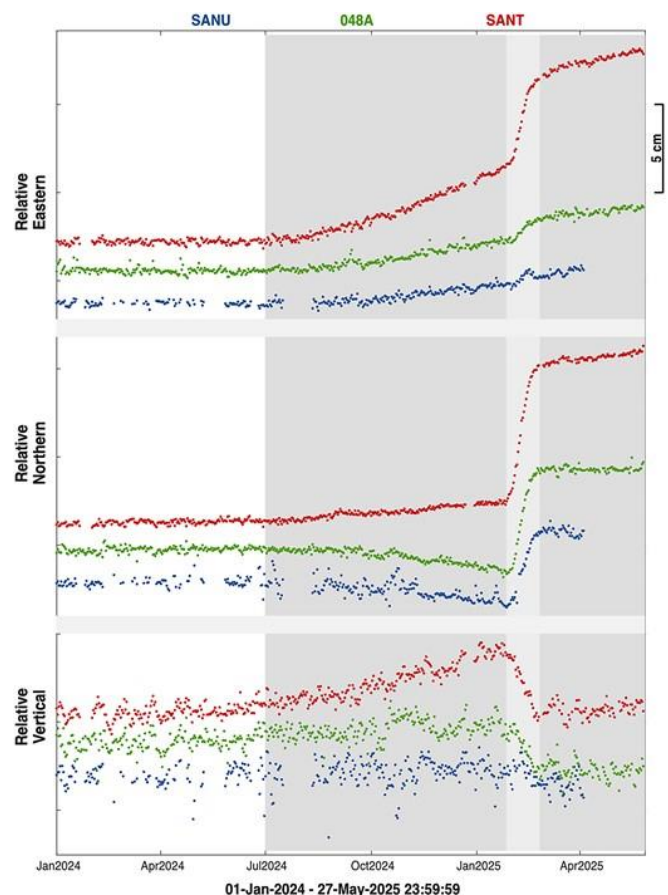


Figure 2. Time-series (East, North, Up) of daily coordinates of the GNSS stations 048A, SANT and SNTR from 2024 January 1 to 2025 May 26 corrected for the tectonic trend (calculated with data before the unrest). Grey areas indicate phase 1 (dark grey), phase 2 (light grey) and phase 3 (dark grey), respectively. See Fig. S3 (Supporting Information) for the other stations.

The first phase (Fig. S4 and Table S2, Supporting Information) is reminiscent of the 2011–2012 unrest of Santorini (Newman *et al.* 2012). We model it with an isotropic point source in a homogeneous elastic half-space, using the Mogi (1958) formalism and Williams & Wadge (1998) for the topo-

graphic corrections. Eqs (1) and (2) define the forward problem for a source at depth f with volume change ΔV , allowing us to compute the radial (U_r) and vertical (U_z) displacements at a given point located at a horizontal radial distance r from the source, and an altitude h above sea level. The Poisson's ratio, ν , is set to 0.25 for an isotropic medium. For the selected observation time window, we determine the linear displacement trend for each component and station, along with the associated standard deviation.

$$U_r = \frac{(1-\nu)\Delta V}{\pi} \frac{r}{\left((f+h)^2 + r^2\right)^{3/2}} \tag{1}$$

$$U_z = \frac{(1-\nu)\Delta V}{\pi} \frac{f+h}{\left((f+h)^2 + r^2\right)^{3/2}} \tag{2}$$

The inverse problem is formulated within a Bayesian framework, where the likelihood function, given by eq. (3), incorporates an L1-norm misfit based on the data and their uncertainties.

$$P(d|m) = P_0 \exp \left\{ - \sum \frac{d_{\text{obs}}^i - d_{\text{cal}}^i}{\sigma^i} \right\} \tag{3}$$

The model space is explored using a grid search method. The optimal model corresponds to the maximum likelihood estimate. The time-series are analysed and plotted in the WebObs environment (Beauducel *et al.* 2020). Fig. 3 and Fig. S5 (Supporting Information) present the observed and modelled displacements and Table S3 (Supporting Information) the parameters of the point source model for phase 1 and the other phases. The modelled source is located 1 km east of Thirasia island at 3.1 ± 0.3 km depth with a volume change of $7.7 \pm 0.6 \times 10^6$ m³.

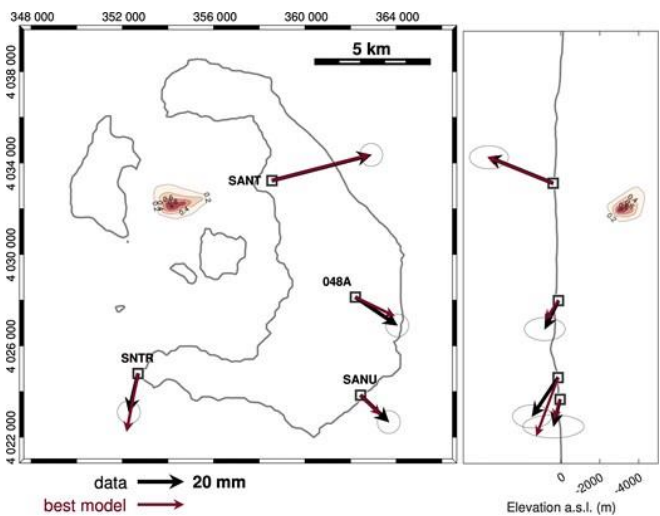


Figure 3. Map of Santorini showing GNSS displacements and model for phase 1. Horizontal view (left, in UTM35) and North–South vertical profile (right, in m). Displacements and uncertainties (black vectors with large tips and uncertainty ellipses), and modelled displacements (red vectors with small tips). Probability of an isotropic point source location expressed as maximum normalized likelihood function (red shaded contours).

3. DEFORMATION ASSOCIATED WITH THE SEISMIC CRISIS OF FEBRUARY 2025

The coordinate time series show strong variations between around 2025 January 27 and February 24 especially at Santorini (Fig. S6, Supporting Information), with maximum intensity between 2 and 18 February, and progressive increase

and decrease towards both ends of the period. The Anydros station only captures the second half of the crisis with displacements reaching 7 mm d^{−1} vertically and westwards. The shape of the deformation at all stations fits well with a hyperbolic tangent of the form of eq. (4), with A amplitude, t_0 central time and T decay time.

$$D = A \tanh \left(- \left(\frac{t - t_0}{2T} \right) \right) \tag{4}$$

Table S4 (Supporting Information) indicates the best fitting values of those parameters for each station. The average values of t_0 and T are 10/2/2025 and 3.5 d with small differences between stations. Fig. S7 (Supporting Information) shows the existence of a strong temporal correlation between the energy released seismically and the motion at SANT.

A planar dislocation model provides a good fit for both the amplitude and orientation of the motions. The fit is robust due to the good azimuthal coverage. Table S5 (Supporting Information) lists the parameters of our best models for the two candidate antithetic planes and Table S6 (Supporting Information) the modelled displacements. Both planes give fairly similar fits, with, in both cases, a 18 km long fault located between the Kolumbo volcano and the north–west edge of Anydros with a tip at 7.5 km depth. The angular parameters of the model are consistent with the focal mechanisms of the main earthquakes (Fig. 1) calculated by various agencies and distributed by the Euro-Mediterranean Seismological Centre (<https://www.emsc-csem.org/>). The modelled seismic moment is 17.5×10^{18} Nm which corresponds approximately to a $M_w = 6.8$ earthquake.

Fig. 4 shows the location of the south–east dipping fault model and the observed and calculated horizontal displacements.

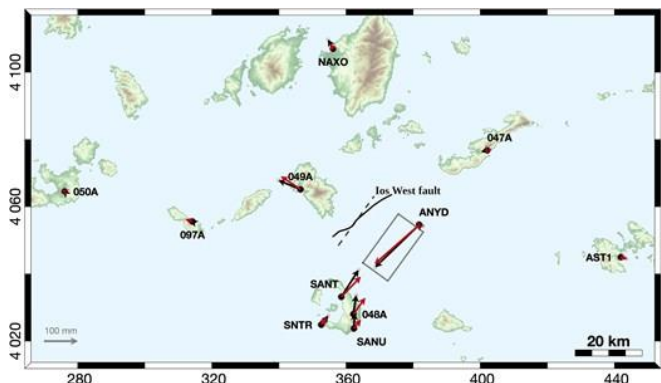


Figure 4. Observations (black vectors with uncertainty ellipses) and model (red vectors) for phase 2 (map scale in km; UTM35). The numerical values are given in Tables S4 and S6 (Supporting Information). The grey rectangle shows the projection of the modelled fault (parameters in Table S5, Supporting Information) at the surface, and the dashed line the intersection of the modelled fault plane with the surface. The thick black line indicates the Ios West fault trace.

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(λήψη αρχείου [PDF](#))

Geophysical Journal International, Volume 242, Issue 3, September 2025, ggaf262, <https://doi.org/10.1093/gji/ggaf262>

Anatomy of the Right-Lateral Strike-Slip Cephalonia Fault to the Western Hellenic Arc Frontal Thrust

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Abstract

The region offshore the Ionian Islands (Kefalonia or Cephalonia, Lefkada, Zakynthos, and Ithaca), western Greece, is characterized by very high seismogenic and tsunamigenic potential. Despite numerous studies, many questions remain regarding the structures and kinematics in this area. Here, the right-lateral Cephalonia Transform Fault divides the Hellenic Arc from the Albanian compressional system. Historically, this area has been hit by several destructive earthquakes, such as the 1953 sequence (Mw >6) that destroyed Cephalonia. To improve the understanding of shallow sediment deformation, fault geometry and potential hazard, we carried out two oceanographic cruises (May 2022 and June 2023) during which a significant multiscale and multidisciplinary geophysical and geological data set has been collected. These data allowed us to define the deformation style of sediments at the intersection between the Cephalonia Fault and the thrust fronts of the Hellenic System, and the geometry of the Cephalonia Fault. The Fault, south of Cephalonia, opens in a 25 km-wide fan composed of elongated, sigmoidal, positive flower structures - features indicative of transpressive tectonics regime. In the area to east of Cephalonia we mapped for the first time a series of seaward-verging anticlines with strike-slip component and uplifted blocks. While to southeast of Cephalonia the deformation regime changes, becoming dominated by extensional and large landslides, affecting mainly superficial sediments. These new data allow us to map the transition between the transcurrent and compressional domains, unveiling the geometry of the faults laying the foundation for future studies on slip rates and seismic hazard.

Plain Language Summary

In this work we present the first results of the morphotectonic study carried out in the areas surrounding the Ionian Islands, North-Western Greece. Thanks to the geophysical data we collected on board of two research vessels, the R/V G. Dallaporta and the R/V L. Bassi, we were able to analyze and define the geometry of the main active faults responsible for the numerous earthquakes and tsunamis that hit the islands. For the first time the real trend of the Cephalonia Transform Fault (CTF) is shown together with its role played in the kinematics of the area, the deformations of the superficial sediments in the shelf between the islands of Zakynthos and Cephalonia, and the presence of a system of extensional faults south of Zakynthos probably controlled by gravitational processes. The results of this work are of extreme importance and useful for the assessment of natural risks of the emerged areas, which up to now have been carried out only on faults inferred from seismicity.

Key Points

- The intricate horsetail morphology of the southern Cephalonia Transform fault is more complex than previously interpreted
- Highly deformed shallow sediments and numerous slides and slumps are interpreted at the northwestern end of the Hellenic System
- The revised geometry of the Cephalonia Fault enables a more accurate risk assessment to which the Ionian Islands are exposed

1 Introduction

Strike-slip faults are abundant in both compressional and extensional systems, and a significant component of strike-slip movement is inferred to be present in all orogenic belts (Woodcock, 1986). In a compressional system, such as the Hellenic Arc, characterized mainly by reverse and thrust faults (Polonia et al., 2002; Reston et al., 2002), strike-slip faults play a crucial role in accommodating differential velocity migration of crustal blocks belonging to the deformation complex. Similar mechanisms have been observed in other accretionary complex such as the Calabrian Arc (Van Dijk et al., 2000), the Himalayan belt (Duvall et al., 2020), or the Kazerun Fault System in the Zagros region (Iran; Tavakoli et al., 2008).

Based on the description of Apotria et al. (1992), strike-slip faults are defined as lateral ramps (Figure 1a) when the fault plane is parallel to the main transport direction. In addition to the role of strike-slip faults as lateral ramps, a distinct category of faults can be found within subduction system, known as Subduction-Transform Edge Propagator (STEP) faults. STEP fault form during the fragmentation and sinking of part of subducting slab, capable of generating a long scissor fault in the subducting plate (Figure 1b; Govers & Wortel, 2005). In the section where the slab is disconnected from the lithosphere plate, the fault section is defined as tear fault (Figure 1b), in this case a tectonic window is created capable of allowing molten magma to rise from the mantle beneath the lithosphere. STEP faults have been previously identified at the edges of arc systems (Govers & Wortel, 2005) in the Mediterranean region (Berk Biryol et al., 2011; de Lis Mancilla et al., 2018; Loreto et al., 2021). Additionally, Özbakir et al. (2020) hypothesized that the Hellenic Arc could also be affected by the presence of a STEP fault, suggesting their potential role in the complex tectonic interactions observed in this region.

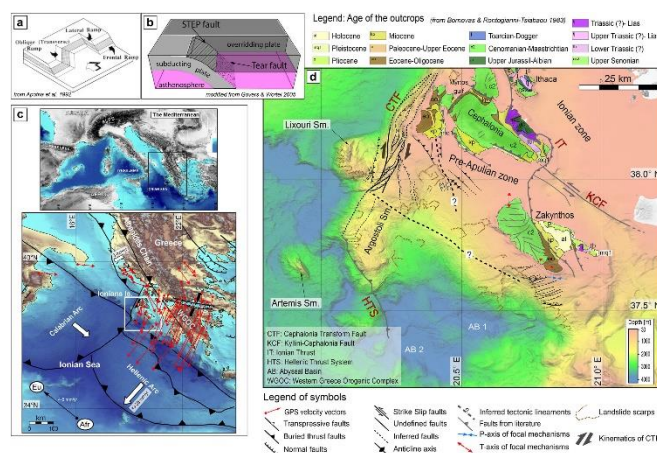


Figure 1 (a) Lateral ramp model from Apotria et al. (1992). (b) Tear and Subduction-Transform Edge Propagator fault model modified after Govers and Wortel (2005). (c) Simplified tectonic map of Greece and the Ionian Sea area, featuring the location of the study area (white box). Bathymetric data were downloaded from the EMODnet portal (<https://emodnet.ec.europa.eu/en/bathymetry>) and gridded using GMT software (Wessel et al., 2019). The main structural elements have been adapted from an online Tectonic Map (Woudloper - Own work, 2009, CC BY-SA 1.0) and by Loreto et al. (2021). GPS velocity vectors are sourced from the Unavco website (<https://www.unavco.org/>). (d) Morpho-bathymetric map of the study area obtained by merging data from the EMODnet portal and new data acquired during the POSEIDON project (Ranero, Nomikou, & Loreto, 2023; Ranero, Nomikou, Loreto, Merino Pérez, et al., 2023). On land, the outcropping units have been digitized using the Geological Map of Greece (Bornovas, & Rontogianni-Tsiabaou, 1983). Refer to the original map for an extensive description

of the units. Major faults and tectonic features (gray lines) have been included, modified from the Geological Map of Greece, by Bourli et al. (2019) and Haddad et al. (2020) along with references therein. Black lines refer to the tectonic structures derived from the interpretation of our seismic profiles. The lateral extension of faults has been supported by high-resolution swath bathymetry. AB1 and AB2 refer to deep basins (4,220 and 4,280 m depth, respectively), which likely function as collectors for landslide bodies and sediments coming from the margin and the surrounding emerged areas. T- (red thin arrows) and P-Axes (blue thin arrows) of focal mechanisms are adapted from Kassaras et al. (2016). Dashed lines with (?) indicate tectonic elements inferred from bathymetry. Map projection: geographic. Datum: WGS84.

The area between Cephalonia Transform Fault (CTF) and Zakynthos exhibits (Figure 1) a complex tectonic setting that might encompass all the fault types above described: strike-slip, reverse and thrust faults. The right-lateral strike-slip CTF behaves as a critical tectonic boundary and connects the Hellenic Arc to the south, which moves southwestward at 33–35 mm/yr (Reilinger et al., 2006; Figure 1c), with the external Albanides migrating to the north at about 3 mm/yr (Figure 1c). The CTF system, whether interpreted as a lateral ramp or a STEP fault (see Özbakır et al., 2020), is a more than 100 km-long, NNE-SSW-trending right-lateral fault that defines the western boundary of Cephalonia and Lefkada Islands (Figures 1a and 1b). It is likely composed of multiple fault segments rather than a single continuous structure, as suggested by the distribution of shallow earthquake ruptures (Ganas et al., 2016). The CTF system is dominated by strike-slip motion with a compressive component and is represented by a ~10 km deep discontinuity (Tsironi et al., 2024) with a SE dip of about 65°. Based on the analysis of focal mechanisms, Kiratzi and Louvari (2003) suggested that the strike-slip movements are distributed across a broad shear zone, about 100 km-wide, extending from Cephalonia to the Peloponnese. Around Zakynthos Island the stress field is dominated by compression with a minor transcurrent component, as inferred by seismic (Wardell et al., 2014), seismological and morphological data (Ganas et al., 2020; Haddad et al., 2020).

Pockmark morphologies have also been detected within this tectonized domain. Pockmarks are crater-like seafloor depressions of various sizes and depths, typically found in soft, fine-grained sediments along continental margins, often attributed to episodic, perhaps catastrophic, fluid expulsion (i.e., shallow gas from overpressured gas pockets or continuous fluid discharge; Hovland & Judd, 1988). These fluid-escape features are common on the seafloor of the Mediterranean Sea (Loreto et al., 2019; Mascle et al., 2014; Miramontes et al., 2023 and reference therein) and they have also been described also in the Ionian and Aegean Seas (Hasiotis et al., 1996; Papatheodorou et al., 1993; Soters, 1999). In the region close to our study area, five depressions ranging from 180 to 580 m-wide and up to 60 m-deep, organized in a linear trend, have been reported offshore between Kyllini Peninsula and Zakynthos Island (Hasiotis et al., 2002).

The geometry of CTF has been inferred primarily from seismological data and seafloor morphology (see map in Ganas et al., 2020). Although the CTF represents the greatest potential earthquake hazard in the central Mediterranean, is still poorly studied with regard to the geometry of active tectonic structures and the kinematics associated with them. Despite previous geophysical surveys in the area, the deformation of sediments and the overall subsurface geometry of the CTF remained poorly understood (Karakitsios, 2013; Poulos et al., 1999). The analysis of new geophysical data sets (Loreto et al., 2022; Ranero, Nomikou, Loreto, Merino Pérez, et al., 2023) helps bridge this knowledge gap, facilitating future seismotectonic studies.

This work aims to understand how shallow structures accommodate the stress field variations (from transcurrent to compressive) in the area between Cephalonia and Zakynthos, examining particularly the interactions between the different types of faults observed in this area and the corresponding sediment deformation. Furthermore, fluid escape structures detected in the continental shelf (Pre-Apulia Domain) between Cephalonia and Zakynthos might provide information on the interaction between fluid circulation and tectonics.

2 Geological and Seismotectonic Setting

The Ionian Islands (Figure 1c) are part of the western Greece orogenic complex, formed by the convergence between African and Eurasian plates, which led to the subduction of Tethyan lithosphere, beneath the Aegean continental domain. The orogenic complex is composed by the Pre-Apulia and Ionian zones. It is bounded to the northwest by the CTF system and to the west by the frontal thrusts and the inner Ionian Thrust (Figures 1c and 1d). The CTF system is a dextral strike-slip fault system (Louvari et al., 1999; Scordilis et al., 1985), as also evidenced by focal mechanisms analyses (Kassaras et al., 2016), which links the Hellenic subduction system to the south and the Albanian continental collision to the north (McKenzie, 1978; Sachpazi et al., 2000).

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(<https://doi.org/10.1029/2024TC008765>)

Algorithms Ahead, Understanding Behind—Time to Close Geotech's Skills Gap

Dr. Reginald Hammah, Chief Scientific Officer



Advanced algorithms now drive geotechnical analysis, but if practitioners lack the theoretical foundation needed to interpret and challenge software outputs, analysis quality may decline just as tools get smarter.

The geotechnical engineering profession is at a critical juncture. While software is becoming sophisticated at a rapid rate, geotechnical education is not changing as fast. Software tools increasingly incorporate advanced algorithms and theoretical frameworks, while geotechnical curricula at higher educational institutions advance at a much slower pace. As a result, a troubling gap has emerged between software sophistication and users' theoretical foundations. This disconnect threatens the quality of geotechnical engineering practice.

The User-Friendly Paradox

Rocscience has witnessed firsthand how the pursuit of user-friendly software has created an unexpected challenge. Our commitment to developing intuitive, accessible tools has been tremendously successful – engineers can now perform complex analyses with a few clicks that would not have been possible, or would have taken weeks of manual calculation, just decades ago. However, this accessibility has inadvertently contributed to what might be called the "user-friendly paradox": the easier software becomes to use, the greater the risk of users treating it as a black box.

Critical state mechanics is one instance. This robust framework, initially developed at Cambridge University about 70 years ago, provides beneficial insight into understanding the contractive and dilative behaviours of tailings and weak, granular soils. The state parameter, for example, helps geotechnical engineers predict how these materials respond to loading. Yet, despite its fundamental importance, many practitioners use software implementing critical state principles without understanding the underlying theory.

This discussion is not merely academic. Research shows that the rapid advancement of geotechnical programs has widened the gap between software sophistication and practitioners' capabilities [1]. As an educator once observed, "It is often deplorable to see an engineer building a sophisticated numerical model straight away, forgetting to think things through beforehand" [2]. The consequences are threefold:

- Inefficient use of (both basic and advanced) software tools.
- Potential errors in analysis and design.
- Missed opportunities for developing innovative solutions.

The Historical Perspective: Technology Never Goes Backward

Some argue that the solution lies in making software less user-friendly to force engineers to engage more deeply with the underlying theory. In our opinion, this approach fundamentally misaligns with the nature of technological progress. Throughout human history, technological advancement has been in one direction—forward. Societies have never willingly reversed their technological capabilities.

Technological change has accelerated dramatically in recent decades. It took our ancestors 2.4 million years to control fire, but only 66 years to go from the first flight to landing on the moon [3]. And this acceleration shows no signs of slowing down. Artificial intelligence and advanced computing are continuing to revolutionize every aspect of our lives [4]. Asking the engineering profession to step backward technologically is not just unrealistic; it is impossible.

The University Challenge

The logical response that most readily comes to mind is to strengthen geotechnical engineering education at the university level. However, research shows that universities are struggling to keep pace with industry trends. Current undergraduate curricula often provide inadequate geotechnical training and leave graduates unprepared for the complexities of the real world [1]. Specialized postgraduate programs are not too common, which further limits the development of geotechnical expertise [1].

Moreover, universities face another fundamental challenge: they need to balance foundational knowledge with rapidly evolving technology. As a software engineering thesis notes, "The field of software engineering is constantly changing and evolving. New skills are constantly needed... Education cannot keep up with the constantly changing workplace" [5]. Geotechnical engineering is no different, and the gap between academic theory and practical application continues to widen [6].

Enhancing learning with technologies such as LLMs offers some promise. Educators are implementing computer-based simulations, virtual laboratories, and advanced computational tools [7]. However, these initiatives often suffer from resource constraints, a lack of faculty experience with new technologies, and difficulties in aligning new knowledge with existing curricula [7].

Learning from History: The Master-Apprentice Tradition

The solution to our current predicament possibly lies not in the future, but in the past. History's most outstanding teachers and innovators understood that true mastery comes through mentorship and hands-on experience. Leonardo da Vinci, perhaps the ultimate Renaissance engineer, learned his craft in a traditional apprenticeship system under Andrea del Verrocchio [8][9].

From age 14, Leonardo spent seven years in Verrocchio's workshop, progressing from basic tasks like grinding pigments and maintaining tools to eventually creating masterpieces that surpassed his master's work [8][10]. For centuries, this model of progression from apprentice to journeyman to master formed the basis of knowledge transfer [11][12].

The medieval guild system provides another relevant example. Guilds maintained strict quality standards through a hierarchical training system in which apprentices learned not just techniques, but the reasoning behind them [11]. Masters had to train apprentices properly, and the guild system ensured that knowledge was passed down efficiently from one generation to the next [13].

Similarly, great teachers throughout history – from Aristotle

training Alexander the Great to Newton's role as a professor at Cambridge – understood that true education requires personal mentorship and hands-on guidance [14]. In ancient Egypt, artisan skills were transmitted through familial workshops where apprentices shadowed masters during real projects, learning through observation and repetition [15].

The Modern Solution: Dual Pathways

In today's world, the answer may lie in recognizing that we need both technological advancement and enriched human development. Modern professional engineering registration systems already acknowledge this principle. Countries worldwide require engineers to demonstrate not just academic knowledge, but also practical experience under supervision (typically four years of mentored practice) [16].

This arrangement recognizes that becoming a competent engineer requires both formal education and on-the-job training under experienced professionals. The UK's Engineering Council describes this process as assessing both knowledge and competence, ensuring that engineers can apply their learning in the real world [16].

Corporate Training: The Missing Link

Rocscience believes that one of the most promising solutions lies in corporate training programs that bridge the gap between university education and practical application. We, and companies like GeoTraining in Canada, have successfully developed comprehensive training programs specifically for geotechnical professionals, offering both online and in-person instruction [17]. These programs have provided immediate payback through the enhanced quality of work and improved professional capabilities [17]. A Rocscience expert has even floated the idea of establishing a formal geotechnical academy to train practitioners in the use of software.

Modern technology offers opportunities for effective corporate training. Blended learning approaches that combine instruction with hands-on practice have proven particularly useful for technical training [18][19].

Engineering Education Australia has pioneered the integration of online and face-to-face training. It recognizes that "many people seek continuous learning and the ability to learn new skills when they need them, preferably in short hits" [20]. Their approach complements face-to-face training by enriching it through online components [20].

The Call to Action

Despite the significant roles of universities and software developers, the responsibility for addressing the skills gap cannot rest solely with them. A concerted effort from the entire geotechnical engineering community is required. We are calling for the following actions:

For Companies and Consultants:

- Implement training programs that go beyond software tutorials to include the underlying theory.
- Establish mentorship programs that pair experienced engineers with junior staff.
- Invest in continuing education for all staff levels, not just new graduates.
- Create formal pathways for knowledge transfer and skills development.

For Experienced Professionals:

- Embrace your role as mentors and teachers.
- Share practical knowledge through formal and informal

training.

- Contribute to industry training programs and professional development initiatives.
- Take active responsibility for developing the next generation of geotechnical engineers.

For Junior Engineers:

- Cultivate intellectual curiosity beyond just learning software usage (simple clicks of buttons).
- Seek mentorship opportunities and actively engage with experienced professionals.
- Pursue formal and informal learning opportunities to understand the theory behind the tools.
- Ask questions and challenge assumptions rather than accepting software outputs uncritically.

For Industry Organizations:

- Support the development of comprehensive training programs.
- Recognize and reward companies that invest in employee development.
- Create industry-wide standards for professional competency that go beyond software proficiency.
- Foster collaboration between software developers, educators, and practitioners.

The Future of Geotechnical Engineering

The geotechnical engineering profession has always relied heavily on empiricism and experience [21]. This fundamental character means that no amount of sophisticated software can replace the need for experienced judgment and deep understanding of soil and rock behaviour. The geotechnical legend Dr. Ralph Peck once stated, "No theory can be considered satisfactory until it has been adequately checked by actual observations" [21].

The path forward requires that we embrace both technological advancement and human development. We must continue to develop user-friendly software with relevant, sophisticated advances. Simultaneously, we must ensure that users understand the principles underlying these tools. This path is not about moving backward technologically – it is about moving forward responsibly.

The stakes are high. Geotechnical failures can result in catastrophic consequences. The profession cannot afford to have sophisticated tools in the hands of practitioners who do not understand their limitations and assumptions.

As we face increasingly complex challenges in mining and civil engineering, our greatest asset will be a well-trained, highly skilled workforce proficient in both the principles of geotechnical engineering and the effective use of software tools. The time for action is now. The future of our profession depends on how we respond to this challenge.

- *The author acknowledges that this article may be controversial. However, the current trajectory of increasing software sophistication without corresponding increases in user competency fundamentally threatens the quality of geotechnical engineering practice. Only through honest acknowledgment of this challenge can we begin to address the issue effectively.*

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- (ROCSCIENCE, ROCNEWS, JUKY 2025, Jul 21, 2025, <https://www.rocscience.com/learning/algorithms-ahead-understanding-behind-time-to-close-geotechs-skills-gap>)

10 Amazing Geological Folds You Should See

[Folds](#) are some of the most common geological phenomena you see in the world – a geological fold occurs when planar (usually sedimentary) layers are curved and/or bent, permanently deformed due to outside pressure. Folds' sizes can vary from microscopic to mountain sized.

The folds of the rocks at position Apoplystra



Photo credit: © by G. Shuttleworth.

The folds of the rocks at position Apoplystra, between the village of St. Paul and the sandhills (Greece) are remarkably colorful.

Slump Folds at Antipaxos Island in Greece



Photo credit: © Maki Doukouros

Slump Folds, slump-overturned folds, are a type of fold that forms in unconsolidated sediments when they are subjected to gravity-driven mass movements. Slump folds are typically found in submarine slopes and other areas where unconsolidated sediments are deposited in steeply dipping layers.

Oligocene carbonate sediments exposed on the Ionian Island of Antipaxos, Greece.

The Sideling Hill, Maryland, USA

A syncline is a fold in which the layers of rock are curved downward, with the youngest rocks at the center.

The Sideling Hill rock cut is famous for its impressive geologic display, exposing layers of sedimentary rock folded in a broad syncline.



Photo credit: Schnabel Engineering, Inc.

Folded Carbonates flysch, France



Photo credit: Thibault Cavailles

Chevron folds are a type of fold that forms when layers of rock are subjected to intense compressional forces. They are characterized by their V-shaped cross-section and their straight limbs. Chevron folds are typically found in areas of active tectonics, such as mountain belts and convergent plate boundaries.

Folded Carbonates flysch in Basque Country, France.

The Chevron folds, North Cornwall, United Kingdom



Photo credit: Nik on Flickr

Chevron folds are a structural feature characterized by repeated well behaved folded beds with straight limbs and sharp hinges. Well developed, these folds develop repeated

set of v-shaped beds. They develop in response to regional or local compressive stress. Inter-limb angles are generally 60 degrees or less.

Mount Head, Canada



Photo credit: ZME Science

Located in the Highwood River Valleysouth of Head Creek and north of Wileman Creek. Highwood Range, Kananaskis Park, Alberta

Richat Structure, Sahara desert of Mauritania

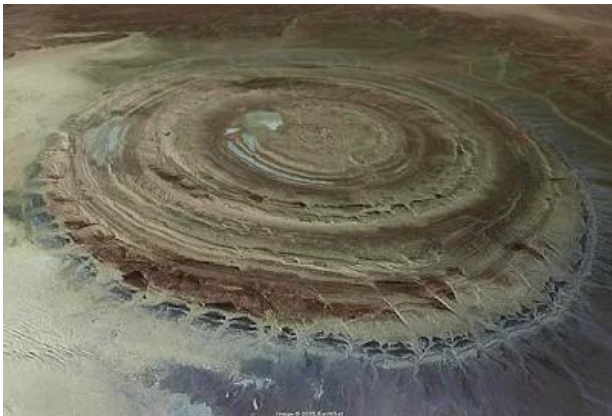
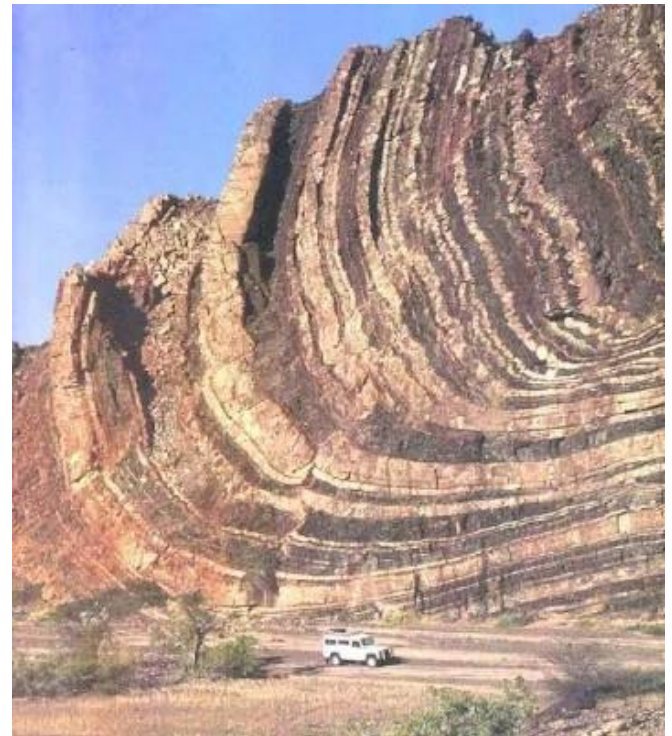


Photo credit: Viva NOLA on Flickr

The Richat Structure in the Sahara Desert of Mauritania. Long considered to be an impact structure, it is now believed by most to be a structural dome. The Richat Structure is a deeply eroded, slightly elliptical dome with a diameter of 40 km. The sedimentary rock exposed in this dome ranges in age from Late Proterozoic within the center of the dome to Ordovician sandstone around its edges

The Folded layers in valley in Namibia



Geologic Folds in the Lower Ugab valley in Namibia.

Folded banded iron formation, Minnesota



Photo Credit: Callan Bentley/American Geophysical Union

Folded banded iron formation (BIF) is a distinctive type of sedimentary rock composed of alternating layers of iron oxides and iron-poor chert. These layers are often folded and contorted due to the intense tectonic forces that have shaped the Earth's crust.

Folded banded iron formation with shale interbeds, exposed in a pavement near Soudan, Minnesota.

Folded beds at Eilat mountains, Israel



Photo Credit: Iyad M. Swaed

Some seriously folded and faulted rocks at Eilat mountains, southern Israel.

(GeologyIn, <https://www.geologyin.com/2016/09/10-amazing-geological-folds-you-should.html>)

Harpea's Cave



(https://www.reddit.com/r/pics/comments/1ccrx0o/harpea_cave_located_on_the_french_side_on_the/)

Harpea's Cave (from the Basque "the place under the rock" is a cave located in Estérençuby, in the Navarre commune, a few meters from the Franco-Spanish border.

It is an example of an anticline, a convex fold of strata, the centre of which is occupied by the oldest geological layers.

(https://en.wikipedia.org/wiki/Harpea%27s_Cave)

Chevron fold formation mechanisms

Chevron fold formation mechanisms mainly involve compressive forces causing buckling of layered rocks with contrasting physical properties.

Chevron folds form primarily by flexural slip along bedding planes, where layers slide past each other with minimal internal deformation.

This slip allows the sharp hinges and straight limbs characteristic of chevron folds to develop without significant thickening of the layers.

The folding occurs by layer-parallel shortening or buckling in competent layers surrounded by less competent, more ductile layers or matrix, creating angular hinges and planar limbs.

In the hinge zone, deformation may include minor faulting, pressure solution, and localized grain movements to accommodate the folding strain.

These processes help accommodate strain during the transition from gently folded to sharply angled chevron folds.

The development of chevron folds is favored by rocks with strong competence contrast between beds (e.g., sandstone vs shale) and generally occurs during a single deformation event with progressive fold tightening.

Additional deformation features such as fibrous veins or fractures can form contemporaneously with folding but do not primarily drive fold shape.

The geometric evolution of chevron folds can include dilation at the hinge zones and flow of less competent layers into the hinge areas, further assisting in the fold shape's angularity.

(Resource Geologist TSAYO BOGNING GAIUS MARCIAL • <https://www.linkedin.com/feed/update/urn:li:activity:7366768859720151042>)

How sustainable was ancient Roman concrete?

Daniela M. Martinez, Sabbie A. Miller, Paulo J.M. Monteiro

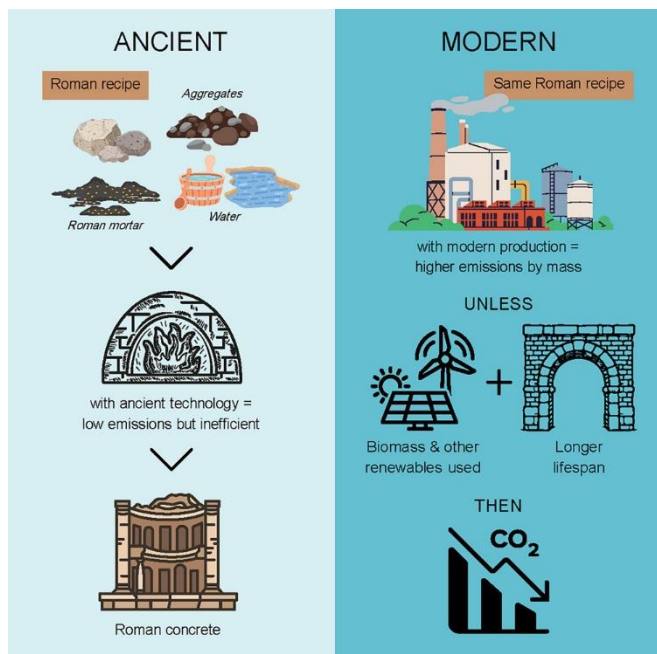
Highlights

- Roman concrete offers insights for future low-carbon construction materials
- Romans' use of biomass suggests strategies to decarbonize modern cement
- Considering longevity and low-carbon fuels reduces the impacts of Roman concretes
- Longer lasting concrete could significantly reduce cement-related emissions

Summary

The remarkable longevity of Roman concrete has long fascinated researchers and hinted at its potential as a sustainable alternative to modern concrete formulations. However, rigorous assessment of its environmental impact—particularly in the context of modern production technologies—has been lacking. Here, we follow the life cycle assessment methodology to systematically quantify the impacts of various Roman concrete formulations relative to modern technologies. Our findings reveal nuanced insights into the sustainability prospects of Roman concrete, shedding light on its greenhouse gas emissions, energy demand, particulate matter emissions, and water utilization. Contrary to initial expectations, adopting Roman formulations with current technology may not yield substantial reductions in emissions or energy demand unless used in conjunction with other decarbonization advancements. Nonetheless, our findings underscore the importance of Roman practices, particularly the reliance on biomass as a fuel source, which presents opportunities for decarbonizing modern cement production.

Graphical abstract



Introduction

Concrete is the most used manufactured material worldwide. This substantial consumption is the primary driver for the large environmental burden of the concrete industry (approximately 8% of total global anthropogenic CO₂ emissions,¹ approximately 3% of the total global energy demand,² and approximately 30 Gt of material produced annually³).

Evaluation of greenhouse gas (GHG) emissions, energy demand, and other environmental impacts has been performed extensively for modern concrete production at both regional^{1,4,5,6,7} and global scales.^{2,8,9,10} Other impacts, such as the generation of air pollutants, have also been estimated for concrete production (with the industry leading to approximately 8% of global nitrogen oxide emissions, 5% of global sulfur oxide emissions, and 5% of global particulate matter [PM] emissions smaller than 10 μm³). While these values have notable uncertainty due to data availability limitations, the environmental impacts from the cement and concrete industries have garnered recent attention, and emissions mitigation mechanisms are being pursued in many regions. These studies are based on modern concrete production with currently commercially available cement-based materials.

Roman concrete and mortar formulations have demonstrably withstood the test of time.^{11,12} While sharing one main raw material (i.e., a source of calcite mostly from limestone rocks), concretes made with modern Portland cement and ancient Roman cement have differences in chemistry and production. Modern concrete is mostly composed of Portland cement, which is obtained when limestone and clays are heated up to approximately 1,450°C to form clinker (Portland cement's principal ingredient). To control early cement hydration, 3%–5% of gypsum by mass is finely ground with clinker, and the final product is Portland cement. When Portland cement is combined with water and aggregates, it forms most of the formulations of modern concrete mixtures.

Thousands of years ago, Roman concrete formulations combined mortar with pyroclastic rocks.¹² Roman mortars utilized lime-based binders (hydrated lime or quicklime), water (commonly seawater for marine structures), and pulverized volcanic rocks known as pozzolans (*pozzolana* in Italian).¹³ This term, originating from Pozzuoli, Italy, nowadays encompasses a wider range of materials. A pozzolan is considered a material rich in poorly crystallized silica or aluminosilicates that, when combined with lime (i.e., a source of calcium hydroxide or CH) under moist, ambient conditions, reacts to form cementitious components like calcium-silicate-hydrates (C-S-H) or calcium-aluminum-silicate-hydrates (C-A-S-H).

Ancient Roman builders developed durable, low-carbon construction materials by leveraging locally available volcanic materials and using lower temperature production methods than those used in modern Portland cement manufacture.^{11,13} Their pozzolanic mortar, self-healing concrete properties, and hydraulic structures demonstrate an approach to sustainability that remains relevant today. These principles align with modern advancements in low-clinker cements, alternative binders, and carbon-efficient construction techniques. By revisiting historical engineering strategies, modern researchers can gain insights into how longer lasting, resource-efficient materials could reduce carbon emissions and improve the environmental footprint of construction industries.

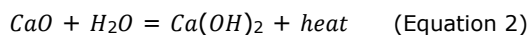
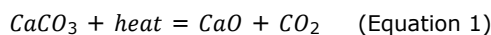
Despite the extensive evaluation of environmental impacts associated with modern concrete production, exploration of pathways to mitigate environmental damages through the use of Roman concrete and mortar formulations remains unassessed. Here, we aim to bridge this gap by comparing Roman concrete/mortars with their modern, Portland cement-based counterparts. Through this comparison, we intend to shed light on the sustainability of Roman concrete, offering insights that can inform more environmentally responsible practices in the modern construction industry. We systematically quantify the expected life cycle inventory for Roman concrete based on anthropological literature and fundamental understanding of the concrete and mortar composition. We then assess how impacts would alter if modern technology were used to implement the same formulations. We juxtapose these findings to modern mixtures and address additional factors that could drive the sustainable application of

Roman formulations—such as extended life scenarios and increased in-use longevity.

Results and discussion

What were the impacts of making Roman mortar and concrete with ancient technology?

Lime-based materials, such as hydrated lime and quicklime, are obtained from the calcination of lime-bearing minerals (e.g., limestone). The chemical reactions are depicted in [Equation 1](#) for quicklime and in [Equation 2](#) for hydrated (slaked) lime.



Based on these stoichiometric relationships, the decomposition of limestone to produce 1 ton of hydrated lime releases 595 kg of CO₂, while 1 ton of quicklime releases 786 kg of CO₂. This calcination process requires the kiln to reach temperatures of approximately 900°C, contributing an additional 320 kg of CO₂ per ton of quicklime,¹⁴ with variations depending on the fuel utilized to achieve this temperature.

The production of modern Portland cement is similar in principle—limestone is heated up to obtain calcium oxide as the main chemical compound in clinker. However, the raw materials (i.e., limestone and clay) in the kiln must reach higher temperatures, up to 1,450°C to form the clinker phases needed for modern Portland cement to be reactive. The limestone decarbonation emissions are lower than those for quicklime and slacked lime due to the different composition of Portland cement; yet, the higher temperatures mean that, by mass, Portland cement contributes to notable CO₂ emissions (approximately 0.6–1 ton of CO₂ per ton of cement [2,15,16](#)).

In the initial phase of our assessment, we evaluated the environmental impacts of Roman mortars and concretes manufactured using traditional Roman techniques. This involved consolidating Roman mortar and concrete formulations reported in the literature^{11,12,13,17,18,19} in three main groups according to their lime-to-pozzolan mass ratio: mixes 1:2, mixes 1:3, and mixes 1:4. See [STAR Methods](#) for a description of Roman mortar and concrete mix proportions.

Emissions and energy demand of Roman mortars and concrete with ancient technology

As shown in [Figure 1](#), there is seemingly high energy use for the Roman mortars (i.e., 9,300 to 23,800 MJ/m³). Romans used oak and fir wood as fuel to fire the lime kilns in a process that required several days of loading, calcining, cooling, and unloading of materials. This demand is unlike modern concrete, which relies heavily on fossil fuels for kiln firing²⁰ and which can produce over 100 tons of clinker per hour.^{21,22} It would appear that the high energy demand is likely a function of the relatively inefficient kilns used in Roman times, with energy requirements of approximately 26 MJ/kg of lime produced²³ (defined in the [supplemental information](#)). Except for the energy needed for calcination, most of the processes were carried out using human and animal labor (e.g., loading, transportation, mixing, and casting of materials), and these human and animal contributions are outside the scope of analysis. Based on the technologies available to the Romans, their recorded fuel sources, and their cement compositions, GHG emissions from Roman mortar and concrete production were likely in the range of 225–577 kg CO_{2-eq}/m³ (see [Figure 2](#)) depending on the ratio between slaked lime and pozzolan contained in their mortars.

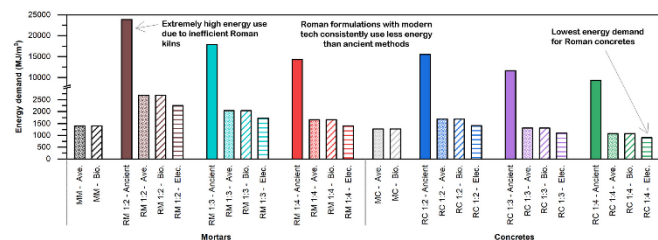


Figure 1 Energy demand of mortars and concretes (modern and Roman formulations)

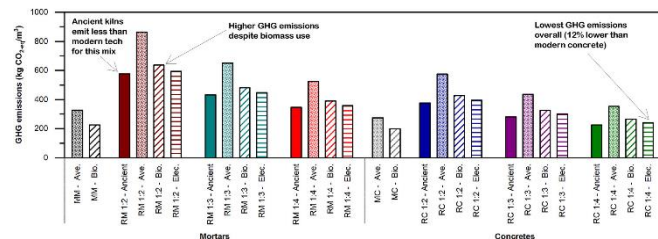


Figure 2 GHG emissions of mortars and concretes (modern and Roman formulations)

MM, modern mortars; RM, Roman mortars; MC, modern concretes; and RC, Roman concretes. Roman formulations vary according to their lime-to-pozzolan ratio, as detailed in [STAR Methods](#). Different production technologies and fuel scenarios were assessed (Ave., global average kiln fuel; Bio., use of biomass; Elec., use of electricity; and Ancient, Roman technology and fuel).

Impacts of modern vs. Roman mortar and concrete using contemporary production technology

Climate change impacts

We quantified the energy demand, GHG emissions, and several key air pollutant emissions for producing Roman mortar and concrete formulations following their production technology, which included the sole use of bioresources as fuels to feed the kilns and the use of lower heat-demand powders for cement production. For this assessment, three different mortar and concrete global production scenarios were modeled. These scenarios accounted for variations in the pyroprocessing stage as follows: (1) average modern production reflects the current global average fuel mix for kiln firing defined in the [supplemental information](#), (2) modern production with bioresources replicated Roman practices by using only bioresources as fuel, and (3) electric calcination with renewables explored the production process under the adoption of an electric calciner powered by 100% renewable energy sources (e.g., solar, hydropower, and wind).

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ΝΕΑ ΑΠΟ ΤΙΣ ΕΛΛΗΝΙΚΕΣ ΚΑΙ ΔΙΕΘΝΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΝΩΣΕΙΣ



ΕΛΛΗΝΙΚΗ
ΕΠΙΣΤΗΜΟΝΙΚΗ
ΕΤΑΙΡΕΙΑ
ΕΔΑΦΟΜΗΧΑΝΙΚΗΣ
& ΓΕΩΤΕΧΝΙΚΗΣ
ΜΗΧΑΝΙΚΗΣ

Ημερίδα "Τρέχουσες Πρακτικές και Νέες Τεχνολογίες στη Βραχομηχανική"

Η ΕΕΕΕΓΜ θα διοργανώσει ημερίδα με τίτλο «**Τρέχουσες Πρακτικές και Νέες Τεχνολογίες στη Βραχομηχανική**», η οποία θα διεξαχθεί σε συνεδριακό χώρο στην Αθήνα την **Ανοιξη του 2026**.

Τα άρθρα της ημερίδας θα συμπεριληφθούν σε **τόμο πρακτικών**, ο οποίος **θα διανεμηθεί δωρεάν στους παρευρισκόμενους στην ημερίδα**. Στόχος είναι ο τόμος να αποτελέσει ένα εγχειρίδιο τόσο για τους έμπειρους μηχανικούς που θέλουν να εμβαθύνουν στο αντικείμενο της βραχομηχανικής, όσο και για τους νέους μηχανικούς και φοιτητές που θέλουν να γνωρίσουν και να κατανοήσουν το αντικείμενο, ακολουθώντας το πρότυπο που εφαρμόστηκε στις προηγούμενες επιτυχημένες ημερίδες.

Προσκαλούνται όσοι επιθυμούν να υποβάλουν:

- Περίληψη** με όριο τις 300 λέξεις για πιθανή συμμετοχή με άρθρο.
- Εκδήλωση ενδιαφέροντος για **διαφημιστική καταχώρηση** στον τόμο και πρόσθετη παροχή μικρού εκθεσιακού χώρου ή χρόνου παρουσίασης δραστηριοτήτων.

Η καταληκτική προθεσμία και για τα δύο είναι η **30^η Σεπτεμβρίου 2025**. Αποστολή περιλήψεων και εκδήλωσης ενδιαφέροντος για διαφημιστική καταχώρηση στις διευθύνσεις mbardanis@edafos.gr, gbelokas@uniwa.gr και stratakos@namalab.gr.



SIMSG ISSMGE



**International Society for Soil Mechanics and
Geotechnical Engineering**

ISSMGE News
www.issmge.org/news

To All CAPG members: Advertise with Global Impact — for FREE!

ISSMGE IT Administrator / Corporate Associates / 03-07-2025

Members of the ISSMGEs Corporate Associate Presidential Group (CAPG) are invited to post Commercial Ads of their companies in the ISSMGE Bulletin.

Ready to showcase your company to the global geotechnical community? As a Corporate Associate (CA) of ISSMGE, you have now access to dedicated advertising space in the ISSMGE Bulletin.

Reach Thousands of geotechnical professionals worldwide
Promote Your Brand in a prestigious and trusted publication

No Cost to You A benefit exclusively for CA members

Advertisement Allocation in ISSMGE Bulletin

Heres how it works:

Platinum Members

- **Ad Size:** Full-page
- **Placement:** Back cover (inside)
- **Frequency:** Once per year
- **Priority Placement**

Journal Sponsor Members

- **Ad Size:** Full-page
- **Placement:** Back cover (inside)
- **Frequency:** Once per year

Gold Members

- **Ad Size:** Half-page
- **Placement:** *Strategic Positions*
 1. Between Presidents Desk Report and Vice Presidents Report
 2. Between From the Board and ISSMGE Highlights
- **Frequency:** Once per year

Silver Members

- **Ad Size:** Quarter-page
- **Placement:**
 - Between Global News Member Societies and Young Member Area
 - Between CAPG Activities and Technical Committee Activities
- **Frequency:** Once per year

Ready to advertise?

Submit your ad or request more details at
capg@issmge.org.

Webinar on "Numerical Analysis of Ground Improvement" with Prof. Helmut F. Schweiger

ISSMGE IT Administrator / TC211 / 03-07-2025

ISSMGE TC211 is pleased to extend an invitation to you for the upcoming ISSMGE TC211 free webinar featuring a presentation by **Prof. Helmut F Schweiger**. This insightful and educational talk, titled **Numerical Analysis of Ground Improvement** will provide valuable perspectives on advancements in the field.

The webinar will be hosted on Zoom (<https://utsmeet.zoom.us/j/89658918418>) and is scheduled for **10:00 AM (Vienna time) on Friday 11 July 2025**. Attendees will have the opportunity to engage with Prof. Schweiger during a Q&A session following the presentation.

For further details on the webinar and the speaker, please refer to the [attached presentation flyer](#).

Your continued support in promoting TC211 events, including this webinar, is greatly appreciated. Please share this invitation and the flyer with your local geotechnical societies, colleagues, and any other interested professionals who may benefit from this discussion.

We look forward to welcoming you all to this event.

Be part of the CAPG session at the 21st ICSMGE in Vienna, June 2026

ISSMGE IT Administrator / Corporate Associates / 03-07-2025



CAPG will host a dedicated 30-minute session showcasing **Outstanding Geotechnical Projects**. This session will feature 5 to 6 selected presentations, each approximately 5 minutes in length.

Roadmap to the ICSMGE Showcase:

Stage 1 Call for Contributions (June 2025)

Corporate Associates (CAs) interested in presenting are invited to contact the CAPG Chair [CAPG Contact](#).

Submissions should include a brief description of the proposed project and highlight key elements demonstrating excellence in:

1. Innovation
2. Sustainability
3. Advancements in geotechnical engineering practice

Stage 2 Jury Formation (June/August 2025)

Stage 3 Evaluation (September 2025)

Stage 4 Announcement of Selected Projects (October 2025)

Stage 5 Presentation Development (November 2025 - February 2026)

A draft version should be submitted by **December 2025** for review and feedback.

Stage 6 Presentation at ICSMGE (June 2026).

ISSMGE Announces 2025 International Lifetime Achievement Medal Winners

ISSMGE IT Administrator / General / 16-07-2025

The International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE) is proud to announce the recipients of the 2025 International Lifetime Achievement Medal (ILAM): Professor Kenji Ishihara (Japan) and Professor Willy A. Lacerda (Brazil).



Kenji Ishihara and Willy A. Lacerda

The prestigious ILAM award recognizes individuals who have made outstanding contributions to the field of geotechnical engineering throughout their careers. This year's winners were selected by the ISSMGE Board on June 24, 2025, following a rigorous review process conducted by the ISSMGE Awards Committee (AWAC). A total of 13 candidates from all 6 ISSMGE regions were nominated and evaluated based on strict criteria reflecting excellence and global impact.

According to the rules, the medals will be delivered by the President or Vice-President of ISSMGE.

Congratulations to Professors Ishihara and Lacerda on this well-deserved honor!

ISSMGE TC217 3RD ANNUAL ONLINE SEMINAR SERIES: Dual-Phase of Vacuum Consolidation Combined with Surcharge Preloading at Kalibaru Port, Jakarta, 24 JULY 2025

Siau Chen Chian / [TC217](#) / 18-07-2025

The executive committee of TC217 is hosting a trilogy of webinars on topics relating to land reclamation. This is the third consecutive year that TC217 has conducted the online seminar series, under the auspicious of the ISSMGE.

We are pleased to announce our invited speaker for our webinar on 24th July 2025, Dr Agus Himawan, from PT Promisio Sinergi Indonesia and Institut Teknologi Sains Bandung (ITSB).

Seminar details:

Title: Dual-Phase of Vacuum Consolidation Combined with Surcharge Preloading at Kalibaru Port, Jakarta

Time: 24 July 2025, 7.30pm (GMT+8h)

Registration Link: https://us06web.zoom.us/webinar/register/WN_S3DT1WH3TxuVthE_MHwGqw#/registration

*For non-GeoSS members, your name and email address would suffice in the registration form.

We look forward to receiving your registration and meeting you at the webinar!

Sincerely,

A/Prof Darren Chian
Secretary, TC217 Land Reclamation

AYGEC'26 is Coming to Lagos!

Max Barbosa / Young Members / 18-07-2025

Another great initiative under the ISSMGE and YMPG umbrella!

The **African Young Geotechnical Engineers Conference (AYGEC26)** will be hosted in Lagos by the Nigerian Institution of Geotechnical Engineers (NIGE) from **April 2629, 2026**.

It's a fantastic opportunity for young geotechnical professionals and students across Africa (and beyond!) to network, exchange knowledge, and strengthen the bond between industry and academia. AYGECs are all about building the future of geotechnics together.

Check out more details in the original announcement by Precious Osagie here:
https://www.linkedin.com/posts/precious-osagie-r-eng-mnse-m-eng-296246190_aygec26-nige-geotechnicalengineering-activity-7348790770486636544-UbLh?utm_source=share&utm_medium=member_desktop&rcm=ACoAAA72VREBXWu-ObhI9uKx5vnKyfGWE5DYJ2b0

Let's keep supporting regional conferences like this and encouraging young engineers to take part in the global geotechnical community!

#AYGEC26 #NIGE #ISSMGE #GeotechnicalEngineering #YoungEngineers #Africa #Networking #Lagos2026

ISSMGE Interactive Technical Talk Episode 25: Deep Foundations (TC212)

ISSMGE IT Administrator / [TC212](#) / 23-07-2025

The twenty-fifth episode of International Interactive Technical Talk has just been launched and is supported by TC212. Sangseom Jeong, Mario Terceros H., Raffaele Cesaro and Rara Dwi Noviarti are discussing with Marc Ballouz about "Deep Foundations".

<https://www.issmge.org/education/interactive-technical-talks>



News

<https://www.isrm.net>

17th ISRM Young Members' Seminar Series on July 8th 2025-07-03

The next Young Members' Seminar will be held on 8th July at 3 PM (UTC) and will feature presentations on underground and surface mining from South Africa:

- Quality Control of Cable Bolt Support in Underground Mines - [Thovhedzo Gcuda](#) ([University of the Witwatersrand](#), South Africa)
- Re-design of the Mogalakwena Pits Using Discrete Fracture Network Modeling to Enhance Slope Critical Control Implementation and Slope Optimization - [Thlologelo Daddy Mametja](#) ([Valterra Platinum Mogalakwena Mine](#), South Africa)
- Rock Engineering Systems employed at an underground Mine to combat rockfalls - Omphile Diale - ([Sefateng Chrome Mine](#), South Africa)

[Make sure to register to assure your spot.](#)



News

<https://about.ita-aites.org/news>

ITACET Lunchtime Lecture Series #47 08 July 2025

Join us for the next LLS on July 8!

The 47th edition of the Lunchtime Lecture Series will focus on "**Design of Fibre Reinforced Segments**", presented in collaboration with **ITAtch**.

This session will feature three expert lectures, followed by a live Q&A with all speakers.

Start time: 13:00 CET

Programme:

- Design and construction considerations for FRC tunnel segments – **Verya Nasri**
- Design of fibre reinforced segments against concrete bursting and splitting – **David Oliveira**
- The Lee Tunnel – Steel fibre segmental lining and other innovations – **Charles Allen**

Register here: https://us06web.zoom.us/webinar/register/WN_u_0jWb8PRdq1_yiWkMKYZA#/registration

Scooped by ITA-AITES #135, 15 July 2025

[Antwerp's Scheldt Tunnel sinking operation kicks off | Belgium](#)

[Construction starts on Cross Island Line Phase 2; 6 MRT stations in S'pore's west ready by 2032](#)

[ECRL mega rail project marks another milestone with breakthrough of Genting Tunnel | Malaysia](#)

[ITA Awards 2025 Finalists Announced](#)

[This old train tunnel is now Australia's coolest mushroom farm | Australia](#)

[Hudson Tunnel Project construction advances under Hudson River | USA](#)

[Dubai Metro Blue Line: Linking nine districts, serving more than one million passengers | UAE](#)

[2.7 km Breakthrough Achieved in Bullet Train Tunnel | India](#)

[Could Manchester be the next city to go underground | UK](#)

[Contractors Making Progress on Howard Street Tunnel Project | USA](#)

Scooped by ITA-AITES #136, 31 July 2025

[New Fréjus Tunnel Opens: Enhancing Safety and Connectivity Between France and Italy](#)

[DPWH Steps up construction as Southbound Tunnel Excavation of Davao City bypass nears breakthrough | Philippines](#)

[Green light for the world's longest and deepest road tunnel: cars to travel 16 miles under the sea | Norway](#)

[Up she comes! Remains of tunnel borer Emily are raised | UK](#)

[The undersea tunnel network that could transform Shetland's fortunes | UK](#)

[China's longest loop metro line project sees tunnel](#)

[Sydney Metro West tunnelling machines power into Parramatta | Australia](#)

[Delhi Metro achieves major milestone: Tunnel completed on golden line | India](#)

[DC Water mobilises Potomac River Tunnel Project | USA](#)

[Civil engineering services to be assessed for new CERN collider](#)

[ITA Tunnelling Awards extends early bird deadline](#)

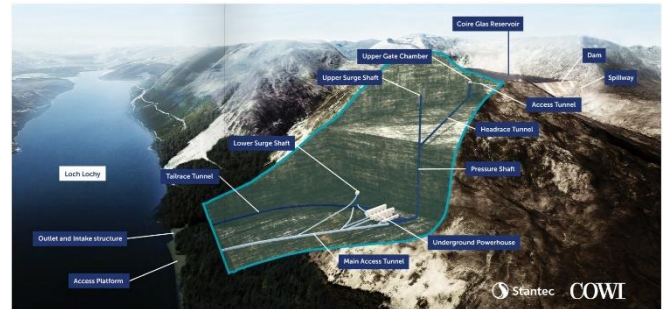
[Underground reservoir keeps Helsinki cool through summer heatwave | Finland](#)



Joint Webinar - ATSYM and BTSYM

Underground Power: Pumped Hydro Developments in the UK and Australia

Thursday, 17 July 2025, 9:30–10:30 AM BST (London)/
6:30–7:30 PM AEST (Melbourne)



Event Agenda

Welcome and Opening – ATSYM

Introduction to the BTSym

BTSym Presentation: Tobias Bisenberger & Aitor Perez Suescun

ATSYM Presentation: Igor Buvac & Sean Edwards

Joint Q&A and Closing Remarks

Event Information:

The Australian Tunnelling Society Young Members (ATSYM) and the British Tunnelling Society Young Members (BTSym) are proud to host their first-ever joint international event, uniting early-career professionals from opposite sides of the globe for a shared discussion on one of the most critical energy transition technologies: pumped hydro.

With pumped storage schemes gaining momentum as a key enabler of large-scale renewable energy storage, this technical session will explore two major projects shaping the underground infrastructure landscape in their respective regions.

Join us for an engaging and collaborative session as we learn from each other's challenges and achievements in delivering complex underground works for pumped hydro storage.

Speakers:

Tobias Bisenberger (Construction Manager Tunnels, STRABAG)

Tobias studied Civil Engineering in Vienna and completed his PhD in Mechanised Tunnelling, focusing on contract models dealing with deviating construction timelines. He joined STRABAG in 2021 and has been involved in Pumped Storage Hydro schemes in the UK since 2022. Based in Vienna, Tobias supports UK projects on a rotational basis, contributing his tunnelling expertise to energy infrastructure.

Aitor Perez Suescun (Senior Project Manager Dams, STRABAG)

Aitor is a passionate civil engineer with over 12 years of global experience in ground engineering and dam construction. Having studied in Spain and Denmark, he has worked across five countries and now resides in London, UK. Aitor brings a deep understanding of multidisciplinary civil infrastructure delivery in complex environments.

Igor Buvac (Experienced Engineer - Tunnels, SMEC)

Igor is a Civil Engineer with over 5 years of experience across major infrastructure projects. He holds degrees from UNSW in Civil Engineering and Geotechnical Engineering. Igor has been a central part of the Snowy 2.0 Owner's Team for over three years, working across design, TBM operations, grouting, and permanent linings.

Sean Edwards (Graduate Engineer - Tunnels, SMEC)

Sean is a Graduate Engineer from Western Sydney University, with hands-on experience in TBM and drill-and-blast tunnelling, segmental linings, caverns, and intake shafts. He has contributed to automation and modelling tools using RS3, FLAC, and Strand7, and brings a strong interdisciplinary approach to underground engineering and data-driven design.

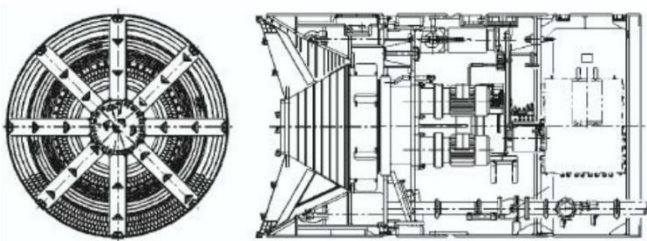
[REGISTER](#)



Ground Movement Analysis & Pipe Jacking Design

Joint webinar with BTSYM and the Nigeria Tunnelling Association Young Members

Friday, 25th July 2025, 18:00 (GMT+1)



Event Information:

This event provides an overview of sewer diversion works carried out near Rye Meads Sewage Treatment Works, one of Thames Water's largest facilities serving over 400,000 people. It outlines the design and construction of shafts and tunnel sewers undertaken by OTB^e to replace a section of the existing Stevenage Trunk Main.

This webinar will highlight key aspects of pipe jacking methods, shaft construction techniques, and ground movement analyses, with a focus on the impact of tunnelling on surrounding infrastructure. Prepared for Nigeria Tunnelling Association Young Members, it aims to provide students and young professionals with valuable insights into tunnel design and construction practices.

Speaker

Dr. Hashmi Sohawon (OTB Engineering Ltd)

Dr. Hashmi Sohawon is an engineer with OTB^e since January 2023. He is a passionate civil and geotechnical engineer, who likes to find creative, innovative, cost-effective, safe and sustainable solutions to design problems.



www.geosyntheticssociety.org

News

[IGS Premium Corporate Members Revealed](#) July 2, 2025

Heavyweights from the geosynthetics industry have been among the first to sign up to the IGS Premium Corporate Membership scheme. HUESKER, Maccaferri, Naue, SKAPS, Solmax, [Read More »](#)

[Maccaferri Wins GeoAsia8 Corporate Case Study Contest](#) July 7, 2025

A shored reinforced soil embankment solution for a North Indian railway project has won the GeoAsia8 conference Corporate Case Study competition. Italian multinational Maccaferri worked [Read More »](#)

[Focus On Empathy At EuroGeo8 Diversity Lecture](#) July 15, 2025

A compassionate approach to integrating diversity into organisations will be the subject of an IGS Diversity Committee (DC) session at EuroGeo8. The 8th European conference [Read More »](#)

[EuroGeo8 LMNS Lecturer Named](#) July 17, 2025

Professor Nicola Moraci prepares to give the next LMNS Lecture on the behaviour of interfaces in geotechnical structures. Established to celebrate the pursuit of excellence [Read More »](#)

[IGS India To Host GeoAsia9](#) July 22, 2025

Thriving metropolis Ahmedabad is set to stage the 9th Asian Conference on Geosynthetics following IGS India's successful bid to host. Announced at the closing ceremony [Read More »](#)

[IGS Diversity Committee Launches 'Mentorship' Initiative](#) July 23, 2025

Personal stories from a range of high profile IGS members are set to be shared in a new initiative by the IGS Diversity Committee (DC). [Read More »](#)

[IGS Educate The Educators Marks 10 Years](#) July 28, 2025

One of the IGS's most innovative and impactful teaching programs celebrates a decade of activity this month. The IGS Educate the Educators (EtE) initiative was [Read More »](#)

[Global Gathering For Earth-Focused GeoAsia8](#) July 29, 2025

Hundreds of delegates from more than 45 countries descended on Brisbane for the 8th Asian Regional Conference on Geosynthetics (GeoAsia). Some 450 attendees were welcomed [Read More »](#)

[Prize-Winning Young Engineers Attend GeoAsia8](#) July 30, 2025

Students from the Asia-Pacific region have been telling of their experiences after eight won a student award to attend the 8th Asian Conference on Geosynthetics (GeoAsia8). [Read More »](#)



News

<https://www.britishgeotech.org/news>

Chris Raison receives the John Mitchell Award 04.07.2025

The BGA is pleased to announce that Chris Raison has received the 2025 John Mitchell Award [Read More](#)

Winner announced of the BGA Poster Competition 2025 06.07.2025

The BGA Poster Competition 2025 was won by Yukun Ma of the University of Surrey [Read More](#)

Awards Presented at BGA Annual General Meeting June 2025 06.07.2025

Awards Presented at BGA Annual General Meeting June 2025 [Read More](#)

Call for abstracts for RootS25 – International Workshop on Soil-Vegetation-Atmosphere Interaction – Deadline 20th July 16.07.2025

The deadline for abstract submission to participate in the 3rd International Workshop RootS25 – Soil-Vegetation-Atmosphere Interaction, taking place at the Politecnico di Bari, Italy, from 6th to 8th November 2025, has been extended to 20th July 2025. [Read More](#)

The Conference Programme is now available for Earthworks 2025 22.07.2025

The British Geotechnical Association's 4th Biennial Earthworks Conference Organising Committee is delighted to announce that the full conference programme has been confirmed and is now available online. [Read More](#)

The August/September 2025 issue of Ground Engineering is available on line 30.07.2025

The August/September 2025 issue of Ground Engineering is available on line. Online access to Ground Engineering (GE) is included in BGA subscriptions. [Read More](#)



News

www.geoinstitute.org/news

Bridging the Gap: How DIGGS DATA PROCESSING is Democratizing Geotechnical Data Exchange

Created: 22 Jul 2025



Breaking down silos between Excel spreadsheets, SQL databases, and industry-standard DIGGS XML files

Nicholas Miller, P.E.

In the world of geotechnical engineering, data is everything. From soil boring logs to laboratory test results, the information gathered from subsurface investigations forms the foundation—quite literally—of every infrastructure project. Yet for decades, this critical data has been trapped in various formats, scattered across incompatible systems, and locked away in organizational silos. Data allows you to reduce costs, reduce risk, reduce uncertainty, increase profitability, and create better, safer, more cost-effective infrastructure, but only when it can be accessed, shared, and utilized effectively...

(ολόκληρο το άρθρο παρατίθεται σε άλλη ενότητα του περιοδικού)



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OF THE GEOLOGICAL SOCIETY OF GREECE THE ΕΛΛΗΝΙΚΗΣ ΓΕΩΛΟΓΙΚΗΣ ΕΤΑΙΡΙΑΣ

No. 14 (2025): Special Publication BGS No 14

Published: 12-09-2025

Special Publication 14 contains the Proceedings of the 2nd Tectonics and Structural Geology meeting held on 13 June 2018 | "Conference and Cultural Centre of the University of Patras | - Patras, Greece

Sponsored by: University of Patras | Hellenic Petroleum

Publisher: Geological Society of Greece

ISBN (print) 978-618-86841-4-0

ISBN (e-book) 978-618-86841-5-7



Patras, June 13 2018
Conference and Cultural Center of the University of Patras

2nd Proceedings of Scientific Meeting of the Tectonics Committee of the Geological Society of Greece

**"10 Years after the 2008 Movri Mtn M6.5 Earthquake;
An earthquake increasing our knowledge for the deformation
in a foreland area"**



ΠΑΝΕΠΙΣΤΗΜΙΟ
ΠΑΤΡΩΝ
UNIVERSITY OF PATRAS

Bulletin of the Geological Society
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Full Issue <https://ejournals.epublishing.ekt.gr/index.php/geosociety/issue/view/2328/1214>



Institution of Civil Engineers

Κατερίνα Τσιμπούση
Bill Curtin Medal for Real World Impact



**Prof. Chrysothemis Paraskevopoulou and
Mr. Ioannis Fikiris at the Steering Board of the
ITA-AITES and ITA-CET Committee**



Chrysothemis Paraskevopoulou
New university network Leader

It is with regret that the ITA-CET Committee says goodbye to a valued member, Professor Georg Anagnostou, from ETH Zurich in Switzerland, who for over ten years was the Leader of the Committee's Activity Group 3, in charge of developing the ITA university network. We wish him a long and fulfilling retirement. He is replaced in this position by Chrysothemis Paraskevopoulou, Associate Professor at the University of Leeds, UK, who will be assisted by Professor Markus Thewes, from Ruhr Universität Bochum, Germany. Both are long-standing members of the ITA-CET Committee.



Ioannis Fikiris
New ITA-CET Tutor

Following the WTC elections and the changes to the composition of the ITA Executive Council, Mr Ioannis Fikiris has been appointed the new Tutor in charge of overseeing the work of the ITA-CET Committee. Mr Fikiris was President of the Greek Tunnelling Society from 2017 – 2021. He has been a member of the ITA's Executive Council since 2020 and currently holds the position of ITA Vice-President. He was also the chair of the Organizing Committee of the World Tunnel Congress 2023 that was held in Athens. Outside the ITA, Mr Fikiris is the CEO at EDAFOS Engineering Consultants S.A., a leading geotechnical engineering consulting firm, based in Athens, Greece. The ITA-CET Steering Board warmly welcomes him as a new member.

(Read more in the ITA-CET Newsletter Issue 19 July 2025, https://about.ita-aites.org/files/ITA-CET_Newsletter_Issue_19_July_2025.pdf)



Honoured to have received the [hashtag#ICE](#) Bill Curtin Medal for Real World Impact for our paper "Destabilisation of seawall ground by ocean waves" published in [hashtag#Geotechnique](#). Thank you Hidenori Takahashi, Lidija Zdravkovic and Nobuhito Mori for the excellent collaboration! [hashtag#ICEAwards](#) Imperial Civil and Environmental Engineering



The Bill Curtin Medal, awarded by the Institution of Civil Engineers (ICE), recognizes outstanding research innovation in civil engineering that has a significant real-world impact. It specifically focuses on papers published by the ICE that demonstrate practical applications and positive contributions to the field.

The medal is awarded annually and acknowledges the best paper that showcases how civil engineering research has been effectively translated into tangible benefits for society or the industry. The award highlights the importance of research that is not only academically sound but also practically relevant and impactful.

Examples of the type of work recognized by the Bill Curtin Medal include:

Innovative design and construction techniques: Papers describing novel approaches to building structures or infrastructure that improve efficiency, sustainability, or safety.

Solutions to real-world problems: Research that addresses challenges such as coastal flooding, waste reduction, or resource management.

Advancements in specific areas of civil engineering: Recognition for papers that contribute to the progress of areas like coastal protection, dredging, or nuclear engineering.

The Bill Curtin Medal serves as a platform to celebrate and promote research that makes a meaningful difference in the built environment and beyond



University of California, Davis

Κατερίνα Ζιωτοπούλου
Professor Civil and Environmental Engineering



As of today, I have been promoted to Professor at the University of California, Davis.

I am indebted to the students, colleagues, mentors, friends, and family who've been part of the path—formally or informally, recently or years back.

I have learned a lot, I have had help, and I am certainly still learning.

(Linkedin, 3rd July 2025)



Κατερίνα Ζιωτοπούλου
Core Editor ASCE Journal of Geotechnical and
Geoenvironmental Engineering



Retiring Editor
Prof. Armin Stuedlein
Oregon State University



Incoming Editor
Prof. Katerina Ziotopoulou
UC Davis

On July 1 we will have a transition in our core editor team, whose membership is term-limited. Prof. Armin Stuedlein's term has come to an end and he will be replaced by Prof. Katerina Ziotopoulou.

Katerina Ziotopoulou has been an outstanding Associate Editor and we are delighted she agreed to step up to this role!

Katerina will work with Catherine O'Sullivan, Ed Kavazanjian, Adrian Rodriguez-marek, Monica Prezzi, and Mohammed (Mo) Gabr to manage papers, and oversee the operation of the JGGE, with the support of our fantastic team of associate editors!

ΠΡΟΣΕΧΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΚΔΗΛΩΣΕΙΣ

Για τις παλαιότερες καταχωρήσεις περισσότερες πληροφορίες μπορούν να αναζητηθούν στα προηγούμενα τεύχη του «περιοδικού» και στις παρατιθέμενες ιστοσελίδες.

ISGSR2025 9th International Symposium for Geotechnical Safety and Risk, 24th – 27th August 2025, Oslo, Norway, www.isgsr2025.com

Giz2025.org 6th International Conference on GIS and Geoinformation Zoning for Disaster Mitigation (GIZ), August 28-30, Almaty, Kazakhstan, <https://qiz2025.org>

On-site Short Course on Geotechnical Earthquake Engineering, 30 August – 7 September, Kobe and Tokyo, Japan, ixa@ethz.ch

UNSAT2025 5th European Conference on Unsaturated Soils, 1 to 3 September 2025, Lisbon, Portugal, <https://eun-sat2025.tecnico.ulisboa.pt>

ISP8 Symposium International pour le 70ème anniversaire du pressiomètre / International Symposium for the 70th Anniversary of the Pressuremeter, 2nd to 5th of September 2025, LUXEMBOURG, <https://isp8-pressio2025.com>

TKZ2025 XXI Technical Dam Control International Conference, 09-12 September 2025, Chorzów, Poland <https://tkz.is.pw.edu.pl/en/>

EYGECE 29th European Young Geotechnical Engineers Conference, 9-12 September, 2025, Rijeka, Croatia, <https://eygece2025.uniri.hr>

EUROGEO Technical Challenges and Environmental Imperatives for the 21st Century, 15-18 September 2025, Lille, France, <https://eurogeo8.org>

TRANSOILCOLD 2025 7th International Symposium on Transportation Soil Engineering in Cold Regions, September 17-20, 2025, Incheon, Korea, www.transoilcold2025.org

2025 AIGTAS IWLSC 3rd International Workshop on Landslides in Sensitive Clays, September 28th to October 2nd, 2025, Quebec, Canada www.iwlsc2025.ca

GROUND ENGINEERING GEOTECH 2025 Where innovation meets opportunity, 2 October 2025, London, United Kingdom <https://www.geplus.co.uk/news/ground-engineering-to-launch-geotech-2025-conference-where-innovation-meets-opportunity-16-01-2025>

GEOTECH ASIA 2025 - GEOVADIS: The Future of Geotechnical Engineering, October 7th to 10th, 2025, Goa, India, <https://www.geotechasia.org>

FOMLIG3 FLORENCE 2025 Third Workshop on the Future of Machine Learning in Geotechnics "Ethics and intelligences for a geotechnical Renaissance", October 15-17, 2025, Florence, Italy <https://fomlig2025.com>

Urban GeoEngineering 5th AsRTC6 "Urban GeoEngineering" Symposium, 23rd & 24th of October 2025, Taipei, Taiwan, www.asrtc6urbangeoengineering2025.com/index.html

6ο Πανελλήνιο Συνέδριο Αντισεισμικής Μηχανικής και Τεχνικής Σεισμολογίας (6ΠΣΑΜΤΣ), 30, 31 Οκτωβρίου και 1 Νοεμβρίου 2025, <https://6psamts.eltam.org>

Med-GU-25 5th Annual Meeting Mediterranean Geosciences Union, 10-13 November 2025 in Athens, Greece, <https://2025.medgu.org/index.php>

7ο Συνέδριο Αναστηλώσεων, 13-15 Νοεμβρίου 2025, Αθήνα, www.etepam.gr/7o-synedrio-anastiloseon

ORFEUS+EFEHR+EMSC (EPOS Seismology) & Geo-INQUIRE Workshop 2025, 24-27 November 2025, Athens, Greece, <https://www.geo-inquire.eu/about/terms-and-conditions>, https://docs.google.com/forms/d/e/1FAIpQLSf-LXXy8X-jiEtaCaI_n2VIp7QcM-71TJAY9ZCsPlt8SVNM1Q/viewform

17th International Conference on Geotechnical Engineering 8th International Symposium on Geohazards, December 4-5, 2025, Lahore, Pakistan, <https://17icge-8isg.com>

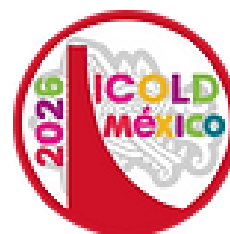
PMGEC LEBANON 2026 Pan Mediterranean Geotechnical Engineering Conference, 25 - 28 March 2026, Phoenicia Beirut IHG, Lebanon <https://pmgec-leb.com>

International Conference on Geotechnics, Civil Engineering and Structures (CIGOS) 2026 Innovation in Planning, Design and Civil Infrastructure for Resilient and Sustainable Transformation, April 16 & 17, 2026, Ho Chi Minh City, Vietnam <https://cigos2026.sciencesconf.org>

LANDSLIDES 2026 Landslide Geo-Education and Risk (LANDER), 27 April - 1 May 2026, Queenstown, New Zealand <http://landsliderisk.nz>

15th International Conference "Modern Building Materials, Structures and Techniques", May 12-15, 2026, Vilnius, Lithuania, <https://vilniustech.lt/332107>

ITA-AITES WTC 2026 World Tunnel Congress, May 15 to 21, 2026, in Montreal, Quebec, Canada, <https://wtc2026.ca>



94th Annual Meeting & International Symposium on Large Dams
Water, Energy and Society: The Evolving Role of Dams in a Changing World
May 21 to 29, 2026, Guadalajara, Mexico
www.icoldmexico2026.com

The International Commission on Large Dams (ICOLD) invites dam, levee, hydraulic structures, and water infrastructure professionals, engineers, planning, researchers, policy-makers, and industry experts to submit abstracts for its 2026 International Symposium in Guadalajara, Mexico. The Inter-

national Symposium is scheduled to be held on May 26 and May 27, 2026, as part of the ICOLD Annual Meeting.

Main topics of the Symposium:

- Water Planning, Water Management, and Climate Resilience
- Dam Safety Policy and Governance
- Dam Construction and Rehabilitation: Innovation and Lifecycle Extension
- Dam Performance Monitoring
- Flood Resiliency in Developed and Developing Countries
- Sedimentation Management and Reservoir Longevity
- Fish Passage, Biodiversity and Environmental Integration
- Community Engagement in Dam Development
- Tailings Dam Safety
- Dam Decommissioning and Removal

For any questions, please contact simpotio.icoldmexico@gmail.com



ICPMG 2026 Physical Modelling in Geotechnics, 8–12 June 2026, ETH Zürich, Switzerland, <https://tc104-issmge.com/icpmg-2026>

8th International Young Geotechnical Engineers Conference - 8iYGEC, 11. - 14. June 2026, Graz, Austria, www.tugraz.at/institute/ibg/events/8iygec

21st International Conference on Soil Mechanics and Geotechnical Engineering Geotechnical Challenges in a Changing Environment, 14 – 19 June 2026, Vienna, Austria, www.icsmge2026.org/en

3rd International Geotechnical Innovation Conference - Shaping the World Beneath: Fostering Sustainability, Innovation and Resilience in Geotechnics, 15 - 16 June 2026, Jed-dah, Saudi Arabia, <https://geotechnicalinnovationconference.com> Email info@creativeconnectionevents.com

ICONHIC 2026 International Conference on Natural Hazards & Infrastructure, 29 June – 2 July 2026, Chania, Greece <https://iconhic.com/2026>

ISFMG 2026 12th International Symposium on Field Monitoring in Geomechanics, 06 -10 August 2026, Indian Institute of Technology Indore, India, <https://sites.google.com/view/isfmg2026/home>



International Conference on Advances and Innovations in Soft Soil Engineering 2026

24-26 August 2026, Delft, Netherlands

<https://softsoils2026.dryfta.com>

As global land development expands into coastal regions, off-shore reclamation areas, and wetlands, the geotechnical challenges posed by soft soils are becoming more critical. These soils, including highly sensitive clays, marine silty clays, organic soils, peats, loose sands, and dredged soils, are known for their high compressibility, water content, and complex mechanical properties, making construction projects in such areas problematic. To address these challenges, soft soil engineering is evolving with innovative technologies and approaches.

This conference, organised under the auspices of the ISSMGE Technical Committee 214 on "Foundation Engineering for Difficult Soft Soil Conditions", will showcase the latest developments in testing, modelling, monitoring and construction and improvement techniques for soft soils. It will provide a platform for researchers, engineers, and industry professionals to exchange expertise and discuss how these innovations can be applied to address modern construction challenges in soft soil environments.

Themes

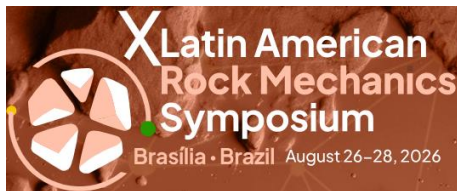
The conference aims to highlight and discuss the most recent state-of-the-art developments in soft soil engineering including although not limited to the following themes:

- Design, construction, performance and monitoring on soft soils
- Developments in laboratory and in situ testing
- Behaviour of soft soils including Bio-Chemo-Thermo-Hydro-Mechanical coupling
- Constitutive and numerical modelling of soft soils
- On-shore, near-shore and off-shore soft soils engineering
- Climate impact and resilience, including vegetation
- Machine learning and data analysis
- Soft soils in Geo-engineering education
- Others

Contact Information

General questions on submissions of the conference
softsoils2026@tudelft.nl





**X Latin American Congress on Rock Mechanics
Rock Mechanics for a Sustainable Future:
Innovating in Mining, Energy, and Infrastructure
26 - 28 Aug, 2026, Brasília, Brazil
<https://larms2026.com>**

The Brazilian Committee of Rock Mechanics, part of the Brazilian Association of Soil Mechanics and Geotechnical Engineering and the ISRM National Group, is honored to invite you to the **10th Latin American Rock Mechanics Symposium (LARMS 2026)**, which will take place from **August 26 to 28, 2026, in Brasília, Brazil**.

The theme of LARMS 2026 is: **"Rock Mechanics for a Sustainable Future: Innovating in Mining, Energy, and Infrastructure."**

Key points include:

- Focus on sustainable practices in rock mechanics
- Innovations in mining, energy, and infrastructure
- The role of rock mechanics in shaping a sustainable future
- Traditional topics in rock mechanics

2026 marks the 10th edition of this prestigious symposium. The previous event, held in **Asunción, Paraguay, in 2022**, was a significant milestone, uniting students, professionals, researchers, and academics dedicated to advancing rock mechanics in Latin America. LARMS 2026 promises to continue this legacy, fostering collaboration, innovation, and knowledge exchange among experts in the field. LARMS 2026 will be held alongside the **XXII Brazilian Congress on Soil Mechanics and Geotechnical Engineering**, which attracted over 2,000 participants in 2024.

The conference topics will include

- Sustainable practices in rock mechanics
- Innovations in infrastructure, mining, and energy
- Stability of rock slopes and deep excavations
- Applied geophysics for sustainable resource management
- Advanced instrumentation and monitoring techniques
- Numerical methods
- Soft rock mechanics and its applications
- Tunneling technologies for a sustainable future
- Environmental considerations in oil extraction and rock mechanics
- Climate change and its effects on rock engineer
- Rock mechanics' role in energy transition
- Strategies for natural disaster management in rock mechanics
- Geothermal energy and its integration with rock mechanics
- Applications of artificial intelligence in rock mechanics
- Digital transformation in Rock Mechanics
- Digital twins for real-time simulation and monitoring

- Risk management in infrastructure, mining, and energy projects

Organization

QE Events

www.qeeventos.com.br

Email secretaria@qeeventos.com.br

Tel. +55 62 99900-2577



13 ICG - 13th International Conference on Geosynthetics (13 ICG), 13-17 September 2026, Montréal, Canada, www.13icg-montreal.org



**Eurock 2026
Risk Management in Rock Engineering -
an ISRM Regional Symposium
15-19 September 2026, Skopje, Republic North Macedonia, <https://eurock2026.com>**

On behalf of MAG, it is our honor to invite the global ISRM community, including rock mechanics professionals' accompanying persons, to the **ISRM Regional Symposium – EUROCK 2026**, taking place from **September 15–19, 2026, in Skopje, N. Macedonia**.

We warmly welcome academics, researchers, and professionals from around the world to join us for this important event! The symposium will address the growing challenges in rock engineering, particularly in complex ground conditions, urban environments, and near critical infrastructure, while also considering environmental concerns.

The central theme will be **Risk Management in Rock Engineering**, with a focus on innovations and applied research. The program will feature global case studies, cutting-edge technologies, and interdisciplinary discussions. Our aim is to foster collaboration among engineers, researchers, designers, consultants, and academics in rock mechanics and engineering.

In addition to technical sessions, the symposium will include short courses, workshops, industrial exhibitions, and technical tours. Rockbowl competition, paper and poster contests for young researchers and students will be organized, while separate programs are planned for accompanying guests. Thus, the delegates will have opportunity to also enjoy social events, gala dinner, and guided tours showcasing Skopje's charm and North Macedonia's rich cultural heritage and natural attractions.

We look forward to welcoming the ISRM family to Skopje in September 2026!

Conference Theme

The proposed full title of the symposium is **2026 ISRM International Symposium – EUROCK2026 "Risk Management in Rock Engineering"**. The theme is considered to be of high interest to the ISRM members and wider, as it covers the framework and principles in rock engineering that are necessary to achieve high quality rock engineering structures. Provisional Symposium themes are the following: (but not limited to)

- Risk assessment methods
- Rock properties, testing methods and site characterization (incl. planetary rock mechanics)
- Design methods and analysis (incl. EC 7)
- Rock dynamics, crustal stress and earth/marsquakes
- Rock mechanics related to environmental and mining engineering
- Implications of climate change on rocks and rock engineering projects
- Geotechnical aspects of soft rocks and hard soils
- Rock mechanics for cultural heritage
- Artificial Intelligence and Machine Learning in Rock Mechanics and Rock Engineering.
- Case histories
- Rock Mechanics education and training

RockBowl at EUROCK 2026

We are excited to announce that the popular RockBowl competition, sponsored by Geobruigg, will be held during EUROCK 2026 in Skopje. RockBowl is a fun and challenging quiz tournament designed for young rock engineers and scientists, testing both technical knowledge and general understanding of rock mechanics and rock engineering. More details about the competition format, registration, and prizes will be available soon.

This edition of RockBowl is exclusively sponsored by Geobruigg.



ECEE2026 18th European Conference on Earthquake Engineering Shaping the Future of Earthquake Engineering, 14 – 1 September 2026, Berlin, Germany, <https://ecee2026.eu>

International Symposium Preservation of Monuments & Historic Sites, 16 – 18 September 2026, Athens, Greece <https://tc301-athens.com>

6th International Conference on Information Technology in Geo-Engineering JTC2 Conference, 13-16 October 2026, Graz, Austria, www.icitg2026.com



7th International Conference on Environmental Geotechnology, Recycled Waste Materials and Sustainable Engineering 22-25 October 2026, Surat, Gujarat, India www.egrwse2026.com

The Environmental Geotechnology, Recycled Waste Materials, and Sustainable Engineering (EGRWSE) Conference is an annual international event that has been held since 2018 at esteemed research institutions, including NIT Jalandhar (India) in 2018 and 2023; the University of Illinois Chicago (USA) in 2019; Dokuz Eylul University (Turkey) in 2022; Warsaw University of Life Sciences (Poland) in 2024; and the University of Vigo (Spain) in 2025. Each edition of EGRWSE has brought together global experts to share advancements in environmental geotechnics, innovative reuse of waste materials, and emerging engineering practices for sustainable and resilient environment and infrastructure. Recognizing the vital role of engineering in advancing sustainable development, EGRWSE promotes the integration of sustainability across engineering disciplines to enhance quality of life and address the growing demand for environmentally responsible solutions, in alignment with the UNESCO Engineering Initiative. The conference fosters meaningful international networking while encouraging active participation from students and early-career researchers. The conference also provides unique opportunities for cultural exchange and collaboration, with minimal bureaucracy and full autonomy for organizers to foster both creativity and academic excellence. With a strong emphasis on affordability and inclusiveness, EGRWSE draws a diverse global community of engineers, scientists, and decision-makers committed to building a more sustainable and resilient future. EGRWSE-2026 marks the 7th edition of this global conference, which will address pressing civilizational challenges related to climate change and the environment, with a focus on sustainable and resilient engineering, incorporating systems thinking to support progress toward the UN Sustainable Development Goals.

The conference encompasses several thematic areas that address a wide range of topics, including environmental geotechnology, reuse of waste materials and circular economy, sustainable and resilient engineering practices, and testing and monitoring of geotechnical and geoenvironmental systems. The specific themes are as follows:

- Solid Waste and Circular Economy
- Geoenvironmental Pollution Control
- Sustainable Geo-Infrastructure
- Geotechnics for Renewable Energy
- Environmental Geotechnics for Climate Change
- Sustainable and Resilient Practices
- Biotechnologies/Nature-Based Solutions
- Advances in Geotechnical and Geoenvironmental Testing and Monitoring
- Education/Teaching
- Geosynthetics for Sustainability
- Sustainable Ground Improvement Techniques

For more information & updates visit www.egrwse2026.com

For general enquiries contact@egrwse2026.com



**Slope for Safety Performance
an ISRM Specialized Conference
26 – 29 October 2026, Lima, Peru
www.slopestability2026.com/en**

It is our great honor to welcome you to **Slope Stability 2026**, which will take place in Lima, Peru, from October 26 to 29, 2026.

This edition will pay tribute to **Dr. John Read**, pioneer of the Large Open Pit (LOP) research project, in recognition of his outstanding contributions to the mining industry and, in particular, to the Slope Stability series over the past 20 years. His work was instrumental in establishing the event as one of the world's foremost forums on slope and open pit stability. Each edition brings together leading experts, researchers, and professionals from around the globe to share knowledge, experiences, and cutting-edge solutions in geotechnical engineering and hydrogeology. It is also worth noting that Peru was the country where Dr. Read carried out his final expert consultancy before his passing in 2024.

For us, hosting Slope Stability in Lima for the first time holds special significance. Peru not only plays a vital role in global mining and infrastructure development but also possesses a millennia-old tradition in the construction and management of slopes and challenging terrains.

This heritage is evident in the terraces of ancient Andean civilizations, particularly in the extraordinary Inca engineering that endures to this day—high-quality infrastructure that has withstood both time and nature. This unique legacy, together with the technical focus of the scientific community and the cultural richness of Peru, provides an ideal setting for technical dialogue and innovation. These elements are essential to advancing open pit excavations with sustainability and diversity—values we are committed to passing on to younger generations.

In addition to its technical excellence, **Slope Stability 2026** promises an unforgettable cultural experience. Lima has been home to some of the world's most acclaimed restaurants in recent years, and Peru as a whole offers exceptional experiences across its diverse geographical regions, with vibrant traditions and extraordinary historical and natural landmarks. We hope every participant will enjoy not only the professional exchange but also the cultural richness and warm hospitality of our country.

We warmly invite the international geotechnical and mining community to join us. Together, we will make **Slope Stability 2026** an inspiring and memorable event that strengthens knowledge, fosters collaboration, and deepens friendship.

The conference agenda will be focus on the following themes:

- 1 Blasting
- 2 Design acceptance criteria in weak and hard rocks
- 3 Geo-Education and Training
- 4 Geohazards (rockfall, runoff, etc.)
- 5 Machine learning, artificial intelligence, and new technologies implementation

- 6 Mine Closure
- 7 Mine Waste and Dump Leach Stockpiles.
- 8 Numerical modeling and three-dimensional analysis.
- 9 Rock mass characterization and data uncertainty.
- 10 Slope monitoring, instrumentation, and risk management.
- 11 Slope stability and design optimization
- 12 Structural data gathering and interpretation
- 13 Hydrogeology



PBD-V Chile International Conference on Performance-Based Design in Earthquake Geotechnical Engineering, November 4th to 6th, 2026, Puerto Varas, Chile www.pbd-v-chile.com

ARMS 14 Fukyoka 2026 - 14th Asian Rock Mechanics Symposium Rock Mechanics for the Next Generation –Innovations, Sustainability, and Resilience– an ISRM Regional Symposium, 22-26 November 2026, Fukuoka, Japan, www.ec-convention.com/ARMS14/



**16th International Congress on Rock Mechanics
Rock Mechanics and Rock Engineering
Across the Borders
17-23 October 2027, Seoul, Korea**

Scope

The scope of the Congress will cover both conventional and emerging topics in broadly-defined rock mechanics and rock engineering. The themes of the Congress include but not be limited to the following areas:

- Fundamental rock mechanics
- Laboratory and field testing and physical modeling of rock mass
- Analytical and numerical methods in rock mechanics and rock engineering
- Underground excavations in civil and mining engineering
- Slope stability for rock engineering
- Rock mechanics for environmental impact
- Sustainable development for energy and mineral resources
- Petroleum geomechanics
- Rock dynamics
- Coupled processes in rock mass
- Underground storage for petroleum, gas, CO2 and radioactive waste
- Rock mechanics for renewable energy resources
- Geomechanics for sustainable development of energy and mineral resources
- New frontiers & innovations of rock mechanics
- Artificial Intelligence, IoT, Big data and Mobile (AICBM) applications in rock mechanics
- Smart Mining and Digital Oil field for rock mechanics

- Rock Engineering as an appropriate technology
- Geomechanics and Rock Engineering for Official Development Assistance (ODA) program
- Rock mechanics as an interdisciplinary science and engineering
- Future of rock mechanics and geomechanics

Our motto for the congress is “Rock Mechanics and Rock Engineering Across the Borders”. This logo embodies the interdisciplinary nature of rock mechanics and challenges of ISRM across all countries and generations.



**XIXth European Conference on Soil Mechanics
and Geotechnical Engineering
“Connecting Continents Through Geotechnical
Innovations”
04-08 September 2028, Istanbul, Turkey**

Conference Topics

- 01 Modelling and Experimental Assessment of Geomaterials
- 02 Geohazards, Earthquakes and Risk Mitigation
- 03 Development of Resilient and Sustainable Geosystems
- 04 Geotechnical Construction and Soil Improvement
- 05 Geotechnical Engineering of Multiscale Observations, Sensors and Monitoring
- 06 Energy Geotechnologies
- 07 Technological Innovation
- 08 Geo Education, Standards And Codes

Contact

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Dams around the world hold so much water they've shifted Earth's poles, new research shows

Dam construction since 1835 has caused Earth's poles to "wander" away from the planet's rotational axis because of the massive weight of water reservoirs.



Baihetan Dam is a huge hydroelectric operation in China.
(Image credit: VCG/VCG via Getty Images)

The construction of thousands of dams since 1835 has caused Earth's poles to wobble, new research suggests.

Scientists found that large dams hold so much water they redistribute mass around the globe, shifting the position of Earth's crust relative to the mantle, the planet's middle layer.

Earth's mantle is gooey, and the crust forms a solid shell that can slide around on top of it. Weight on the crust that causes it to shift relative to the mantle also shifts the location of Earth's poles, the researchers said.

"Any movement of mass within the Earth or on its surface changes the orientation of the rotation axis relative to the crust, a process termed true polar wander," the researchers wrote in the study, published May 23 in the journal [Geophysical Research Letters](#).

Scientists already knew human activities that displace enormous volumes of water can trigger polar wander. A study published in March showed that dramatic ice melt due to climate change may move the poles by 90 feet (27 meters) by the end of this century. And a 2023 study concluded that groundwater extraction between 1993 and 2010 caused a polar drift of 31 inches (80 centimeters).

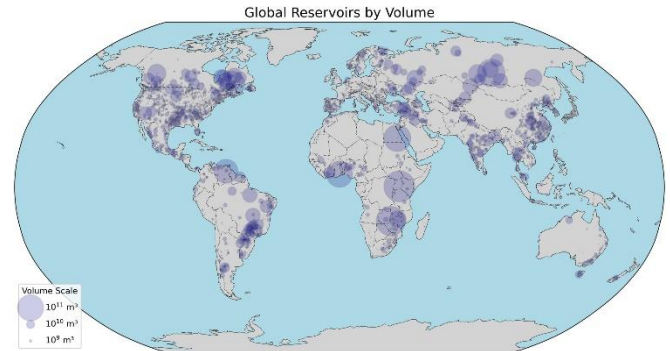
For the new study, researchers examined the impact of 6,862 dams, built across the planet, on Earth's poles between 1835 and 2011. The team used an already-published database of dams, which previously revealed that the volume of water held by these dams — a volume that could fill the Grand Canyon twice — had resulted in a 0.9-inch (23 millimeters) fall in global sea levels.

Storing water behind dams caused Earth's poles to move a total distance of 3.7 feet (1.1 m) over the study period, the authors of the new research found.

"As we trap water behind dams, not only does it remove water from the oceans, thus leading to a global sea level fall,

it also redistributes mass in a different way around the world," study lead author Natasha Valencic, a graduate student in geology, geophysics and planetary science at Harvard University, said in a statement.

The results, which were based on computer calculations and modeling, showed two distinct phases of polar wander within the study period. The first, from 1835 to 1954, reflects large-scale dam construction in North America and Europe. This caused the North Pole to migrate 8 inches (20 cm) closer to the 103rd meridian east — an imaginary line that runs north-south through Russia, Mongolia and China.



(Image credit: [Valencic et al. \(2025\)](#). Redistributed under the terms of [Creative Commons](#).)

The second phase, from 1954 to 2011, reflects expansive dam construction in East Africa and Asia. These dams added mass onto the opposite sides of the globe to North America and Europe, leading to a 22-inch (57 cm) shift in the North Pole's location toward the 117th meridian west, which runs through western North America and the South Pacific. Polar wander is not linear, instead forming a wobbly line, which is why the net shifts in each direction do not add up to 3.7 feet.

While the location of the poles has relatively little impact on Earth's processes, the impact of dams on sea levels is meaningful, Valencic said. "We're not going to drop into a new ice age, because the pole moved by about a meter in total, but it does have implications for sea level," she said.

The results suggest that scientists should account for dams in their sea level rise projections, because dams block so much water from reaching the oceans. Global sea levels rose by 4.7 to 6.7 inches (12 to 17 cm) during the 20th century. About a quarter of that amount of water is behind dams, which means that depending on where you are in the world, dams will influence sea levels, Valencic said.

"That's another thing we need to consider, because these changes can be pretty large, pretty significant," she said.

(Sascha Pare / LIVESCIENCE, Jul. 9, 2025, <https://www.livescience.com/planet-earth/dams-around-the-world-hold-so-much-water-theyve-shifted-earths-poles-new-research-shows>)

True Polar Wander Driven by Artificial Water Impoundment: 1835–2011

N. Valencic, E. Speiser, E. Doi, E. T. Lee, B. Ford, A. Hatzius, D. Komaravalli, B. Erdmann, W. Hawley, J. X. Mitrovica

Abstract

Artificial water impoundment contributed significantly to global mean sea level change during the 20th century and is included in recent studies of the budget of 20th century true

polar wander (TPW). We adopt a recent global database of water impoundment that accounts for 72% of an integrated global volume estimate and compute the associated TPW path from 1835 to 2011 CE. We find a highly non-monotonic pole path, with an integrated path length of 113.4 cm, a net displacement of 20.5 cm in the direction 103.4°E from 1835 to 1954 CE and 57.1 cm in the direction –117.5°E from 1954 to 2011. Across the first half of the 20th century, the mean rate of TPW was 0.30 cm/yr, while in the second half of the century it was 0.95 cm/yr. Finally, we demonstrate that the 28% of the total global water impoundment missing in our database likely had a negligible impact on polar motion.

Key Points

- A recent study compiled a global database of artificial water impoundment (dams) from 1835 to 2011
- We adopt this database to compute the signal of the impoundment in the reorientation of the Earth's rotation axis, true polar wander (TPW)
- The calculation differs in both magnitude and orientation from previous estimates and has implications for the budget of 20th century TPW

Plain Language Summary

Any movement of mass within the Earth or on its surface changes the orientation of the rotation axis relative to the crust, a process termed true polar wander (TPW). In this study, the authors compute TPW driven by the impoundment of water in globally distributed dams from 1835 to 2011. The calculation is based on a recent, comprehensive database of water impoundment, and the resulting polar wander path and magnitude is significantly different from an earlier estimate of the signal. Constraining TPW due to impoundment and using it to correct the observed 20th century rate of TPW, will help to constrain other physical processes contributing to the signal, including melting of polar ice sheets and glaciers in our warming world.

<https://doi.org/10.1029/2025GL115468>

(AGU Geophysical Research Letters, First published: 23 May 2025,
<https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2025GL115468>)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΣΕΙΣΜΟΙ & ΑΝΤΙΣΕΙΣΜΙΚΗ ΜΗΧΑΝΙΚΗ

First video of an earthquake fault cracking has revealed another surprise

A stunning video of the ground cracking during a magnitude 7.7 earthquake in Myanmar is revealing new surprises.



<https://www.youtube.com/watch?v=77ubC4bcgRM>

A first-of-its-kind video showing the ground cracking during a major earthquake is even more remarkable than previously thought. It not only captures a ground motion never caught on video before but also shows the crack curving as it moves.

This curvy movement has been inferred from the geological record and from "slickenlines" — scrape marks on the sides of faults — but it had never been seen in action, geophysicist Jesse Kears, a postdoctoral researcher currently at Kyoto University in Japan, said in a statement.

"Instead of things moving straight across the video screen, they moved along a curved path that has a convexity downwards, which instantly started bells ringing in my head," Kears said, "because some of my previous research has been specifically on curvature of fault slip, but from the geological record."

The video — captured by a security camera near Thazi, Myanmar — shows the ground rupturing during a magnitude 7.7 quake that hit the region on March 28. It shows the ground shaking, followed by a crack opening up. These ground ruptures are relatively common during big quakes, but they'd never been caught on video.

Kears said he watched the video with chills down his spine shortly after it was uploaded to YouTube. On his fifth or sixth viewing, he noticed that the crack was curvy. He and his colleague at Kyoto University, geophysicist Yoshihiro Kaneko, then analyzed the video more closely. They found that the crack curves sharply at first and then accelerates to a peak velocity of about 10.5 feet per second (3.2 meters per second) of movement, slipping a total of 8.2 feet (2.5 meters) in 1.3 seconds. After hitting its top velocity, the crack straightens and slows.

The findings suggest that the curvature happens because stresses on the fault right at the ground surface are lower than the stresses on the fault deeper in the Earth. This cre-

ates an uneven pattern in how the fault moves. "The curvature holds important information about the dynamics of the rupture," Kears said in an annotated video of the slip he posted on YouTube.

The differing stresses at the surface push the fault off its course, "and then it catches itself and does what it's supposed to do," Kears said in the statement.

The dynamics of these curvatures depend in part on which way the rupture travels, so an understanding of the curves can reveal clues about how past earthquakes unfolded and help scientists better predict future ground ruptures.

The research was published today (July 18) in the journal [The Seismic Record](#).

([Stephanie Pappas](#) / LIVESCience, July 17, 2025, <https://www.livescience.com/planet-earth/earth-quakes/first-video-of-an-earthquake-fault-cracking-has-revealed-another-surprise>)

Curved Fault Slip Captured by CCTV Video During the 2025 M_w 7.7 Myanmar Earthquake

Jesse Kears and Yoshihiro Kaneko

Abstract

On-fault geological observations from surface-breaking earthquakes typically contain curved slickenlines, suggesting fault slip is curved. However, slickenlines commonly record only a fraction of coseismic slip, making it difficult to reconstruct the full slip trajectory. Near-fault seismic records, though capable of capturing ground motions associated with rupture, are limited in their ability to constrain on-fault slip direction because they record motion on only one side of the fault. Here, we overcome these challenges by directly observing fault slip using video footage of the 2025 M_w 7.7 Myanmar, strike-slip earthquake. We use pixel cross correlation to track features in successive frames of the video, revealing a pulse of fault slip with a magnitude of 2.5 ± 0.5 m, a duration of 1.3 ± 0.2 s, and a peak velocity of 3.2 ± 1.0 m/s. The observed trajectory is notably curved and includes a transient (0.3 m) dip-slip component on a steeply dipping strike-slip fault. These observations are consistent with geological records of curved slickenlines, supporting mechanical models that link rupture propagation direction to near-surface slip curvature. Our results provide the first direct visual evidence of curved coseismic fault slip, bridging a critical gap among seismological observations, geological data, and theoretical models.

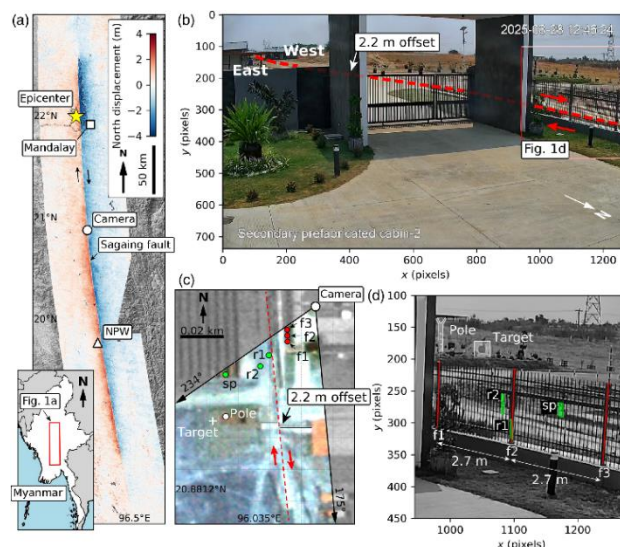


Figure 1. (a) Map of Myanmar (inset) and the Myanmar earthquake. Red and blue colors show the coseismic surface displacement field derived from sentinel-2 images taken before and after, the earthquake from Van Wyk De Vries (2025). The locations of the CCTV camera and strong-motion station NPW are shown. (b) Frame 1 of video (before rupture arrives) showing the field of view captured by the CCTV camera. The red dashed line shows the location of the Sagaing fault rupture. The offset path is obscured behind the gate structure in the foreground. (c) Planet labs satellite image with a 0.5 m resolution taken after the earthquake (5 April 2025). Features observable in panel (d) are labeled. The colored area corresponds to the field of view of the video frame in panel (b). f1–f3 denote fence posts located on the east side of the fault used to calibrate coseismic displacements. r1, r2, sp, and pole are objects that are displaced by fault motion. The white cross labeled “target” shows the location of features tracked using image cross correlation. (d) Enlarged subset of the video frame showing the locations of the objects in pixel coordinates.

The Seismic Record (2025) 5 (3): 281–288.
<https://doi.org/10.1785/0320250024>

Open Access

(The Seismic Record / July 18, 2025, <https://pubs.geoscienceworld.org/ssa/tsr/article/5/3/281/659624/Curved-Fault-Slip-Captured-by-CCTV-Video-During>)



Google tapped billions of mobile phones to detect quakes worldwide — and send alerts

Study reveals how the tech behemoth is using the motions sensors on phones to expand quake warnings to more countries.

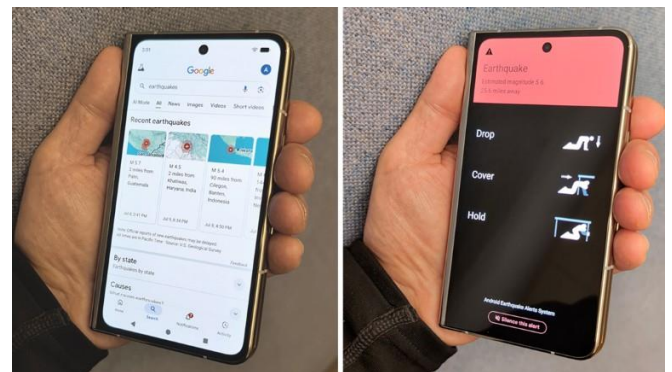
Technology giant Google harnessed motion sensors on more than two billion mobile phones between 2021 and 2024 to detect earthquakes, and then sent automated warnings to millions of people in 98 countries. In an analysis of the data, released in *Science* today¹, Google’s scientists say that the technology captured more than 11,000 quakes and performed on a par with standard seismometers. Earthquake researchers who were not involved with the experiment are impressed by the system’s performance, but argue that public officials would need access to more information about the proprietary technology before relying on it.



Rescue workers search the rubble for survivors after a pair of earthquakes in Turkey in 2023. Credit: Eren Bozkurt/Anadolu Agency via Getty

Over the past few decades, earthquake alert systems using standard seismometers have been deployed in locations including Mexico, Japan and the US west coast. But in 2020, Google announced that it would build a crowd-sourced system to detect tremors at their earliest stages by tracking the collective shaking of Android phones. The results from the first three years of operation, released today, show that the technology works and has improved over time. On average, thousands of people are killed by earthquakes each year, and with the mobile-based alert system in place, the number of people who now have access to earthquake alerts has increased tenfold since 2019, says Google.

“It’s very impressive: most countries don’t have an earthquake early-warning system, and this can help provide that service,” says Allen Husker, a seismologist at the California Institute of Technology in Pasadena. But, Husker says, he would feel better if Google would provide independent scientists with more access to the data and algorithms.



When a large quake hits, Google sends an urgent ‘TakeAction’ message to Android phones. Credit: Google

Scientists at Google say they are being as transparent as they can be about how the system works and performs. Owing to privacy concerns, sharing raw data from users’ phones is a challenge, they told *Nature*, but the *Science* paper is designed to shed as much light as possible on how the system works.

“That really is the origin of this paper,” says Richard Allen, a seismologist at the University of California, Berkeley, and visiting faculty member at Google. “I hope the community will recognize that and appreciate that.”

Crowd-sourced detection

The Android Earthquake Alerts system relies on quantity, not quality: research-grade seismometers provide higher quality data, but Google is relying on the ubiquity of modern Android smartphones — which collect and report motion data by default, unless users opt out — to get around a lack of sensitivity in any given device. In addition to mapping out data from individual users to identify earthquake origins and strength, the Google team developed algorithms to analyse the collected signals, which contain regional differences owing to geology and building construction, and account for how various phone models register motion.

The Google team says that challenges remain when it comes to detecting and issuing timely alerts for the largest and most dangerous earthquakes. For instance, the system underestimated a pair of powerful earthquakes in Turkey in February 2023, which resulted in around 4.5 million earthquake warnings being sent to users. When the Google scientists upgraded their algorithms and re-evaluated those earthquakes, however, the system predicted larger quakes and sent more urgent ‘TakeAction’ alerts that would have been received by ten million Android phones.

"This shows they have been working to improve the system since 2023, with tangible positive results," says Harold Tobin, a seismologist at the University of Washington in Seattle.

But Tobin also worries about the proprietary nature of the system. "For a public-safety system like this one, the Android team has a responsibility to be very transparent about how it works so that civil authorities can make those judgement calls themselves."

Google issued a statement to *Nature* describing the alert system as a "supplemental" service that is "not meant to replace official earthquake detection or alerting systems".

doi: <https://doi.org/10.1038/d41586-025-02278-3>

(Jeff Tollefson / *Nature*, 17 July 2025, <https://www.nature.com/articles/d41586-025-02278-3>)

AI predicts how many earthquake aftershocks will strike — and their strength

Models trained on large data sets of seismic events can estimate the number of aftershocks better than conventional models do.

Alexandra Witze



[AI predicts how many earthquake aftershocks will strike — and their strength](https://doi.org/10.1038/d41586-025-02278-3)

What's Earth's lowest point on land?

What's Earth's lowest spot on dry land — and how did it get to be that way?



Salt-encrusted rocks at the surface of the Dead Sea, whose banks are Earth's lowest place on dry land. (Image credit: Ido Meirovich via Getty Images)

The highest point on Earth's surface is the top of Mount Everest, which towers more than 29,000 feet (8,800 meters) above sea level. But what's the lowest point on land?

The lowest spot on dry land are the banks of the Dead Sea in the Middle East. These lie about 1,300 feet (430 m) below sea level, according to the National Oceanic and Atmospheric Administration (NOAA).

The banks of the Dead Sea are the lowest point on dry land but not the deepest point on Earth's surface. That distinction belongs to the Challenger Deep in the Mariana Trench, a point in the Pacific Ocean that reaches about 35,876 feet [10,935 m] below the planet's surface.

The precise depth of the Dead Sea's surface can vary daily. According to NASA, on a hot, dry summer day, the water level can drop as much as 1 inch (2 to 3 centimeters) because of evaporation.

The Dead Sea, which is not really a sea but a large saltwater lake, is 47 miles (76 kilometers) long and up to 11 miles (18 km) wide. The "Dead Sea" was named by monks, who noticed that life seemed to be absent from the salty water, NOAA noted.

The Dead Sea lies along the Dead Sea Fault, which spans about 600 miles (1,000 km) from the Red Sea to the Taurus Mountains in Turkey and started forming nearly 20 million years ago, according to a 2006 study in the journal *Earth and Planetary Science Letters*. The fault helps form the boundary between the African tectonic plate to the west and the Arabian one to the east. NASA notes that the Dead Sea lies in the Great Rift Valley, which is currently ripping the African continent apart.

"The Dead Sea fault is primarily a transform fault, similar to the San Andreas Fault in California, where two plates are moving next to each other," Rob Pockalny, an associate marine research scientist at the University of Rhode Island, told Live Science.

Both sides of the fault are moving northward, "but the east-

ern side moves a bit faster, about 5 millimeters [0.19 inches] per year," marine geophysicist Zvi Ben-Avraham, director of the Minerva Dead Sea Research Center at Tel Aviv University in Israel, told Live Science. In comparison, "the San Andreas Fault moves 10 times faster."

Previously, researchers suggested the Dead Sea formed essentially because of a zigzag in the Dead Sea Fault. If the Dead Sea Fault was perfectly straight, one side could slide relatively smoothly next to the other. However, if the fault had a zigzag in it, then as one side slid past the other, a gap would form in the zigzag area where both sides of the fault were pulling apart. Such a "pull-apart basin" could have steep walls, helping to explain why the Dead Sea is so low in elevation, Pockalny said.

However, the standard model of pull-apart basins suggest they become long before they become deep. In contrast, the basin of the Dead Sea is significantly wider than it is deep, Ben-Avraham said. The sediment that makes up the floor of the southern Dead Sea "extends down close to 15 kilometers [9.3 miles], and that part of the basin is only about 10 kilometers [6 miles] wide."

Instead, Ben-Avraham and his colleagues suggest the Dead Sea is a "drop down basin." As both sides of the fault slid past each other, they spread apart a bit, "but then an isolated chunk of basalt detached from them and dropped down starting about 4 million years ago," Ben-Avraham said. "So the Dead Sea basin became deeper while its other dimensions stayed fixed."

Determining which model of the Dead Sea's formation might be correct is challenging "because these motions are very slow," Ben-Avraham said. "Understanding what is going on in this part of the crust in real time is very, very difficult and expensive."

(Charles Q. Choi / LIVESCIENCE, July 13, 2025, <https://www.livescience.com/planet-earth/geology/whats-earths-lowest-point-on-land>)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΛΟΙΠΑ

Ιστορική η απόφαση UNESCO για την ένταξη των Μινωικών Ανακτόρων Κρήτης στον Κατάλογο Παγκόσμιας Κληρονομιάς



«Μετά από μια ιστορική απόφαση τα Μινωικά Ανακτορικά Κέντρα της Κρήτης αποτελούν πλέον μέρος του Καταλόγου της Παγκόσμιας Κληρονομιάς», σημειώνει με δήλωσή του στο ΑΠΕ-ΜΠΕ ο Μόνιμος Αντιπρόσωπος της Ελλάδας στην UNESCO, Γιώργος Κουμουτσάκος.

Όπως τονίζει «η UNESCO έβαλε στην Κνωσό, στη Φαιστό, στα Μάλια, στη Ζάκρο, στη Ζωμίνθο, στη Κυδωνία, δική της σφραγίδα κύρους, αναγνωρίζοντας τη σπουδαιότητα και τη μοναδικότητα του μινωικού πολιτισμού. Ενός πολιτισμού που έλαμψε πριν από 5.000 χρόνια, με την πολιτιστική του δημιουργία, την ανάπτυξη του εμπορίου σε όλη την Ανατολική Μεσόγειο και τη διαμόρφωση μιας στιβαρής κοινωνικής δομής που είχε στο επίκεντρό της τα ανακτορικά κέντρα. Ενός πολιτισμού που ταυτόχρονα πίστευε στη χαρά της ζωής, όπως αποδεικνύουν οι γνωστές σε όλον το κόσμο τοιχογραφίες. Η ιστορική αυτή απόφαση είναι για την Ελλάδα, για την Κρήτη, και για όλους μας, πηγή χαράς και υπερηφάνειας, αλλά ταυτόχρονα και μεγάλης ευθύνης: για να προστατεύσουμε και να διατηρήσουμε, με όλες μας τις δυνάμεις, αυτό το μοναδικής σημασίας πολιτισμικό αγαθό. Κάθε μεγάλη επιτυχία είναι αποτέλεσμα συλλογικής, όχι ατομικής προσπάθειας. Ευχαριστώ από την καρδιά μου όλους εκείνους στο Υπουργείο Πολιτισμού, στο Υπουργείο Εξωτερικών και τους συνεργάτες μου στη Μόνιμη Αντιπροσωπεία της Ελλάδας στην UNESCO που εργάστηκαν με πίστη, αφοσίωση και υψηλό επαγγελματισμό, ώστε να φτάσουμε στο αποτέλεσμα αυτό. Η συνεργασία όλων υπήρξε άψογη. Ένα μεγάλο ευχαριστώ και συγχαρητήρια στην Υπουργό Πολιτισμού, κα Λίνα Μενδώνη που καθοδήγησε με αποφασιστικότητα και γνώση όλην αυτήν την εθνικής εμβέλειας προσπάθεια.»

Η εγγραφή των Μινωικών Ανακτορικών Κέντρων στον Κατάλογο Παγκόσμιας Κληρονομιάς της UNESCO, η οποία ανακοινώθηκε χθες Σάββατο στο πλαίσιο των εργασιών της 47ης Συνόδου της Επιτροπής Παγκόσμιας Κληρονομιάς, αποτελεί μεγάλη επιτυχία της χώρας μας, σημειώνει το Υπουργείο Πολιτισμού σε ανακοίνωσή του. Συνιστά την διεθνή αναγνώριση της εξέχουσας οικουμενικής αξίας των έξι εξαιρετικά σημαντικών αρχαιολογικών χώρων της Κρήτης -της Κνωσού, της Φαιστού, των Μαλίων, της Ζάκρου, της Ζωμίνθου και της Κυδωνίας- που συγκρότησαν τη σειριακή υποψηφιότητα. Ταυτόχρονα, αποτελεί δέσμευση για την Ελλάδα να διατηρήσει και να προστατεύσει αλώβητες τις πολιτιστικές αξίες των σημαντικών αυτών μνημειακών συνόλων. Η εγγραφή αποτελεί το επιστέγασμα της συστηματικής, επίπονης, μακροχρόνιας προσπάθειας των έμπειρων στελεχών και υπηρεσιών του Υπουργείου Πολι-

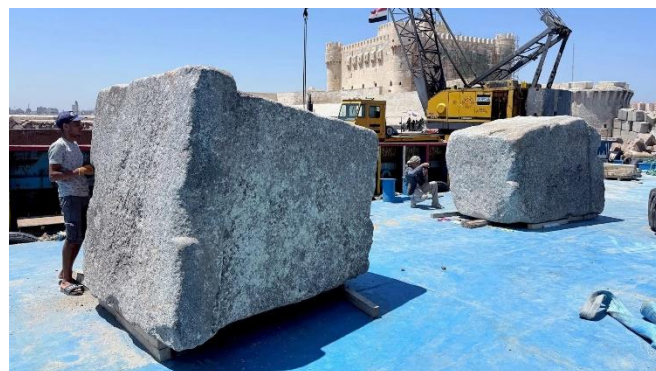
τισμού και της εποικοδομητικής συνεργασίας τους με την Περιφέρεια Κρήτης και συναρμόδιους φορείς για την προετοιμασία του φακέλου της υποψηφιότητας. Η Επιτροπή Παγκόσμιας Κληρονομιάς, βασιζόμενη και στην αξιολόγηση του αρμόδιου συμβουλευτικού οργάνου της, ICOMOS, αναγνώρισε την Εξέχουσα Οικουμενική Αξία των Μινωικών Ανακτορικών Κέντρων, την αυθεντικότητα και την ακεραιότητα του αγαθού, καθώς και την ύπαρξη ισχυρού πλαισίου προστασίας και δομημένου Σχεδίου Διαχείρισής του, συστατικά απαραίτητα της εγγραφής στον Κατάλογο Παγκόσμιας Κληρονομιάς.

(ΑΘΗΝΑΪΚΟ ΜΑΚΕΔΟΝΙΚΟ ΠΡΑΚΤΟΡΕΙΟ ΕΙΔΗΣΕΩΝ, Κυριακή 13 Ιουλίου 2025,
<https://www.amna.gr/mobile/article/918655/Istoriki-i-apofasi-UNESCO-gia-tin-entaxi-ton-Minoikon-Anaktoron-Kritis-ston-Katalogo-Pagkosmias-Klironomias>).



Massive blocks from the Lighthouse of Alexandria, an ancient wonder, hauled up from the Mediterranean

French and Egyptian researchers are making a "digital twin" of the Lighthouse of Alexandria in Egypt after lifting its ancient submerged blocks out of the Mediterranean Sea.



A total of 22 massive stone blocks have been recovered from the underwater ruins of the ancient lighthouse at Alexandria in Egypt. (Image credit: GEDEON Programmes/CEAlex)

Workers at the Egyptian port city of Alexandria have recovered 22 massive stone blocks that were used thousands of years ago to build the city's famous lighthouse, one of the wonders of the ancient world.

The stone blocks were raised from the harbor floor at Alexandria, on the southeastern coast of the Mediterranean Sea, and will now be studied and digitally scanned. The results will be added to digital records of more than 100 stones discovered underwater over the past decade, according to a statement from the Dassault Systems Foundation, one of the project's sponsors.

The research is led by French archaeologist and architect Isabelle Hairy and brings together the expertise of historians, archaeologists, architects and engineers to create a virtual 3D model of the ancient lighthouse, which had already been badly damaged by earthquakes when it collapsed in the 14th century.

The recently recovered stones include pieces of a huge door-

way that weighed "70 to 80 tons," according to the statement. The workers also recovered parts of a massive Egyptian-style "pylon," or ceremonial gateway, that may have been a monument.

Ancient wonder

The Lighthouse of Alexandria — also known as the Pharos of Alexandria, after a small island at the mouth of the harbor where it stood — was built in about 280 B.C. on the orders of the Egyptian king Ptolemy II Philadelphus (who had been born in Macedonia) mainly to guide approaching ships safely to the harbor.

The city was founded by and named after the Macedonian king Alexander the Great, who seized Egypt from the Persian Empire in 332 B.C. Alexandria then became the Egyptian capital under the Hellenistic (Greek) Ptolemaic dynasty of pharaohs (the first, known as Ptolemy I Soter, had been one of Alexander's most trusted generals) and one of the wealthiest cities in the ancient world.



The lighthouse collapsed during earthquakes in the 14th century. This 1909 drawing was based on ancient descriptions. (Image credit: Public domain)

Alexandria's lighthouse was a technological marvel for its time. According to the statement, it was more than 328 feet (100 meters) high, making it one of the tallest structures in the ancient world, with a multitiered design of a square base, an octagonal middle section and a cylindrical top.



The newly-recovered stone blocks include pieces of a massive doorway that led into the lighthouse structure (Image credit: GEDEON Programmes/CEAlex)

Its light was produced by a large fire, probably fueled by wood or oil, and it formed a concentrated beam that could be seen up to 30 miles (50 kilometers) away, according to ancient writers. The beam of light seems to have been created

by reflecting the lighthouse fire with large, polished metal surfaces, perhaps of bronze or copper — although they have not survived, and little is known about them.

The Lighthouse of Alexandria was one of the ancient "wonders of the world" — a designation bestowed by ancient Greek writers. It was "highly celebrated" by the time of Pliny the Elder (lived A.D. 23 to 79) during the Roman Empire, who wrote about the lighthouse hundreds of years after it had been built.

Digital twin

The ruins of the Lighthouse of Alexandria were discovered underwater in 1994 by French archaeologist Jean-Yves Empereur, and the latest work at the site is the third research project there by academics from France.



The French researchers are using data from the stone blocks to create a virtual reconstruction of the ancient wonder (Image credit: Isabelle Hairy/Centre d'Etudes Alexandrines)

Instead of physically rebuilding the collapsed lighthouse, however, the researchers are making a virtual reconstruction, or "digital twin," based on what they can learn from the ruins and historical records.

The newly recovered stone blocks will be digitally scanned, and the data will be given to volunteer engineers from the Dassault Systems Foundation, who will attempt to position them correctly in the reconstruction — "like pieces of a giant archaeological puzzle," according to the statement.

In addition to testing theories about its construction and collapse, the virtual model will "revive the lighthouse's original grandeur, allowing visitors to explore it as if they were on site," the statement said.

(Tom Metcalfe / LIVESCIENCE, July 8, 2025, <https://www.livescience.com/archaeology/ancient-egyptians/massive-blocks-from-the-lighthouse-of-alexandria-an-ancient-wonder-hauled-up-from-the-mediterranean>)



IGS NEWSLETTER - July 2025

• GeoAsia8 Reflections

Hundreds of delegates from more than 45 countries descended on Brisbane for the 8th Asian Regional Conference on Geosynthetics (GeoAsia) last month. [Read the full article](#) reflecting on the fantastic event, or catch up on some headlines below:

→ [Maccaferri won](#) the GeoAsia Corporate Case Study contest.

→ Students from the Asia-Pacific region [have been telling of their experiences](#) after eight won a student award during GeoAsia8

→ We are pleased to announce that the [GeoAsia9 will take place in Ahmedabad, India](#).



IGS Young members social event



Shine Salur delivering DE&I Presentation

• Premium Corporate Members Announced

We are pleased to announce our first Premium Corporate Members; HUESKER, Maccaferri, Naue, SKAPS, Solmax, Strata, TechFab India and TRI Environmental. You can learn more by [visiting our website](#).

HUESKER

MACCAFERRI

Naue



SOLMAX

STRATA

TECHFAB INDIA

TRI ENVIRONMENTAL

• EuroGeo8 Updates

Keep up to date with the latest [EuroGeo8](#) announcements:

→ Professor Nicola Moraci [will give the next LMNS lecture](#) on *Suitable design approaches for interfaces involving geosynthetics under various loading and flow conditions*. You can find the full list of Invited Lecturers [here](#).

→ We are pleased to announce during the conference, that the IGS Diversity Committee [will host a session](#) delivered by Daniela Felletti on *Awakening Perceptions: challenging minds to lead with empathy*.

→ The EuroGeo8 Corporate Case Study Competition is now open for submissions from IGS Corporate Members through 15 August 2025. [Visit our website](#) to learn more.

→ You can find the programme [here](#) and, if you haven't already, you can register to attend [here](#).



DEI Practitioner, Daniela Felletti & Professor Nicola Moraci

• Complete the [FedIGS Sustainability Survey](#)

Help shape the future of sustainable geo-engineering by taking this survey from JTC4, uniting global experts to support long-term environmental and infrastructure sustainability. [Complete the survey](#).

• Calendar of Events

3-4 September 2025 [3G Conference 2025](#), Kumasi, Ghana

15-18 September 2025 [EuroGeo 8](#), Lille, France

22-23 October 2025 [Geosintec 4](#), Madrid, Spain

13-17 September 2026 [13th ICG](#), Montreal, Canada





https://about.ita-aites.org/files/ITA-CET_Newsletter_Issue_19_July_2025.pdf

Κυκλοφόρησε το τεύχος αρ. 19, Ιουλίου 2025 του Newsletter της ITA – CET (Committee on Education and Training της ITA) με τα ακόλουθα περιεχόμενα:

Facts, figures and fika! A lookback at the training course that took place during the WTC in Stockholm (page 2).

Uniting minds for global training Missed our plenary meeting in Stockholm? Find out what we discussed (page 4).

Lunchtime lecture series: spread the word! Help us promote the successful monthly webinars (page 5).

What's new on the

Steering Board? We say goodbye to a valued member and welcome our newcomers (page 6).

University network event: save the date! Our next university professors meeting and PhD students conference, promoting research in tunnelling, will take place in June 2026, (page 7).

Training the next generation of tunnelling experts in India News on the successful workshop on sustainable tunnelling and the inauguration of the Center of Excellence in Tunneling and Underground Construction (page 8)



www.nxtbook.com/dfi/DEEP-FOUNDATIONS/july-august-2025/index.php#/p/2

Κυκλοφόρησε το τεύχος Ιουλίου / Αυγούστου 2025 του περιοδικού Deep Foundations με τα ακόλουθα περιεχόμενα:

[Cover Story: Anchoring the Future: Building the World's First Floating Eco-Park](#)

[Micropiled Post-Tensioned Raft Foundation System](#)

[Cursed Again: Despite Advances in Technology, the Curse Continues to Plague Drillers in Canada](#)

[Performance-Based Design: Why Aren't We Leveraging it to its Full Potential? Managing Opportunity, Safety and Contract Risk](#)

[A Look Back: 30 Hudson Street Foundation Design and Construction in Variable Rock](#)

[Member Profile Minnesota DOT's Derrick Dasenbrock Leads by Example](#)

[Foundations for a Sustainable Future: Sustainability Is Essential for a Company's Sustainable Future](#)

[Risk Corner: Deep Foundation Contract Risk...and...the Finer Things?](#)

[Legally Speaking: The "Bargain" of Arbitration](#)

ΕΚΤΕΛΕΣΤΙΚΗ ΕΠΙΤΡΟΠΗ ΕΕΕΕΓΜ (2023 – 2026)

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