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A New Low-Cost Seismic Isolation System Based on Pre-Inca Technology

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In this issue

Abstract

This article presents a study that revisits the seismic wisdom of ancient Peruvian civilizations and explores the development of a new low-cost seismic isolation system inspired by the Shicras, stones wrapped in natural fibres, originally used more than 3000 years ago. Archaeological discoveries from the Andean region indicate that Shicras played a crucial role in enhancing the seismic stability of early structures. Drawing inspiration from these discoveries, this research aims to establish the physical basis of Shicra-based isolation through analytical, numerical, and experimental approaches. The analytical model idealises a Shicra as a rigid polygonal body that rocks and rolls under dynamic excitation, dissipating energy through successive impacts. The governing equations of motion are formulated, solved, and verified against observed behaviour. Complementing the analytical work, experimental investigations using hybrid simulation is proposed to validate the energy dissipation mechanism. The study demonstrates how ancient construction wisdom can guide the design of affordable, locally sourced seismic protection systems for developing regions worldwide. Access the full presentation details in the recorded talk.

1. Introduction and Background

Earthquake remain among the most devastating natural hazards known to humankind. Despite remarkable advances in structural engineering, their destructive power continues to pose severe risks, especially in developing regions where economic constraints hinder the adoption of conventional seismic protection technologies. According to global disaster statistics, nearly sixty percent of casualties from natural disasters are caused by earthquakes alone. The uneven global distribution of seismic activity is well recognised. Regions along the Pacific 'Ring of Fire' are particularly prone to catastrophic earthquakes. One of the most active of these is the Andean region, stretching along the western coast of South America, where tectonic subduction of the Nazca plate beneath the South American plate triggers frequent high-magnitude earthquakes. Amid this seismic reality, an extraordinary archaeological discovery has revealed that ancient Andean builders, thousands of years before the invention of modern base isolation systems, had already developed an ingenious seismic protection technique using *Shicras* - stones enclosed in woven fibre bags.

2. Discovery of *Shicras* and Their Engineering Significance

Numerous archaeological sites in the Andean region underwent excavation during the late 20th century, revealing remnants believed to be ancient sanctuaries dating back to approximately 3000 BC. Among these sites, the City of Caral, part of the Norte Chico civilization of Peru, was recognized as a UNESCO World Heritage Site in 2009 (see Figure 1), along with other significant locations such as Apero Ruins, Las Shicras (see Figure 2), and Las Aldas. Notably, the archaeological exploration led to the discovery of stones wrapped in bags of vegetable fibres known as *shicras*.

Research conducted during excavations at Las Shicras by Tosso, (2009) revealed variations in the size of *shicras* across different sites. Tosso concluded that rounded *shicras* with diameters ranging from 30 to 40 cm were commonly positioned around the walls of structures. These structures, often interpreted as shrines, were erected on raised platforms constructed using either adobe or stone masonry. Through the observation of layered raised platforms, it was determined that each new shrine was built atop the previous one, with the latter levelled to the ground to create a platform for the former. This repeated and layered construction methodology as visible in Figure 3, termed 'Shrine reconstruction' by Shady *et al*., (2009), eventually formed stepped pyramids.

Consequently, *shicras* were systematically integrated into the substructure of newly constructed shrines, and in some cases, were used as land fill materials in the continuation works of these constructions, as revealed by findings of the various researchers (Manco, 1978; Shady *et al*., 2009; Tosso Morales, 2009; Vargas, *et al*., 2011).

Archaeologists and researchers are still exploring the purpose of *shicras* in ancient constructions. Various interpretations exist regarding the use of fibre-based baskets for carrying stones i.e., *shicras*. One possible reason could be enhancing the structural stability of the platform (Vargas Neumann, 2012). It is clear that the application of loose rubble for constructing platforms with vertical walls is hindered by the relatively small friction angle, compromising structural stability. On the other hand, *shicras*, which are carried in vegetable-based fibre baskets, increase internal friction, and strengthen the structure, possibly enhancing its stability.

Additionally, the fixed arrangement of stones within *shicras* prevents them from being easily altered and enables the transfer of loads between layers. Moreover, *shicras* are easily carried and handled when placed in baskets made of plant fibre. In conclusion, *shicras* were incorporated to enhance structural stability against long-term loadings. *Shicras*, not only improve structural stability, but also demonstrate a potential to dissipate seismic energy from ground vibrations. Archaeological findings indicate that structures built with *shicras* in their foundations have survived for more than 3000 years in one of the most seismically active regions of the world, namely the Pacific Coast

Figure 1: Sacred City of Caral-Supe. (photo by Christopher Kleihege)

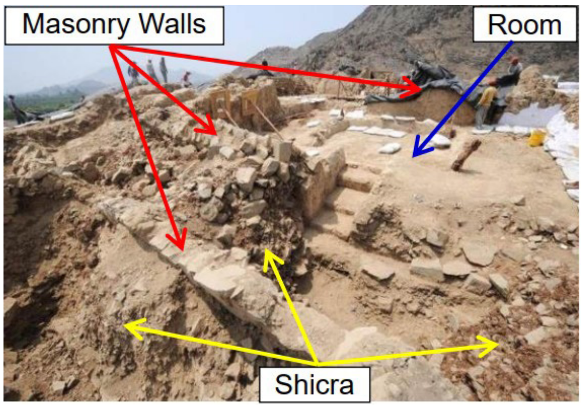


Figure 2: Excavation site of Las Shicras Ruins (Fukuyama *et al*., 2016)

Figure 3: Unearthed *shicras* revealed at Bichama Ruins (Tosso Morales, 2009).

Figure 4: *Shicra* dating circa 3000 years old unearthed from the Las Shicras

of Peru (Sosa *et al.*, 2014). According to the Atlas del Peru, (1989), three major earthquakes with a magnitude of IX or greater on the Moment Mercalli intensity scale have occurred in the region since 1555 CE.

Based on records, major earthquakes in 1586 (IX), 1655 (IX), and 1746 (X) might have affected the aforementioned areas, including Las Shicras Ruins and Caral Ruins. These remains may have faced additional major earthquakes, considering that the frequency of major earthquakes over 5000 years is approximately 30 times. The undamaged state of the pyramids in these regions, as noted by Huapaya, (1978), indicates that *shicras* have played an important role in improving the seismic response of their host structure, despite their primary purpose being to enhance long-term loading effects.

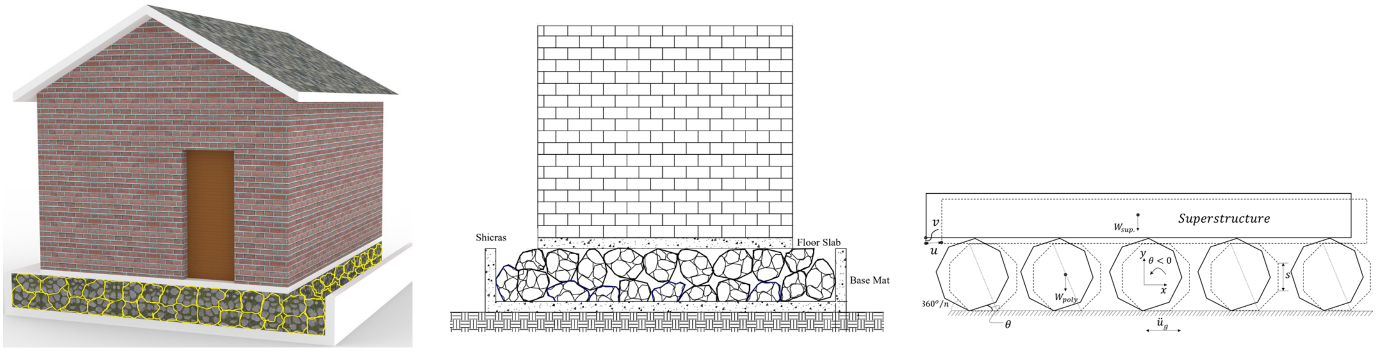
Survival of the structures having *shicras* in their foundations for extended periods within the high seismic zone of Pacific Coast of Peru clearly demonstrates the phenomenal performance of *shicras* during earthquakes. The application of *shicras* emphasizes the engineering knowledge of people of the central Andean coast during late archaic period, showcasing their ability to develop such sophisticated earthquake resistant solutions for their important structures. Stones encapsulated in junco fibre bags have the potential to deform and exhibit favourable elasticity, effectively absorbing lateral thrusts during earthquakes and thereby contributing to prolonged structural integrity of buildings – a pursuit resonating with contemporary engineering goals.

Moreover, archaeological evidence presented by Eduardo Torres, (2017) in his work on pre-Hispanic construction further supports the hypothesis of *shicras* being used for dissipating the seismic energy. This further elaborates the strategic placement of *shicras* within fills, forming layers that attest to their efficacy in addressing seismic demands. The ingenious application of *shicras*, to tackle the adverse natural challenges, reflects the comprehensive understanding of material properties and seismic engineering principles of the people of that time. To further validate this hypothesis, the potential of *shicras* to reduce the earthquake induced vibrations was examined experimentally through shake table testing conducted on reproduced *shicras* units. (Fukuyama *et al.*, 2013, 2016; Vargas Neumann *et al.*, (2019).

3. Analytical Modelling of Energy Dissipation

Building upon these archaeological and experimental insights, the present research aims to establish an analytical framework that explains how *Shicra*-like units dissipate energy during seismic loading. Initially, for the development of empirical expressions, this study idealizes each *Shicra* as a regular rigid polygon — specifically, an octagon, capable of rocking and rolling about its pivot points (see Figure 5(c)). The superstructure is represented by a lumped mass, and the interface friction between *Shicras* and the base is assumed to be sufficiently high. This assumption eliminates sliding, simplifying the kinematics to rotational uplift and impact-driven transitions between consecutive pivot points. When ground acceleration exceeds a critical threshold, a *shicra* loses contact at one edge, leading to uplift and subsequent rocking about the opposite vertex. The energy dissipation mechanism arises primarily from impact during these rocking and rolling transitions.

The rotational motion of each polygonal *shicra* is governed by the principle of angular momentum about the instantaneous pivot. The motion satisfies the Lagrange equation, and hence variational principles can be used to derive an analytical expression for the system's evolution. The



(a) (b) (c)

Figure 5: (a) Proposed use of *shicras* (b) Two-dimension idealization of a masonry structure with *shicras* as isolation layer (c) Idealized rocking of *shicras* due to a horizontal ground acceleration.

corresponding Euler–Lagrange equation, once simplified, yields a form similar to the classical rocking block equation first developed by Housner as expressed in Equation 1. However, in our case, the frequency parameter (p) differs significantly; it represents a geometric–inertial property rather than the frequency of the system.

$$\ddot{\theta} = -p^2 \left(\sin(\phi \operatorname{sgn}(\theta_t) - \theta) + \frac{\ddot{u}_g}{g} \cos((\phi \operatorname{sgn}(\theta_t) + \theta) \right) \quad \text{Equation 1}$$

The analytical formulation adopts an event-driven framework that systematically captures the sequential stages of motion. The process commences with the definition of the geometric configuration, specification of initial conditions, and application of the prescribed excitation input. As the response evolves, uplift events are detected, triggering the solution of the governing nonlinear rotational equation of motion. Throughout the simulation, the model continuously monitors whether the polygon transitions to a new pivot point. When such a transition occurs, new initial conditions are computed to reflect the loss of energy associated with impact, and the subsequent motion is reinitiated accordingly. In the absence of a pivot transition, the system continues to oscillate about the same pivot until the next event arises. This iterative procedure proceeds until the external excitation ceases or the motion naturally attenuates, thereby providing a comprehensive representation of the coupled phenomena of rocking, rolling, uplift, and impact within a unified analytical framework.

4. Discussion

The analytical results demonstrate the effectiveness of the proposed *shicra* based isolation mechanism. The hybrid rocking–rolling behaviour inherent to the polygonal units naturally limits the transmission of accelerations to the superstructure, as illustrated in Figures 6 and 7. These figures show that both rotational and acceleration responses become progressively more stable as the number of polygon sides increases, indicating that higher sided geometries provide more predictable dynamic characteristics. The system's reliance on uplift, impact, and geometric nonlinearity rather than mechanical components renders it economical, environmentally sustainable, and feasible for construction using locally available materials.

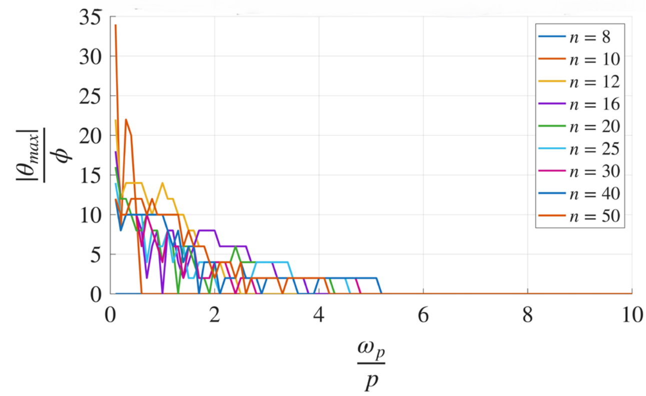


Figure 6: Rotational response against different frequencies

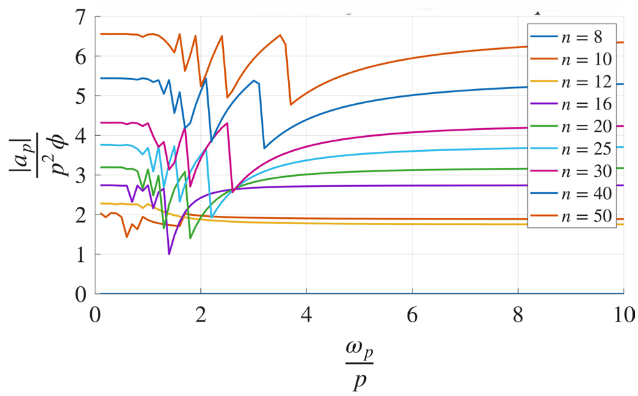


Figure 7: Acceleration response against different frequencies

From a mechanics perspective, energy dissipation arises primarily from successive uplift events and inelastic impacts, which act as a passive selfregulating isolation mechanism. This distinguishes the system from conventional damping devices that depend on material yielding or supplemental hardware. Shaking table tests on the proposed system are currently being planned, and these experiments will further support the theoretical findings and strengthen the link between analytical predictions and practical implementation. Ultimately, the simplicity of fabrication and the promising seismic performance make this approach a viable pathway for developing low cost, sustainable isolation strategies for vulnerable masonry and earthen structures in resource constrained regions.

5. Conclusion

This study proposes a new seismic isolation approach inspired by ancient pre-Inca *shicra* technology, reinterpreted through the lens of modern structural dynamics. Analytical formulations reveal that rocking and rolling interactions among the *shicra* units provide substantial energy dissipation and isolation effectiveness. Ongoing experimental work will further clarify the dynamic behavior and validate the theoretical findings. The outcomes are expected to contribute to the design of low-cost, sustainable, and culturally integrated seismic protection systems capable of enhancing the resilience of vulnerable communities worldwide.

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Structural Damping in Tall Buildings: Evolution, Challenges, and a New Integrated Approach

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Abstract

This article presents a concise overview of the evolution of structural damping in tall buildings, highlighting the limitations of conventional damping systems and the growing need for efficient, resilient, and sustainable design solutions. It introduces the Integrated Damping System, a novel approach that repurposes a portion of the building's own mass to generate significant damping without relying on large external devices. Analytical, numerical, and experimental studies confirm the system's ability to reduce wind and seismic response demands while maintaining minimal differential displacements, thereby demonstrating its practicality for modern tall building applications. This article summarises the material presented in the evening lecture delivered on the 24th of September 2025. For further details and access to the full presentation, please refer to the recorded talk here.

With increased pressure on urban development, soil scarcity, and the target to achieve sustainable, resilient infrastructure grids, tall building design and construction have experienced a significant rise over the last 40 years. The structural design of tall buildings is generally governed by their dynamic behaviour under both wind and seismic excitations. While seismic design of tall buildings still often relies on capacity design principles, Performance-Based Seismic Design is becoming the new norm, and the traditional approach of dissipating energy via hysteretic behaviour is shifting towards adopting supplementary damping systems to result in more efficient designs with reduced non-structural damage after frequent seismic events. This shift has also been very evident in the design against wind loads, where the requirement to meet wind-induced accelerations has led to the widespread implementation of damping systems, particularly Tuned Mass Dampers (TMDs), as more cost and carbon-efficient designs.

Due to the low intrinsic damping in tall buildings, damping plays a crucial role in controlling the structural response. Even a modest increase can lead to significant reductions in accelerations, drift demands, and base forces (Figure 1). Damping systems can be broadly categorised into passive, active, or hybrid, with passive systems being the most common, either as distributed or mass systems, due to their greater reliability and good performance. Distributed systems include viscoelastic, fluid viscous dampers, friction, and hysteretic dampers. They can be used in a wide range of applications, such as in mega braces, outriggers, or as replacements for coupling beams. While they provide a redundant system, enabling their damping to reduce strength demands, their reliance on overall flexibility to generate sufficient differential displacements at the damper ends limits their applicability in tall buildings compared to low- and mid-rise buildings. Mass systems, particularly TMDs, are, however, the most commonly implemented in tall buildings (Saaed *et al.*, 2015). TMDs rely on adding a heavy mass at the top of the building and tuning to the building frequency so it oscillates out of phase with the structure (Figure 3(a)). Despite their proven success, TMDs have several limitations: they require dedicated space in premium locations, they are highly sensitive to changes in properties, they are only able to control the specific frequency for which they are tuned, and, as a non-redundant system, the generated damping cannot be used to reduce strength demands.

For conventional TMDs, the mass ratio between the damper mass and the main mass is the parameter that influences their performance the most (Figure 3(b)), and numerous researchers have investigated how to maximise this value (Martinez-Paneda & Elghazouli, 2020). Facing

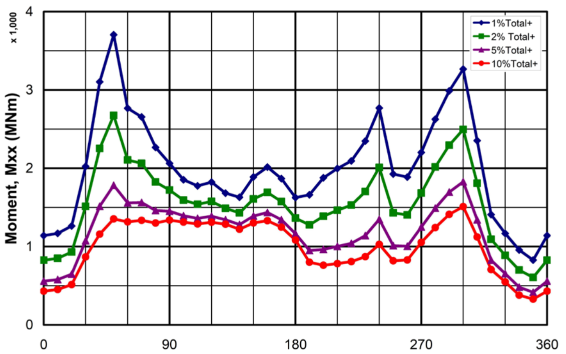

Figure 1: Reduction in wind base overturning moment with increased damping for a specific building for every wind direction.

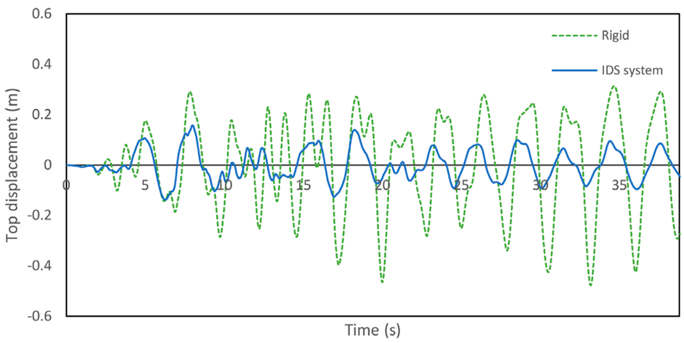

Figure 2: Displacement time history response under the 00302T Irpina, Italy, record.

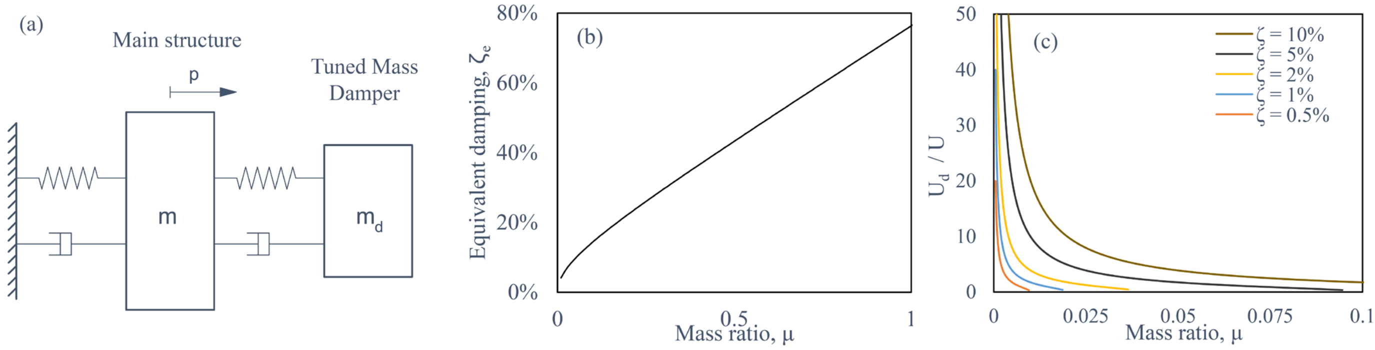

Figure 3: (a) Simplified SDOF with TMD; (b) equivalent damping vs mass ratio under harmonic excitation; (c) ratio of relative displacement amplitude vs mass ratio for different target equivalent damping levels (Martinez-Paneda *et al*. 2025b).

these challenges, a fundamental question arises: instead of adding a small external mass, could we not use a portion of the building's own mass as it is? The notion underpins the Integrated Damping System (IDS). By mobilising a usable part of the building itself, typically the upper floors, to act as a large inertia mass that moves differentially with respect to the lateral load-resisting system, we are able to generate large levels of damping, and, thanks to the large mass that is mobilised, only require very small differential displacements (Figure 3(c)). Motions on the movable mass are controlled by connecting it with springs in parallel with fluid viscous dampers. The springs provide the necessary static stiffness to resist mean wind loads and limit differential displacements, while the dampers dissipate energy and control accelerations. In doing so, the system does not require additional external masses, does not occupy valuable architectural space, and can be seamlessly integrated into the building layout. Moreover, thanks to the large mobilised mass, the system is able to depart from conventional TMD formulation and sets the spring stiffness to meet serviceability requirements rather than optimal tuning requirements, still achieving a robust response reduction (Martinez-Paneda & Elghazouli, 2020; Martinez-Paneda & Elghazouli, 2023).

The concept was validated through a combination of analytical studies, numerical simulations, and experimental testing when implemented in a 300 m tall steel central core building. Using a simplified lumped mass model with the mass of every storey with matching dynamic properties to the prototype and tuning the spring stiffness to a maximum differential displacement of 150 mm under the 50-year Eurocode wind load applied as a static load, the system was able to generate up to 6% additional equivalent damping. When the tower was subjected to a suite of seven selected earthquake records, the results showed a drastic reduction in response across all performance indexes considered (Figure 2). When comparing the behaviour to that of a conventionally rigid counterpart, top displacements were reduced by an average of 37%, inter-storey drifts by 36%, top accelerations by 72% and accelerations through the building by 41% (Martinez-Paneda & Elghazouli, 2024). Moreover, the large response enhancement was achieved with a maximum average differential displacement of 58 mm, thus verifying the feasibility of the system to be seamlessly incorporated into a building.

The numerical simulations were followed by experimental validation through dynamic seismic testing (Figure 4) on a 1:300-scale prototype that explicitly incorporated the IDS and aeroelastic wind tunnel testing (Figure 5). The results validated the previous numerical analysis and provided further insights into the behaviour. The seismic tests yielded matching results to the numerical simulations

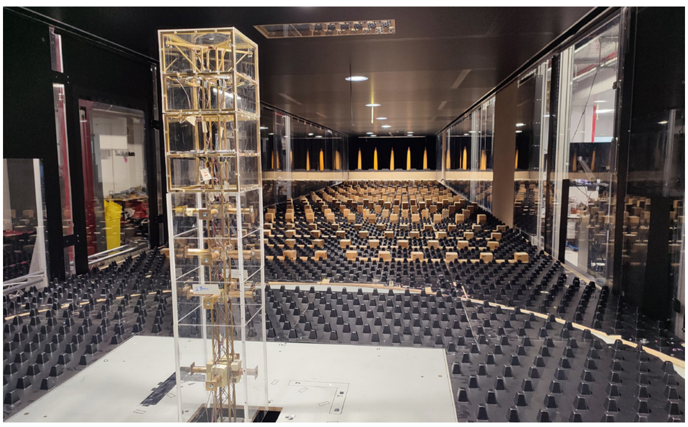

Figure 4: View of scaled model mounted on actuator for dynamic seismic tests, and close-up of part of the model.

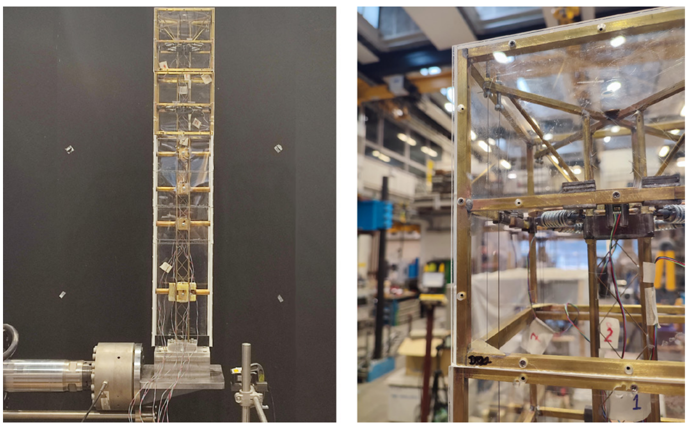

Figure 5: Aeroelastic wind tunnel test at Imperial College London Aeronautics Wind Tunnel Facility.

(Martinez-Paneda *et al.*, 2025b). The wind tunnel test showed an even further improved performance. Along wind and across-wind accelerations were reduced by up to 71% and 57%, respectively, while keeping maximum differential displacements under a 50-year return period wind speed below 50 mm in both directions.

Through the different numerical and experimental simulations, the Integrated Damping System was established as a novel, robust, and effective damping system. Rather than being an add-on device, the IDS is conceived as an integral part of the structure, transforming the building itself into a distributed mass damper. By enhancing damping levels, improving occupant comfort, reducing seismic and wind-induced forces, and, therefore, enabling substantial material savings, the IDS offers a promising pathway towards more resilient, sustainable, and efficient tall building design.

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EEFIT-UM6P Workshop. Lessons Learned from Al Haouz Earthquake: Challenges and Future Strategies

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The Earthquake Engineering Field Investigation Team (EEFIT), in collaboration with Mohammed VI Polytechnic University (UM6P) Rebuild Initiative, conducted a workshop in May 2025 at UM6P Benguerir Campus in Morocco titled: "*Lessons learned from Al Haouz Earthquake: Challenges and Future Strategies*". The workshop was convened as a direct response to the catastrophic Al Haouz earthquake of September 8, 2023, which brought devastating consequences and posed urgent challenges for earthquake engineering and resilience in Morocco.

With a moment magnitude (M_w) of 6.8, the Al Haouz Earthquake hit Morocco's High Atlas Mountains, causing ~3,000 casualties, ~5,700 injuries, and affecting around ~6,600,000 people in the region. The event resulted in extensive damage, especially in non-engineered residential buildings, in both urban and rural centres such as Marrakesh, Taroudant, Asni, Amizmiz, and Chichaoua. Non-engineered residential buildings included both traditional (vernacular) and modern constructions. Both categories lacked adequate engineering design, and their performance was further limited by the gradual loss of traditional building knowledge and the economic constraints of individuals. In contrast, schools, hospitals, and infrastructure sustained damage to a relatively lesser extent, as these facilities were generally built in accordance with engineering standards and regulations. Additionally, the event triggered hundreds of landslides, blocking vital roads and isolating remote villages. EEFIT's field mission in 2024, supported by NERC and in collaboration with UM6P Rebuild Initiative and other local Moroccan partners, conducted an extensive investigation of failure modes and structural performance in over 500 buildings, covering typical construction typologies, including traditional

Figure 1: EEFIT Team at the Workshop

rammed-earth and stone-masonry dwellings, confined masonry, and reinforced concrete structures. The mission also mapped the impacts of more than 2,000 landslides, some triggered by earthquakes, ranging from minor boulder falls to large-scale debris slides, disrupting rescue and recovery and threatening remote high-altitude villages and transport infrastructure.

Building on EEFIT's mission, the EEFIT-UM6P ReBuild workshop was held on 14-15 May 2025 at Mohammed VI Polytechnic University in Benguerir, Morocco. The workshop brought together EEFIT experts, leading local technical consultants, academics, NGOs, and policymakers. From EEFIT's perspective, the workshop's main objective was to synthesise the mission's technical findings into actionable strategies to enhance the resilience of Moroccan High-Atlas communities against future seismic events. The EEFIT team was represented by Viviana Novelli (Cardiff Univ.), Michael Whitworth (AECOM), Fabio Freddi (UCL), Martin Stokes (Univ. of Plymouth), Giorgia Giardina (TU Delft), Roberto Gentile (UCL), Zeyad Khalil (Imperial College London), Sarah Esper (UCL), and Valentina Putrino (Ariel Re).

Spanning over two days, the workshop included thematic presentations and roundtables covering a diverse set of topics, including seismic hazard zoning, construction performance, regulatory compliance, landslide assessment, remote sensing, and post-earthquake resilient reconstruction. On the first day, Hassan Kaddouri (Head of UM6P ReBuild Initiative) opened the workshop with a welcome address, highlighting the initiative's role in reconstruction efforts and its ongoing collaboration with EEFIT. Michael Whitworth (AECOM, EEFIT Vice-Chair) presented a general overview of EEFIT's reconnaissance mission in Morocco, focusing on the mission's key findings and observations. Nacer Jabour (Head of the Geophysics Division, National Institute of Geophysics) discussed seismic monitoring and early warning systems, addressing the seismic monitoring network and its role in early warning in Morocco. Alaeddine Belfoul (University Ibn Zohr, Agadir) presented insights on the evolving understanding of regional tectonics and seismic risks in Morocco. Robin Kurtz (UM6P) examined the Moroccan historical seismicity and perspectives of prevention through regulatory seismic hazard zoning. Mustapha Rguig (Head, Department of Bridges and Roads, Hassania School of Public Works) addressed the consequences of non-compliance with seismic regulations. Martin Stokes (University of Plymouth, EEFIT) concluded the first day's talks, presenting valuable insights into the understanding of landslides triggered by earthquakes and their implications for hazard mitigation. On the second day of the workshop, Ahmed Belkhdim (Director, Directorate of Geology, Mines, and Hydrocarbons, Ministry of Energy Transition and Sustainable Development) presented Moroccan geoscientific infrastructure and the Ministry's contribution to post-earthquake reconstruction in the Al Haouz-affected regions. Viviana Novelli (Cardiff University, EEFIT) and Sarah Esper (UCL, EEFIT) presented the different building techniques and the seismic performance of traditional constructions and cultural heritage structures during the earthquake, highlighting vulnerabilities in typical Moroccan traditional residential building structures. Smail Hammoumi (Portfolio Lead, UM6P-Citinnov) shared insights on transforming construction through crisis, drawing on a number of pilot projects in the Al Haouz region. Fabio Freddi (UCL, EEFIT) and Zeyad Khalil (Imperial College London, EEFIT) addressed the building performance of non-residential constructions, focusing on mosques, schools, commercial, and healthcare facilities, and provided insights into the typical structural vulnerabilities observed and the strategic importance of such structures. Jérôme Skinazi (Director of Projects, Architecture and Development, Morocco) presented highlights of the reconstruction efforts following the earthquake, focusing on support and training for self-builders in the Al-Haouz affected region. Giorgia Giardina (TU Delft, EEFIT) provided valuable insights on the role

Figure 2: Group photo of the workshop participants.

Figure 3: Presentation highlights

of remote sensing (satellite and aerial imagery) in post-earthquake damage assessment, demonstrating the value of technological tools in rapid damage mapping. Finally, Chourak Mimoun (Vice-President, African Seismology Commission) provided an overview of the lessons learned from the Al Haouz earthquake, summarising seismic observations and recovery strategies. Both days of the workshop concluded with roundtable discussions and networking sessions that encouraged interdisciplinary dialogue on earthquake response, reconstruction, and future resilience strategies. The roundtable discussions showcased Morocco's ongoing evolution in earthquake risk management and highlighted the need for a more integrated and resilient approach to future natural disasters.

Based on the presentations and roundtable discussions, the workshop concluded with the following observations and recommendations:

- Efforts to improve compliance with seismic codes and building standards remain extremely critical, especially for traditional and informal constructions. Ensuring high-quality, code-compliant construction and proper building maintenance is of significant importance for enhancing resilience to future events.
- There is a need for a clear, transparent, and consistent damage classification system that is specifically tailored to Morocco's diverse building typologies. The lack of standardised criteria leads to inconsistent post-disaster assessments, especially for rural, non-engineered housing, which was a major contributor to fatalities and losses in the Al Haouz Earthquake. Improving post-disaster damage classification, especially for Morocco's unique building typologies, to better support future field missions is vital to ensuring coherent, consistent, reliable, and transparent communication of technical damage data to aid in developing future hazard mitigation strategies.
- Al Haouz Earthquake highlighted the need to critically review and update the local seismic hazard maps for more accurate hazard zonation. In addition, reliable soil characterisation, bedrock location, and topographical data are lacking, which are critically needed for conducting proper hazard assessments accounting for soil amplification effects. Recognising that Al Haouz was not considered a high-seismic-risk zone before the 2023 event raises key concerns about the reliability of the seismic hazard maps currently provided. Since the earthquake, the Ministry of Energy has been undertaking ongoing efforts to improve geophysical and seismotectonic mapping.

Figure 4: EEFIT Team at the Workshop

- Participants emphasised the critical need for open-access/publicly available central GIS databases that collate all relevant and valuable data from all stakeholders involved, including ministries, regions, local provinces and municipalities, academia, and NGOs. Current barriers include limited data sharing across stakeholders, highlighting the need to establish regional and national observatories under the Ministry of Urban Planning to systematically monitor damage and reconstruction activities at the regional scale. This becomes critically important for effective multi-hazard adaptation planning for earthquakes, floods, and other hazards, which was highlighted as a national priority. Such observatories would ensure transparency and enhance post-disaster learning and response. In addition, hazard and vulnerability models can be easily updated with new field and satellite data, ultimately supporting policymaking and community resilience. There are ongoing efforts by the relevant government agencies to establish such observatories under the Ministry of Urban Planning.
- Finally, integration of international best practices with local knowledge is needed for enhancing resilience in multi-hazard environments across Morocco. Additionally, fostering intergenerational knowledge transfer by actively involving young researchers in disaster risk reduction efforts is crucial for meeting this objective.

EEFIT's participation to help enhance Morocco's resilience to future earthquakes is still ongoing. EEFIT is currently actively engaged with local partners in Morocco to enhance the resilience of traditional building construction. In close collaboration with Build Change and other active local partners, including Architecture and Development Maroc (A&D), Association de développement du Douar de Taourirt (Tiwizi), and Coopératives Belarej, EEFIT aims to investigate and showcase viable, low-cost retrofitting techniques for such vulnerable building typologies, tailored to the Moroccan context. In addition, EEFIT's mission technical findings are being disseminated through several presentations at international conferences and technical institutions. Additionally, several comprehensive publications are in development to disseminate the detailed technical findings to the broader community.

Mallet–Milne Lecture 2025

Damian Grant
Arup

On 28th May 2025, we welcomed Professor Gian Michele Calvi to One Great George Street to deliver the nineteenth Mallet–Milne lecture. As I said in my introduction to the event, the Mallet–Milne lecture is held every two years, aligned with the two-year term of the SECED committee's Chair. A real highlight of each Chair's tenure, therefore, is organising "their" Mallet–Milne event.

In my case, this took on a special resonance, as the Committee selected Professor Calvi to deliver the lecture, the person most responsible for drawing me from New Zealand to Europe more than 25 years ago to study earthquake engineering in Pavia, Italy. Aside from launching the ROSE School programme in Pavia, Professor Calvi founded the non-profit research institution, the Eucentre Foundation, published several textbooks and hundreds of journal publications, and contributed to many engineering projects. For more information about the Mallet–Milne event and Professor Calvi's career achievements, please refer to my introduction (Grant, 2025) to his article that accompanies the lecture (Calvi, 2025).

On night, we were treated to a brilliant lecture, bringing together several strands of earthquake history, technical engineering detail and aspects of disaster risk management. The best Mallet–Milne lectures both remind us why the lecturer received the prestigious invitation in the first place and also tap the speaker's wisdom for suggestions for new research directions or future practice. Professor Calvi's lecture certainly delivered both – the throughline of the "C.A.S.E. Project" (for reconstruction following the 2009 L'Aquila Earthquake) was logistically and technically impressive, and Calvi's ideas for preparing for future earthquakes were a natural – but not obvious – extension of the lessons he drew from that project. The lecture was followed by a vote of thanks from Dr Christian Malaga-Chuquitaype from Imperial College, and a drinks reception in the ICE's Rennie Room. The lecture and reception were well-attended, despite the date falling during half-term holiday for many schools. I look forward to helping Barnali (the current SECED Vice Chair) bringing the twentieth Mallet–Milne lecturer to the ICE in 2027.

I encourage you all to read Professor Calvi's written lecture, available in open access from the Bulletin of Earthquake Engineering (Calvi, 2025). A video of the lecture is also available on SECED YouTube Channel which can be viewed here. I take this one last opportunity to thank our sponsors for the event: joint Gold sponsors: Ramboll and Servotest, and Silver sponsors: AWE, Jacobs, and AtkinsRéalis.

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Annual General Meeting of the SECED Young Members' Sub-Committee

Maria Liapopoulou
University of Cambridge

On the evening of 29th October 2025, we gathered at the Institution of Structural Engineers in London for the Annual General Meeting of the Young Members' Sub-Committee (YMSC) of SECED. As the outgoing Chair, it was a pleasure for me to present my Annual Report, summarising our work during the period from November 2024 to October 2025.

Over the past year, the YMSC has been involved in ongoing activities within SECED, including editing and reviewing articles for the SECED Newsletter, maintaining and developing the SECED website, and producing episodes for the SECED Talks Podcast. I took the opportunity to thank all members for their dedication and valuable contributions, including the Immediate Past Chair, Evangelos Yfantidis, the Vice Chair, Mohamed Elzeadani, the elected members Ludovica Pieroni, Daniel Gilmore, Ashraf Nayel, Jessica Christie, and Zeyad Khalil, and the co-opted members Atif Rasheed, Joshua Robinson, Rafik Nizarali, and Rafael Fernández. Our work in the YMSC would not have been possible without the continued support of the SECED Chair, Damian Grant, and the main Committee, including Fabio Freddi, who reviews, edits, and coordinates the SECED Newsletter, Barnali Ghosh and Guillermo Aldama-Bustos, who support the SECED Fund, Manuela Davi, who maintains and develops the SECED website, and Valentina Putrino, who coordinates SECED's social media presence (LinkedIn and YouTube). Behind the scenes, many others have contributed to our activities. Special thanks to Katherine Coldwell for support with events promotion and administrative work, Shelly-Ann Russell for advertising and promoting events through the Institution of Civil Engineers, and Janet Homer and Brian Young for administrative support.

In my report, I also summarised the SECED Talks Podcast activities over the past year. We released three episodes featuring Zeyad Khalil, Rafael Fernández, and me in conversation with Francesco Morfuni, Ji-Eun Byun, and Gian Michele Calvi, respectively. Many thanks to the rest of the members of the 2023–2024 and 2024–2025 podcast teams, including Filip Zinkiewicz, Hang Li, Ludovica Pieroni, Evangelos Yfantidis, and Rafik Nizarali, for their contributions. All episodes are available on YouTube and Spotify.

The next item on the agenda was the SECED Fund 2025, which offers financial support of up to £1,500 for activities related to engineering dynamics. This year, we received 12 applications from a diverse pool of candidates from the UK and overseas. Congratulations to the two SECED Fund 2025 winners, Vikram Kumar Ramesh from the University of Strathclyde and Nabilah Abu Bakar from Universiti Putra Malaysia.

An overview of the webinars and events organised during the previous year followed. These included 7 online webinars, 1 hybrid event at University College London, and 1 site visit to the Schofield Centre at the University of Cambridge, with contributions from 24 speakers representing 14 institutions. Many thanks to all speakers for sharing their expertise and insights from academic, industrial, and experimental perspectives. For anyone who missed or wants to revisit a session, the recordings can be found on the SECED YouTube Channel.

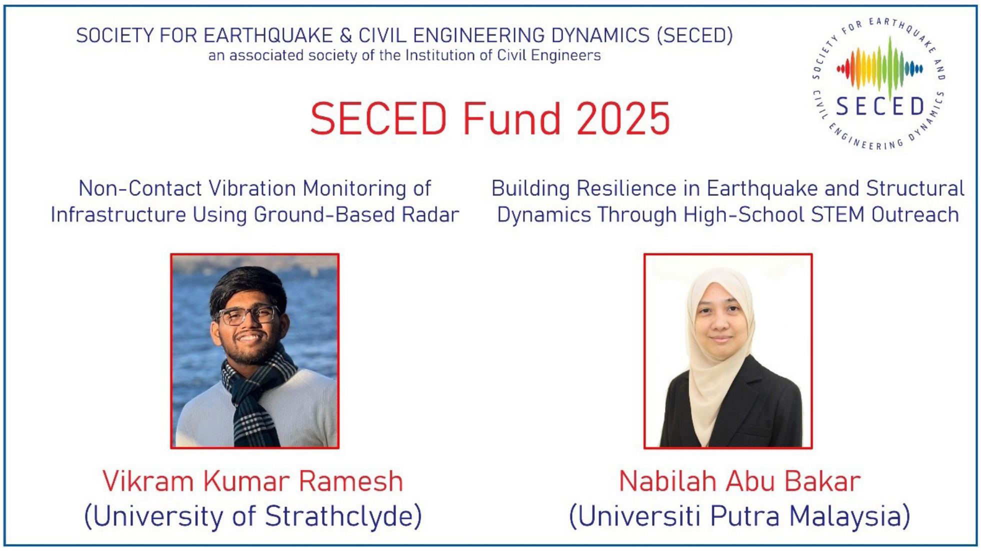
Finally, I announced the results of the YMSC Elections for 2025. Congratulations to James Douglas, Atif Rasheed, and Maria Maglio on their election to the Committee. I was also delighted to welcome the incoming Chair, Mohamed Elzeadani. Having worked alongside Mohamed over the past year, I am confident that he will excel in the role, and I look forward to seeing the direction he brings to the Committee in the year ahead.

Winners of the SECED Fund 2025

The SECED Fund 2025 has been jointly awarded to **Vikram Kumar Ramesh** (PhD Student, University of Strathclyde) and **Dr. Nabilah Abu Bakar** (Senior Lecturer, Universiti Putra Malaysia).

Vikram's project, titled "*Non-Contact Vibration Monitoring of Infrastructure Using Ground-Based Radar*", aims to develop an innovative structural health monitoring platform capable of assessing the vibrations of large-scale structural prototypes and bridges under both laboratory and filed conditions. This research seeks to advance non-contact measurement techniques and enhance the reliability of infrastructure monitoring.

Dr. Abu Bakar's project, "*Building Resilience in Earthquake and Structural Dynamics Through High-School STEM Outreach*", focuses on an educational initiative designed to introduce high-school students to key concepts in structural dynamics and earthquake engineering. The programme aims to inspire future engineers and foster



early interest in resilience-focused research and practice

Both these types of activities are being funded for the first time through the SECED Fund, reflecting the scheme's growing commitment to supporting a broad spectrum of impactful initiatives within the earthquake and civil engineering dynamics community.

Further information about the SECED Fund can be found at: https://www.seced.org.uk/index.php/young-seced/seced-fund.

Two New Episodes of SECED Talks

The SECED Talks podcast, produced by Young SECED, has just released two new episodes featuring insightful conversations with leading voices in civil and earthquake engineering..

Episode 3 – Dr. Ji-Eun Byun: Building a Career in Civil Engineering Dynamics

In this episode, host **Rafael Fernández** speaks with **Dr. Ji-Eun Byun**, Civil Engineer and Lecturer at the University of Glasgow. Together, they explore Dr. Byun's early career in Civil Engineering Dynamics and Systems Resilience, the lessons she has learned along the way, and the realities of pursuing a career in academia.

Dr. Byun's episode forms part of the First Steps in Civil Engineering Dynamics series, which spotlights the experiences of young professionals and academics in the field. The series aims to foster open conversations about the transition from university to the professional world, the day-to-day responsibilities of early-career engineers, and the path toward professional accreditation.

Episode 5 – Prof. Gian Michele Calvi: Reflections on a Life in Earthquake Engineering

In this episode, **Dr. Maria Liapopoulou** interviews **Prof. Gian Michele Calvi,** a pioneering figure in earthquake engineering. Prof. Calvi is a professor at the University Institute of Superior Studies in Pavia, Director of Science of the European Centre for Training and Research in Earthquake Engineering (Eucentre), and Executive Vice-President of the International Association of Earthquake Engineering.

Prof. Calvi reflects on his formative years—his education in Pavia, Berkeley, and Milan—and the professional milestones that shaped his career in Italy and abroad. The conversation delves into the founding and vision of the ROSE School (European School for Advanced Studies in Reduction of Seismic Risk), which continues to unite leading experts from around the world to train the next generation of earthquake engineers.

He also discusses the pioneering work undertaken at

the Eucentre, highlighting its efforts to address the growing challenges of climate change and disaster complexity. Prof. Calvi shares technical insights from notable consulting projects, including the Rion–Antirion Bridge and post-earthquake reconstruction efforts in L'Aquila. The episode concludes with his forward-looking perspective on the future of earthquake engineering, the potential of artificial intelligence, and his advice for aspiring engineers

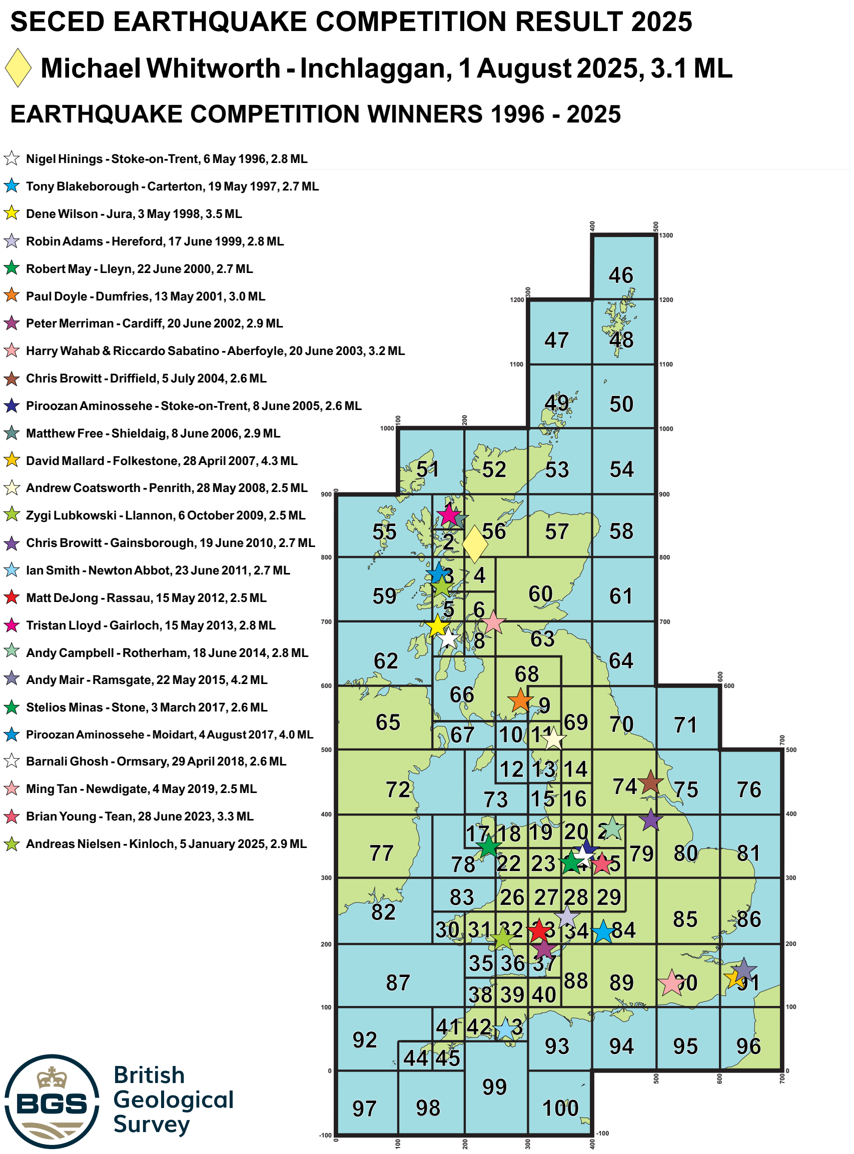
Behind the Mic

Both episodes were produced by the SECED Talks podcast team: hosts Rafael Fernández and Maria Liapopoulou, alongside Ludovica Pieroni, Zeyad Khalil, Rafik Nizarali, and Evangelos Yfantidis.

SECED Earthquake Competition Result 2025

The SECED Earthquake Competition, organised by SECED since 1996, seeks to forecast the location of the next earthquake in Britain with a local magnitude (M_L) of at least 2.5. Participants use their understnading of british historical seismicity, combined with an element of chance, to predict where the next significant earthquake will occur, choosing a location from the grid shown in the figure below.

The 2025 winner is Dr Michael Whitworth, who accurately predicted a 3.19 M_L earthquake in Inchlaggan. This earthquake occured on Sunday 1st August 2025. As an elected member of the SECED Committee, Michael continues the long-standing tradition of previous winners being SECED Committee members.



SECED Earthquake Competition Winners, 1996-2025.

Notable Earthquakes May 2025 – August 2025

Reported by British Geological Survey

Issued by: Davie Galloway, British Geological Survey, October 2025.
Non British Earthquake Data supplied by: United States Geological Survey.

			Time			Dep	Magnitude			
Year	Day	Mon	UTC	Lat	Lon	km	ML	Mb	Mw	Location
2025	02	MAY	12:58	56.81S	68.10W	10			7.4	DRAKE PASSAGE
2025	03	MAY	22:05	53.61N	2.29E	10	2.3			SOUTHERN NORTH SEA
2025	04	MAY	23:49	53.78N	1.06E	10	2.2			SOUTHERN NORTH SEA
2025	15	MAY	11:15	51.92N	2.92W	9	1.8			ROWLESTONE, HEREFORDSHIRE
2025	16	MAY	01:36	54.16N	2.15W	5	2.5			LITTON, NORTH YORKSHIRE
Felt in Litton, Kilnsey, Horton-in-Ribblesdale, Hawes, Buckden, Settle (North Yorkshire), Docker, Cowgill (Cumbria) and in several other towns and villages, mainly within around 35 km of the epicentre (3 EMS).										
2025	20	MAY	15:06	3.76S	144.10E	10			6.5	PAPUA NEW GUINEA
2025	22	MAY	02:55	52.46N	5.27W	7	1.5			IRISH SEA
2025	22	MAY	19:59	53.39N	2.45E	10	2.3			SOUTHERN NORTH SEA
2025	26	MAY	06:06	53.26N	2.66E	10	2.2			SOUTHERN NORTH SEA
2025	01	JUN	13:39	55.25N	3.53W	3	1.5			ST ANN'S, D & G
2025	07	JUN	09:25	59.86N	1.20E	15	3.0			NORTHERN NORTH SEA
2025	13	JUN	03:55	56.40N	4.02W	2	1.1			COMRIE, PERTH & KINROSS
Felt Comrie (3 EMS).										
2025	16	JUN	02:18	56.39N	3.98W	2	1.4			COMRIE, PERTH & KINROSS
Felt Comrie (3 EMS).										
2025	16	JUN	02:51	56.39N	4.00W	2	0.9			COMRIE, PERTH & KINROSS
Felt Comrie (2 EMS).										
2025	17	JUN	10:25	53.12N	2.42W	8	2.3			CREWE, CHESHIRE
2025	28	JUN	08:32	60.98S	38.97W	10			6.6	SCOTIA SEA
2025	02	JUL	23:42	52.37N	3.10W	13	2.5			KNUCKLAS, POWYS
Felt Knighton and Newtown, Powys and Clun, Bishops Castle and Craven Arms, Shropshire (3 EMS).										
2025	08	JUL	21:41	14.45N	90.65W	10			5.7	GUATEMALA
At least 7 people killed, over 300 others injured, over 2,000 homes and buildings damaged or destroyed and many landslides and rockfalls occurred in the departments of Escuintla, Guatemala and Suchitepez.										
2025	08	JUL	23:21	49.26N	6.42W	18	1.5			CELTIC SEA
2025	14	JUL	05:49	6.22S	131.23E	70			6.7	BANDA SEA
2025	16	JUL	20:37	54.57N	160.47W	38			7.3	ALASKA PENINSULA
A tsunami was generated with a maximum wave height of 10 cm recorded at Sand Point, Alaska.										

Year	Day	Mon	Time UTC	Lat	Lon	Dep km	Magnitude ML	Mb	Mw	Location
2025	18	JUL	06:22	56.73N	4.24W	8	1.7			KINLOCH RANNOCH, P & K
2025	20	JUL	06:28	52.93N	160.62E	23			6.6	KAMCHATKA (OFFSHORE)
2025	20	JUL	06:49	52.83N	160.68E	34			7.4	KAMCHATKA (OFFSHORE)
A tsunami was generated with an estimated wave height of 1.53 m recorded at Avachinskaya Guba, Kamchatka.										
2025	20	JUL	07:07	52.70N	160.83E	10			6.6	KAMCHATKA (OFFSHORE)
2025	20	JUL	07:23	52.89N	160.75E	35			6.5	KAMCHATKA (OFFSHORE)
2025	24	JUL	23:37	14.91S	175.70W	314			6.6	SAMOA ISLANDS
2025	27	JUL	19:15	54.54N	3.72E	18	3.2			SOUTHERN NORTH SEA
2025	27	JUL	20:19	54.55N	3.76E	21	3.2			SOUTHERN NORTH SEA
2025	27	JUL	21:40	54.57N	3.58E	11	2.1			SOUTHERN NORTH SEA
2025	28	JUL	22:10	57.61S	157.04E	31			7.0	MACQUARIE ISLAND REGION
2025	29	JUL	17:53	23.45S	178.86E	553			6.6	SOUTH OF FIJI ISLANDS
2025	29	JUL	21:21	14.10N	89.79W	11			5.6	GUATEMALA
Two people killed, some 26 others injured and over 1,390 homes damaged in southeast Guatemala. One person injured, 66 homes destroyed and over 375 homes damaged in El Salvador.										
2025	29	JUL	23:24	52.50N	160.24E	35			8.8	KAMCHATKA (OFFSHORE)
Four people injured, at least 1,400 homes damaged and damage to infrastructure and power outages occurred in the Petropavlovsk area and at least 106 buildings damaged in the Kuril Islands. A tsunami was generated with a maximum wave height of 5 m recorded at the Vodopadnaya meteorological station, Russia. The tsunami damaged a pier at the nuclear submarine base at Avachinskaya, a port in the Kuril Islands and a harbour in Crescent City, California, USA. The earthquake also triggered the eruption of seven volcanoes on the Kamchatka Peninsula.										
2025	30	JUL	00:09	52.20N	159.80E	35			6.9	KAMCHATKA (OFFSHORE)
2025	01	AUG	16:45	57.07N	5.21W	3	1.5			INCHLAGGAN, HIGHLAND
2025	01	AUG	16:45	57.07N	5.21W	3	3.1			INCHLAGGAN, HIGHLAND
2025	3	AUG	05:37	50.59N	157.86E	30	6.8		6.8	KURIL ISLANDS
2025	6	AUG	01:27	56.34N	5.26W	3	1.5			ANNAT, ARGYLL & BUTE
2025	8	AUG	09:04	56.36N	5.26W	3	1.9			ANNAT, ARGYLL & BUTE
2025	10	AUG	16:53	39.37N	28.02W	10			6.1	WESTERN TURKEY
One person killed, 52 others injured, 6 buildings destroyed and around 850 others damaged in Balkesi.										
2025	15	AUG	04:35	56.36N	5.28W	3	1.5			ANNAT, ARGYLL & BUTE
2025	18	AUG	13:11	55.23N	3.38W	4	1.5			JOHNSTONEBRIDGE, D & G
2025	18	AUG	15:05	51.98N	0.93W	6	2.1			THORNBOROUGH, BUCKS
2025	18	AUG	17:21	55.92N	5.32W	16	2.2			MELLDALLOCH, ARGYLL/BUTE
2025	22	AUG	02:16	60.32S	61.92W	10			7.5	DRAKE PASSAGE
2025	26	AUG	21:24	52.94N	4.41W	8	1.6			LLWYNDYRYS, GWYNEDD
Felt Caernarfon and Pwllheli (3 EMS).										
2025	31	AUG	17:02	53.72N	3.22W	7	1.5			IRISH SEA

			Time			Dep	Magnitude			
Year	Day	Mon	UTC	Lat	Lon	km	ML	Mb	Mw	Location
2025	31	AUG	19:17	34.52N	70.73W	10			6.0	HINDU KUSH, AFGHANISTAN
At least 2,220 people killed, over 3,975 others injured and several villages close to the epicentre were destroyed, the majority of which occurred in Kunar province.										

Forthcoming Events

Evening Lecture

A Functional Recovery Qualification Procedure for Seismic Force-Resisting Systems

Carlos Molina Hutt
Online event
28 January 2026 (6:00 pm UTC)

Synopsis

The development of prescriptive seismic design standards for functional recovery in new buildings is critical to advancing the adoption of recovery-based design and supporting community resilience. Central to this effort is the creation of a standardized procedure to qualify seismic force-resisting systems for functional recovery performance. This presentation will begin with a brief overview of the structural and nonstructural functional recovery design requirements contained in Appendix A of the forthcoming 2026 NEHRP Recommended Seismic Provisions. It will then introduce the qualification procedure for seismic force-resisting systems, which is based on safety-critical structural damage, i.e., damage that must be repaired before a building can be safely reoccupied. This procedure establishes the functional recovery allowable drift limit (Δ_{afr}), the functional recovery response modification coefficient (R_{fr}), and the functional recovery structural ductility reduction factor ($R_{\mu fr}$). An illustrative example will demonstrate the implementation of the qualification procedure currently being applied to a broad range of seismic systems in preparation for the release of the functional recovery design requirements in the 2026 NEHRP Provisions.

About the speaker

Carlos Molina Hutt is an Associate Professor of Structural and Earthquake Engineering at the University of British Columbia in Vancouver, Canada, where he leads the Engineering for Seismic Resilience Research Lab (www.esrlab.org). His work focuses on the development of methodological approaches to assess seismic risk in buildings and its implications on urban resilience, and on the translation of this knowledge into tools and information for use by practicing engineers, seismic planners, and policy makers. Carlos is a registered professional engineer in the province of British Columbia in Canada, in the state of California in the US, and is also a chartered engineer in the UK. In 2019, he received the Earthquake Engineering Research Institute (EERI) Shah Family Innovation Prize. In 2022, he was invited by the US Building Seismic Safety Council, via the Provisions Update Committee, to become a member of the Functional Recovery Task Committee, which has been tasked with developing design procedures for buildings to achieve different functional recovery targets for use in the next generation of building codes. He continues this effort as a member of the Seismic Subcommittee in the ASCE 7-28 code revision cycle..

Further information

This event is organised by the Society for Earthquake and Civil Engineering Dynamics (SECED), and chaired by Fabio Freddi (UCL). The event is open to all and is free to attend.

Joining instructions for this online event will be published on the SECED website in due course.

Evening Lecture

Innovative Floor Anchorage System for Low-Damage Seismic-Resistant Building Structures

Dr Robert B. Fleischman
Institution of Civil Engineers
Also broadcast online
25 February 2026 (6:00–7:30 pm UTC)

Synopsis

The economic costs and loss of function associated with recent seismic events has brought about a recognition for the need for low-damage structural systems. This seminar describes the development of a novel low-damage seismic system developed through research in the U.S. The multi-university National Science Foundation (NSF) Natural Hazards Engineering Research (NHERI) Project was led by the University of Arizona, and involved large-scale experiments at the University of California-San Diego (UCSD) shake table and the ATLSS Laboratory at Lehigh University. The project successfully developed a novel low-damage seismic system (and reduced-response wind system) for buildings, termed the Inertial Force-Limiting Anchorage System (IFAS).

In an IFAS structure, the floors are attached to the walls using deformable connections, thereby transforming a portion of the lateral forces into relative floor motion that can be used to dissipate the earthquake energy. The IFAS system has the potential to lower structural damage due to interstory drift, non-structural damage due to accelerations, and prevent non-ductile or diaphragm failures due to higher mode effects. Further, the system provides design control that limits the dispersion of response across disparate earthquake motions. The deformable connection can be Buckling Restrained Braces (BRBs) or Friction Dampers (FDs). The system employs an assemblage of rubber bearings and polyurethane bumpers to provide stability, impact protection and a measure of self-centering to the wall elements.

About the speaker

Dr Robert B. Fleischman is a University Distinguished Professor in the Department of Civil and Architectural Engineering & Mechanics at the University of Arizona (UA). He formerly held the Delbert R. Lewis Associate Professorship at UA. Dr. Fleischman received his B.S. from Carnegie-Mellon University and his M.S. and Ph.D. from Lehigh University. Dr. Fleischman has industry experience at Turner Construction (New York, NY), Thornton-Tomasetti/C-B-M (Chicago, IL) and Rutherford & Chekene (San Francisco, CA), and is a member of several national committees.

Dr. Fleischman's research area is seismic resistant design of precast/prestressed concrete and steel structures with recent focus on the development of new low-damage seismic-resistant building systems and floor diaphragms and collectors. He has served as Principal Investigator (PI) on over $5M of external funded research, and has 100+ journal publications/conference papers. His research has integrated computational simulation with physical experiments, including over 30 large-scale structural tests and three large-scale shake table tests. The findings of one project, the development of a new design methodology for precast concrete floor diaphragms, has been included in the ASCE 7-16 Load Standards and Part 3 of the 2015 National Earthquake Hazards Reduction Program (NEHRP) Recommended Provisions for Seismic Design for New Buildings.

Dr. Fleischman has won several national awards for his research on precast floor systems including the 2016 American Society of Civil Engineers (ASCE) Charles Pankow Award for Innovation, the National Science Foundation (NSF) 2014 NEES Outstanding Contributor Award, and the Precast/Prestressed Concrete Institute (PCI) 2014 Leslie D. Martin Award of Merit, the 2009 and 2004 Martin P. Korn Awards, the 2006 Charles C. Zollman Award, and 2004 George D. Nasser Award. Dr. Fleischman has led earthquake reconnaissance teams to Haiti and New Zealand, and was named a 2018-19 U.S. Fulbright Global Scholar. Dr. Fleischman has also won departmental teaching awards at the University of Arizona eight times in the past two decades.

Registration

The event will be held in-person at the Institution of Civil Engineers, organised by the Society for Earthquake and Civil Engineering Dynamics (SECED), and chaired by Fabio Freddi (UCL). Attendance at this meeting is free for members and non-members alike. Prior registration is not required. Seats are allocated on a first come, first served basis. We encourage everyone to attend in person if they can. Tea, coffee, and biscuits will be served from 5.30 pm–6:00 pm.

The event will also be broadcast online, and further details on how to register for online attendance will be published on the SECED website.