SESSION 11- Next-Generation Strong Motion Data: From Big Data to Actionable Insights

Conveners

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Session Description

Strong-motion seismology has reached a pivotal moment. We now benefit from unprecedented volumes of high-quality data and robust databases that have supported the most advanced seismic hazard assessments to date. Yet, new challenges and opportunities are emerging. The continuous expansion of monitoring networks, combined with greater instrumental variability and recent research advances, demand a paradigm shift in our methodological approaches. This session explores the dual challenge of managing the increasing complexity of strong-motion data and transforming it into actionable knowledge. We focus on cutting-edge approaches that not only process and curate vast datasets but also critically enhance the underlying databases and metadata. This session aims to bridge the gap between big data and physically-informed insights that can directly improve seismic hazard characterization, engineering design, and risk mitigation across Europe and other seismically active regions. We welcome contributions addressing the following topics:

- Advanced Methodologies for Big Data: Development and application of Machine Learning (ML) and Artificial Intelligence (AI) techniques for automated processing, quality monitoring, and extraction of actionable insights from large strong-motion datasets.

- Database and Metadata Refinement: Innovations in the curation and enhancement of strong-motion databases, including improved tools for rapid automated processing, quality control, and enrichment of metadata (e.g., through advances in site characterization, standardized incorporation of parameters like stations installation conditions, etc.)

- Uncovering New Physical Insights: Studies leveraging large datasets to investigate and quantify the impact of factors not yet routinely incorporated into Ground Motion Models (GMMs), such as near-source effects or installation conditions that can affect the spectral content of the signals.

- Novel Datasets and Emerging Needs: Presentations on new, significant strong-motion datasets, as well as specialized studies highlighting emerging data collection requirements or innovative applications, such as the use of strong-motion data in environmental seismology, helping to shape the future of the discipline.

This session is highly relevant for turning the current deluge of strong-motion data from a management challenge into a strategic asset, helping to reduce epistemic uncertainty in seismic hazard models and ultimately enhancing global earthquake resilience.