SESSION 10- Investigating Seismic Dynamics with Dense Multidisciplinary Infrastructures

Conveners

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Session Description

Understanding earthquake generation processes requires an integrated approach that combines the use of dense observational networks, advanced modeling and cross-disciplinary collaboration. Recent developments in near-fault monitoring—including dense seismic network and array, Distributed Acoustic Sensing (DAS) systems, high-resolution GNSS and other geodetic instruments, and machine learning detection techniques provide unprecedented insights into fault behavior, rupture initiation, and seismic hazard. The session aims to collect innovative approaches for characterizing, both natural and induced earthquakes, leveraging multiparameter datasets and advanced data processing techniques. By combining seismology, geodesy, geochemistry, and environmental monitoring, participants will explore how integrated observations improve our understanding of stress accumulation, rupture propagation, aseismic slip, postseismic deformation, and fluid migration along faults.

Relevance

Understanding fault mechanics and earthquake dynamics is essential for seismic hazard assessment and risk mitigation. Dense, real-time observational infrastructures allow for detailed tracking of fault processes, facilitating the development of predictive models and early warning systems.

Key Themes and Methodologies

The session invites contributions that demonstrate the following:

● **Innovative Monitoring Techniques:** Development and application of novel strategies for collecting and analyzing data from dense seismic networks and arrays, DAS, low-cost GNSS, geochemical sensors, and satellites.

- **Data Integration and Analysis:** Use of machine learning, automated detection pipelines, real-time processing, and multiparameter data assimilation to enhance earthquake characterization.

- **Fault Process Studies:** Investigation of rupture initiation, propagation, aseismic slip, postseismic deformation, fluid migration, and induced seismicity.

- **Modeling and Simulation:** Development of models for earthquake rupture dynamics and hazard assessment based on dense observational data. By fostering interdisciplinary collaboration, this session aims to highlight how next-generation monitoring infrastructures and integrated datasets are transforming earthquake science. We especially encourage contributions that introduce innovative instruments, novel methodologies, or advanced analytical approaches, as these enhance both scientific understanding and practical strategies for mitigating seismic risk.