SESSION 17- The Crustal Stress Field: Seismological Constraints, Tectonic Implications, and Hazard Assessment

Conveners
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Session Description

The Earth's crust is continually subjected to stress caused by the interaction of gravitational and tectonic forces. This stress field in the Earth's crust leads to tectonic deformation, fault rupture, and ultimately seismic hazards. It provides essential background for understanding seismotectonic settings, fault mechanics, and the forces that govern the seismic cycle. One of the most critical goals in Earth science is to understand the orientation, size, and spatial variability of this stress field, which differs significantly from one region to another and even within the same area.

This session seeks to highlight the vital role of seismology as a quantitative tool for examining the crustal stress field. We will investigate interdisciplinary approaches that integrate seismological data with geodynamic models and geological information to enhance our understanding of the Earth's interior. Our emphasis will be on how seismic data—spanning from individual earthquake sources to comprehensive waveform catalogs—can be utilized to enhance our understanding of the forces that drive seismic activity, rather than merely mapping seismic events.

We invite contributions that utilize seismological methods to investigate the stress field across all scales. Key methodologies and topics of interest include:

• Advancements in moment tensor inversion and focal mechanism analysis as primary data for formal stress tensor inversion techniques.

• The application of full-waveform modeling and other seismic forward modeling to constrain stress parameters and understand regional tectonic features.

• Studies on Coulomb stress changes, earthquake interaction, and aftershock forecasting rely on having an accurate background stress field.

• Investigating the role of the ambient tectonic stress field in modulating seismicity induced by human activities (e.g., fluid injection, resource extraction).

• Multi-disciplinary approaches that combine seismological stress indicators with borehole breakouts, geode9c strain rates, and geodynamic numerical models.

• Observational or modeling studies focused on detecting and interpreting temporal changes in stress associated with the earthquake cycle or aseismic processes.

This session will offer a comprehensive overview of how seismology serves as a vital diagnostic tool, connecting fundamental rock properties with large-scale tectonic processes.