SESSION 43- Statistical Seismology and AI: from theory to operational forecasting and risk communication

Conveners

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Session Description

Recent advances in earthquake understandings and emerging technologies in monitoring and modelling are driving a new era of earthquake forecasting. This session focuses on deterministic and probabilistic methods for modelling earthquake occurrence, clustering, and spatiotemporal evolution of seismicity. Special attention is given to the integration of statistical and physical models to assess earthquake related hazards such as tsunamis, landslides, and cascading risks. The increasing availability of high-resolution seismic catalogues, real-time GNSS data, and machine learning techniques is reshaping the field of statistical seismology, creating opportunity for more accurate and timely forecasts. However, the transition from scientific models to actionable forecasts remains complex and challenging. This session will explore how statistical rigor can coexist with practical usability, fostering dialogue between model developers, operational agencies, and end users.

Emphasis will be placed on:

• Statistical models of earthquake occurrence (e.g., Poisson, ETAS, renewal, etc.).

• Advances in Bayesian inference, machine learning, and data assimilation for earthquake forecasting.

• Evaluation metrics for forecast skill, uncertainty quantification, and reliability testing.

• Integration of seismic and other observational data (e.g. geodetic, geochemical, etc.) into statistical frameworks.

• Operational Earthquake Forecasting (OEF) systems and their use in civil protection and communication strategies.

• Case studies and lessons learned from operational systems in different countries.

• Ethical, societal, and communication challenges associated with probabilistic earthquake forecasting.