

SESSION 38- Seismic Risk Assessment by using Probabilistic and Deterministic Methods for Seismic Hazard Identification

Conveners

Murat Altug Erberik¹, Ufuk Hancılar², Taner Yılmaz³, Cem Yenidoğan⁴

¹Middle East Technical University, ²Bogazici University KOERI, ³Ozyegin University, ⁴Yildiz Technical University

Session Description

It is a known fact that disaster resilience of the urban areas and inhabitants all around the world are under the threat of high seismic activity. Densely populated mega-cities like Istanbul, Izmir, Bursa in Türkiye, Thessaloniki and Athens in Greece, Tehran in Iran, Tokyo in Japan, San Francisco and Los Angeles in the United States and many others have great likelihood to encounter destructive earthquakes, which might cause irrecoverable losses of human life and severe damage to property. The recent earthquake sequence in Kahramanmaraş Türkiye that affected 11 populated cities in the year 2023 revealed the importance of pre-earthquake loss mitigation strategies and planning as well as post-earthquake response management. The consequences also revealed that the impact of destructive sequential earthquakes on structures should be studied in a more detailed manner. The first step of an effective mitigation plan is to carry out a detailed seismic risk assessment study in the region which will also support and contribute to the actions to be taken in the aftermath. This special session aims to discuss and share knowledge regarding seismic risk assessment studies which have been completed or planned for the near future for loss mitigation purposes by using either probabilistic or deterministic methods for seismic hazard identification. The key themes of this special session can be presented as follows:

- Past studies regarding regional seismic risk assessment for loss mitigation
- The use of probabilistic and deterministic seismic hazard analyses for risk assessment
- Comparing the actual and estimated damage distributions of past earthquakes by using deterministic scenarios
- The consideration of local site effects in seismic risk assessment studies
- The utilization of synthetic/simulated ground motions for seismic hazard identification



- Development of fragility functions for different structural systems and components (e.g. buildings, bridges, pipelines) for seismic risk assessment
- Implementation of novel methods and techniques such as artificial intelligence, machine learning, remote sensing, etc. for seismic risk modeling and analysis.
- Integration of mainshock-aftershock sequence modeling into regional or global seismic risk frameworks, including portfolio loss estimation and resilience assessment
- Performance-based earthquake engineering approaches that incorporate multi-event seismic sequences into the development of seismic fragility curves and cumulative damage assessment.

