On the use of paleoseismic data in ground motion simulations based on earthquake rupture scenarios

Atakan K.

Department of Earth Science, University of Bergen, Allegaten 41, N-5007 Bergen, Norway
Corresponding Author: Atakan, K., (atakan@geo.uib.no)

Seismic hazard has traditionally been treated probabilistically based on the statistical analysis of the historical and instrumental earthquake catalogues. Such an approach usually ignores the fault rupture complexity and its physical basis. In recent years, however, ground motion simulation techniques based on either kinematic or dynamic treatment of the fault rupture have gained popularity due to their capacity to account for the physical processes that underlie the earthquake occurrence. Most of the crucial input parameters in these simulations can be assessed by paleoseismology and hence have tremendous potential to improve the resulting earthquake hazard assessment. Hybrid ground motion simulation techniques take into account the fault rupture complexity through a number of kinematic and dynamic parameters (e.g focal mechanism, location and size of the asperities, rupture initiation point, stress drop, rupture velocity, rise time). Here, we explore the significance of various paleoseismological data that can contribute to assess some of these parameters. These are discussed through case studies in the Marmara Sea, Sumatra and Myanmar. However, there exist challenges in establishing the critical parameters reliably. The sensitivity of the results to these critical parameters can be quantified and hence the uncertainties can be taken into account in assessing the seismic hazard.