MODELLING OF NEAR-FAULT EARTHQUAKE GROUND MOTION WITH EARTHQUAKE SIMULATIONS

*Aydin Mert[1]

1. Kandilli Observatory and Earthquake Research Institute

Engineering structures are usually designed on the base of accelerations derived from ordinary Probabilistic Seismic Hazard Analysis (PSHA) under the hypothesis of far-field conditions and further modified taking into account the local seismic response. As a consequence, a structure might not have proper safety levels if it is located close to an earthquake source. Despite the progress that has been accomplished so far by seismologist and earthquake engineers, the conducted research and papers in the literature highlighted that there could be a deficiency of seismic safety in near-field domains if the near-field seismic effects are not considered in the seismic design, as is the case of the Turkish seismic code.
The main purpose of this study is to analyze the near-field effects, focusing to evaluate ground shaking for specific fault configurations, specific source parameters and rupture process. For this reason, scenario simulations will be performed systematically to investigate the influence of different source parameters on the resulting near-source ground motion and to quantify the uncertainty in the employed source parameters and the associated variability in ground motion. The basis of the methodology is to generate a suite of synthesized seismograms from quasi-dynamic rupture models that use measurable or theoretically determined physical parameters that define fault rupture and control resulting ground motion.
Recent, well-instrumented earthquakes generated a large number of ground-motion recordings from sites close to the active fault. In these datasets, the observed variability of seismic ground motion meaningfully different from those far from the source not only in terms of intensity but also in terms of nature and topology. This contribution of earthquake source complexity to the ground-motion variability is generally thought to be significant, especially in the area near seismic sources. Only a few studies systematically investigated the influence of different source parameters on the resulting near-source ground motion. For that reason, there is a clear need to develop reliable synthetic ground motions or simulations reveal that not only influence of different source parameters on the resulting near-source ground motion but also capture different physical characteristic of near fields records both qualitatively and quantitatively.

Keywords: NEAR-FAULT EARTHQUAKE GROUND MOTION, EARTHQUAKE SOURCE PARAMETERS, SIMULATION OF STRONG GROUND MOTION, GREEN’S FUNCTIONS

