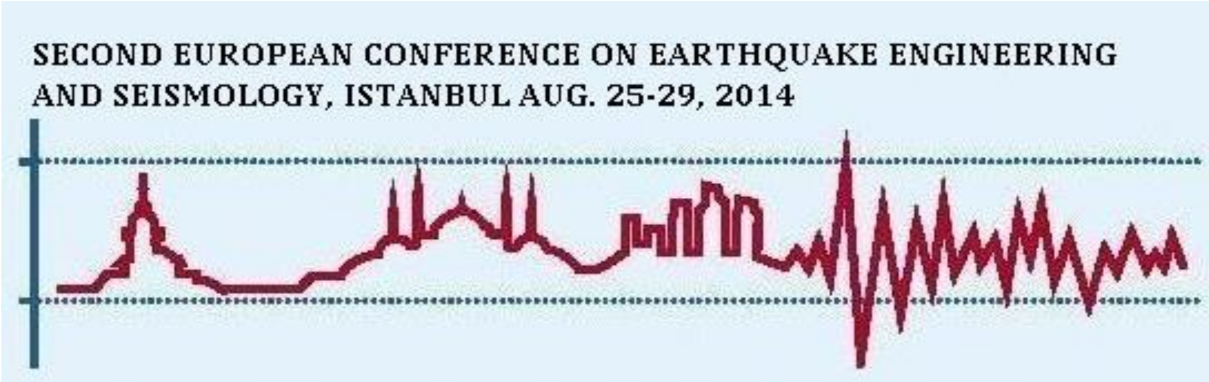

SEISMIC HAZARD ANALYSIS FOR SAKARYA CITY INCLUDING HAZARD DEAGGREGATION

Engin Harman[1] and H. Serdar KUYUK[2]

Accurate earthquake forecasting is controversial and still considered to be impossible. Probabilistic Seismic Hazard Analysis (PSHA) has been one of the best methods in earthquake engineering and seismology to estimate probable impending hazard and risk for a region. Seismic hazard analysis might be considered an exercise to compute the site-specific earthquake-induced ground motion considering geological evidences and regional seismicity. PSHA takes the (aleatory) uncertainties such as earthquake magnitude (M), source-to-site distance (D), and wave attenuation into account and it aims to quantify these uncertainties. PSHA combine all these uncertainties to produce an explicit description of the distribution of forthcoming shaking that may occur in a region that is exposed to earthquakes.

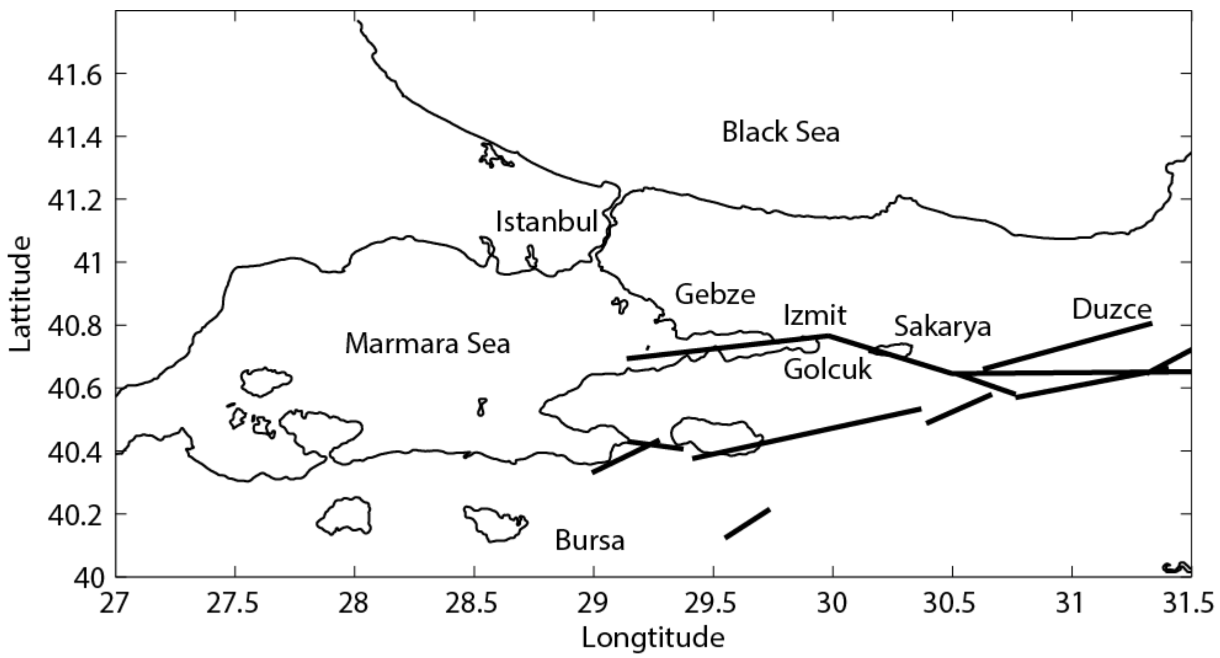

Figure 1. Map of Marmara region with seismic sources included in this PSHA for Sakarya city

Sakarya city is one of the most earthquake-prone cities in Turkey located very close to North Anatolian Fault System. It is categorized as the first degree earthquake risk zone by Turkish government. It is located in a region that experienced M_w7.4 Kocaeli earthquake and M_w7.2 Duzce earthquake 15 years ago where thousands of people died. Sakarya is also geopolitically important for being located between the two biggest metropolitan cities; Istanbul and Ankara. All transportation and

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energy lines pass through the city boundaries. Due to these importance of the region, population density grows each year.

This study aims to launch in-depth PSHA and hazard deaggregation investigation for Sakarya city. We have derived the Peak Ground Acceleration (PGA) hazard curves for the city center of Sakarya by employing a logic-three analysis with three probable attenuation relationships. The mean annual rates of exceedance are calculated per year. Moreover corresponding seismic hazards at 10% and 2% exceedance probabilities within 50 years are computed. We have found that city is subjected to a high earthquake hazard and thus, the local administration should conduct more investigation to ensure the risk to be in acceptable limits for the current earthquake safety designs.

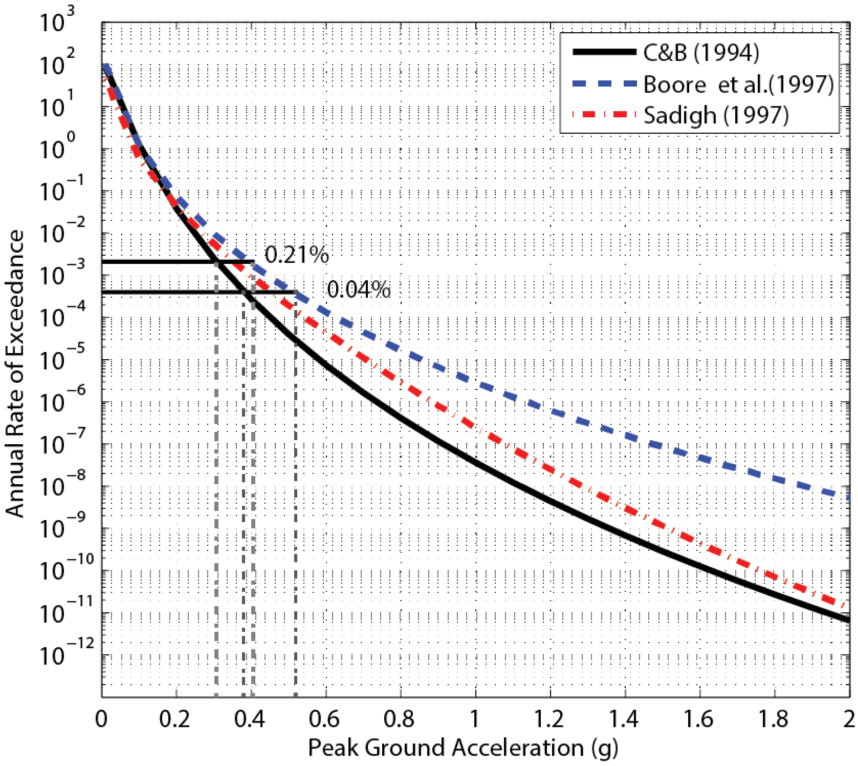

Figure 2. PGA seismic hazardcurve for the geographical center of Sakarya located at 30.4 E and 40.77N

Three attenuation relationship; Campbell and Bozorgnia (1994), Boore et al. (1997) and Sadigh et al. (1997) gave quite different results (Figure 2). PGAs for seismic hazard level at 2% exceedance probabilities are calculated as 0.3, 0.37 and 0.4 g for three attenuation relationship. The variation is higher for the seismic hazard level at 10% exceedance probabilities. PGAs at this hazard level are obtained as 0.38, 0.48 and 0.52 g for three different attenuation relationships.

In addition to PSHA, hazard deaggregation results showed that near-source earthquakes are the most probable scenario for Sakarya (Figure 3). Results from Sadigh et al. (1997) and Boore et al. (1994) indicated that earthquakes with magnitude higher than 7 dominates hazard level. On the other hand results from Campbell and Bozorgnia (1994) showed that moderate-size events has influence on the hazard level. Similar to the findings in a few recent studies, the earthquake risk for Sakarya is found relatively high. Considering this city's importance, the high risk should not be overlooked and a potential revision of the local technical reference would be needed.

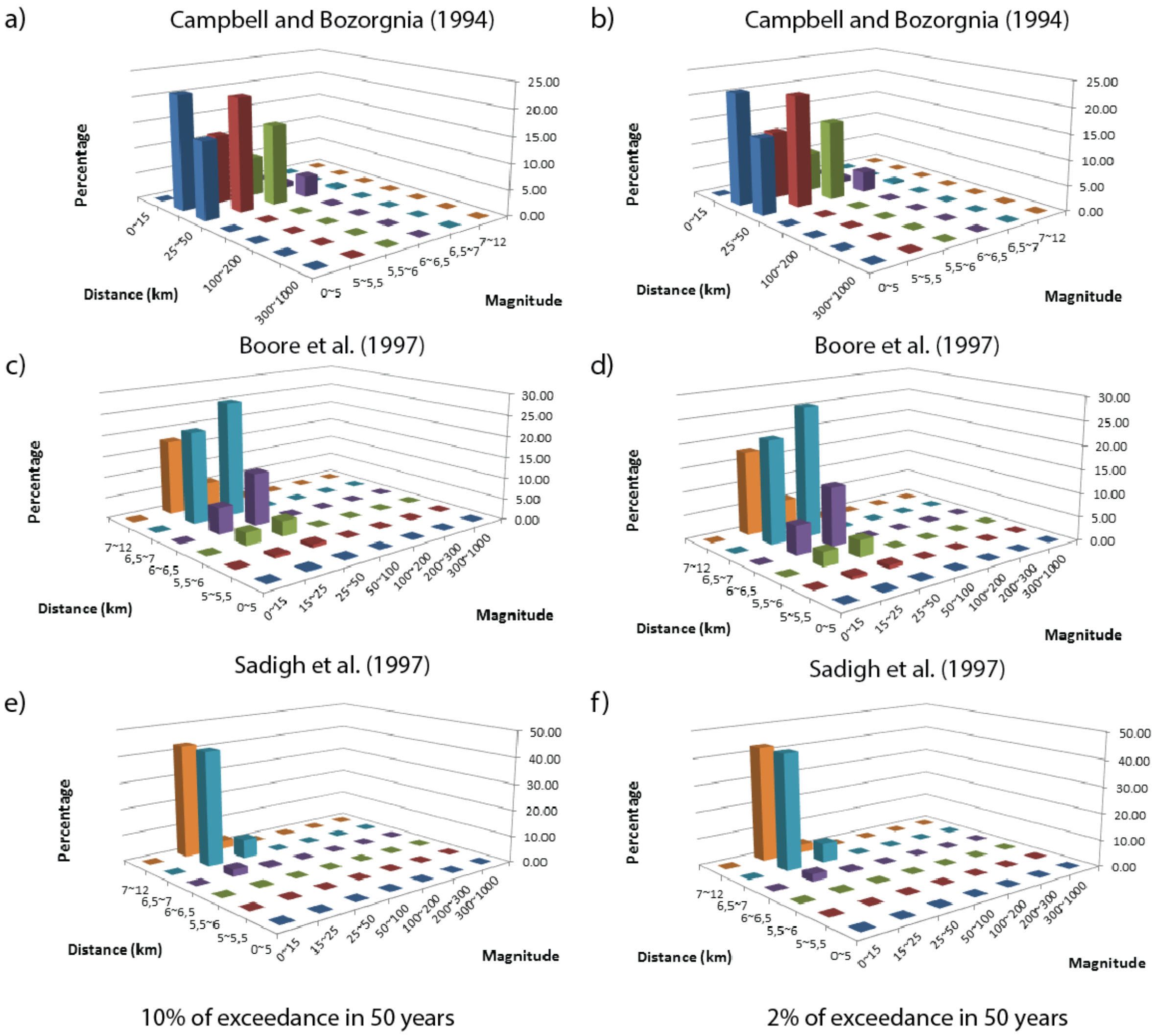

Figure 2 hazard deaggregation for Sakarya city a) Campbell and Bozorgnia 10% of exceedance in 50 years risk level (1994) b) Campbell and Bozorgnia (1994) 2% of exceedance in 50 years risk level c) Boore et al (1997) 10% of exceedance in 50 years risk level d)) Boore et al (1997) 2% of exceedance in 50 years risk level e) Sadigh et al (1997) 10% of exceedance in 50 years risk level f) Sadigh et al (1997) 2% of exceedance in 50 years risk level

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