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COMPARISON OF PEAK GROUND ACCELERATION AND VELOCITY IN DIFFERENT ATTENUATION RELATIONSHIPS

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ABSTRACT

The comparison of peak ground acceleration (PGA) and velocity is examined using the IzmirNET strong-motion network installed in Izmir metropolitan city. We detected that Sadigh equation is most appropriate for our local array. It should be also noted that all limitations (min magnitude level, soil type, faulting, min and max distance interval) were carefully investigated for each event and taken into consideration during the study. Since there were no strong quakes (Mw>6.0), we could not compare some conventional theoretical curves with measured peak accelerations by IzmirNET. Once happens, this will be done for all soil types and different distances.

***Keywords**: IzmirNet; Peak Ground Acceleration, Attenuation Relationships, accelerometer*

INTRODUCTION

Actually in determining the seismic hazard, the most important dynamic parameter represents the peak ground acceleration (PGA) (www.afad.gov.tr). The different peak acceleration amplitudes are generated surface geology, fault systems, topography, rocks and loose ground. These differences will clearly observed if you have the accelerometer records (kyh.deprem.gov.tr). Glancing at the peak ground velocity (PGV); many think it is better correlated with damage than other measures, it is sensitive to longer periods than PGA, but it requires digital processing (www.usgs.gov).

In this study, the distinct attenuation relationships for peak ground acceleration and velocity are analyzed by using more than twenty strong-motion data from the network. A sample result was shown in Figure 1 according to the Turkish Earthquake Code (TDY) and Eurocode-8 for an event occurred on June 20, 2009 (Mw=4.9). This study was repeated for several events on different soil types.

For a different example; Balikesir-Sindirgi earthquake (2009, May 7; Mw=4.0), showed same results. In Figure 2, red triangles indicate the stations which used IzmirNET we also added 4 AFAD stations. The measured values, which are thought to generate earthquakes 62 km from Gelenbe Fault Zone (Rrup) change AFAD-Demirci and URL-IzmirNET with the 118km (Rrup) distance.

The best models of measured values are noticed that curve of S97_Site A and B. Other models of the observed values are given over exaggerated (with high acceleration) assets.

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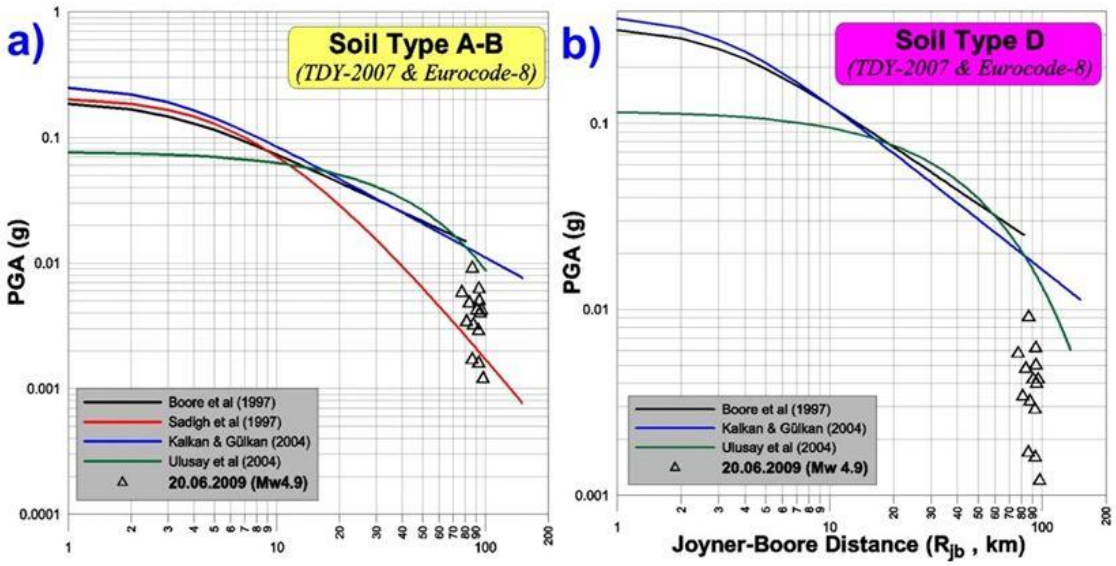

Figure 1. Excel otomatization for different type of attenuation relationship after a magnitude Mw=4.9 occurred in a distance ~90 km far on June 20, 2009. A) Attenuation distribution with distance was shown according to Turkish Earthquake Code (TDY) and Eurocode-8 for; a) soil type A&B, and b) soil type D.

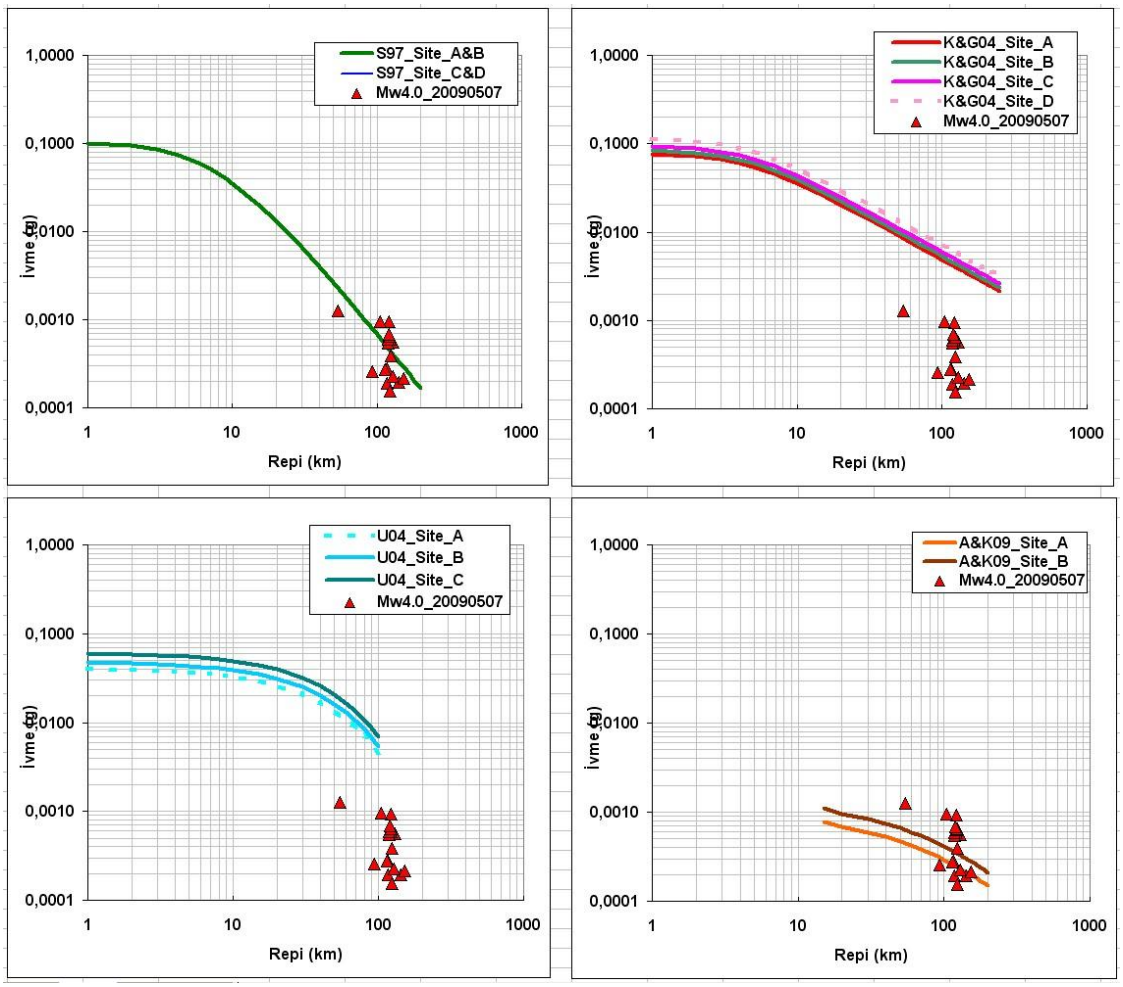

Figure 2. Comparison of Different attenuation relationships.S97: Sadigh (1997), K&G04: Kalkan and Gülkan (2004), U04: Ulusay (2004),A&K09: Akyol and Karagöz (2009)

We have also analyzed the Foca earthquake occurred on May 1, 2012 with a local magntitude M_L=5.0. The moment magnitude Mw=5.3 was derived from empiric relation defined by Kalafat et al. (2007). Site *C*- and *D*- can be defined by different attenuation models such as Ambraseys et al. (2005), Campbell et al. (1997) and Ozbey et al. (2004). But Sadigh et al. (1997) gives most suitable results for all soil types including sites *A*- and *B* (Figure 3).

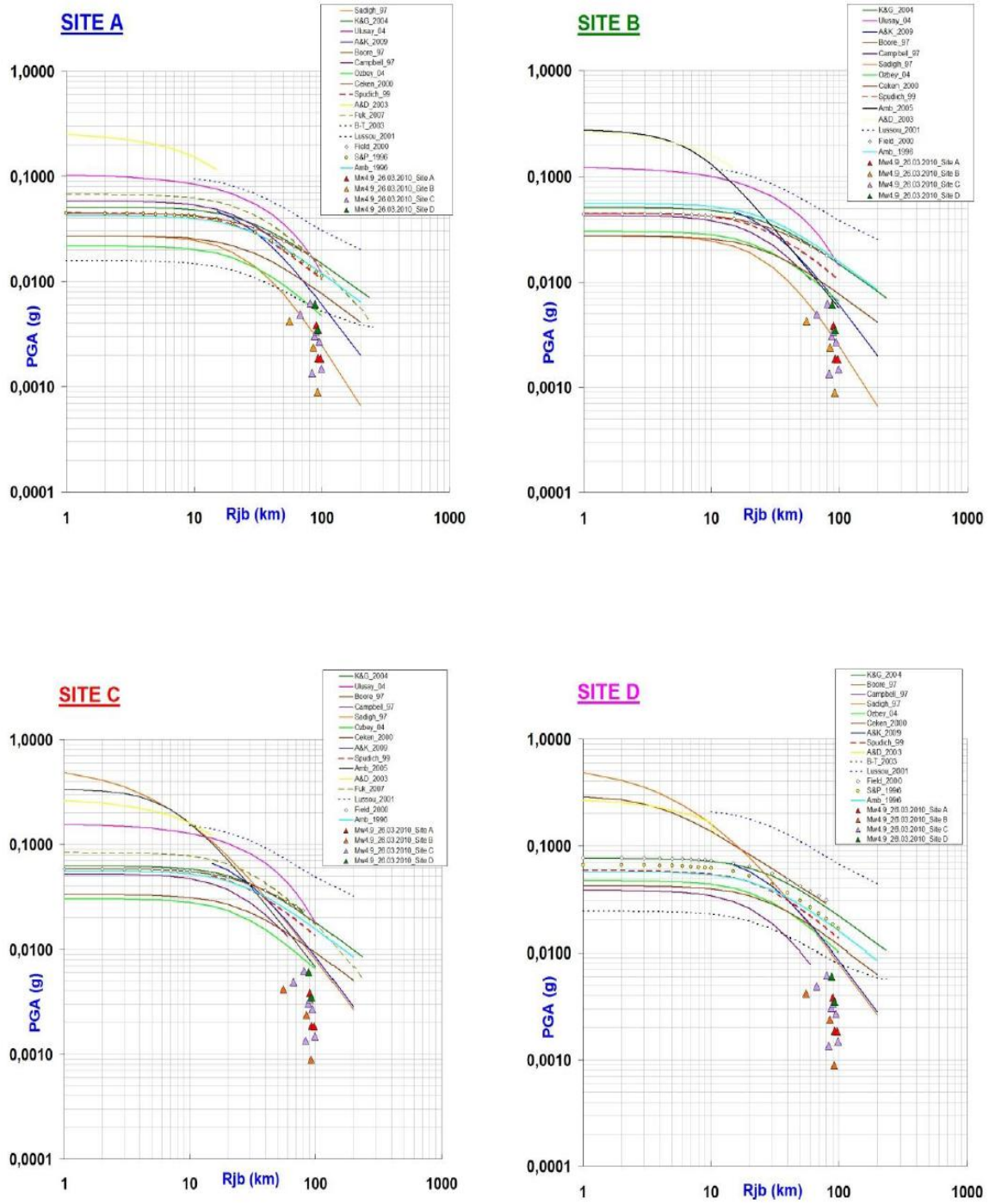

Figure 3: Different type of attenuation relationships after for Foca earthquake occurred in a distance between 50 and 100 km far with a magnitude Mw=5.3 (M_L=5.0) on May 1, 2012. Attenuation distribution was shown according to Turkish Earthquake Code (TDY) for soil types A, B, C and D (earthquake parameters are taken from AFAD Ankara). Triangles show measured peak acceleration values observed in different sites.

During the project period earthquakes are recorded by IzmirNET; obtained measurements of the peak acceleration (PGA, peak ground acceleration) were compared with known attenuation relationship models. As a result of this analysis, acceleragrams (measurements) based on the peak acceleration values are compared to theoretical models. For earthquakes of a certain size in Izmir highest measured acceleration values compared to a theoretical model, we observed under acceleration values. In other words; earthquake which specific distance and magnitude in a residential area Izmir will create the largest acceleration value. If it calculates to theoretical model, it will stand out more exaggerated compared to the actual measured peak acceleration values. This generalization is made for only analyzed earthquakes. Earthquakes at different distances and sizes are reached the obtained data should be revised.

RESULTS

We have compared different empiric attenuation relationships with observed peak ground accelerations. It was performed for different events occurred with various distance and magnitudes. First event was an earthquake with a magnitude Mw=4.9. Distance interval changes from 70 to 100 km. It is obvious that Sadigh et al. (1997) gives most reliable curve for soil types A- and B while Ulusay et al. (2004) reveals most appropriate result for D-type soils. Second comparison was made for Sindirgi (Balikesir) earthquake (Mw=4.0) with a distance more than 100 km. Sadigh et al. (1997) model als gave most relevant result while Kalkan and Gulkan (2004) and Ulusay et al. (2004) fail to estimate reliable peak ground motions. Similar study was performed for a third event occurred on May 1, 2012 in Foca (Izmir). This event was closest one to IzmirNET array comparing with above two events. Similarly, Sadigh et al. (1997) can be represented most relevant attenuation model for different soil type.

New generation attenuation models can be also tested for the study area in the future. It could not be performed in the frame of this study due to lack of strong ground motions.

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