SECOND EUROPEAN CONFERENCE ON EARTHQUAKE ENGINEERING
AND SEISMOLOGY, ISTANBUL AUG. 25-29, 2014

A DETAIL INVESTIGATION ON AKKAR ET AL. (2013) PAN-EUROPEAN GROUND MOTION PREDICTION EQUATIONS AND PROPOSALS FOR FUTURE VERSIONS

M. Abdullah SANDIKKAYA[1] and Sinan AKKAR[2]

The Akkar et al. (2013; ASB13) predictive models for point- and extended-fault sources have recently published. These equations are the updated version of the previous generated models for pan-European region and include a number of novelties, namely: inclusion of a nonlinear site amplification function that is a function of V_{S30} and reference peak ground acceleration on rock; extension of the magnitude range of applicability of the model down to M_w 4; extension of the distance range of applicability out to 200km; extension to shorter and longer periods (down to 0.01s and up to 4s); and consistent models for both point-source (epicentral and hypocentral distances) and finite-fault (distance to the surface projection of the rupture) distance metrics. In addition, data from more than 1.5 times as many earthquakes, compared to previous pan-European models, have been used, leading to regressions based on approximately twice as many records in total. The metadata of these records have been carefully compiled and reappraised in recent European projects. These improvements lead to more robust ground-motion prediction equations than have previously been published for shallow (focal depths less than 30km) crustal earthquakes in Europe and the Middle East. The inclusion of anelastic attenuation, magnitude dependent fictitious depth, and magnitude dependent standard deviations were also investigated in the study; however, they are not applied to the equations.

In this study, we focus on other possible parameters and functions to simulate the ground-motion characteristics in prediction equations. The first analysis that we made is on investigating magnitude dependency on style of faulting term. It is observed that the residuals are uniformly distributed for strike-slip and normal earthquakes. For reverse ground-motions it shows a magnitude dependency however, the number of accelerograms are quite limited. Secondly, the residuals are plotted against focal depth. Depth seems to increase its effect on ground-motion estimates for moderate magnitudes (M_w 5-6) towards longer periods ($T \geq 2s$). The bias in ground-motion estimates for low magnitudes (M_w 4-5) towards longer periods ($T > 2s$) is also observed. The third and final investigation is made on reducing the sigma of the equations. For several magnitude and distance bins we noticed that the outlier records are responsible for high sigma values. In addition the increase in long period sigma is due to long-distant recordings. Small magnitude ($M_w < 5.5$) events increases tau towards longer periods as well.

REFERENCES

Akkar S, Sandıkkaya MA, Bommer JJ (2013) "Empirical Ground-Motion Models for Point- and Extended-Source Crustal Earthquake Scenarios in Europe and the Middle East", *B. Earthq. Eng.*, DOI 10.1007/s10518-013-9461-4.

[1] Ph.D. Student, EERC, Middle East Technical University, Ankara and ISTerre, Universite Joseph Fourier, Grenoble, asandikkaya@gmail.com
[2] Prof. Dr., KOERI, Boğaziçi University, Istanbul, sinan.akkar@boun.edu.tr