Expected PGA Map for Istanbul

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INTRODUCTION

This study aims to forecast the peak ground accelerations (PGA) at different locations throughout Istanbul in a future earthquake. Compared to other studies in which the expected value of one of the variables is taken as constant and thus only one scenario is evaluated, both the magnitude and epicenter of the expected earthquake are taken as random variables in this study. Our study considers the facts that peak ground accelerations will decay with increasing distance from the epicenter and soil conditions at different geological sites will have variable amplification effects on peak ground accelerations. The major outcome of our study is a three dimensional map of Istanbul containing expected peak ground acceleration values. The other available outcomes are probability mass functions of peak ground acceleration for all grid points on map of Istanbul.

METHODOLOGY

The geological map of Istanbul was corrected for image processing, digitized and a soil amplification factor was assigned for each data point. All earthquake data for Turkey for 1900-2000 was combined and screened for the earthquakes between longitudes 28 and 30 and latitudes 40 and 42 with magnitude in the required range. For every data point on the map, PGA values for all earthquakes in the list formed by screening were simulated. The theoretical PGA at grid points was calculated using Ansal's PGA attenuation relation (1997). The ambient PGA at a specific location was calculated as the theoretical PGA times the soil amplification factor assigned from that point. For each data point, the expected value of PGA was calculated from simulation results.

RESULTS

A three dimensional expected PGA map was formed using the expected PGA values at grid points. Probability mass functions of PGAs for selected points were plotted as histograms.

CONCLUSION

The Prince Islands and the Marmara coast on the Anatolian side will face the highest peak ground acceleration in an earthquake that will occur between the coordinates evaluated in this study. The region that seems the least susceptible to seismic hazards is the northwest region. It is observed however, that local soil conditions will change the expected PGA dramatically.

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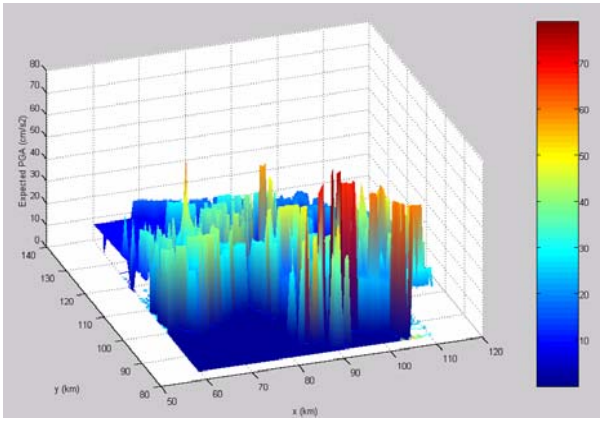

Figure 1. Map of expected PGAs using earthquakes with Mw>4

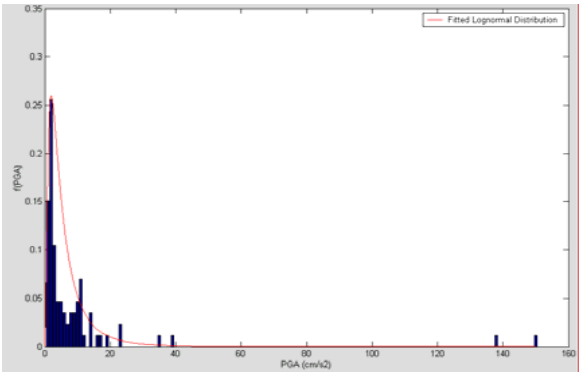

Figure 13. Probability mass function of PGA for the most critical point

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