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### **Analysis of Site Response in the Athens Area from the 7 September 1999, Mw 5.9 Athens Earthquake and Aftershock Recordings, and Intensity Observations**

**IOANNIDOU, E., Ministry of Education, Greece; VOULGARIS, N., Geothermics, University of Athens; KALOGERAS, I. and STAVRAKAKIS, G., Institute of Geodynamics, National Observatory of Athens; and HUTCHINGS, L., Lawrence Livermore National Laboratory, Livermore, CA 94551**

We investigate to what extent relative damage from local earthquakes can be predicted by estimating site response or by mapping surface geology. We estimate site response in the Athens area from recordings of aftershocks of the 7 September 1999, Mw 5.9 Athens earthquake at 22 stations. The highest damage from this earthquake was about 15 km from the epicenter. The sites studied are in and around the highest damage area and at about the same distance from the hypocenter, so that differences in site conditions may be the stronger factor in determining where damage occurred. We describe site response from weak motion recordings in two ways: (1) by an inversion to estimate site specific  $t^*$ , and (2) by calculating site response relative to reference sites by the spectral ratio method. We also assemble site-specific information on geology of the recording sites and categorize it. We compare these results to estimated intensity at each site to evaluate whether these factors can provide an indicator of potential damage from local earthquakes. We conclude that the spectral ratio method is the best indicator of potential damage. The four sites that had the highest intensities showed the highest amplifications by the spectral ratio method, and most other sites showed relative amplifications consistent with intensity.  $t^*$  is a moderately effective method of identifying relative intensity but did not identify the highest intensity area. Near-surface site geology showed very poor correlation with potential damage. Spectral ratios and  $t^*$  did not correlate with geology very well but show significant correlation with each other. \*This work was performed under the auspices of the U.S. Department of Energy by the University of California, Lawrence Livermore National Laboratory under contract No. W-7405-Eng-48.

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