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SITE EFFECTS IN THE VALLEY OF MEXICO

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ABSTRACT

The Michoacan earthquake of 19 September. 1985, M 8, resulted in a great impetus to research on seismic wave amplification in the lake-bed zone of the Valley of Mexico due to the unprecedented damage caused by this event to Mexico City. From the obtained records we can make the following observations: (1) large spectral amplification relative to a reference "hard" site, (2) very long harmonic coda with beating, and (3) evidence that even at the "hard" sites the seismic waves suffer an amplification of about 10. Although observation (1) could be explained by 1-D subsoil, appropriate for the lake-bed, excited by a vertically propagating SH-wave with enough duration, no simple and physically realistic model could be proposed to observations (2) and (3).

The instrumented sites in the valley at present total more than 100, eight of these are equipped with surface and downhole sensors and one with VBB seismograph.

This network has recorded many moderate and some large earthquakes. Also, special field experiments have been carried out to understand the Nature of wave propagation in the valley. The analyses of the new data offer some explanations to the observations (2) and (3) above. It seems that the long coda is generated by multipathing of waves between the source and the valley and/or within the deeper deposits of the valley. Thus there is no need to require a large Q value of the clays. There is strong evidence of regional amplification in and around the valley. In fact, there may not be a truly "hard" site in the valley since the upper 2-km of the crust consists of relatively low-velocity volcanic rocks.

A microarray at Roma site allows determination of dynamic strains in the valley during earthquakes. The results from Roma, when scaled to a M 8 event, suggest surface strains of about 0.06% and vertical gradient of horizontal displacement of about 1.3% during the Michoacan earthquake.