

Local site effects in Palestinian cities: a preliminary study based on Nablus earthquake of July 11, 1927 and the earthquake of February 11, 2004

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Abstract:

In recent years, there has been a great deal of interest to assess the local site response, which is one of the key components of any seismic risk analysis. The empirical method is one of the several techniques to compute the spectral ratios of horizontal and vertical components (H/V) using microtremor records, a method proposed by Nakamura (1989). Recent studies of large destructive earthquakes have shown that damage during the earthquakes are often caused by the amplification of seismic waves in near-surface sedimentary layers.

Studies of historical earthquakes for the past few thousand years demonstrate that the damaging earthquakes in Palestine were located along the Dead Sea Transform (DST) fault. In the past century, a destructive earthquake has occurred in the Jordan rift region at the boundary between the Arabian and the Sinai–Palestine plates: Nablus earthquake of 11 July 1927 north Jericho (M 6.2). The most recent earthquake of 11 February 2004 (Mb 5.1) also in the Dead Sea Region (about 16 km south of Jericho city with a focal depth of 21 km) caused some partially damage cases; in Nablus city few historical buildings have been affected with damages between grade 2 to grade 4 according to EMS-98.

A study on the H/V ratio of microtremor motion at the rock substratum is presented using records from 3-component digital seismograph installed in two Palestinian cities: Nablus and Ramallah. Spectral ratios were computed for different sedimentary sites, where the youngest sediments of Quaternary alluvium and alternating layers of unconsolidated sedimentary materials give the highest amplification factors.

Our results show a good correlation between the site amplification and the damage areas of Nablus earthquake of 11 July, 1927 and the disastrous effects of the recent earthquake of 11 February 2004.