

Estimation of fundamental frequency peaks, in the Chlef City, Algeria, using different methods

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We estimate the site effects in downtown Chlef city (formerly El-Asnam), Algeria, using standard spectral ratios (SSR), receiver functions (RF), and H/V spectral ratios using ambient vibrations (HVSRN).

Theoretical HVSRN curves were also calculated from suggested soil models for each site of the temporary seismic network.

Two groups of fundamental frequencies were distinguished in the city. In the northern part of the study area, the frequency peaks varied from 0.3 to 0.4 Hz; in the southern part they varied from 0.6 to 1.6 Hz. The amplitudes of these frequency peaks were 4–8. Earthquake and ambient vibration data were able to identify fundamental frequency peaks successfully; however, the amplitudes of the peaks were slightly lower for ambient vibrations. Moreover, the fundamental frequency peak progressively increased from northwest to southeast, which is consistent with the direction of decreasing thickness of a Miocene layer overlying the basement. We infer, as expected, that this layer is the cause of the fundamental frequency. Furthermore, earthquake data were more appropriate for identifying peaks at frequencies higher than the fundamental one. Indeed, a clear peak was observed at all northwestern sites in the 3–4 Hz range, with amplitude of 3–5. At the other sites, particularly in the center of the city, the peak was less evident.

Directivity analysis of the observed HVSRN data was carried out in order to seek plausible explanation to the spectral ratios high amplitudes found in the center of the study area.

Finally, inversion of the observed HVSRN curves was carried out in order to estimate the Vs-structure in the city of Chlef.