Microtremor measurements to detect zones of potential cracking in the Basin of México

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Abstract Fissures and cracks in the clayey masses of the basin of Mexico have recently increased in number and have produced considerable damage to low-price popular dwellings, such as in San Lorenzo, a location in the Ixtapalapa hilly area in Mexico City and in San Martin Cuautitlan, in Chalco, close to the city. Cracks in these two cases are difficult to control and are caused by regional subsidence which, in turn, originates in the extraction of water from deep strata. Cracking and fissuring usually occur in abrupt transition zones in which the thickness of compressible clay layers changes sharply over short distances and in places where one finds buried geological structures within the basin. Many of these cracks and fissures have been located and even mapped, but there are ample zones in the basin where the zones of potential cracking are yet to be defined. In this paper we use analyses of microtremor records to study three zones where cracks and fissures have appeared in and around Mexico City. Our results show that Nakamura’s ambient vibration method can be used advantageously to study cracks and potential cracking, including some of its features: length, depth, etc. It can also be used to derive hypotheses regarding the possible origin of cracking phenomena and to define zones of potential cracking in certain areas of the basin. Results of exploratory geotechnical soundings are used to validate our method.

Key words subsidence; cracks; fissures; Nakamura’s method