

Geophysical characterization of the subsoil using several methods: the case of the city of Pedernales after the Mw7.8 earthquake on April 16, 2016

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The April 16, 2016, Pedernales Mw7.8 earthquake, devastated a large part of the Ecuadorian coast in South America. It produced almost a thousand casualties and widespread damage with over thirty thousand collapses of houses and public facilities. One of the urgent tasks is to characterize and understand the soil characteristics of these affected areas for a proper risk management.

The study consisted in the installation of seismic station arrays for approximately 7 days, right after the mainshock, recording both ambient noise and aftershocks. We employed several methods to characterize the soil in Pedernales, including single-sensor horizontal-to-vertical (H/V) spectral ratios (Nakamura, 1989; Sánchez-Sesma et al. 2011), relative spectral ratios at various sites of interest with respect to a reference site (SSR), and linear arrays for multi-channel analysis of surface waves (MASW). The soil fundamental frequency and dispersion curves are combined to obtain shear wave velocity profiles. These parameters are then used to identify zones sharing similar response characteristics to understand the seismic response of the damaged area.

The aftershock measurements allowed computing the earthquake-horizontal-to-vertical spectral ratio (eHVSr) and these results are interpreted using the diffuse field concept (Kawase et al. 2011). The various data sets acquired allowed to get a reliable description of the underground structure.

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