

Site effect determination using seismic noise from Tungurahua volcano (Ecuador): implications for seismo-acoustic analysis

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Abstract

Scattering and refractions that occur in the heterogenous near-surface beneath seismic stations can strongly affect the relative amplitudes recorded by three-component seismometers. Using data from Tungurahua volcano we have developed a procedure to correct these 'site effects'. We show that seismic noise signals store site information, and then use their normalized spectral amplitudes as site frequency response functions. The process does not require a reference station (as per the S-wave and coda methods) or assume that the vertical amplitude is constant (the H/V component ratio method). Correcting the site effects has three consequences on data analysis: (1) improvement of the seismic source location and its energy estimation; (2) identification of a strong influence on the volcanic acoustic seismic ratio (VASR) and (3) decoupling the air wave impact on the ground caused by explosions or eruption jets. We show how site effect corrections improve the analysis of an eruption jet on 2006 July 14–15, appearing two periods of strong acoustic energy release and a progressive increase of the seismic energy, reaching the maximum before finishing the eruption.

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