

## **Local seismic hazard assessment in explosive volcanic settings by 3D numerical analyses**

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This work deals with the assessment of local seismic response in the explosive volcanic settings by reconstructing the subsoil model of the Stracciacappa maar (Sabatini Volcanic District, central Italy), whose pyroclastic succession records eruptive phases ended about 0.09 Ma ago. Heterogeneous characteristics of the Stracciacappa maar (stratification, structural setting, lithotypes, and thickness variation of depositional units) make it an ideal case history for understanding mechanisms and processes leading to modifications of amplitude-frequency-duration of seismic waves generated at earthquake sources and propagating through volcanic settings.

New geological map and cross sections, constrained with recently acquired geotechnical and geophysical data, illustrate the complex geometric relationships among different depositional units forming the maar. A composite interfingering between internal lacustrine sediments and epiclastic debris, sourced from the rim, fills the crater floor; a 45 meters thick continuous coring borehole was drilled in the maar with sampling of undisturbed samples. Electrical Resistivity Tomography surveys and 2D passive seismic arrays were also carried out for constraining the geological model and the velocity profile of the S-waves, respectively. Single station noise measurements were collected in order to define natural amplification frequencies. Finally, the nonlinear cyclic soil behaviour was investigated through simple shear tests on the undisturbed samples. The collected dataset was used to define the subsoil model for 3D finite difference site response numerical analyses by using FLAC 3D software (ITASCA). Moreover, 1D and 2D numerical analyses were carried out for comparison purposes. Two different scenarios were selected as input motions: a moderate magnitude (volcanic event) and a high magnitude (tectonic event). Both earthquake scenarios revealed significant ground motion amplification (up to 15 in terms of spectral acceleration at about 1 s) essentially related to 2D/3D phenomena associated to sharp lateral variations of mechanical properties within the Stracciacappa maar. Our results are relevant to face the assessment of local seismic response in similar volcanic settings in highly urbanised environments elsewhere.