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to identify cavity due to UNE using seismic wave fields

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The resonance seismometry is one of the CTBT's permitted techniques during OSI. Numerical modeling of seismic wave fields makes it possible to investigate resonance phenomena and their signatures in free-surface records. The necessary condition for reasonable results is an optionally accurate and computationally efficient numerical-modeling tool together with a sufficient set of realistic structural models. Based on extensive review of the available literature we have developed 3D realistic models of the underground structure after an UNE. The most general model consists of cavity, chimney with apical void, crushed zone, fractured zone, environment and free surface. We performed extensive numerical modeling of seismic wave fields due to plane-wave excitation (representing regional and distant events), near point double-couple sources (representing aftershocks) and seismic ambient noise. We then comprehensively analyzed the simulated wave fields in the time, frequency and time-frequency domains. In a seismic wave field due to a distant source it was possible to identify and locate cavity. A seismic wave field generated by an aftershock was much more difficult to interpret in terms of the cavity presence due to strong effects of a radiation pattern. Analysis of seismic noise makes it possible to identify cavity at least for relatively shallow cavities.

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