Dynamical characterization of the shallow hydrothermal system at Ischia Island through the analysis of seismic noise

Paola Cusano (1), Enza De Lauro (2), Mariarosaria Falanga (2), and Simona Petrosino (1)

(1) Istituto Nazionale di Geofisica e Vulcanologia - Sezione di Napoli, Osservatorio Vesuviano, Naples, Italy, (2) Università degli Studi di Salerno, Dipartimento di Ingegneria dell'Informazione ed Elettrica e Matematica applicata/DIEM, Fisciano (SA), Italy

We have analysed the wavefield of the background seismic noise at Ischia Island (Italy), recorded between 2017 and 2018. The Independent Component Analysis highlighted two persistent independent signals, with dominant frequency peak around 1 Hz and 3–4 Hz, respectively. The first signal is the most energetic and persistent. Its polarization shows preferential directions properties, with a shallow propagation that seems to be controlled by the tectonic-volcanic structures and the morphology of the Island. Moreover it is well correlated at all the stations in Casamicciola town. The second signal evidences similar polarization properties, but it is strongly affected by cultural noise and does not show any correlation.

We interpret the 1-Hz wave-packets as the signature of the shallow hydrothermal system. Following a conceptual model of self-sustained musical instruments, the shallow hydrothermal system of Ischia can be seen as a solid structure constituted by a network of channels, continuously excited by the circulating hydrothermal fluids. In this framework the 1-Hz seismic signal and the eventual higher modes would be produced by persistent self-sustained oscillations.