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# Geostatistic applied to seismic noise measurements for hydrothermal basin characterization

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We present a geo-statistical analysis applied to seismic noise measurements in the framework of a thermal basin characterization. The site test is located in the N-E part of Italy (Caldiero, Verona Province) where more than 100 passive single station seismic noise measurements were conducted. The final aim was the characterization of an important hydrothermal basin, which is exploited since the Roman Period. The huge amount of measurements offers high density cover, since the measurements point has average spacing of 100 m for a total area investigated of ca 100ha. The HVSR (Horizontal to Vertical Spectral Ratio) is a geophysical passive technique used to retrieve fundamental resonance frequency of the subsoil. The measurement consists in passive recording of seismic noise with 3 components broadband receivers. From the spectral analysis of the recorded data, we can retrieve the resonance frequency of soil and hence information about depth and mechanical properties of soil covers. Since HVSR is a punctual measurement, 2d map of the results are usually extracted with interpolation procedure, as common kriging or natural neighbor techniques. Despite this accurate statistical procedure are rarely adopted for HVSR analysis, limiting the real significance of the dataset. As a matter of fact, rigorous statistical approach of the spatial distribution is neglected in common HVSR geophysical prospecting. Here we present the use of advanced spatial-statistic technique (e.g. cross-validation, residual distribution etc.) applied to HVSR data. Our results show as critic data scrubbing, joined to rigorous statistical approach for data interpolation, are mandatory to assure meaningful structural interpretation of microtremor HVSR survey. The maps obtained are compared with boreholes data, reflection seismic prospecting, and geological information. The proposed procedure highlighted the potential of these quick passive measurements, if correctly treated from the statistical point of view.