Passive Seismic in Hydrogeological Prospecting: The Case Study from Hard Rock and Alluvium Plain

Authors : Prarabdh Tiwari, M. Vidya Sagar, K. Bhima Raju, Joy Choudhury, Subash Chandra, E. Nagaiah, Shakeel Ahmed Abstract : Passive seismic, a wavefield interferometric imaging, low cost and rapid tool for subsurface investigation is used for various geotechnical purposes such as hydrocarbon exploration, seismic microzonation, etc. With the recent advancement, its application has also been extended to groundwater exploration by means of finding the bedrock depth. Council of Scientific & Industrial Research (CSIR)-National Geophysical Research Institute (NGRI) has experimented passive seismic studies along with electrical resistivity tomography for groundwater in hard rock (Choutuppal, Hyderabad). Passive Seismic with Electrical Resistivity (ERT) can give more clear 2-D subsurface image for Groundwater Exploration in Hard Rock area. Passive seismic data were collected using a Tromino, a three-component broadband seismometer, to measure background ambient noise and processed using GRILLA software. The passive seismic results are found corroborating with ERT (Electrical Resistivity Tomography) results. For data acquisition purpose, Tromino was kept over 30 locations consist recording of 20 minutes at each station. These location shows strong resonance frequency peak, suggesting good impedance contrast between different subsurface layers (ex. Mica rich Laminated layer, Weathered layer, granite, etc.) This paper presents signature of passive seismic for hard rock terrain. It has been found that passive seismic has potential application for formation characterization and can be used as an alternative tool for delineating litho-stratification in an urban condition where electrical and electromagnetic tools cannot be applied due to high cultural noise. In addition to its general application in combination with electrical and electromagnetic methods can improve the interpreted subsurface model.

Keywords : passive seismic, resonant frequency, Tromino, GRILLA

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