Geophysical Research Abstracts
Vol. 16, EGU2014-1799-1, 2014
EGU General Assembly 2014

A passive seismic experiment and ground penetration radar to characterize subsurface cavities in Eastern Saudi Arabia

Septriandi Asmaidi Chan and SanLinn Ismail Kaka
King Fahd University of Petroleum and Minerals, Saudi Arabia (skaka@kfupm.edu.sa)

We have carried out a small-scale passive seismic experiment over a known shallow cavity at King Fahd University of Petroleum & Minerals in an attempt to characterize the near surface cavities. This experiment was conducted as part of a larger study to develop an integrated geophysical approach (i.e. seismic, gravity, resistivity and ground penetration radar) in detecting and characterizing shallow subsurface cavities. Characterizing shallow cavities is of particular interest in the eastern province of Saudi Arabia where many cavities were discovered during a number of construction projects. We used a Geospace passive seismic recording system to collect continuous data over a partly dolomitized limestone bed with several fractures and cavities. Systematically selected time series data at different times of the day were processed using Geopsy software developed by the SESAME (Site Effects Assessment using Ambient Excitations) project. Data from the 10 Hz geophone was used in this experiment and we extracted part of the data recorded during the night as this has been found to exclude most of the anthropologic noise that usually masks signals on data recorded during the day time. We analyzed time series data and performed spectral analysis. Horizontal-to-vertical ratio (H/V) and power spectral density (PSD) were performed as an enhancement tool to determine the resonance frequencies possibly associated with the shallow cavity. Various processing windows with 5% cosine tapers were applied to reduce spectral leakage. To retain the analysis at frequency range of interest between 0.1 to 20 Hz, a band-pass-filter with smoothing procedure described by Kamo and Omachi (1998) was applied. Moreover, the same frequency peaks were picked at each measuring point to check the stability of the H/V curve. The preliminary results (frequency peaks in the spectral H/V ambient ground motions as well as PSD plots) do not uniquely define the near surface cavity. However, further processing is currently underway to verify the results. Meanwhile, we are conducting resistivity and ground penetration radar measurements at the same site to integrate the results. We believe that the final results of this study will enable us to develop a robust methodology to detect and characterize shallow cavities in the region.