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Seismic noise study for a new seismic station at King Fahd University of Petroleum and Minerals in Saudi Arabia

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We have carried out a seismic noise study in order to understand the noise level at three selected locations at King Fahd University of Petroleum and Minerals (KFUPM), Dhahran, Saudi Arabia. The main purpose is to select a suitable site with low seismic noise and good signal-to-noise ratio for our new broadband seismic station. There are several factors involved in the selection of a site location for a new station. Most importantly, we need to strike a balance between a logistically convenient site versus a technically suitable site. As a starting point, we selected six potential sites due to accessibility and proximity to the seismic processing center laboratory in the Department of Earth Sciences (ESD) at KFUPM. We then eliminated two sites that are relatively close to possible low-frequency noise sources. We have considered many possible noise sources which include: vehicle traffic / heavy machinery, the direct path of air flowing from air conditioning vent, tall trees / power poles and metal doorways. One more site was eliminated because the site was located in the open where it experiences maximum wind speed which is considered a major source of noise. All three potential sites are situated within the Dammam Dome where both lower middle and upper Rus Formations are exposed. The upper Rus is mainly made up of fine grained chalky limestone and the lower Rus is made up of alternation of marls and thin dolomitic limestone. The area is not known for any major faults and considered very low seismicity and hence the identification of seismoteconic features is not required. Before conducting the noise study, we calibrated and tested the seismic recording system, which was recently acquired by the ESD at KFUPM. The system includes a seismic recorder and a sensor with a GPS device. We deployed the system in order to measure the low-frequency background noise. Knowing the low frequency noise will help in predicting the high-frequency noise. The recording systems were deployed for twenty eight days (based on the memory available with the recorder) continuously collecting data at all three potential sites. This continuous data collection was done as part of a larger study where microtremor measurements were made to better understand and characterize the origin of various near-surface noises over a non-producing reservoir in Dhahran, Saudi Arabia (Papoola and Kaka, 2011). The new station at KFUPM will be equipped with a 3-component 120s to 50Hz Trillium120 broad band seismometer, Taurus 24-bit data acquisition system along with a large LCD to display the waveform data in real-time. The KFUPM community will have an opportunity to observe daily seismic activity in real-time and to monitor/record both regional and teleseismic events. Moreover, students will gain the opportunity to identify P, S, Love, and Rayleigh waves and learn how to locate an earthquake. The station will also play an important role in providing a source of information about seismic activity for the general public. The new station is expected to be operational in a few months time.