

Analyzing field seismogram in overburden, case study of a site in Peshawar Basin

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The geophysical technique of seismic refraction is usually used for subsurface investigation and provides a relatively fast, economical and non-destructive means of deriving information on subsurface geology. The paper discusses 24-channel Geode Seismograph with 24 geophones and its possible applications in Pakistan. For geodynamical characterization of the shallow subsurface, site effect investigation are very important. P and S-wave seismic velocities at shallow depths provide useful information for studies about subsurface. In this context, an experimental seismic refraction survey was conducted at a small local site at the new campus of National Centre of Excellence in Geology near the Agriculture University. This experiment was performed to determine the thickness of alluvial material in our area of investigation. During this experiment, representative velocities were calculated for the alluvial material.

Twenty four geophones were positioned across the site to record signals created by a thumper at one end of the line. A seismic line, 30 m long was used to determine representative velocities of alluvial material and its thickness. Figure 1 shows a straightforward example of a field seismogram from the site Time-term inversion and tomographic inversion models are created using Plotrefa software to enhance the subsurface picture using input data shown in Figure 1. Three subsurface lithologies are recognized. From top to bottom these yield velocities of 300-660 m/sec, 661-1570 m/sec and 1571-1930 m/sec. We interpret these velocities to represent 3-layer lithological variations in top 30 meter of the soil, which include from top to bottom, 1) top most which contains mostly sand mix clay (2.5 m thick), 2) moderately compact sands gravels (7 m thick) and 3) hard compact clay (17 m thick). This paper presents preliminary investigation and example as a result of the seismic refraction method using Geode. The future aim is to investigate subsurface geology in various parts of the country in detail.

Keywords: Seismic refraction, seismogram, velocity, alluvial material

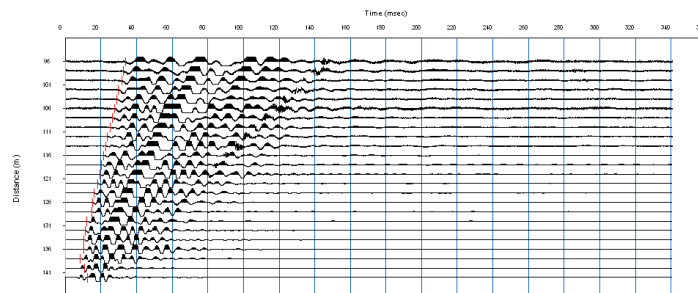


Figure 1. Field seismogram (seismic record in time domain) from the Peshawar Basin, Peshawar. First breaks for each geophone trace are indicated by a red arrow. This seismogram exhibits a three-layer (two horizontal interfaces) pattern.