Detecting and Determining Bauxite Layer Depth by Using Multichannel Analyses of Surface Wave Method

Saad Almalki[1], Majed Almalki[1], Abdurahman Alanezi[1], and Abdulaziz AlMutairi[1]

[1]King Abdulaziz City for Science and Technology (KACST), Riyadh, Saudi Arabia

Abstract

The purpose of this study was to obtain a model of shear wave velocity (Vs) by using the multichannel analysis of surface wave (MASW) method in order to map the potential subsurface structure of a bauxite layer found in the northern part of Qassim City, Saudi Arabia. A seismic survey was conducted in the study area by the King Abdulaziz City for Science and Technology (KACST) for the purpose of acquiring high-resolution seismic reflection data. There is also two wells, which reveal depth and thickness of bauxite layer, along the seismic line to define and correlate bauxite layer with Vs profile. In this study, the geometry was modified to reach the optimum field parameters for the MASW method, mainly by testing the source-receiver offset. This offset was defined to form a common and certain offset range during the analysis, where the offset remains fixed for each shot in the forward direction of the seismic survey. This geometrical arrangement was also modified to analyze the data in a backward direction using the same source-receiver offset. The advantage arising from these modifications is to have one model in each direction and to characterize the wave modes on the dispersion images for interpretation purposes. These dispersion images describe the wavefield transformation that converts the shot gather to velocity-frequency dispersion images. For inversion, we used fundamental-mode analysis technique based on the wave modes observed .After processing and inversion of the MASW data, the results of the two models of V_s reveal that there is a normal fault located in the middle part of the first V_s module. The bauxite layer depth for both V_s profiles is approximately 26 m at the first well location and approximately 25 m at the second well location. Our analysis indicates that the MASW method was successful in detecting the bauxite layer and determining its depth.