Geophysical Research Abstracts
Vol. 13, EGU2011-11142, 2011
EGU General Assembly 2011

Low Velocity Layer Survey in 3D Seismic Acquisitions (In an oil field, Iran)

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This paper is devoted to geometric and seismic characteristics of low-velocity near surface layers by seismic acquisitions that have considerable influence in processing and interpretation of deep seismic data. Low-velocity or Weathered layers, which are located some distance below the Earth's surface, are a critical zone in seismic operations. They are characterized by low transmission of seismic waves and generation of seismic multiples. Near surface modeling is an integral part of any seismic survey for two reasons. One is the placement of the dynamite at the right depth, and second, the role it plays in reducing the seismic data to a specified datum. The most widely used methods for modeling near surfaces are seismic downhole and seismic refraction surveys. The study area is an exploration oil field in south of Iran and covers an area of about 120 km2. A total of 35 seismic refraction profiles and 5 downholes have been processed and interpreted. The purpose of this study is to determine the depth and velocity characteristics of surface and near surface layers in the desired region. For this reason the popular slope/intercept method was applied, and for layers in which travel time plot had overlap, the Plus-Minus method was used, and in some cases, the Palmer method was applied. The results were presented in the form of Depth-Velocity sections of the seismic refraction and downhole profiles. Furthermore, in order to investigate the seismic velocity distribution of the weathered layers and changes of thickness of layers in the region, iso-velocity and iso-depth maps of different layers were presented. Both methods produced a four layers model of the near surface. the average velocity of these layers was 500, 1450, 2450 and 3400 m/s from the upper to the lower, and the average thickness of the layers was, 1.7, 6.9 and 21 meters, respectively. The results of both methods confirm each other, and this shows that in places where there are no boreholes and due to high costs of borehole surveys, the refraction survey can confidently be applied.