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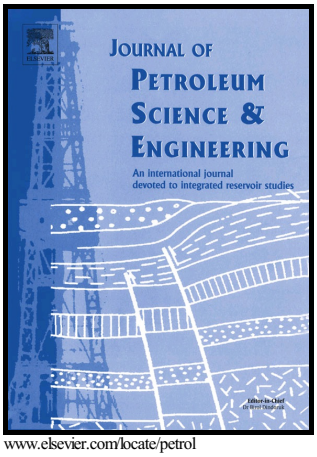

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Seismic imaging by 3D partial CDS method in complex media

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Abstract

Seismic imaging in complex geological structures is state of art to deliver a high quality section for further geological interpretation. Conventional processing and imaging methods will fail in case of facing complex media, strong heterogeneity and poor quality data. Thus, conventional seismic imaging methods have to be improved inevitably or new approaches have to be extended to produce valid images. The partial common diffraction surface method is based on improving the common diffraction surface operator to handle lateral heterogeneities in complex media. In this study, the partial diffraction surface method was improved to 3D. This method enhances quality of the 3D pre-stack data to be used for further depth imaging. It can also resolve some of the possible ambiguities in geological interpretation from seismic images. This also will enhance the quality of the seismic images, where it suffers from conflicting dips problem. A time variant linear function defines the offset range for each zero offset sample in the stacking operator. This function controls the offset increment for the partial form of the operator in the time-midpoint-offset domain. It should be noted that the velocity model can be considered as smooth and simple as possible in this method for further depth imaging. The introduced method was applied on a 3D synthetic and a real land data set. Results from both data example show the ability of the new method in enhancing the quality of the seismic section in the presence of faults and lateral velocity heterogeneity. This enhancement achieved by a simple velocity model in a strong complex media. Consequently, depth migrated result of the real land data underwent a time conversion to create a time underground contour map, for comparison with the maps obtained with conventional methods. More details of the target formation were observed on the map used result of the proposed method for mapping.

Keywords: Seismic imaging, common diffraction surface, lateral velocity heterogeneity, Complex media, Zagros overthrust.

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1. Introduction

Seismic imaging methods that are based on ray tracing techniques face with problem in imaging the complex media data. Geologically boundaries of complex structures such as salt dome, overthrust zone and faulted - folding system are illuminated by different ray paths. Tracing the paths of these rays cannot be properly handled by conventional imaging techniques (Yilmaz, 2001). Significant improvement in quality of imaging seismic data from such media could be achieved both in performing an accurate velocity model building procedure and/or applying advanced migration algorithm. In imaging complex structures with strong heterogeneity, the conventional migration methods based on the Kirchhoff integral, have

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