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Reflection travel time tomography applied in Lorestan

Naimeh Moghadasi, Mohammad Reza Gheitanchi, and Hossein Hashemi Shahdani
Institute of Geophysics,University of Tehran,Tehran, Islamic Republic Of Iran (n.moghadasi@ut.ac.ir)

Seismic tomography is a methodology for estimating the Earth's properties and several methods have been developed for this purpose such as reflection , refraction , finite frequency , wave form tomography.The basic aim of reflection tomography is to construct a quantitative cross sectional image from reflection data . Seismic reflection data is a good tool to estimate velocity with using multi -channel seismic reflection data which it consists of two steps: 1) identification of acoustic discontinuities and determination of relative travel times for various source – receiver positions , 2) local velocity model estimations by an iterative procedure . We started with a simple single layer model for reflection data to study the ambiguities between velocity and depth perturbations using the tomographic techniques. This ambiguity is caused by insufficient source – receiver offset and laterally velocity changes in seismic reflection travel time data. This velocity - depth ambiguity is formulated in terms of a linear estimation theory. At first velocity and depth perturbations were discussed for reflection data in two individual parts: first velocity and depth perturbation is uniform (spatial variations are not considered in this part) and second part of this study was defined for laterally variable velocity and depth perturbation (assuming that the velocity perturbation has no variation in depth). The depth perturbation shows more sensitive to reflection travel time anomaly than velocity perturbation as we expected. Then synthetic travel times were generated and compared results with true model. We applied reflection tomographic technique to a seismic profile data set along a linear array in the Lorestan province in the western part of Iran , which was extended about 24 km. Seismic travel times were picked automatically because this process is a very time consuming method and requires careful inspection for possible errors. The picking accuracy is decreased by various effects, for instance the presence of background noise. However, the automatic picking increases efficiency substantially. The inversion tomographic method was applied in this study. The main objective of seismic tomographic inversion is to minimize the difference between observed seismic travel times and the corresponding theoretical predictions. In this case study, the velocity model and the depth variations of layers were determined along our seismic profile in subsurface of the Earth.Because of high density of ray tracings and presence of accuracy origin times, the results obtained from reflection travel times tomography display a good correlation to the true model.