SEISMIC INVERSION AND DIFFRACTION TOMOGRAPHY

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The computational tomography applied to seismic experiments can be interpreted as the method for the solution of the inverse seismic problems. Ray tomography is relevant to an inverse kinematic seismic problem, whereas diffraction tomography is relevant to an inverse dynamic problem. We introduce the notion of tomography functional which can be interpreted as the functions of the influence of various spatial region on a particular sampling of seismogram. The tomography functional is determined by the interaction of the incoming field from the source in a known reference medium and the reversed outgoing field from the receiver with an interaction operator. We introduce the information sensitivity of the observation field (seismogram) which is determined by the limit of the derivative with respect to the signal/noise ratio from the Shannon information. We propose the general solution of the seismic diffraction tomography problem and illustrate the efficiency of algorithms on the numerical modeling and real seismic data. The aim of the numerical experiments is to investigate the resolving power of the observation system formed by the regular net of three-component geophones. The results of numerical experiments show that the suggested modification of the diffraction tomography method allow us to recover the medium imaging in the rather wide space domain. This effect is due to gathering of the seismic information from set of experiments. The numerical experiments can be used in the design of seismic experiment. This research was supported by Grant No 99-05-64127 from the Russian Foundation for Basic Research.