

Basis for calculations of travel time curves in a 1D model and optimization problem associated to seismic tomography

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Abstract

This work is divided in two parts. First, we discuss some theoretical base of refraction and reflection *seismology*, which are used to describe the earth structure based on velocity models, to help in the understanding of a simple model of that structure. We provide an algorithm using refraction *seismology* to identify the velocities and calculate the depths of a multilayer model of the earth using travel-time data collected by *geophones* (seismograms) from artificial sources. This algorithm allows us to create a one dimensional model, which can be used as the input for calculating a 3D velocity model of the earth structure through a seismic *tomography* approach. Second we modify a widely used procedure to calculate this 3D model to implement state-of-the-art algorithm for solving the nonlinear optimization problem, that arises in seismic tomography applications. Then compare the results obtained with both methods in terms of efficiency and accuracy.