

First Arrival Tomography Using Depth-Varying Velocity Gradients

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Many cell and layer tomography methods assume that the velocity or velocity perturbation is constant within each cell or layer. When the velocity field varies continuously, traditional cell or layer tomography methods will be problematic. While it will be erroneous to approximate the velocity field using few constant-velocity cells, using too many cells will increase the number of inversion variables and the computation cost. Here we improve a first arrival layer tomography to invert for the interface geometry and depth-varying velocity gradient of each model layer. An efficient ray tracing is developed for the model with depth-varying velocity gradients. For areas of prominent velocity gradient, our new method will use fewer model parameters and therefore more robust tomographic inversion than the method using constant velocity cells or layers. The method is shown using a 2D synthetic example.