

The article is concerned with accuracy and efficiency issues for the numerical solution of the eikonal equation in heterogeneous media in three-dimensional space. A new second-order finite difference scheme is introduced to approximate the traveltime derivatives *exactly* for elliptic wavefronts. Its ENO-variant, called the *Quadratic ENO (QENO)*, is applied for the travel-time computation in realistic media. QENO shows an excellent accuracy, in particular, near the point source where the wavefront curvature is large. For stability, the expanding-box method requires to adopt an iterative procedure of which each iteration incorporates various directional marchings. Accurate initialization and the introduction of substeps in the pseudo-temporal direction turn out to be two important ingredients for a fast convergence of the iteration. With properly chosen algorithm parameters, the iterative algorithm converges in 2-3 iterations independently on the problem size in most realistic media.