Fast hypocenter determination in a three-dimensionally inhomogeneous velocity-structure (3)

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We have been developing a fast hypocenter determination method in a three-dimensionally inhomogeneous velocity structure to be used in interactive processing. It is assumed to be used for quick hypocenter information reports soon after occurrence of earthquakes. We made three-dimensional travel-time table to reduce calculation time of travel time. One thousand times speedup was achieved comparing with ray-tracing method (Katsumata, 2006). Required computer resources for calculation of the travel-time tables was no more than an available level.

Ray-paths sometime scatter for neighbor grid points of large hypocentral distance due to the complex velocity structure. The scatter makes steps in travel-time tables. We give five to nine initial ray paths to find the fastest path. Nevertheless obtained travel times at grid points are not smoothly varying.

We introduced wavefront tracing method. 0.1 step iso-travel-time points are obtained on the ray paths obtained from ray-tracing. When iso-travel-time point from neighbor paths precede the point calculated on the own ray path, the point from neighbor path is adopted. Faster travel times are obtained from wavefront tracing than the ray tracing only. However calculation time increased by several to ten times.

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