Depth of the Moho discontinuity beneath the Japan Islands estimated by travel-time analysis

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We investigate the velocity structure beneath the Japan Islands to be used for hypocenter determination in a three-dimensionally inhomogeneous structure. We estimate the depths of discontinuities as well as the velocity in layers.

The depth of the Moho discontinuity has been investigated by travel-time analyses and receiver functions. We estimated the depth of the discontinuities by arrival-time data of natural earthquakes.

We assume the Conrad and Moho discontinuities, and modeled them by two-dimensional B-spline functions. We set initial depths with taking topography into account. Seismic velocities in solids parts are expressed by three-dimensional B-spline functions. We do not assume upper boundaries of plates as discontinuities, instead, we assumed high-velocity regions as plates.

We use the ray-tracing method developed by Um and Thurber (1987) for the solid regions, and Snell's law for discontinuities. We allow rays to abut on the convex surface into high-velocity layers. Differential coefficients in the solid regions are obtained by differentiating B-spine functions, and those for the depths of discontinuities are numerically calculated. We estimate the depths of discontinuities and velocities in the layers simultaneously by the least squares method. We restrain the velocity variation in a layer by giving a priori probability of the velocity in layers.

We use arrival time data obtained by the Japan Meteorological Agency for the unified seismic catalog. Focal depths estimated in the FREESIA project are referred to as initial focal depths and a priori information.

We divide the Japan Islands area into several regions in the analysis, and combined them afterwards. Preliminary results are obtained, are being checked.

We use seismic data from the National Research Institute for Earth Science and Disaster Prevention, Hokkaido University, Hirosaki University, Tohoku University, University of Tokyo, Nagoya University, Kyoto University, Kochi University, Kyushu University, Kagoshima University, the National Institute of Advanced Industrial Science and Technology, Tokyo metropolitan government, Shizuoka prefectural government, Kanagawa prefectural government, the City of Yokohama, the Japan Marine Science and Technology Center, and the Japan Meteorological Agency.