日本列島基本構造モデルの構築 -海溝軸・プレート境界モデル-
Fundamental Structure Model of Island Arcs and Subducted Plates in and around Japan -Trench and Plate Boundary Models -

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The eastern margin of the Asian continent is a well-known subduction zone, where the Pacific (PAC) and Philippine Sea (PHS) plates are being subducted. In this region, several island arcs (Kuril, Northeast Japan, Southwest Japan, Izu-Bonin and Ryukyu arcs) meet one another to form a very complicated tectonic environment. At 2014, we started to construct fundamental structure models for island arcs and subducted plates in and around Japan. Our research is composed of 6 items of (1) topography, (2) plate geometry, (3) fault models, (4) the Moho and brittle-ductile transition zone, (5) the lithosphere-asthenosphere boundary, and (6) petrological/rheological models.
This paper is mainly related with the results of items (1) and (2). The area of our modelling is set 12°-54° N and 118°-164° E to cover almost the entire part of Japanese Islands together with Kuril, Ryukyu and Izu-Bonin trenches. The topography model was constructed from the 500-m mesh data provided from GSJ, JODC, GINA and Alaska University.
Plate geometry models are being constructed for the Pacific and Philippine Sea plates through the two steps. In the first step, we constructed “base” models with very smooth boundaries in our whole model area, providing fundamental geometry of the plates. For 41,892 earthquake data from JMA, USGS and ISC. 7,853 cross sections were taken with several different directions to the trench axes. 2D plate boundaries were defined by fitting to the earthquake distribution forming the Wadati-Benioff zone, from which we obtained equi-depth points for each boundary. These equi-depth points were approximated by spline interpolation technique to make longer wave-length (>75-150 km) qui-depth lines of the plate boundary. The grid data for the individual 3-D “base” plate models were constructed from these equi-depth lines.
As the second step, regional plate configuration including shorter wave-length geometry (<50-100 km) is being constrained in the vicinity of Japan by recent results from seismic tomography, RF analysis and active source experiment. We have collected 44 references, from which plate position data were constructed. These data are used as ‘correction terms’ which are superposed to the “base” plate models described above. Preliminary analysis indicates that the plate boundary of the PAC plate from the controlled source experiments is systematically shallower than that from natural earthquakes in a depth range of 10-30 km, which may arise from the difference between the structural and mechanical boundaries of the subducted plate. These regional data are also very important for modelling the PHS plate, particularly beneath the SW Japan arc with less seismic activity.

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