

Crustal thickness and shear wave anisotropy in the central and south Ryukyu arc

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The Okinawa Trough is a backarc basin currently opening behind the Ryukyu arc where the Philippine Sea Plate subducts beneath the Eurasia plate. We analyzed the crustal thickness and shear wave anisotropy in the central and south Ryukyu arc.

First we analyzed crustal thickness beneath the Ryukyu arc. Data used in this study come from short-period JMA Okinawa seismic network. Data sampling rate is 100 samples/s. 500 events, which observed in the period January 1999 to July 2002, are used. Magnitudes of the events are greater than 3.5. Depths of the events are shallower than 20 km. We picked the arrival time of Pn phase. Then we compute the depth of the Moho discontinuity beneath the seismic stations using time-term method. Average of crustal thickness is 35 km. The crustal thickness near the Okinawa Trough is shallower than 20 km. The crustal thickness near the Ishigaki Island and the north Okinawa Island is shallower than 20 km. The computed crustal thickness is similar to the gravity anomaly patterns.

Then we analyzed the shear wave anisotropy beneath the Ryukyu arc using S-wave splitting. Data used in this study come from short-period JMA Okinawa seismic network and broadband NIED seismic network. 500 events, which observed in the period January 1999 to July 2002, are used. Magnitudes of the events are greater than 3.5. Depths of the events are distributed from 20 to 200 km. We measured the splitting parameters (fast polarization direction and the time lag) of S phase by using cross-correlation method. The orientation of anisotropy for the Ryukyu arc is generally parallel to the strike of the Ryukyu arc or Trench. On the other hand, the orientation of anisotropy for the Iriomote Island and Iheya Island is perpendicular to the Ryukyu arc.

(Discussion) Because of the N-S extension of the Okinawa Trough, the orientation of anisotropy is assumed to be perpendicular to the Ryukyu arc. However, the result contradicts the hypothesis. This suggests that the deformation of the upper mantle parallel to the Trench would occur beneath the Ryukyu arc. The thinning of crustal thickness near the Ishigaki Island and north Okinawa Island would be induced by the trench parallel extensional stress of rifting of the Okinawa Trough.