

## Seismicity and crustal structure in the Okinawa Trough

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The Okinawa Trough is an active backarc basin of the Nansei-Shoto (Ryukyu) island arc–trench system, where the crustal thinning caused by backarc rifting is currently in progress in the entire trough. The characteristics of the seismic activity around the Ryukyu Trench and the Okinawa Trough are not enough investigated due to several reasons; 1) the number of large earthquakes related to the plate subduction along the Ryukyu Trench is not many compared with those in the Nankai Trough and the Japan Trench, 2) the coupling of the plate boundary is considered to be weak, and 3) the sparse distribution of the seismic stations on the Nansei-Shoto island arc makes difficult to obtain enough seismic data in the Ryukyu subduction zone and the Okinawa Trough.

The distribution of the shallow earthquakes in the Okinawa Trough by obtained Japan Metrological Agency during 1923–2018 is spatially inhomogeneous and shows several clusters. The seismic activity in the trough should be related to the seismic crustal structures. Recently, the Japan Coast Guard has reported the detailed seismic structure in the Okinawa Trough. We compared the active seismic areas with the seismic crustal models. The  $M7.1$  Satsuma-hanto Seiho-oki Earthquake occurred on Nov. 14, 2015, in the western margin of the northern trough, the transition area between the East China Sea shelf and the Okinawa Trough, where the crust is thinner than the center of the trough with the deepest water. The source mechanisms of the main shock and intense aftershock activity compiled in the NIED (National Research Institute for Earth Science and Disaster Resilience) F-net moment tensor catalog have NW–SE extension axis, indicating that the area is undergoing tectonic rifting.

The largest shallow earthquakes with depths  $< 30$  km observed in the trough is the 1938 Miyako-jima–Hokusei-oki Earthquake ( $M7.2$ ) near the north of Miyako-jima Island and a tsunami with a height of 1.5 m hit Miyako-jima Island. The location of the hypocenter is estimated at the structurally discontinuous area where the northern extension of the Yaeyama Rift, the deepest elongated depression in the Okinawa Trough, meets Miyako Seamount, a fragment of the continental crust of the East China Sea shelf. Active seismicity including three events with  $M > 6$  on Apr. 20, 2007 was observed in the Miyako Rift to the north of Miyako Seamount. Multichannel seismic profiles show many normal faults and deformation in sedimentary layers beneath the Miyako Rift. However, the accuracy of hypocenter locations in this region is poor, and the CMT locations are different over 20 km at the maximum between the NIED F-net and Global CMT.

The P-wave velocity models beneath the Okinawa Trough generally show an extended arc crust of the Ryukyu Islands which consists of upper, middle, and lower crusts. Although the crustal thickness becomes thinner from the north to the south, the crust is thicker than those of typical oceanic crusts or backarc basin crusts such as the Shikoku Basin. Therefore, the seismogenic layer in the Okinawa Trough is thicker than in mid-oceanic ridges, indicating that larger earthquakes could occur in the trough.

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