

New precise topographic map in the southwestern Ryukyu area off the eastern coast of Taiwan

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The southwestern Ryukyu area is the key to understanding the role of the arcuate-shaped trench-arc-backarc system towards the orogeny of Taiwan; with the viewpoint of the northwestern termination of subduction of the Philippine Sea Plate against the Eurasian Plate and the consequent collision against Taiwan from the northeastern side. We now compiled all the available multibeam bathymetric survey data in this area, including the northern part of the West Philippine Basin, Ryukyu Trench, fore-arc basin, island-arc zone and Okinawa Trough. The data were collected since 1990's up to now mainly by JAMSTEC fleets. The new topographic data obtained in 2009 by EM-122 swath bathymetric echo sounder on board R/V Marcus G. Langseth during the TAIGER Leg2 cruise were also added. The unsurveyed areas were supplied by the ETOPO-1 1 minute of arc gridded topographic data.

The SPOT(=Southwestern Part of Okinawa Trough) area is characterised by the termination of the Yonaguni Graben and the NE-SW chain of volcanic cones. Hydrothermal activities were identified from one of these cones. This is also the location of the "segment" boundary between Yonaguni Graben and Ilan Plain. From the topographic point of view this area is most active in volcanism in the Okinawa Trough.

The eastern area of Yaeyama Graben is characterised by a non-transform offset with volcanic cones of 2km in diameter on the junction of the segment boundary. These topographic features suggest that the segment boundary is magmatic and/or hydrothermally active rather than at the segment centres in the case of the Okinawa Trough.

The fore-arc area south of Miyako and Yaeyama Islands is classified into zonal topographic domains. The northernmost zone is characterised by the distribution of well developed submarine canyons along the southern coasts. The next is by amphitheatres, slump sediment blocks and their large-scale subsidence. The southern zone is by quite complicated topography, such as several escarpments, ridges and troughs and an E-W trending half graben. The southernmost zone is the trench axis area with depth of about 6500-6600m, which is characterised by a flat plane. The width of the axial plain is about 40km of Yaeyama Islands which shows maximum and decreases towards both east and west. However, the topographic features of the trench is unclear on the western side of the Gagua Ridge collision (123E). Four seamounts are located on the trench. The observed topographic features suggest that the roll back of the subducting Philippine Sea Plate and the southward retreat of the trench axis is taking place on the eastern side of 123E due to the oblique subduction, which correspond to the extension of the western Okinawa Trough. However, on the western side of 123E, it is unclear whether subduction of Huatung Basin is taking place. It may be possible that Huatung Basin couples with the fore-arc and back-arc areas and that these three areas altogether collides against the Taiwan block. Clear Benioff zone is observed below the fore-arc area on the north of Huatung Basin. However, this might be derived from the West Philippine Basin subducting northwestward obliquely against the Eurasia Plate. The focal mechanism in the westernmost Ryukyu arc area shows that the shallow earthquakes are mostly NW-ward compression while the deep earthquakes show the S-dipping vertical displacement,

which suggests a lack of a continuous Benioff zone in this area.

Keywords: Taiwan, Ryukyu Arc, Okinawa Trough, West Philippine Basin