

Geophysical characteristics between Okino-erabu Island and Okinawa trough (Preliminary results of GH12 cruise)

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Back-arc basins are extensional basins formed behind subduction zones by seafloor rifting or seafloor spreading. Back-arc seafloor spreading process is considered as similar to those of mid-ocean ridges. Likewise, back-arc rifting process is considered as similar to mid-ocean rifting but is not clear because there are few examples of the back-arc rifting in the present. The Okinawa Trough is a back-arc rifting basin of the Ryukyu arc, extending between the southwest Kyushu and north Taiwan. Several evidences of magmatic activity such as dike intrusions and hydrothermal activities were found in the trough. However, it is still not clear when these magmatic activities were initiated and how they proceed during seafloor rifting.

We carried out marine geophysical survey during GH12 cruise by R/V Hakurei from July 20 to 31. The survey area is between Okino-erabu Island and Okinawa trough in the middle of the Ryukyu arc. Sea surface geophysical mapping (bathymetry, magnetics and gravity) was conducted during the survey. We present preliminary results of the morphological and geophysical characteristics of the area.

Lower Bouguer anomaly (-40 to 20 mgal) is observed at Yoron basin, southwest area of Okino-erabu Island, and 30 km northwest area of Iheya Island. Comparing with the seafloor morphologies, these Bouguer anomalies suggest the presence of thick sediments in the area. Sediment thickness of these areas gradually increases to the east. On the other hand, higher Bouguer anomaly (>20 mgal) is observed at north to northeast of Iheya Island and Okino-erabu spur. The highest Bouguer anomaly corresponds to the shallow area extending from Iheya Island. This shallow area including Iheya Island shows weak positive to negative magnetization. These geophysical observations may attribute to the pre-Neogene basement rocks which constitutes Iheya Island. In contrast, Yoron Island and Okino-erabu Island also are characterized by lower Bouguer anomaly and weak magnetization. Yoron Island is also constituted by pre-Neogene basement rocks, therefore the geophysical difference may come from the depth to the basement rocks. Positive magnetic anomaly with moderate Bouguer anomaly is observed at Igyo-sone. Similar features accommodating with shallow topography can be observed toward southwest and form a chain. Considering the location and the trend of these anomalies, this may come from the magmatic activity related pre-volcanic Island-arc of Ryukyu-arc, continuing from Kume Island. Several sea knolls are observed at western end of the survey area. These structures are considered to belong to present volcanic arc from its location, but remarkable geophysical features are not found.

Above preliminary interpretations suggest that the magmatic activity of Ryukyu-arc is limited to the west of Iheya Island. Although the transition of magmatic activity between pre- and present volcanic-arc is not clear in our survey area, several magmatic activities related to the back-arc rifting, such as Iheya knolls and Iheya minor ridge, are located just west to our survey area. Regional scale survey from Island-arc to back-arc is important to understand the back-arc rifting process.

Keywords: Seafloor morphology, magnetic anomaly, gravity anomaly, Okinawa trough