Structure across the South Shetland Trench from the incoming plate to the back-arc basin

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How are back-arc basins (BABs) formed in the continental crust? It is little known because active BABs are rare. Bransfield Strait in the South Shetland Trench system, Antarctica, and Okinawa Trough in Ryukyu Island Arc are considered the limited active continental back-arc basins which going on opening without a large strike-slip. Therefore, the researches of both areas are the key to the question. The formation of BABs is also expected to affect the formation of accretionary prisms through the changes in convergence rate and/or the sediment supply system from the continent.

We conducted the geophysical observations in the Antarctic Sea using R/V Hakuho-maru in December 2019 (KH-19-6 leg4 cruise)., We successfully obtained the data along the lines across the South Shetland Trench from the incoming plate to the back-arc basin. The collected data include; multi-narrow beam echo sounder (MBES) bathymetry data, shipborne vector magnetic fields data, shipboard gravimeter data, sub-bottom profiles (SBP), and XCTD profiles.

We describe the area of the South Shetland Islands in 65°W / 55°W / 62°40’ S / 58°S and show the preliminary report of these data on the point of the structures.

In this area, we had three XCTD casts to obtain the seawater sound velocity profile in which seawater conductivity (equivalent to salinity), temperature, and depth. The profile of XCTD #1 (58°20.974’ S, 65° 18.237’ W) showed higher velocity near sea surface than those of the profiles of XCTD #2 (61° 03.815’ S, 57°56.977’ W) and XCTD #3 (61°58.998’ S, 62°19.352’ W). XCTD #2 and #3 showed the almost similar sound velocity profile. All of the data was used for the sound velocity correction of the MBES data.

The bathymetric grid is created with noise removal processing using Caris HIPS and SIPS. The slope angle map is also created from the bathymetric map. We described the geomorphological features across the lines of the South Shetland Trench from the incoming plate to the back-arc basin with respect to the seafloor morphology, slope angle map, and SBP profiles.

On the incoming plate of the South Shetland Trench, the lineaments trending NE-SW direction are well-developed on the seafloor. Most of these lineaments are considered to be formed during seafloor spreading process of the former Phoenix-Antarctic Spreading Ridge, because they are almost parallel to the direction of the ridge. In addition, several dome-shaped structures can be seen near 58°40’ S, 64° 20’ W on the incoming plate. Based on the SBP profiles, the relative height was approximately 700 m, however, any internal structures were not recognized due to the strong reflection at the surface of the structure.

In the South Shetland Trench, there is a depth difference between the east and west ("west in King George island ", "strait between Smith Island and Snow Island"); the depth of the east side is approximately -5300m, on the west side the depth is approximately -4700m. The bottom of the trench is relatively flat, therefore it can be expected to fill with sediments. In the operation of the piston core, we could recover the samples with almost full recovery. However, SBP profiles do not have enough resolution to confirm a clear sedimentary structure.

In the landward slope in the arc-trench system, on the east side, the motif of the slope looks uniform angle from the bottom to the 500m below the sea surface, and gradually rises to a depth of 300m from there. In the western slope, at our bathymetry data, the sedimentary environment may be different from that on the

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east, since he lamina-like linear structure was observed in the westside upper position.
At the JpGU, we will show magnetic features calculated from vector magnetic data to further describe the structures.

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