Cruise Summary

1. Cruise Information

- Cruise ID KH-24-4
- Name of vessel R/V Hakuho maru
- Title of project MOWALL (Moho Observation along transform fault WALL)
  JSPS KAKENHI Grant Number 23K22590
- Title of Cruise
  - MOWALL-CIR: Temporal variation of mid-ocean ridge process recorded along long oceanic transform wall
  - Evaluation of the distribution of continental crust fragments in the Indian Ocean
- Chief Scientist OKINO, Kyoko The University of Tokyo
- Cruise period 2024.10.12 – 2024.11.8
- Port of departure Port Luis (Mauritius)
- Port of arrival Penang (Malaysia)
- Research area Indian Ocean
- Representative of Science Party
  OKINO Kyoko Atmosphere and Ocean Research Institute, The University of Tokyo
  SATO Hiroshi Senshu University (onshore)

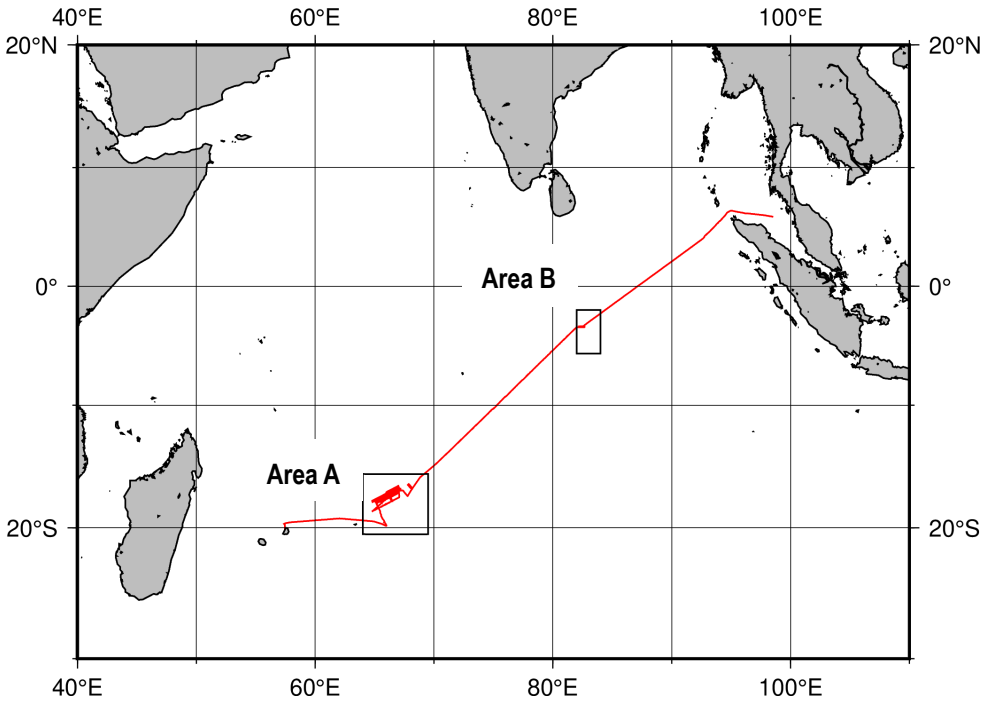

Fig.1 Survey area and track line. Area A: Marie Celeste Transform Fault, CIR, Area B: Apharnasey Nikitin Rise

2. Overview of Research Activities

2.1. Background and Objectives

The Marie Celeste Transform Fault (MCTF) is a strike-slip plate boundary that offsets the Central Indian Ridge about 215 km at 17-18°S. The relative plate motion between the Capricorn and Somalia plates at the MCTF is 37-40mm/yr. (MORVEL, DeMets et al., 2010), so the age offset of the transform is approximately 11 million years.

The objective of this study is to obtain a comprehensive understanding in diversity of crustal structure and mid-ocean ridge process, and spatio-temporal variation of chemical/physical properties of underlying mantle. Our working hypothesis is that the diversity and million-year scale temporal variation of crustal structure and its formation process is controlled by spatial heterogeneity of chemical composition of upper mantle. To achieve this objective and investigate our hypothesis, we plan to conduct the systematic mapping and rock sampling along the MCTF and elucidate the variation of morphology, crustal structure, magma and underneath mantle chemistry since 11 Ma. In terms of water geochemistry and biology, the transform fault valley is a unique semi-closed environment. We try to reveal the structure of water mass and biota within the MCTF valley and to compare with those of deep-sea trenches.

2.2 Operation Summary

The KH-24-4 cruise started at Port Luis, Mauritius on 12th October 2024 and ended at Penang, Malaysia on 8th November. We arrived at the survey area (MCTF) on 15th October and stayed there by 30th October morning. We conducted 27 dredge hauls, 7 CTD vertical casts (6 carousel water sampling) and 7 NORPAC sampling. The near-bottom magnetic survey using wire-line attached magnetometer was done at 8 dredge hauls. Biological samples were also collected from dredged rocks and muds. A 137 km long deep-tow magnetic profile was successfully collected and total 1661 miles of surface mapping (multibeam swath survey, proton precession magnetometer, shipboard three component magnetometer and gravitymeter) was done. On the way to the Penang, we operated two dredge hauls at Aphanasey Nikitin Rise. The loci of stations in the main area is shown in Fig.2.

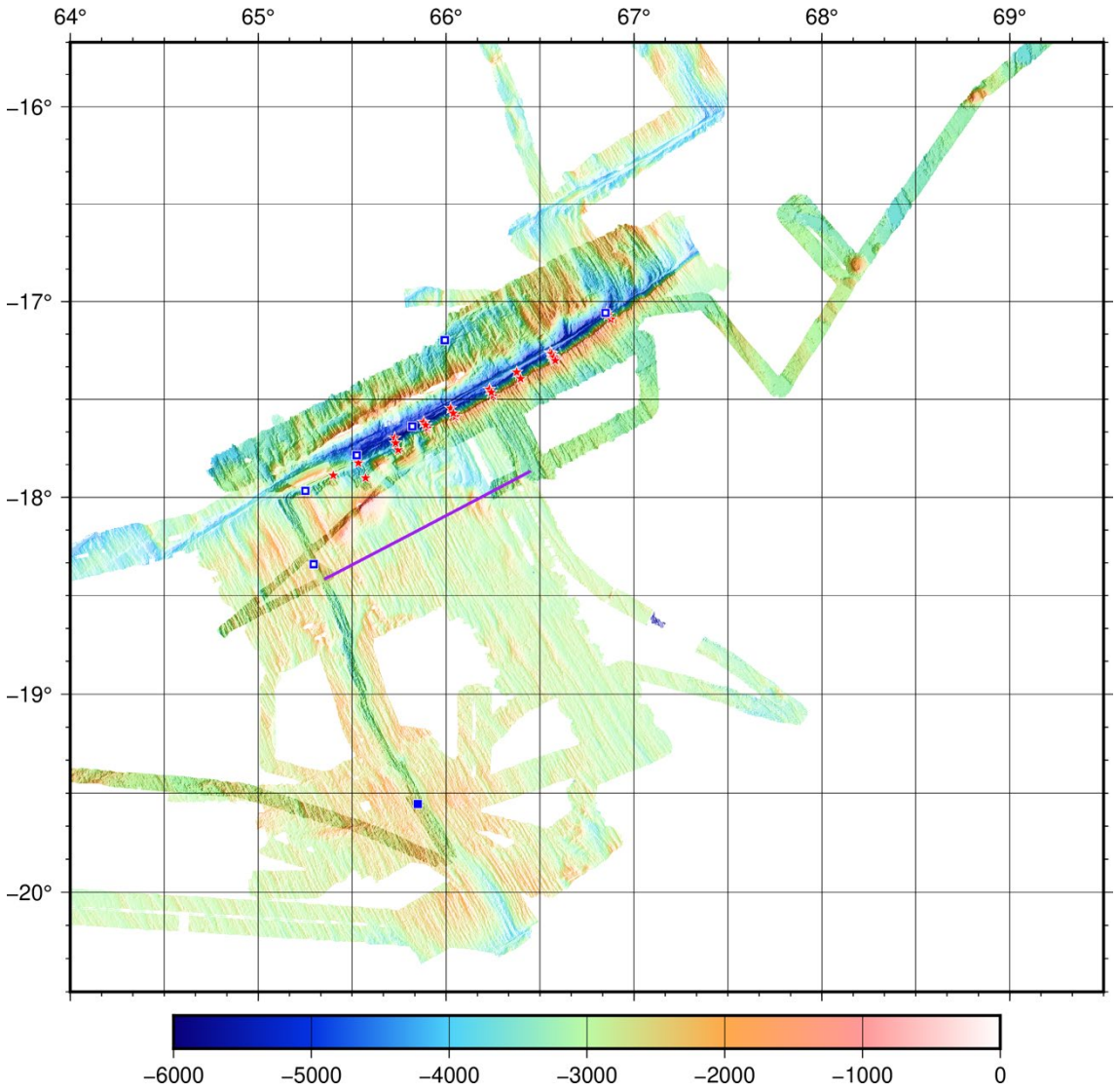

Fig.2 Stations of KH-24-4 in Area A. Red star: dredge, blue solid square: CTD+NORPAC, blue open square: CTD hydrocast + NORPAC, purple line: deep-tow magnetic survey.