

Deep-sea hydrothermal vents and their geochemical and geobiological diversity in Okinawa Trough

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Okinawa Trough is an actively spreading backarc basin that extends for 1200 km between the Ryukyu arc-trench system and the Asian continent in a transitional region between continental and oceanic crust. Most of the trough regions are covered with thick terrigenous sediments and volcanic deposits and potentially hosts many magmatic activities and submarine hydrothermal systems. This has attracted many explorations that address the scientific objectives such as the geologic and geochemical environments of hydrothermal systems and the biological diversity and function. In addition, an increasing number of expeditions have been recently conducted for the research and development of submarine hydrothermal metal deposits. Due to the recent intensive surveys, more than 20 deep-sea hydrothermal fields have been newly found in the mid to south Okinawa Trough in addition to the previously known fields.

Most of the deep-sea hydrothermal systems in the Okinawa Trough have similar physical and chemical features of hydrothermal fluids which are characterised by abundant CO₂, CH₄ and NH₄ components and seafloor phase-separation and partition of hydrothermal fluids. These physical and chemical features would likely foster relatively diverse microbial and macrofaunal communities in various habitats of Okinawa Trough hydrothermal systems. However, several unusual fields as compared to the previously known systems, have been recently discovered. The south Okinawa Trough is relatively deep as compared to the north and mid areas and thus hosts deeper hydrothermal systems, some of which have quite high-temperature metal-rich fluids. The Gondou field, a new field in the mid Okinawa Trough, has quite vapor-lost hydrothermal fluids. These unusual fields would have unique microbial and macrofaunal communities that are different from the ones in the previously known, typical Okinawa Trough fields. I will introduce the historical and recent investigations of deep-sea hydrothermal vents in the Okinawa Trough.