

Overview of scientific drilling active backarc basin, Okinawa Trough: ongoing rifting of Eurasian continental margin

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We introduce the outline of scientific drilling for the Okinawa Trough, active backarc basin. Active backarc basins are unique tectonic features which divide the margin of continents, generate complex subduction geometries, and host a large number of hydrothermal systems that harbour unique mineralization and diverse biological communities. The mechanisms controlling the initiation and evolution of backarc basins has been a long-standing question in global tectonics. Our targets are to perform coring, logging, and monitoring at the Okinawa Trough backarc basin, the Ryukyu arc. The Okinawa Trough is a ~1500-km long continental rift in the East China Sea parallel to and behind the Ryukyu Arc. The Okinawa Trough, together with Bransfield Strait which is in a challenging Antarctic environment and therefore we do not think it is prospective target for a scientific drilling, is the only active and accessible continental backarc basin on earth which has not produced oceanic crust via seafloor spreading yet. Here we propose a new hypothesis on the driving force of the backarc opening: Backarc spreading accelerates with fluids and heat-induced weakening and strain concentration in the rift zone. We propose 3 shallow (200–700 m below the seafloor) riserless boreholes in the southern part of the Okinawa Trough. The drilling of these boreholes aims to recover sediments, volcanic rocks, and pore fluids, collect geophysical logs, and make downhole measurements. The objectives of the riserless program are two-fold: (1) Examine the fluid circulation process in shallow crust by documenting and analysing the physical, hydrogeological and chemical properties, lithology, geometry, microstructure, and thermal state of the fault; and (2) Observe volcanics that are extruded before oceanic basalts are exposed by characterizing the entire sedimentary and volcanic facies under the trough axis (Yaeyama Graben) including the top of a potentially basaltic volcanic intrusion observed in the seismic surveys. This proposal is the first milestone of our future drilling project which ultimately aims to core and monitor in both of the seismogenic rifts zone in the Okinawa Trough and the onland Ryukyu arc.