

# The alteration of detrital sediments by hydrothermal activities in the Okinawa Trough, East China Sea

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The Okinawa Trough (OT), located in the Asian continental margin, is characterized by thick terrigenous sediment and ubiquitous volcanic-hydrothermal activities. In this study, the sediments collected during IODP Expedition 331 to the middle OT were measured for mineralogical and geochemical compositions. For discriminating different sediment origins, the sediments from the East China Sea shelf and surrounding rivers were also determined. The hydrothermal sediment in the mid-OT is dominated by Mg-rich chlorite, while the recharged area has similar clay mineral assemblages with the shelf and rivers, showing high content of illite, subordinate chlorite and kaolinite and scarce smectite. Compared to the terrigenous clays, the hydrothermal clays in the OT have high concentrations of Mg, Mn and Zr but low of Fe, Na, K, Ca, Ba, Sr, P, Sc and Ti, while the hydrothermal clays in the mid-ocean ridge are relatively enriched in Fe and V and depleted in Al, Mg, Zr, Sc and Ti. Different fractionation patterns of rare earth elements also register in the detrital and hydrothermal clays, diagnostic variable clay origins. We infer that the OT hydrothermal clay was predominantly formed by the chemical alteration of detrital sediments or volcanic rocks subject to the impact of hydrothermal fluids. The sediment-starved ocean ridge present remarkably different compositions of hydrothermal clays, comparing with OT hydrothermal area. Different physical and chemical characteristics of hydrothermal fluid and rock/sediments may lead to various alteration products in these two areas. Based on the morphologic and geochemical analyses of bulk samples, anhydrite, chalcopyrite and pyrite were widely observed in the hydrothermal deposits, and the sulfides and sulfates present different assemblages in various depths, suggesting different evolutions of hydrothermal activities and interactions between hydrothermal fluids, seawater and rock/sediments.