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Geochemical characteristics of sediment-pore water systems associated with hydrothermal activity at South Okinawa Trough

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In the past half-decade, several hydrothermal fields were discovered at South Okinawa Trough. Of particular is Geolin Mounds (GLM) hydrothermal field with its vigorous activity confirmed by the gas flame observed through abnormal acoustic reflections in water column, the *in-situ* observations of hydrothermal fluid venting, biotic communities and seafloor massive sulfide deposits. Here, we summarized its unique geochemical characteristics of subsurface sediment-pore water systems. (1) The $^{3}He/^{4}He$ values (7.45~7.62 R_A) in pore waters were higher than the average of volcanic gas from circum-Pacific volcanic arcs, reflecting an involvement of upper mantle source. (2) The downward decreasing Mg (down to 32.7 mM) and Cl (down to 373 mM) with increasing Li (up to 757 μM) in pore waters implied an obvious mixing of seawater and phase-separation-related hydrothermal fluid. Based on two end-member mixing model of Mg, the highest fraction of hydrothermal fluid in pore water was estimated to be 40 %. (3) The low pH values (pH=5.67~6.21) with downward increasing of dissolved inorganic carbon (DIC, up to 60 mM) and high isotopic values ($\delta^{13}C_{DIC}$=2.5~7.0‰) were observed in pore waters. This indicated an *in-situ* liquid CO_2 surrounding. Furthermore, sediments related to hydrothermal alteration were found at few specific layers with significant enrichments of Au, Ag, As, Bi, Cu, Cd, Pb, Sb, Sn and Zn. All the geochemical features found in the GLM hydrothermal field suggested the importance of secondary modification processes after high-temperature water-rock interaction, especially the interaction between hydrothermal fluid and sediment.