Time series change of fluid geochemistry in decade scale: Case studies for hydrothermal systems in back-arc basin

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Several hydrothermal active fields have been discovered in back-arc basins in SW Pacific. Since back-arc spreading center is located in rather complex tectonic setting compared with mid-oceanic ridge, it provides an excellent place to test the influence of magmatic volatiles on the evolution of hydrothermal system.

Hydrothermal activitiy in the Valu Fa Ridge was discovered in 1989 by the French-Germany dive program NAUTILAU, and revisited in 2004 by the SHINKAI6500 dive program SWEEP Vents. At Vai Lili Site, significant decline of hydrothermal activity was observed. While several black smokers venting 340C fluid were observed in 1989, the highest measured fluid temperature was only 88C in 2004. However, the fluid chemistry even in 2004 suggests the hydrothermal fluid endmember which experienced high temperature hydrothermal interaction, and showed evidence for mixing with seawater beneath the seafloor.

Hydrothermal activity in the southern Mariana Back-arc Spreading Center was discovered in 2003 by American dive program. Since then, time series change of hydrothermal activities has been monitored by four dive programs. At Snail Site where high temperature activity of 248C was observed in 2003, the highest measured temperature was as high as 116C. However, the estimated chemical composition of the hydrothermal fluid endmember showed no change from that in 2003. Also in this site, seawater mixing beneath the seafloor may control fluid temperature above the seafloor.