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Chemical composition and stratigraphy of sea floor sediments in Kikai Caldera and Nagahama Bay, Satsuma Iwo-jima Island

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Satsuma Iwo-Jima Island, with volcanic activities, is located about 40km south of Kyushu Island, Japan. This island is one of the best places to observe a shallow water hydrothermal system. Nagahama Bay, in the south of Satsuma Iwo-Jima Island, is partly separated from open sea. The seawater appears dark reddish brown due to suspended ferric hydroxide produced by the mixing of volcanic fluids and seawater (Ninomiya & kiyokawa, 2009; Kiyokawa et al., 2012; Ueshiba & kiyokawa, 2012). Reddish brown seawater sometimes flows out of Nagahama bay. However, movement of ferric hydroxide out of the bay has not been clarified. In this study, we report the results of scientific analysis of caldera bottom core samples at 10km south of Satsuma Iwo-Jima Island.

We observed reddish brown suspended particles and sediments in Nagahama bay with FE-SEM. We collected cores in two survey cruises (KT10-18 and KS14-10) in 2010 and 2014 using a research ship Tansei-maru and Shinsei-maru of JAMSTEC (Japan Agency for Marine-Earth Science and Technology) at 10km south of Satsuma Iwo-Jima Island. We observed the cores with X-ray CT scan and the thin-sectioned samples with a microscope. In addition, we conducted the chemical analysis with XRF to find out scientific behavior of sediments. Moreover, we analyzed the core at 70km south of Yakushima (TSK1PC) for comparison.

FE-SEM observation shows that the suspended particles consist of globular ferric hydroxide (about 0.2μm), on the other hand, the iron-rich sediments are composed of bigger one ($>$1μm). This indicates the ferric hydroxide is precipitated by flocculation. X-ray CT scan observation shows that the cores don't include foreign origins, such as volcanic ash. Characteristic change was observed in the 4 elements out of 10 elements. We found a strong negative correlation between concentration of Ca and that of Si. We can confirm a negative peak of the Ca at 30cm from the surface in the core (KS14-10), which probably results from clastic particles in this depth. It is thought that the high concentration of Mn in the core (TSK1PC) can be caused by high oxidative environment. In the surface of the core (KS14-10), high concentration of Fe can result from leaching iron by burial of sediments. Furthermore, concentration of Fe in the caldera bottom cores (KT10-18 and KS14-10) is smaller than the core (TSK1PC) at 70km south of Yakushima. The former cores are shallower and include more organic matter than the latter core. This suggests that the former has deposited in the more reductive environment, which probably caused the difference of Fe. It is conceivable that redox status affects concentration of iron in sediments more strongly than concentration of iron hydroxide in seawater does.

We discovered the change in color of the caldera bottom core (KT10-18 and KS14-10). Nevertheless, We didn't find foreign origins in the cores. This appears to be the strongest proof that we couldn't find the significant material changes in thin-sections. We conclude that the change in color in the caldera bottom cores (KT10-18 and KS14-10) is due to leaching ferric hydroxide by burial of sediments.

Keywords: Kikai caldera, ferric hydroxide, redox status