

In situ observation of iron-oxide precipitation the Satsuma Iwo-jima, Kagoshima: Modern analogue for Precambrian BIF deposition

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The Satsuma Iou-Jima Island is known as one of the most active volcanic islands in Japan. Numerous hydrothermal activities occur at its margin, frequently changing the color of seawater into red or bluish white by precipitating Fe-oxide or Al-bearing minerals upon mixing of hydrothermal fluids and seawater. At the Nagahama Bay of the island, seawater is characteristically brownish-red in color, due to suspended fine particles of Fe-oxide minerals that formed upon mixing of Fe-rich hydrothermal fluids with oxygenated seawater. Such process is potentially very similar to that for Precambrian Banded Iron Formation (BIF). In order to obtain insight into the precipitation mechanism of Fe oxides in marine environments influenced by submarine hydrothermal activity, we started strategic research project utilizing newly developed in situ monitoring system combined with conventional geochemical methods.

Here we report the results of our survey during 2005-2006, including: (1) detailed topographic mapping of seafloor; (2) isopach mapping of the marine sediments; (3) in situ observation of precipitation of Fe particles at the seafloor by diving and by OGURI-view, an automatic submersible digital camera for long-term continuous observation; (4) gravity core sampling; (5) seawater/seafloor temperature profile mapping; and (6) sediment trap. We discovered Fe oxide crust forming at the seafloor, sometimes as less than 1m high mounds and 3-10cm-long chimneys. The highest seawater temperature is 53.7 degree only at a few meter depth from the surface, also suggesting voluminous input of hydrothermal fluids into seawater. The recovered core samples are mostly composed of Fe oxides of less than 3 micrometer in size. Sediment trap experiments have revealed the estimated sedimentation rate as high as 0.12-0.18 (g/cm²/day).

These results would show that the sedimentation in the Iwo-jima sediments is one of the modern analog for the sedimentation of the Iron Formation which result from the oxidization of ferric iron in the ocean. We will continues to observed these very quick sedimentation of Iron oxide.