Past environmental reconstruction of the ocean surface layer by coral annual bands collected near the Yonaguni Island

Fumie Kobayashi[1]; Osamu Abe[1]

[1] GSES, Nagoya Univ.

Past environmental change of oceanic surface layer near the Yonaguni Island, located in the southwest of Japan, was reconstructed using carbon and oxygen isotope ratio in coral skeletal annual bands. Coral-based paleoenvironmental studies are aimed generally to reconstruct open-ocean environmental changes and sampling sites are oftenly regarded as spatially representative for these changes. In this sense, sampling sites had better be offshore or remote place from reefs, if possible.

In this study, the oceanic surface layer environmental change is reconstructed using a coral sample collected at 17 m depth and offshore of the Yonaguni Island, which has no reefs at present.

Porites coral cores were collected by the SCUBA-based underwater drilling in March, 2001 at 1 km off the Yonaguni Island located at western end of Japan. The longest coral sample has a height of 1.3 m and indicated 88 annual bands.

The core was cut into 3 mm slab for X-ray radiograph and subsampling for isotope analysis. Powdered subsamples were collected every 0.5 mm and 1.0 mm interval for recent 2 years and others, respectively, along the maximum growth axis that was determined by X-ray image. Carbon and oxygen isotope ratios were determined by mass spectrometer with carbonate preparation device (Finnigan MAT 251 with Kiel I carbonate device) using 70 micrograms of these subsamples.

Prior to coral sampling, in situ seawater temperatures were observed to confirm temperature-isotope relationship since 1999 by the temperature logger. Coral oxygen isotope ratio and water temperature have a good linear relationship as follows.

$d18O = -0.178\ t - 0.454\ (r^2 = 0.858)$

The slope of the equation is in good agreement with previous results. We will discuss 88-year surface layer temperature variation based on the oxygen isotope ratios, carbon isotopic variation
and its controlling factors.