

Sedimentary Structure and Development of Holocene Reef, Majuro Atoll, Marshall Islands

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The Holocene subsurface geology and development of atoll reef is studied by submarine drilling research and observations at submarine exposures in Majuro Atoll, Marshall Islands, Micronesia.

The research is carried out across reef and cay island at the southern atoll rim in Majuro Atoll. The width of coral cay is 130m with the height of 2 to 2.5 m above mean sea level. The width of the atoll-rim reef is 300m with the altitudes of around the mean sea level at the ocean-ward reef flat and -0.4m at the lagoon-ward reef flat. Reef conglomerate formed both side of the cay island. Spurs and grooves are developed at the reef edge above -3m deep and the length of around 30m. A submarine reef terrace is formed outside of the spurs and grooves zone at the depth of 3 to 6m with the length of 30m. The steep outer slope is located seaward of the terrace. Overlapped growth of living platy *Montipora* is observed at the outer slope.

A drilling is carried out at the submarine terrace of the atoll reef front at 6m deep. A 6.53m core is recovered by the submersible hydraulic drilling machine. Sedimentary structure of the atoll reef is observed at a quarry excavated 5-m deep in the seaward reef flat and a boat channel excavated to connecting lagoon and ocean through the southern atoll rim. The microfacies observations of core and rock samples collected from the excavations are carried out by scanning electron microscope with energy dispersive spectrometer (SEM-EDS). Twenty AMS radiocarbon dates are measured for fossil corals at The University of Tokyo and Kiel University.

The reef facies characterized by corals *Pocillopora* and *Heliopora* with the fragments of *Halimeda* is the major sedimentary structure at the reef flat. The *Halimeda* fragments are increased at the lagoon-ward reef flat and lower structure of the ocean-ward reef flat. The branching acroporid framework is observed at the lower part of reef edge. The thin-plates of *Montipora* are dominant in drilling core from the reef-front. It agrees with the present biofacies at the reef front. The highly consolidated carbonate rock is observed at the upper part of the reef flat by the Mg-calcite cements. This rigid structure appears around 1m-thick at the ocean-ward reef flat and around 0.3m-thick at the lagoon-ward reef flat.

The radiocarbon dates show the reef flat surface at the southern atoll rim of Majuro Atoll is formed after 4,700 cal yBP. The initial formation is located at the lagoon-ward reef and then extended ocean-ward during 1,000 years. The formation of outer reef slope including submarine terrace lags behind the reef flat formation. The upward reef growth rates show that the carbonate accumulation at the atoll rim is decreasing during the recent 5,000 years.