

# Potential of submarine-cave sediments as a late Holocene paleoenvironmental record

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A 43 cm-thick sediment layer in a submarine limestone cave named, on the fore-reef slope of Ie Island, off Okinawa mainland, Japan, preserves a record of late Holocene paleoenvironment. The sediment consists of massive carbonate mud with sporadic molluscs and coralline sponge remains. Sediment grains consist mostly of carbonate debris, siliceous sponge spicules, coccoliths and benthic foraminifers, and XRD analysis shows that the carbonate sediment consists of 50-58 % high-Mg calcite, 30-37 % aragonite and 9-19 % calcite. There are no stratigraphic changes in both  $\delta^{18}\text{O}$  and  $\delta^{13}\text{C}$  of carbonate mud, the former being about  $\pm 1.2$  per mill and latter about  $\pm 1.1$  per mill PDB. The mollusc shells are excellent-preserved epifaunal or semi-infaunal species that are the most reliable material for radiocarbon dating.  $^{14}\text{C}$  dating of eight horizons of shells reveals a 6 to 13-cm-thick mixed layer, below which there is an orderly progression of ages. The average sedimentation rate changed from 17 cm per 1000 yrs to 35 cm per 1000 yrs in the interval from about 300 to 50 years ago.

These data imply the following conclusions: (1) Carbonate mud is a major constituent of this submarine-cave deposit, and may come from the degradation and fragmentation of cave-dweller skeletons, suspended carbonate mud produced in the reef, and the calcareous skeletons of coccoliths; (2) the sedimentary record spans the past 2,000 yr without discontinuities; (3) the fossil record between 2,000 yr BP and 300 yr BP, time-averaging is estimated to be between 340 and 740 years, based on the thickness of the mixed surface layer. Consequently, the 43 cm of sediment in the Daidokutsu submarine cave may record century-scale environmental changes in this coral reef for the past two million years.