

Sea-level and environmental changes of Holocene using the archives of the submarine cave with the air-filled chamber

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In this study, speleothem (S0) was obtained at the surface of the cave pool in the air-filled chamber of Ginama submarine cave (shallower than 15 m water depth), which was occurred in the Permian limestone at northernmost part of Okinawa main land, Japan. In addition, drowned speleothems and sessile marine organisms were collected in the cave. The result of 14C dating presents that the outermost layer of S0 contains 102.44% percent Modern Carbon (pMC), indicating that the speleothem is forming at the present conditions. Based on the relative pMC value, its dead carbon fraction is estimated to be 7%. Using this value, it is likely that the formation of S0 occurred from about cal 5,745 yr BP to present. Such stalactite is first discovered except the Mediterranean and its forming duration is the world's longest. Given that the speleothem marks the sea level at the time of formation and the instrumental observed subsidence rate (0.037mm/yr) has continued during the last 5,745 years, it is estimated that the sea level at 5,745 years ago is 27-130 cm higher than the present sea-level. All 14C ages of the drowned speleothems were 1,000 years older than the timing of submersion under water.

The 14C ages and the altitudes of sessile marine organisms indicate that the brackish water lens in the cave had become thick after 3,150 cal. years BP. This suggests that the permeability of the limestone had increased after 3,150 cal. years BP. In addition, brackish water lens may have been temporarily thinner from 540 to 360 cal. years BP. This may be explained by reduction of summer monsoon during Little Ice Age.

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