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Paleothermometer using the oxygen isotope ratio of cavernicolous micro-bivalve Carditella iejimensis

Akihisa Kitamura[1*], Nagisa Yamamoto[1], Toyoho Ishimura[2], Tomohisa Irino[3], Urumu Tsunogai[4]

[1]Shizuoka University, [2]Geological Survey of Japan, AIST, [3]Faculty of Environmental Earth Science, [4]Faculty of Science, Hokkaido University

The micro-bivalve Carditella iejimensis inhabits the sediment surface within submarine caves at Ie Island, Okinawa, Japan. The results of mark?release and recapture surveys indicate that C. iejimensis grows not only during spring and summer, but also during the other seasons. The species probably requires more than 3 years to reach its full size of 3.5 mm in shell height.
By comparing $d^{18}O$ values ($d^{18}O_{arag}$)for recaptured specimens and instrumental data, the following palaeothermometry equation was obtained:
T (C) = (22.68+-0.8) - (1.84+-0.35) ($d^{18}O_{arag}$- $d^{18}O_w$)
Using the above equation, the $d^{18}O$-derived temperature of whole shell of C. iejimensis exceeding 1 mm in height is ~1?C higher than the annual mean water temperature within the caves. This difference indicates that shell growth is reduced or ceases during winter. The $d^{18}O_{arag}$of C. iejimensis from sediment cores recovered from Daidokutsu cave shows no clear long-term trend in sea surface temperature or $d^{18}O_w$) in the East China Sea during the past 7,000 years, and indicates anomalously cool and dry events (enrichment in $d^{18}O_w$) at around 6,300 and 5,550 cal. years BP. These events may have been related to changes in the activity of the East Asian monsoon, related in turn to weakening solar activity. In contrast, these anomalies appear to be obscured during the last 1,000 years, including a weak Asian summer monsoon event during the Little Ice Age, thereby indicating that the mode of the East China Sea climatic and hydrologic response to decadal - to centennial-scale variability in the intensity of East Asian monsoon has varied over the past 7,0 00 years.

Keywords: East China Sea, Middle-Late Holocene, oxygen isotope, submarine cave, micro-bivalve, Asian monsoon