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Reconstruction of temperature and oxygen isotopes in the surface water of the Mid-Holocene tropical western Pacific

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Oxygen isotope ratios ($d^{18}O$) in foraminifera from deep sea cores have been used successfully to reconstruct continental ice volume, sea level and deep-ocean temperatures throughout the last glacial-interglacial cycle. Yet there is still considerable debate regarding the relative contributions of changes in the oxygen isotopic composition of seawater in the tropical surface ocean. Obtaining accurate estimate of the past $d^{18}O$ distribution in tropical surface waters is crucial to establishing the role of the tropical oceans in global climate change. In this study, Sr/Ca ratios and $d^{18}O$ values in a fossil coral collected from Vanuatu with the age of 5.2 ka were measured to reconstruct past sea surface temperature (SST) and $d^{18}O$ in seawater. XRD analysis and SEM observation revealed that skeletal material was composed of only aragonite and the age determination was precisely conducted using U-Th dating method. Then Sr/Ca and $d^{18}O$ were analyzed with an approximate time resolution of 2 month. As a result, slightly higher mean SST and about 0.4 per mil enrichment of $d^{18}O$ relative to modern seawater have shown from 5.2 ka coral. The result is corresponding to the previous study from Great Barrier Reef which has suggested that the temperature increase enhanced the evaporative enrichment of ^{18}O in seawater.

Keywords: western Pacific, coral Sr/Ca, oxygen isotope, Holocene