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Salinity change in the tropical western Pacific at 5.2 ka when an abrupt tropical climate change occurred

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It has been reported that an abrupt mid-Holocene climate event that marked the transition from early Holocene (pre-5,000-yr-B.P.) conditions to cooler, late Holocene (post-5,000-yr-B.P.) conditions was widespread and spatially coherent through much of the tropics. This abrupt event was occurred around 5,200 yr ago and was coincident with structural changes in several civilizations. While these evidences are obtained from ice core records and/or lake levels, little has been discussed using marine data. Especially, obtaining accurate estimate of the past δ^{18}O (salinity) 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 δ^{18}O values in a fossil coral collected from Vanuatu were measured to reconstruct past sea surface temperature (SST) and salinity. The age of the fossil coral is 5212 $\pm$ 10 based on the precise U-Th dating method. Sr/Ca and δ^{18}O were then analyzed with an approximate time resolution of 2 month. XRD analysis and SEM observation revealed that skeletal material was composed of only aragonite. As a result, slightly higher mean SST and about 0.5 per mil enrichment of δ^{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 δ^{18}O in seawater.

Keywords: coral, Holocene, abrupt climate change, salinity