Geochemical analyses of shells of *Gafrarium tumidum* and seawater collected from Tongatapu Island and their application for paleoenvironment and archaeology during the Holocene

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South Pacific Convergence Zone (SPCZ) fluctuation largely affects the climate in South Pacific islands. Current climate models have difficulties in a representation of the SPCZ movement, thus paleoclimate records are crucial to understand SPCZ' s variability. Meanwhile, it is suggested that human migration over the South Pacific islands during the Holocene was influenced by sea level and climate changes, however, they are not evidenced from the quantitative geochemical records. The aim of this study is to reconstruct paleoenvironment of Tongatapu Island, Tonga using geochemical analyses of shells of *Gafrarium tumidum* and seawater. The climate in Tonga is under the influence of SPCZ and this island was a base of South Pacific human migration during the Holocene, thus it is suitable for studying past variability of SPCZ and its relation to human migration. Fossil *G. tumidum* is often excavated from archaeological sites in South Pacific, thus this species is of archaeological importance, too. Bivalve shells which consist of calcium carbonate exhibiting growth lines like reef-building corals are ideal archives of paleoenvironment changes. However, few studies have evaluated potential of *G. tumidum* as paleoenvironmental recorder. Therefore, we assessed it from geochemical analyses of live-caught and fossil shells and seawater collected from Tonga. We measured $\delta^{18}O$ using IRMS (isotope ration mass spectrometry) and trace element/Ca ratio (e.g., Sr/Ca, Mg/Ca, and Ba/Ca) using LA-HR-ICPMS (laser ablation high resolution inductively coupled plasma mass spectrometry) along the maximum growth axis of the shell. Furthermore we calculated a local marine radiocarbon reservoir ages (ΔR) from ^{14}C-ages of fossil shells measured by using Single-Stage-Accelerator Mass Spectrometry (Single-Stage-AMS). We also monitored sea surface temperature (SST) *in situ* for four months, and measured sea surface salinity (SSS) using portable salinometer and $\delta^{18}O$ using Cavity Ring-Down Spectroscopy (CRDS). The results suggested: 1) $\delta^{18}O$ of *G. tumidum* shell can record about 3 yr SST variation in monthly timescales; 2) Sr/Ca of *G. tumidum* shell is controlled by a growth rate, neither by SST nor by SSS; 3) The lagoon of Tongatapu island was isolated from the open ocean between ~2.6 ka and ~1.2 ka; 4) the growth of *G. tumidum* is likely controlled by SSS, not by SST.

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