Holocene sea-level and paleoenvironmental reconstruction using radiocarbon local marine reservoir age and geophysical modeling in Tongatapu, Kingdom of Tonga

*福與 直人[1,2]、Anthony Purcell[3]、Geoffrey Clark[4]、 Phillip Parton[4]、横山 祐典[1,2]、宮入 陽介[1]
*Naoto Fukuyo[1,2], Anthony Purcell[3], Geoffrey Clark[4], Phillip Parton[4], Yusuke Yokoyama[1,2], Yosuke Miyairi[1]

1. 東京大学大気海洋研究所、2. 東京大学理学系研究科地球惑星科学専攻、3. オーストラリア国立大学　地球科学研究所、4. オーストラリア国立大学　アジア太平洋学部
1. Atmosphere and Ocean Research Institute, The University of Tokyo, 2. Department of Earth and Planetary Sciences, Faculty of Science, University of Tokyo, 3. Research School of Earth Sciences, The Australian National University, 4. College of Asia and the Pacific, Australian National University

Reconstructing the history of Holocene relative sea levels around Tonga is important for understanding geomorphological theories and also interpreting paleoenvironmental and archaeological studies in that area. However, neither continuous sea level reconstructions nor quantitative paleoenvironmental studies using geochemical/physical methods are available. In this study, we reconstructed Holocene sea level changes in Tongatapu island using radiocarbon local marine reservoir age (ΔR) and glacio-hydro adjustment (GIA) modeling. Furthermore, we interpreted the relationship between the reduction of the size of bivalves (*Gafrarium tumidum*) and changes in their paleoenvironment. We suggest that ΔR results showed a sea surface salinity (SSS) decrease in the islands lagoon as relative sea level have been risen during the period between ~2.6 cal kyr BP to the present, and this can be attributed as closure of the lagoon. Moreover, the maximum sea level in mid-Holocene using GIA modeling suggest that contribution of hydro-isostatic rebound to sea level changes were much smaller than previously reported values. We infer that the current rate of vertical land motion reported from instrumental observations at Tongatapu is inconsistent with the Holocene sea level record, and must have been responsible from recent tectonic events. Comparing ΔR results with paleotopographical maps, we suggest that ΔR can record the response to subtle environmental changes that cannot be reconstructed in the model. We also suggest that there is a possibility that SSS is an environmental stress factor for the growth of *G. tumidum* in Tongatapu for the past 2600 years and that this is due to the closure of the lagoon by RSL changes supporting the implication reported previously from an archaeological study (Clark et al., 2015).

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