

Evidence of intense climate variation and reduced ENSO activity from *Tridacna* $\delta^{18}\text{O}$ 3700 years ago

Yue Hu ^{1,2}, Xiaoming Sun ^{1,2}, Hong Yan ^{3*}

¹ School of Marine Sciences, Sun Yat-sen University, Guangzhou 510006, China

² Guangdong Provincial Key Laboratory of Marine Resources and Coastal Engineering, Guangzhou 510275, China

^{3*} State Key Laboratory of Loess and Quaternary Geology, Institute of Earth Environment, Chinese Academy of Sciences, Xi'an 710075, China (yanhong@ieecas.cn)

Tridacna species are one of the largest bivalves in the global ocean. Their advantages of dense, well-preserved aragonite shells and obviously annual even daily growth lines make them to be an ideal material for high-resolution paleoclimate research, which can reconstruct interannual even seasonal climate variation. In this study, $\delta^{18}\text{O}_{\text{shell}}$ was used to estimate the climate variation in Xisha Islands of South China Sea. Firstly, a modern *Tridacna gigas* shell was used to evaluate the influence of both SST and SSS on $\delta^{18}\text{O}_{\text{shell}}$. The result revealed that SST dominated $\delta^{18}\text{O}_{\text{shell}}$ seasonal variation, while SSS had a tiny effect. Thus, we can roughly use $\delta^{18}\text{O}_{\text{shell}}$ to be a proxy of SST in this area ($\text{SST} (\text{°C}) = 22.69 - 4.41 \times \delta^{18}\text{O}_{\text{shell}}$). Secondly, the monthly resolution $\delta^{18}\text{O}_{\text{shell}}$ profile of a fossil *Tridacna squamosa* which lived in 3700 years ago was analyzed, and forty annual cycles were observed. The average $\delta^{18}\text{O}_{\text{fossil}}$ (-1.34‰) suggested that there was a warm climate with roughly 0.84 °C higher than $\delta^{18}\text{O}_{\text{modern}}$ (-1.15‰) in 3700 years ago. During that warm period, seasonal variation slightly decreased, and the exchange between the warm and cold season was faster compared with recent decades. The reconstructed SST anomaly indicated that the climate variation was more severe, and ENSO was operating on a reduced frequency with more extreme winter El Niño events occurred in the past warm climate.