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Sclerochronological and δ^{18}O study of the giant clam *Hippopus hippopus* shell. Application to Sea Surface Temperatures reconstructions

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In the Pacific Ocean, massive corals are used to reconstruct the past climatic and oceanographic variability. Nevertheless, recent works have pointed out that their aragonitic skeleton might be highly affected by diagenesis so that environmental information deduced from geochemical analyses must be regarded with caution. In similar environments, the bivalves from the Tridanidae family can be regarded as similar recorders of environmental conditions. Their aragonitic shell is more resistant to diagenetic processes than coral skeletons. The Tridacnidae are currently found as fossil remnants, both in coral reefs and archaeological sites. Geochemical analyses of such shells could thus provide additional data on paleoceanographic factors.

In our study, *Hippopus hippopus*, a subtidal giant clam widely distributed in the Indo-Pacific area, was selected to test its suitability to provide reliable paleo-sea surface temperatures (SST). A modern organism, collected in New Caledonia and then cultured under monitored semi-natural conditions for 9 months, was studied. In parallel, a fossil *H. hippopus* dated of 3625 $\pm$ 30 years BP (14C), collected in an archaeological site in the Vanuatu, was analyzed.

The mineralogical and ultrastructural comparison between the modern and fossil shells using SEM observations and microscope infrared analyses provides information on diagenetic patterns. Very rare patchy calcite zones are observed in the fossil form. Such observations allow selecting the pristine areas to analyze. The inner layer was selected for our studies. For the sclerochronological study, the specimens were etched using a modified Mutvei solution. Considering the work performed by Watanabe and Oba (1999), we assume that growth increments were formed every day. Each increment was counted in the modern *H. hippopus* specimen giving an age of at least 3.5 years. The growth increment thickness variations show a seasonal like pattern. However, a positive correlation with SST is observed only in some parts of the shell. This is interpreted as reflecting the presence of growth breaks. Unfortunately, it is not possible to identify these growth breaks in the inner layer microstructure. The δ^{18}O profile from the modern specimen shows a seasonal pattern, directly correlated to the growth increment thickness variations. Taking into account the instrumental SST measurements, we prove that over the period where δ^{18}O and SST are correlated, the shell precipitates in isotopic equilibrium with SST. An equation close to that of Watanabe et Oba (1999) was obtained. This confirms that *H. hippopus* can be a reliable recorder of SST, with a precision of around 1.24˚C. But, the correlation between the δ^{18}O measurements and the growth increment thickness variations confirms that the growth is disturbed and probably stops during several periods. Consequently, the SST variations cannot be reconstructed over the whole living period. Additional studies are needed to better understand the *H. hippopus* growth. The paleo-SST obtained in the Vanuatu fossil specimen shows higher seasonal SST amplitude than the modern ones. Nevertheless, these results must be regarded with caution because we need to identify the growth breaks and to improve the calibration and paleotemperature interpretations.

Watanabe T. and Oba T. (1999). *Journal of geophysical Research*, **104**, no. C9, pp. 20667-20674.