



## **Intra-shell oxygen isotope ratios in the benthic foraminiferan *Amphistegina lobifera* and the influence of seawater carbonate chemistry on this ratio.**

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Using secondary ion mass spectrometry (SIMS) we looked at the natural variability in the oxygen isotope ratio of the shallow water, symbionts bearing foraminiferan *A. lobifera*. Live foraminifera were collected in June 2005 in the Gulf of Eilat, Israel. Vertical section exposing the knob area of this species represents the growth history of this species from December 2004 to June 2005. SIMS profile at a resolution of  $\sim 2$  weeks yielded  $\delta^{18}\text{O}$  changes of  $\sim 1.5$  permil (from  $-0.1$  permil to  $1.45$  permil) that are compatible with the known temperature changes for the Gulf of Eilat for this period ( $20$  to  $25$  °C). Natural variability between primary and secondary calcite at the knob area were obtained on horizontal section of the upper knob area. This section is semi-tangential to the growth lines and exposes relatively wide belts of the primary calcite, which could be analyzed using the SIMS (beam size of  $10 \times 20$   $\mu\text{m}$ ). The primary calcite is on average  $2$  permil more negative than the secondary calcite that represents the bulk of the skeleton (more than  $95$  % by weight). A vertical profile at the knob was obtained by rastering an area of  $50 \times 50$   $\mu\text{m}$  at vertical steps of roughly  $1$   $\mu\text{m}$ . The profile revealed a narrow zone of lower  $\delta^{18}\text{O}$  compared to the higher values above and below it. The difference between the lowest  $\delta^{18}\text{O}$  and the highest one was also close to  $2$  permil. The  $\delta^{18}\text{O}$  in the margin – keel area of *A. lobifera* is also lower compared to the bulk secondary calcite. Specimens that were cultured in the laboratory at a constant temperature and inorganic carbon but at different pH have increased their  $\text{CaCO}_3$  weight by roughly a factor of  $8$ . Single specimen from each pH (ranging between  $7.9$  and  $8.5$ ) was investigated with the SIMS at the knob area. While there is some variability within each specimen (perhaps related to the primary calcite), the general trend was a decrease in  $\delta^{18}\text{O}$  with increasing pH (or  $\text{CO}_3^{2-}$  concentration), in

agreement with previous studies on planktonic foraminifera.