Geochemical ecology of a high latitude coral, Gulf St Vincent, South Australia

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Scleractinian corals record environmental features at high temporal and spatial resolution in the physical, chemical composition of their skeletons. Coral based geochemical proxies provide a means for temporally extending the instrumental record of climate. The lack of long-term environmental information in temperate environments reduces the ability to interpret recent changes in regional oceanographic and climate indices.

X-radiographs of *Plesiastrea versipora* indicate variable growth rates of 1-9 mm per year. Density bands are laid down in annual couplets with low density bands in summer. This interannual variation in extension rate may be due to variability in summer temperature maxiumums. Luminescent bands are correlated with the high density winter bands. The luminescent bands vary in intensity and width and have become more frequent since 1980. They are likely to be influenced by the higher rainfall and terrestrial runoff in winter.

Of prime concern with the construction of paleo-environmental archive using coral skeletons is the level of reproducibility. Initial LA-ICP-MS analysis has produced varied results. Data obtained for 3 coral colonies from Gulf St Vincent, indicate in the reliability of the record may depend on the extension rate of the individual colony. The temperature proxies Sr/Ca and U/Ca are highly correlated and an inverse correlation between Sr/Ca and Ba/Ca has been observed for a coral from Seacliff Reef. A decadal cycle has been observed in the temperature proxies for Gulf St Vincent from the Seacliff Reef coral, but this decadal scale feature has not been observed in the higher density colonies. Ongoing research is focussing on the calibrate *Plesiastrea* for temperature, terrestrial influence and upwelling to determine intra-colony variation and intra-reef variation.

Coral growth histories based on annual band counts have been validated with preliminary U/Th ages for 4 coral cores, including 2 replicates. The base of the 18 cm long high-density coral core from Gulf St Vincent was 129±2 years old. The base of a 48 cm low-density core from the same reef was 98±2 years old. Continuing research is aimed at elucidating the reasons for such large growth rate differences between coral colonies growing in the same environmental conditions. The base of a 24 cm core that has been analysed from Spencer Gulf has been dated at 151±2 years. This particular coral presents an ‘oceanic’ signature compared with the ‘gulf’ signature from Gulf St Vincent corals.
Figure 1. (top) Laser ablation-ICPMS analyses of Sr/Ca and U/Ca. Data has been peak matched to IGOSS SST data. (middle) Ba/Ca compared to monthly rainfall averages for Adelaide (note time-scale difference compared to top panel). Rainfall data supplied by the Bureau of Meteorology. (bottom) Image showing fluorescent banding in the analysed coral core section.