

Data Repository Item

Sr/Ca analysis

For Sr/Ca analysis, powdered samples were taken with a 0.6 cm drill bit. Sr/Ca ratios were measured on an inductively coupled plasma optical emission spectro-photometer (ICP-OES) at the University of Kiel following a combination of the techniques described by Schrag (1999) and de Villier et al. (2002). The sample solution is prepared by dissolving approximately 0.5 mg of coral powder in 1.00 mL HNO₃ 2%. The working solution is prepared by serial dilution of the sample solution with HNO₃ 2% to get a concentration of ca. 8 ppm Ca. Standard solution is prepared by dilution of 1.00 mL of the stock solution (0.52 grams of coral powder from an in-house standard in 250 mL HNO₃ 2-3%) with 2.00 mL HNO₃ 2%. Sr and Ca lines used for the Sr/Ca measurements are 407 nm and 317 nm respectively. The relative standard deviation (RSD) of multiple measurements on the same days and on different days is 0.15% (1 σ).

References for Data Repository Items

- de Villiers, S., Greaves, M., and H. Elderfield, 2002, An intensity ratio calibration method for the accurate determination of Mg/Ca and Sr/Ca of marine carbonates by ICP-AES: *Geochemistry, Geophysics, Geosystems*, v. 3, doi: 10.1029/2001GC000169.
- Schrag, D., 1999, Rapid analysis of high-precision Sr/Ca ratios in corals and other marine carbonates: *Paleoceanography*, v. 14, p. 97-102.
- Smith, T.M., and R.W. Reynolds, 2003, Extended reconstruction of global sea surface temperatures based on COADS data (1854-1997): *Journal of Climate*, v. 16, p. 1495-1510.

Table DR 1. CHAGOS CORALS

Core	Coral species	Longitude	Latitude	Water depth
GIM	<i>Porites solida</i>	71°45.51'E	5°15.08'S	3 m
PIE	<i>Porites lobata</i>	71°44.66'E	5°16.66'S	2.6 m
COI-5	<i>Porites solida</i>	71°45.86'E	5°26.04'S	1.8 m

Table DR 2. CORRELATION MATRIX OF ANNUAL MEAN CORAL Sr/Ca, LOCAL SST AND AIR TEMPERATURE

	ERSST	Air temperature	GIM	PIE	COI-5	Composite Sr/Ca
ERSST	x					
Air temperature	0.75	x				
GIM	-0.52	-0.63	x			
PIE	-0.68	-0.64	0.54	x		
COI-5	-0.50	-0.80	0.38*	0.54	x	
Composite Sr/Ca	-0.70	-0.84	0.71	0.86	0.84	x

Notes: SST is taken from the ERSST dataset, version 2 (Smith and Reynolds, 2003), centered at 70°E, 6°S. Air Temperature is from Diego Garcia (72.4°E, 7.3°S; WMO Station ID 6196700). Composite Sr/Ca is the arithmetic mean of GIM, PIE and COI-5. For all correlations $p < 0.001$ (* $p < 0.05$).

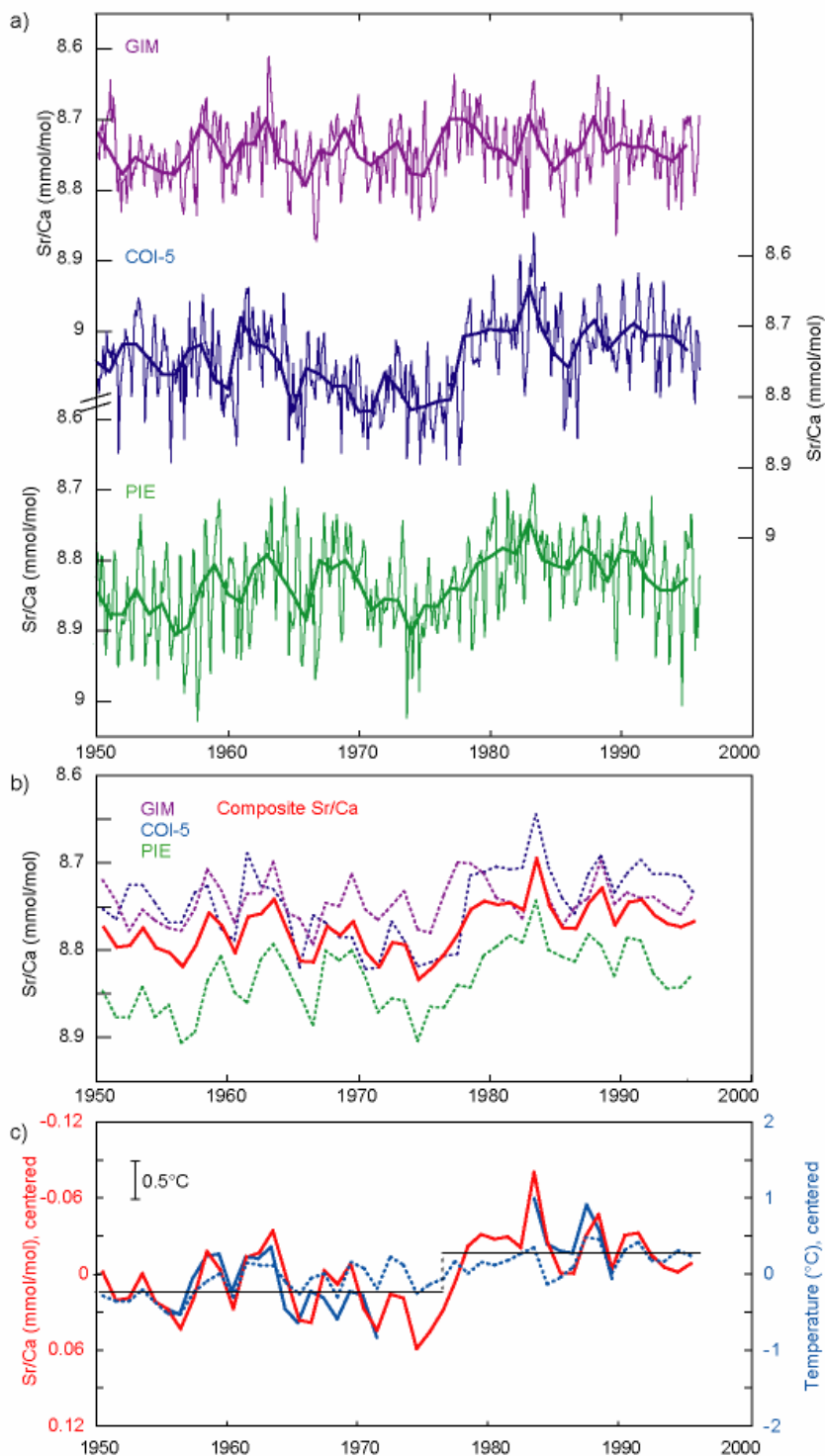


Figure DR 1. (a) Monthly coral Sr/Ca time series (thin lines) measured in the three Chagos corals (GIM, COI-5 and PIE). Annual means (thick lines) are superimposed. (b) Mean annual coral Sr/Ca records (stipled lines) and composite Sr/Ca record (thick red line). (c) Composite Sr/Ca record (red line) versus annual mean SST (blue stipled line) and annual mean air temperature (blue solid line). Thick black lines indicate mean coral Sr/Ca for the time period from 1950 to 1975 and 1976 to 1995. SST data is taken from the ERSST dataset, version 2 (Smith and Reynolds, 2003), centered at 70°E, 6°S. Air temperature is from Diego Garcia weather station (72.4°E, 7.3°S; WMO Station ID 6196700). The Composite Sr/Ca record is the arithmetic mean of GIM, COI-5 and PIE.