Paleoceanography

Supporting Information for

Comparison of equatorial Pacific sea surface variability and trends with Sr/Ca records from multiple corals

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Introduction

This section provides additional information about CT scanning, coral sampling, and temperature logger data.

S1. W037-W497 splice

Two cores, W037 and W497, from the same colony were spliced to produce a longer record (Figure S2). The overlapping period includes seven samples from W497 and 12 samples from W037. The average difference in Sr/Ca between nearest neighbors is 0.03±0.02 mmol/mol (1σ, n=7). Given the small number of overlapping data points for core W497, and the observation that the difference between cores is less than the standard deviation of the consistency standards we did not impose any correction for a potential offset. The spliced record includes all W037 data points, and only includes W497 data points after the end of the W037 record.

S2. E016 sampling

Core E016 displays complex corallite structure and is not optimal for geochemical sampling. Previous studies in Porites corals have found higher Sr/Ca values in "valleys" than in adjacent "bumps" [Alibert and McCulloch, 1997; Cohen and Hart, 1997; Alibert and Kinsley, 2008] and the optimal sampling path is along central axis of the corallite bundle with corallites extending parallel to the sampling surface [DeLong et al., 2013]. We have addressed a potential issue in the sampling track of core E016 by sampling along the "bump" adjacent to a "valley" (dashed red line in Figure S2e). Sr/Ca values are higher in the "valley" than the "bump" (Figure S3) and we use those from the "bump." The sampling track is at a slight angle to the corallites in the bottom year of the record (Figure S2e), although it is not in a "valley." This section does not display anomalously high Sr/Ca values.

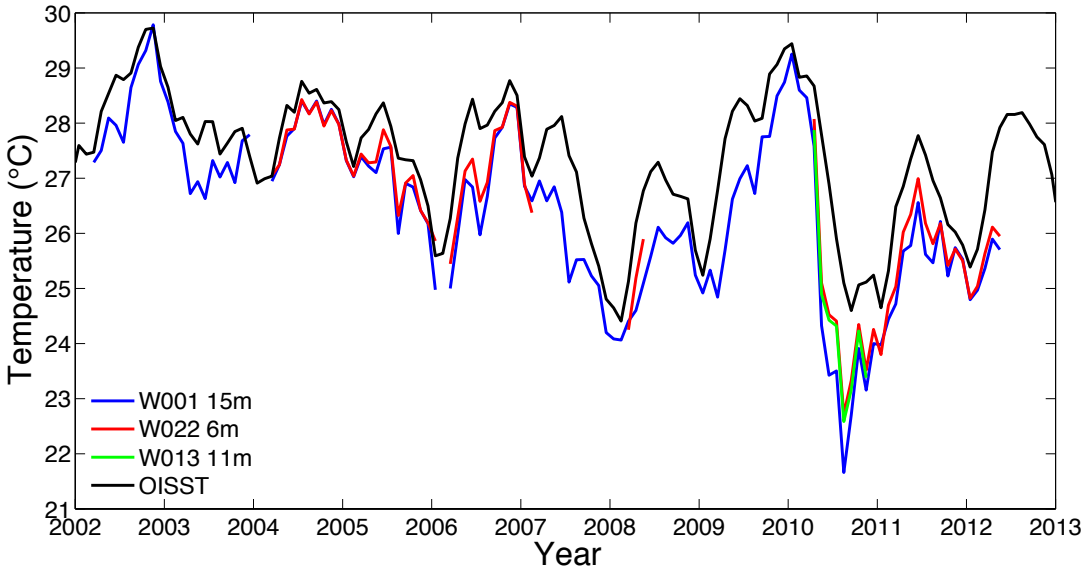

Figure S1. West side logger composite temperature timeseries: W001 (15 m; blue), W022 (6 m; red), and W013 (11 m; green). For reference OISST [*Reynolds et al.*, 2002] is plotted in black. One standard deviation of concurrent logger measurements is 0.07˚C. Logger locations are marked in Figure. 1.

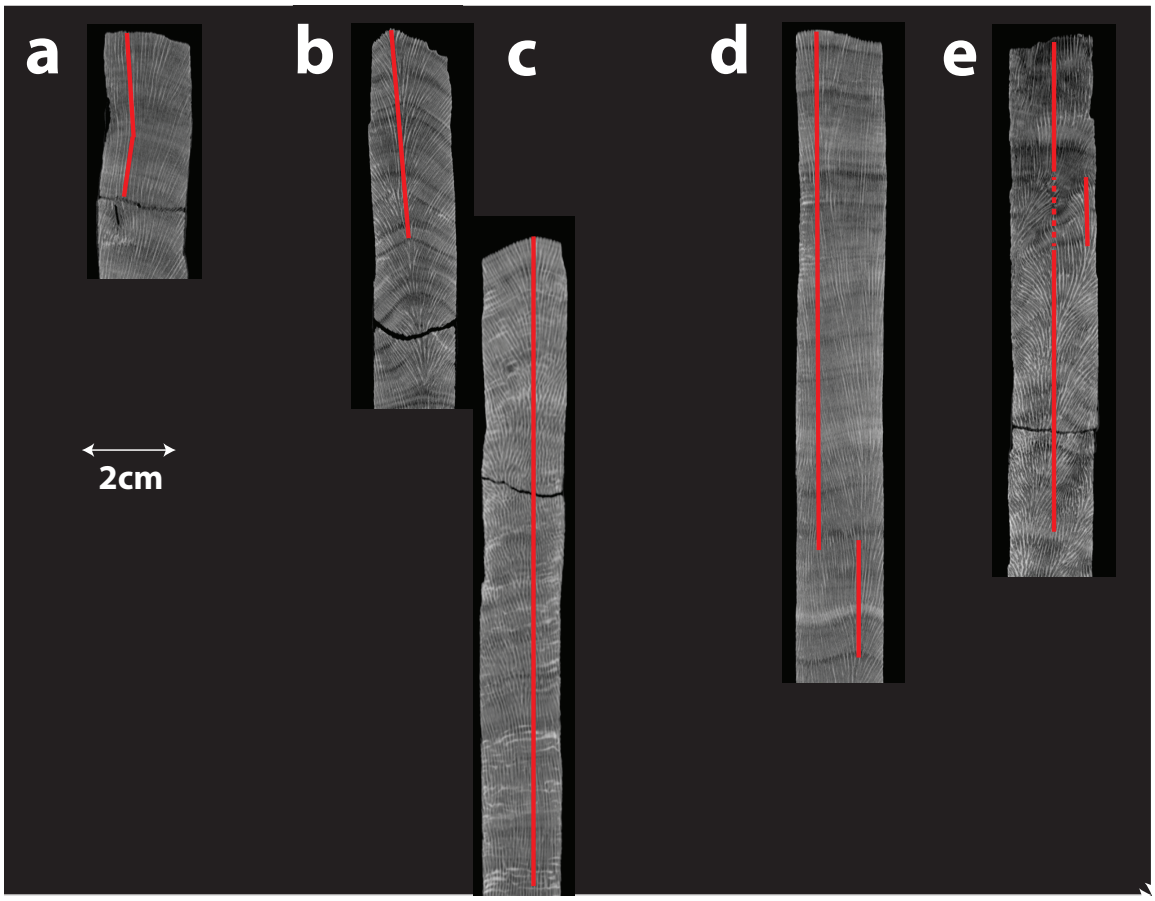

Figure S2. Computerized Tomography (CT) scans of cores a) W497, b) W037, c) W490, d) E500, and e) E016. Annual density couplets visible as light and dark bands, with the low-density band formed in summer marked for each year. Red lines mark sampling axes, scale bar indicates distance in centimeters. W490 and W037 were cored from the same coral and records were spliced together (Figure S3), with the top of W037 corresponding to 2010.3. White regions in W037 indicate high density, but no evidence of infilling is visible by manipulating the 3-dimensional CT scan or in Scanning Electron Microscope (SEM) imaging. The dotted section of the E016 sampling axis indicates a "valley" in the coral surface. The adjacent "bump" was sampled and values were spliced into the record (Figure S3). The high Sr/Ca values in the spliced W037 record during the 2007-08 La Nina (Figure 2) do not correspond to a "valley".

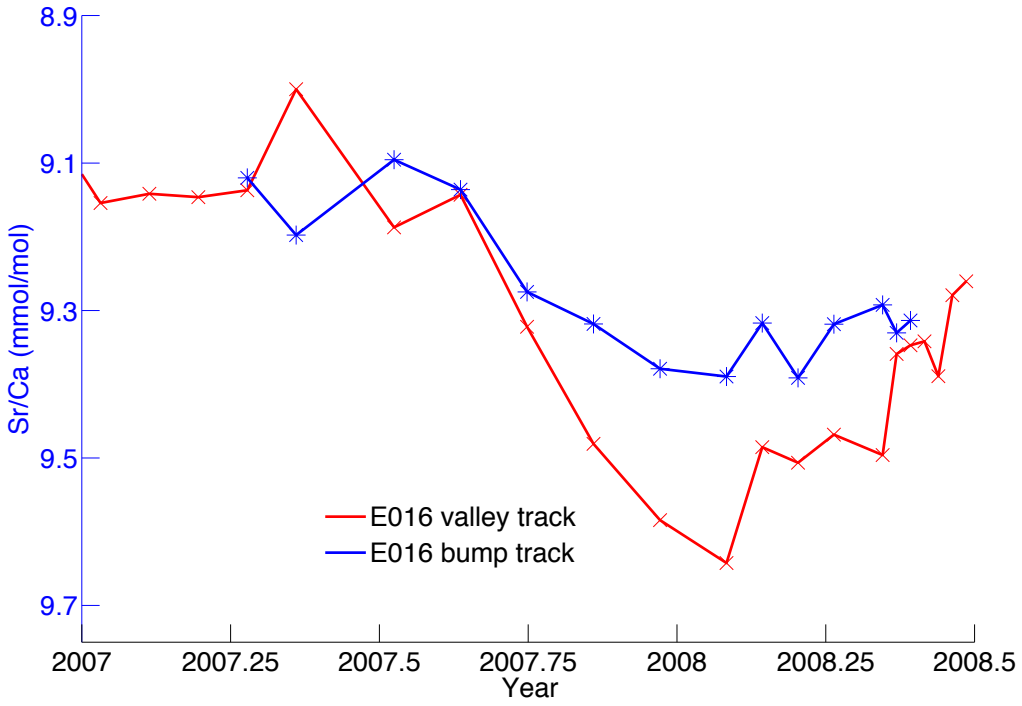

Figure S3. Sr/Ca of "valley" (dashed red line in Figure S2e) and "bump" (adjacent solid red line in Figure S2e) tracks in core E016. The "valley" track shows evidence of anomalously high Sr/Ca values [*Alibert and McCulloch, 1997*]. Where both values exist the "bump" value is used.

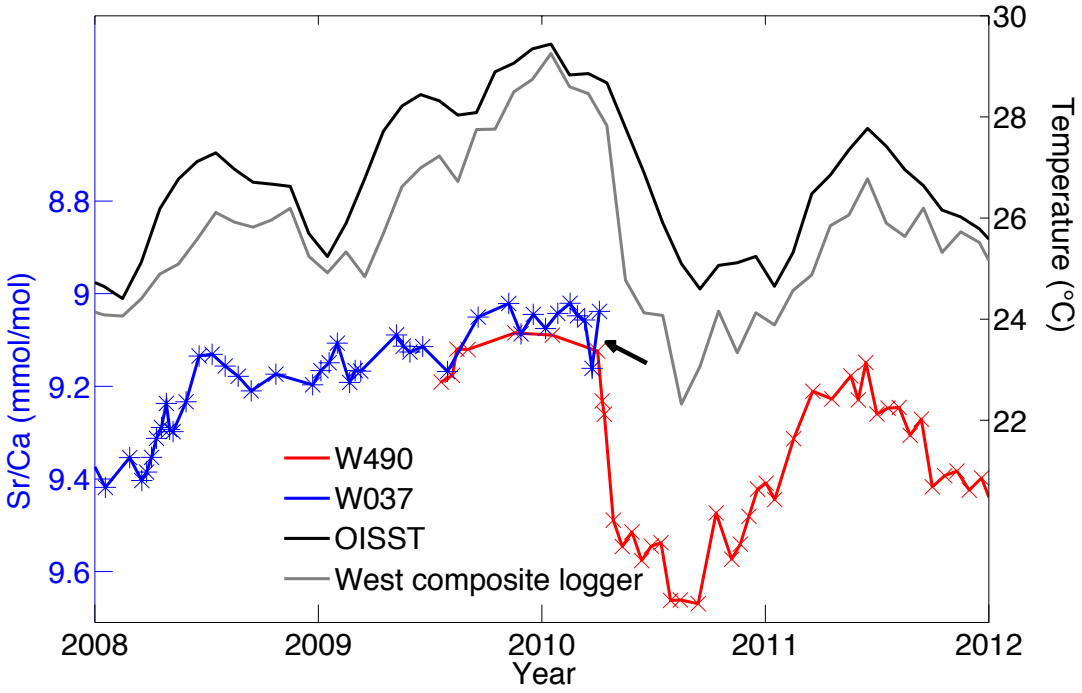

Figure S4. Sr/Ca of W037 and W497, cored from the same coral, plotted with OISST (black; *Reynolds et al.* [2002]) and west logger composite temperature (gray). Black arrow indicates location of splice. Average offset is 0.03±0.02 mmol/mol (1σ, n=7).

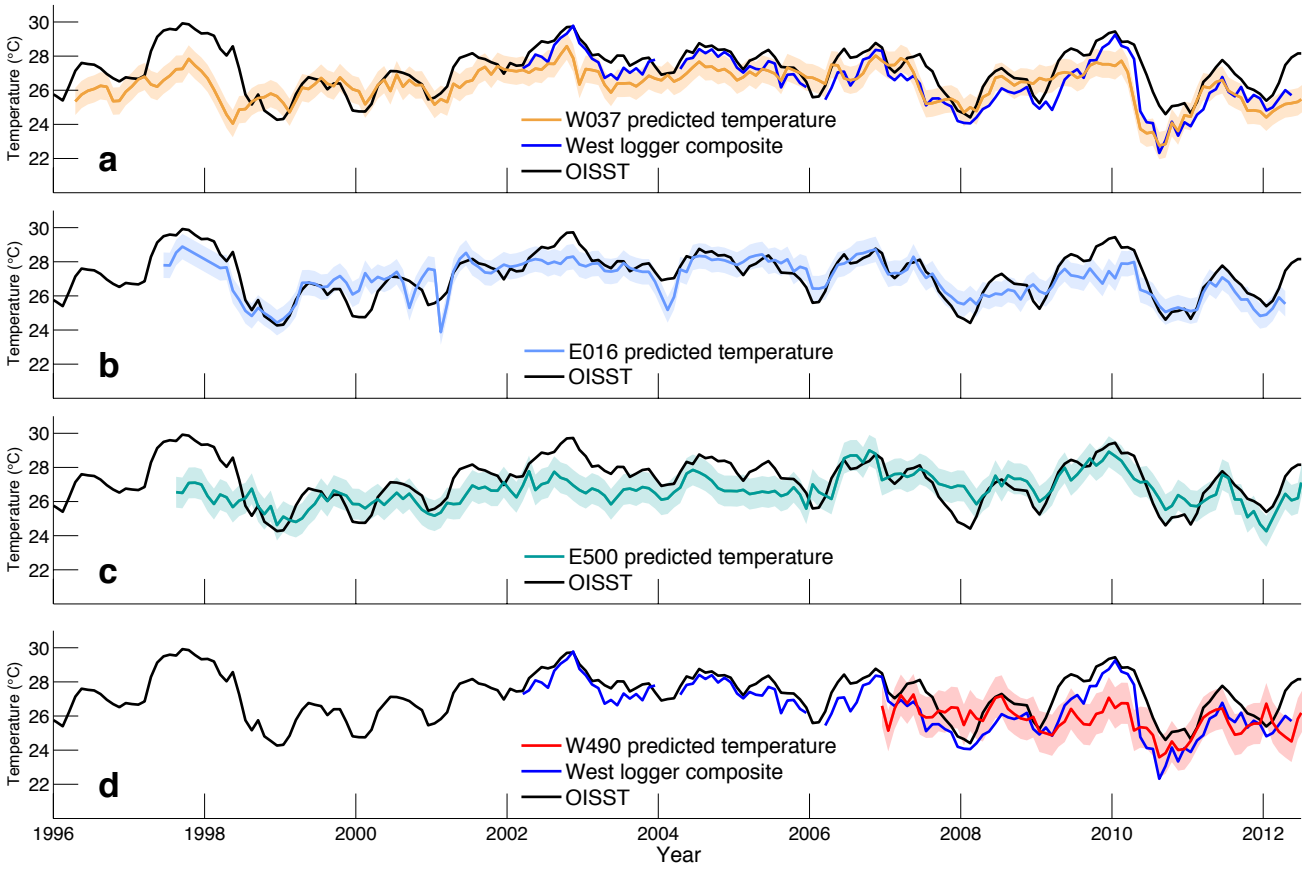

Figure S5. A) Temperatures estimated based on Sr/Ca from core W037, applying the regression of west logger composite temperature onto Sr/Ca from W037, plotted with west logger composite temperature (blue) and OISST (black; *Reynolds et al.* [2002]). Shaded errors indicate one standard error of prediction. B-D) Same as in A but for E016, E500, and W490, respectively. Each record is generated by applying the temperature-Sr/Ca regression specific to that coral (Table 1).

Data Set S1. Sr/Ca data for all corals used in this paper (available online)

References

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