Supplementary materials

Unique behavior of marine conditions in the Java Sea reconstructed from a 70 yr coral $\delta^{18}O$ and Sr/Ca record from the Seribu Islands, Indonesia

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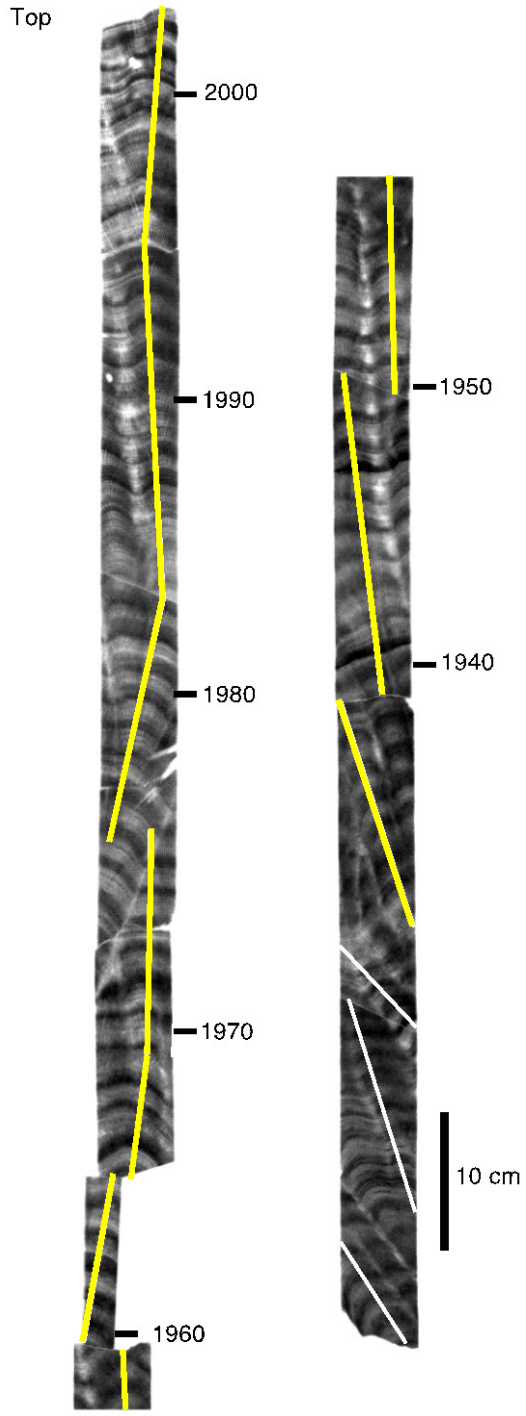
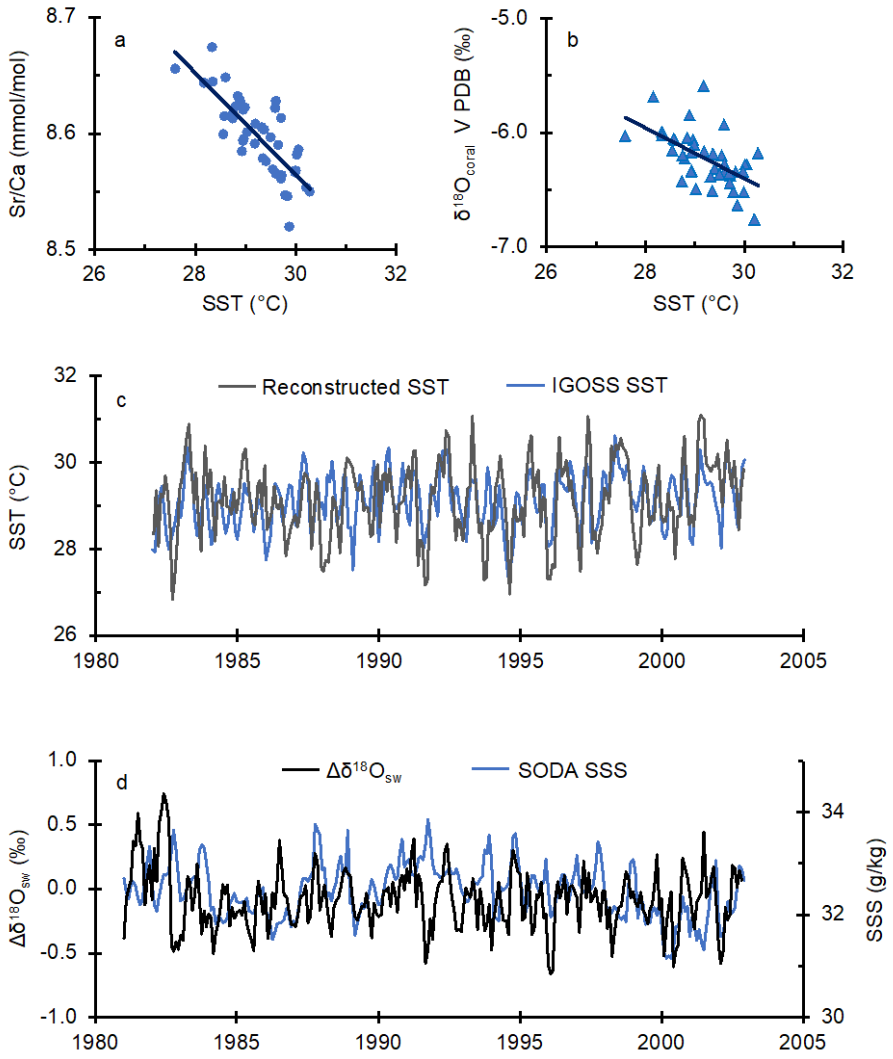
Figure S1 to S8

Figure S1



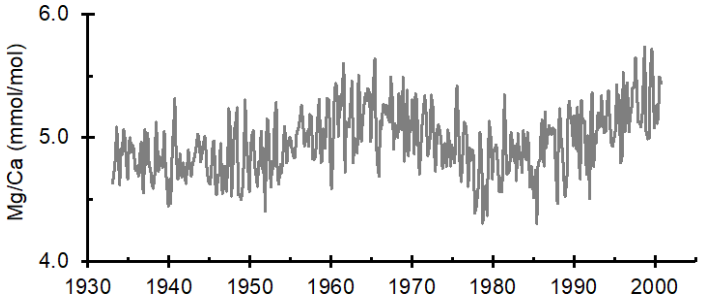
X-radiograph of the coral core (SER03-05) analyzed in this study. Geochemical analysis was performed along the axis of maximum linear extension (yellow line). Years are marked at 10-yr intervals.

Figure S2



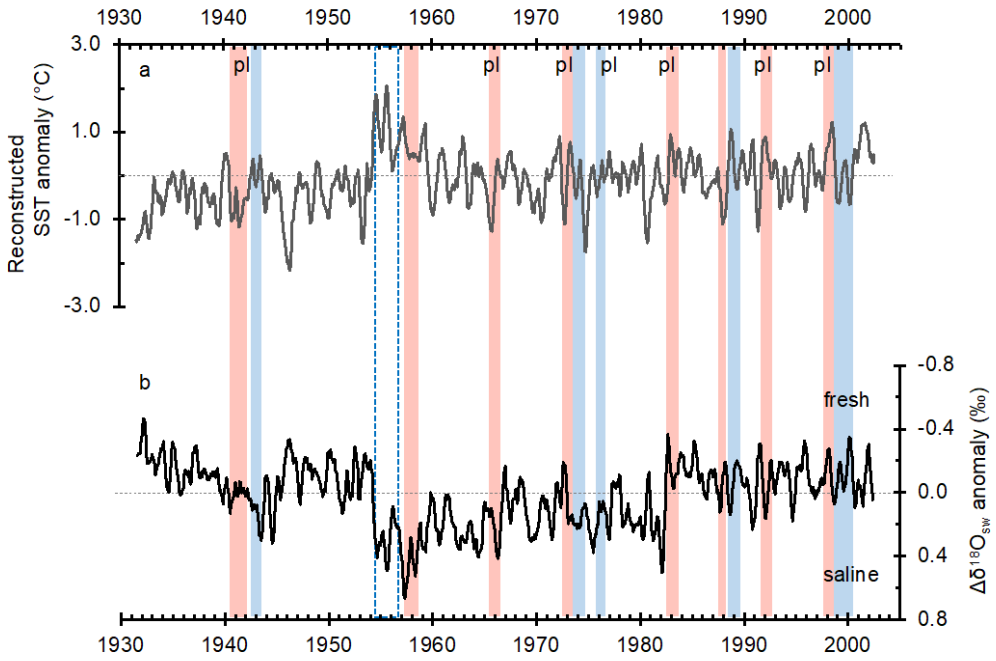
(a) Calibration of Sr/Ca vs IGOSS SST for the period of 1982–2002. [Sr/Ca–IGOSS SST]: Sr/Ca = −0.044 × SST + 9.880 ($r^2 = 0.63$, $p < 0.001$) (b) Calibration of $\delta^{18}O_c$ vs IGOSS SST for the period of 1982–2002. [$\delta^{18}O_c$–IGOSS SST]: $\delta^{18}O_{coral} = -0.223 \times SST + 0.282$ ($r^2 = 0.33$, $p < 0.001$). (c) Comparison between reconstructed Sr/Ca-SST (grey line) and IGOSS SST (blue line). (d) Comparison between reconstructed $\Delta\delta^{18}O_{sw}$ (black line) and SODA SSS (blue line).

Figure S3



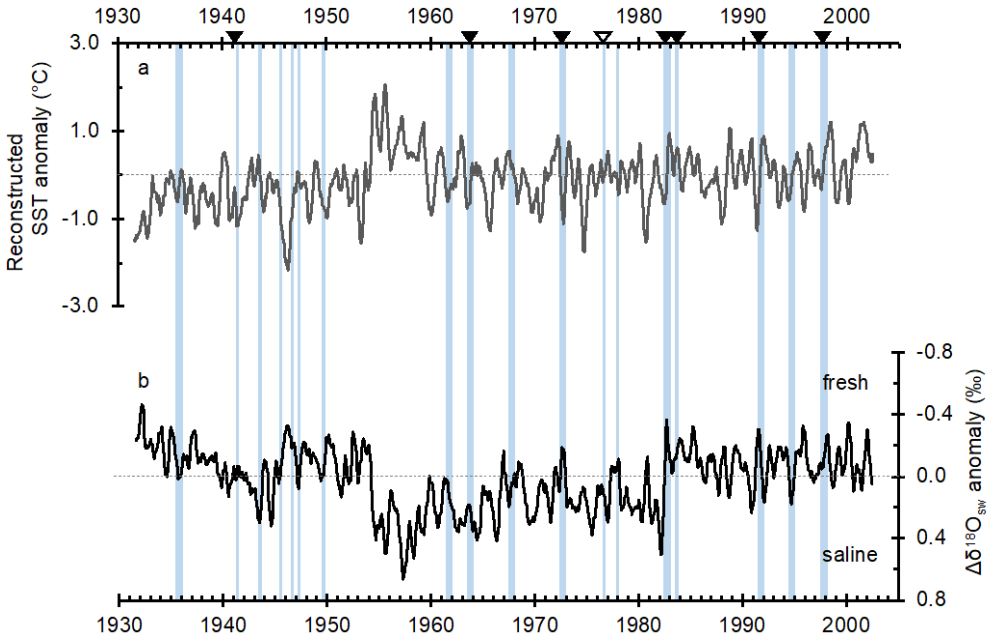
Time-series of Mg/Ca in SER03-05 from 1933 to 2000.

Figure S4



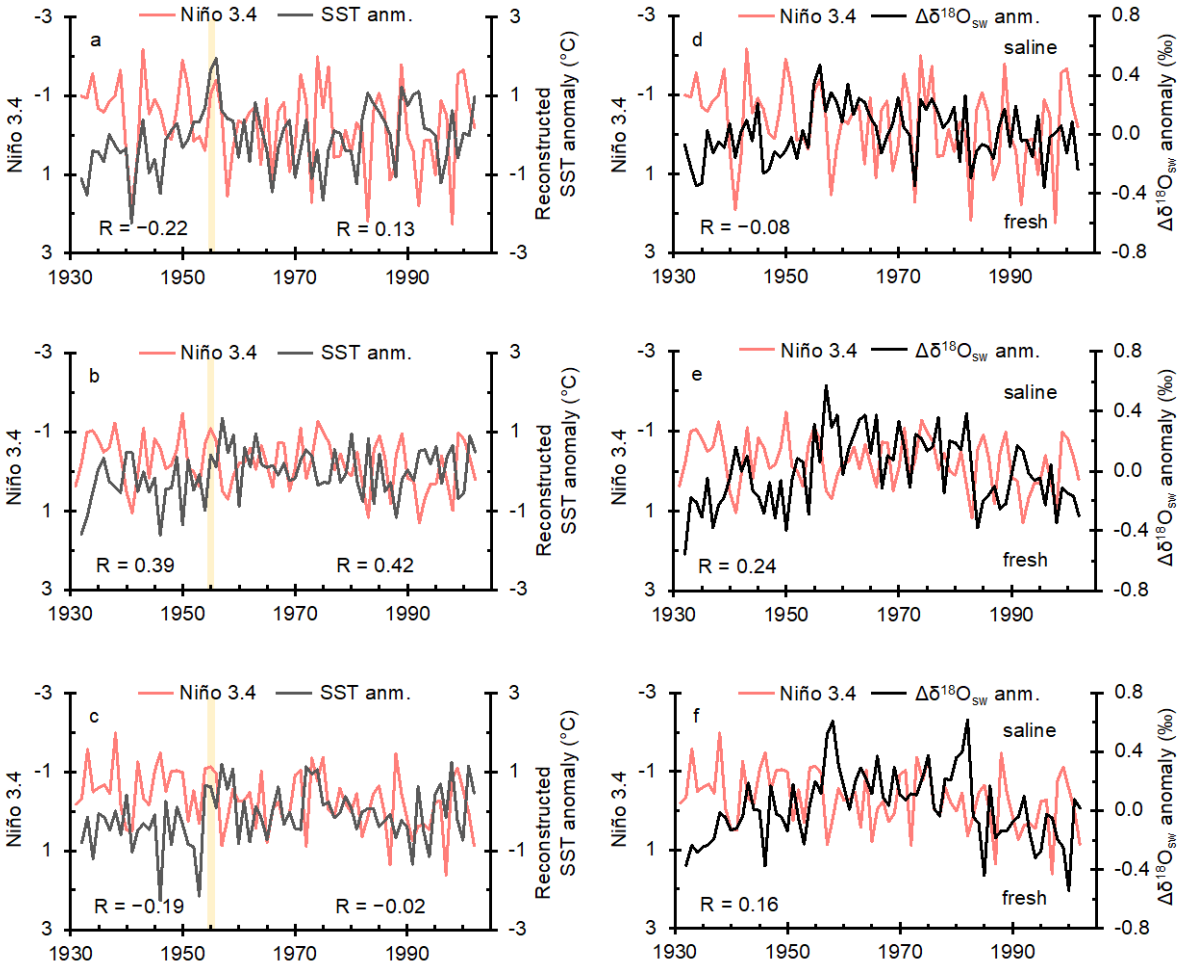
Variations of 6-month moving average of the anomalies of reconstructed (a) SST and (b) $\Delta\delta^{18}O_{sw}$ (relative to 1971–2000). Y-axis for $\Delta\delta^{18}O_{sw}$ is reversed. Color bars imply strong El Niño events (red) and La Niña events (blue). The La Niña event during 1954–1956 discussed in the text which was weak to moderate event is indicated by a dotted square. Symbol of pI represents that positive IOD co-occurred.

Figure S5



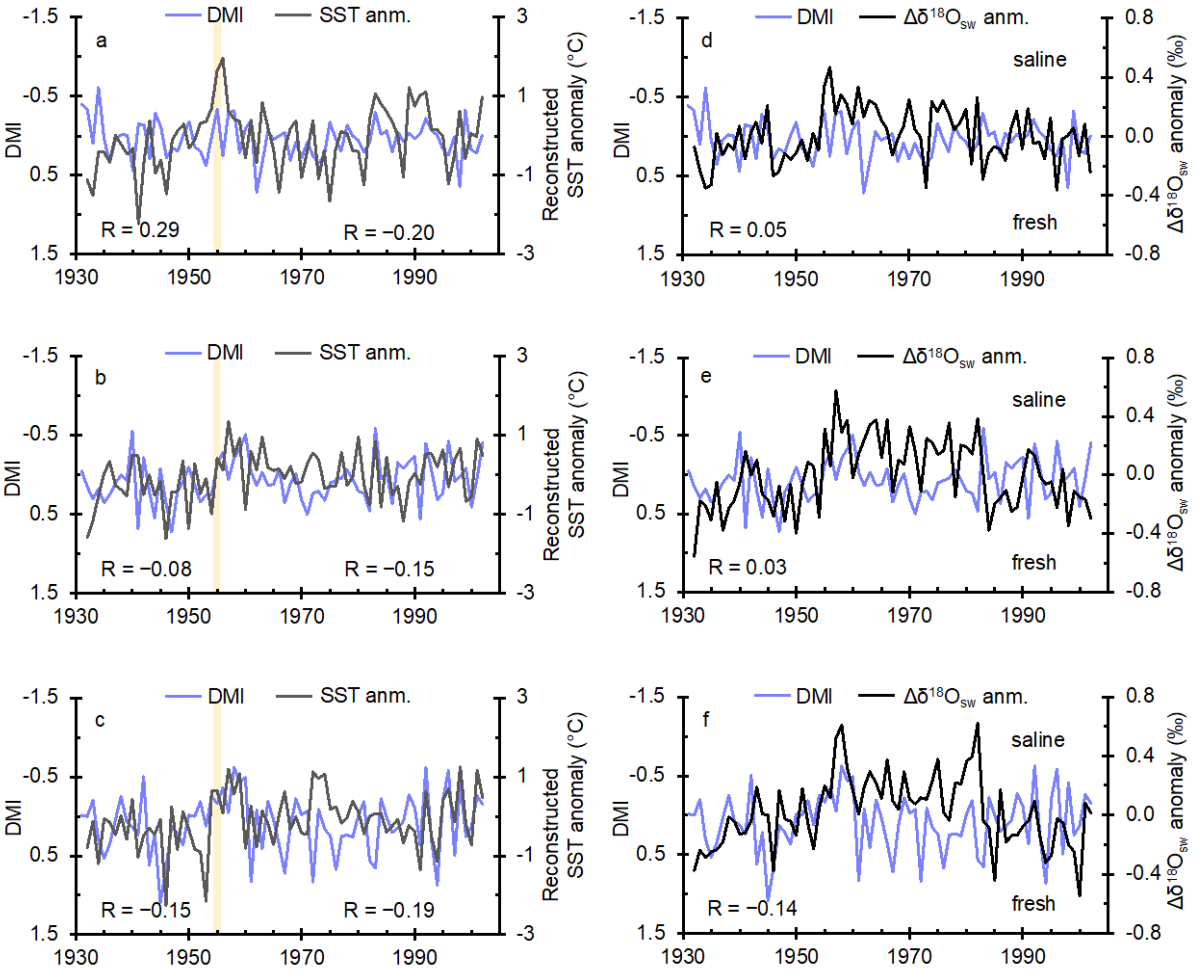
Variations of 6-month moving average of the anomalies of reconstructed (a) SST and (b) $\Delta\delta^{18}O_{sw}$ (relative to 1971–2000). The y-axis for $\Delta\delta^{18}O_{sw}$ is reversed. Color bars indicate positive IOD (> +0.4 on the DMI for 3-month) and black and white triangle denotes co-occurrence of strong El Niño and La Niña events, respectively.

Figure S6



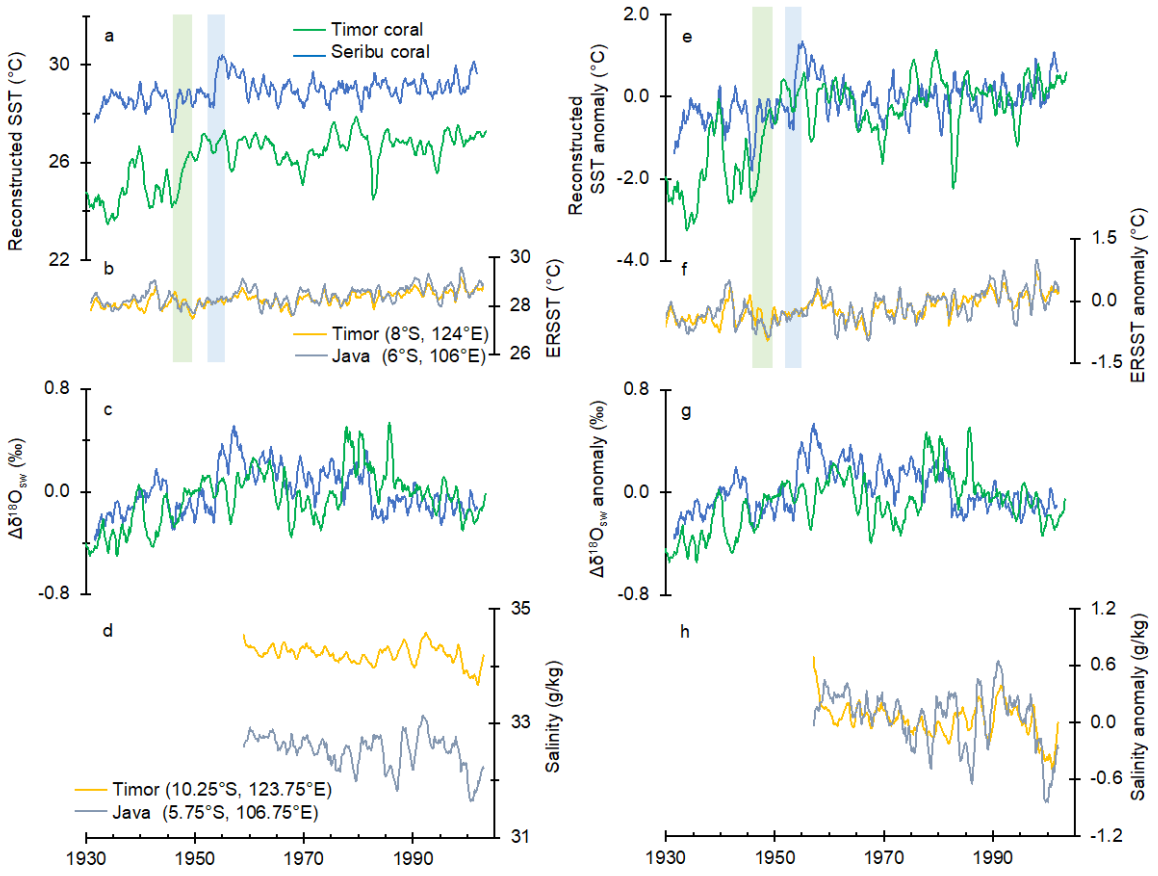
The comparisons of variability of Niño3.4 index with the anomalies of reconstructed SST (left side) and $\Delta\delta^{18}O_{sw}$ (right side) in each season. (a, d) December–January–February, (b, e) March–April–May, (c, f) June–July–August. The peak of rapid warming in the mid-1950s shown with a yellow bar in left panels. The correlation coefficients with Niño 3.4 index are represented in all figures. For the SST comparison (a–c), R values were calculated before and after the peak of rapid warming (1932–1954 and 1957–2002), while those for the $\Delta\delta^{18}O_{sw}$ (d−f) were obtained for all periods (1932–2002).

Figure S7



The comparisons of variability of IOD (Dipole Mode Index: DMI) with the anomalies of reconstructed SST (left side) and $\Delta\delta^{18}O_{sw}$ (right side) in each season. (a, d) December–January–February, (b, e) March–April–May, (c, f) June–July–August. The peak of rapid warming in the mid-1950s is shown with a yellow bar in left panels. The correlation coefficients with DMI are represented in all figures. For the SST comparison (a–c), R values were calculated before and after the peak of rapid warming (1932–1954 and 1957–2002), while those for the $\Delta\delta^{18}O_{sw}$ (d–f) were obtained for all periods (1932–2002).

Figure S8



The 12-month moving average of (a) reconstructed SSTs based on coral Sr/Ca form Seribu Islands (this study, blue), and Timor Island (Cahyarini e al., 2014, green), (b) ERSST around Java coast (6°S, 106°E, gray) and Timor (8°S, 124°E, yellow), (c) $\Delta\delta^{18}O_{sw}$ obtained by combining of coral Sr/Ca and $\delta^{18}O$ from Seribu Islands and Timor Island, and (d) SODA salinity around the Java (5.75°S, 106.75°E) and Timor (10.25°S, 123.75°E). The 12-month moving average of anomalies of (e) reconstructed SST, (f) ERSST, (g) $\Delta\delta^{18}O_{sw}$, and (h) SODA salinity. Color bars represent a period for 1946–1949 (green) and 1953–1955 (blue) when the abrupt warming has occurred at Timor and Seribu, respectively. Timor coral data was obtained from the National Centers for Environmental Information (https://www.ncei.noaa.gov/products/paleoclimatology).