Supplement of Biogeosciences, 16, 695–712, 2019
https://doi.org/10.5194/bg-16-695-2019-supplement

Biogeosciences Open Access EGU

Supplement of

Multi-trace-element sea surface temperature coral reconstruction for the southern Mozambique Channel reveals teleconnections with the tropical Atlantic

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Supplementary Figures

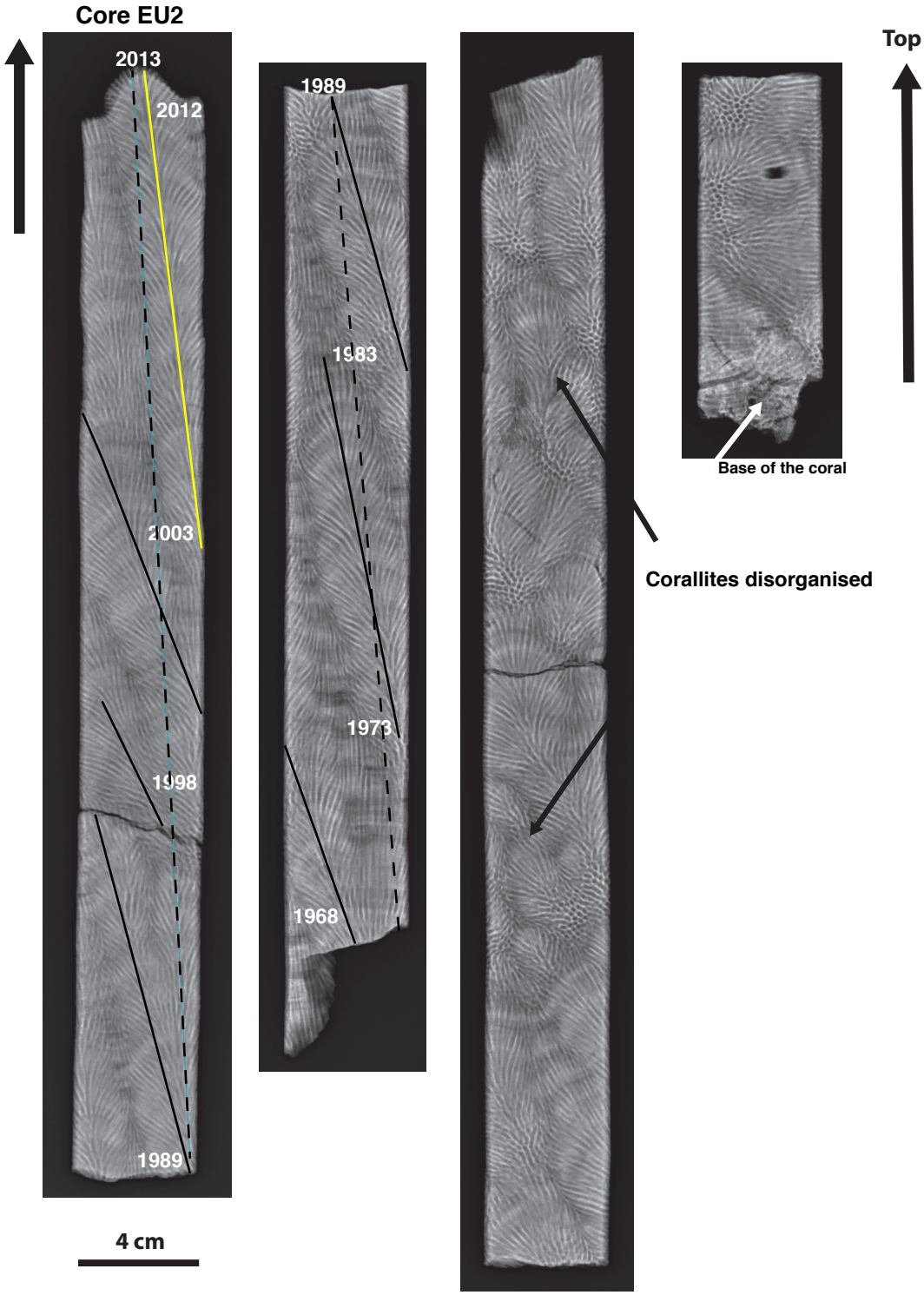

Figure S1 - X-ray of core EU2 with geochemical (solid black line) and coral-XDS sampling tracks (dashed line) indicated. Coral growth parameters were measured up to 1968, while geochemical proxies were measured between 2003 and 2013 (yellow line indicates sampling path).

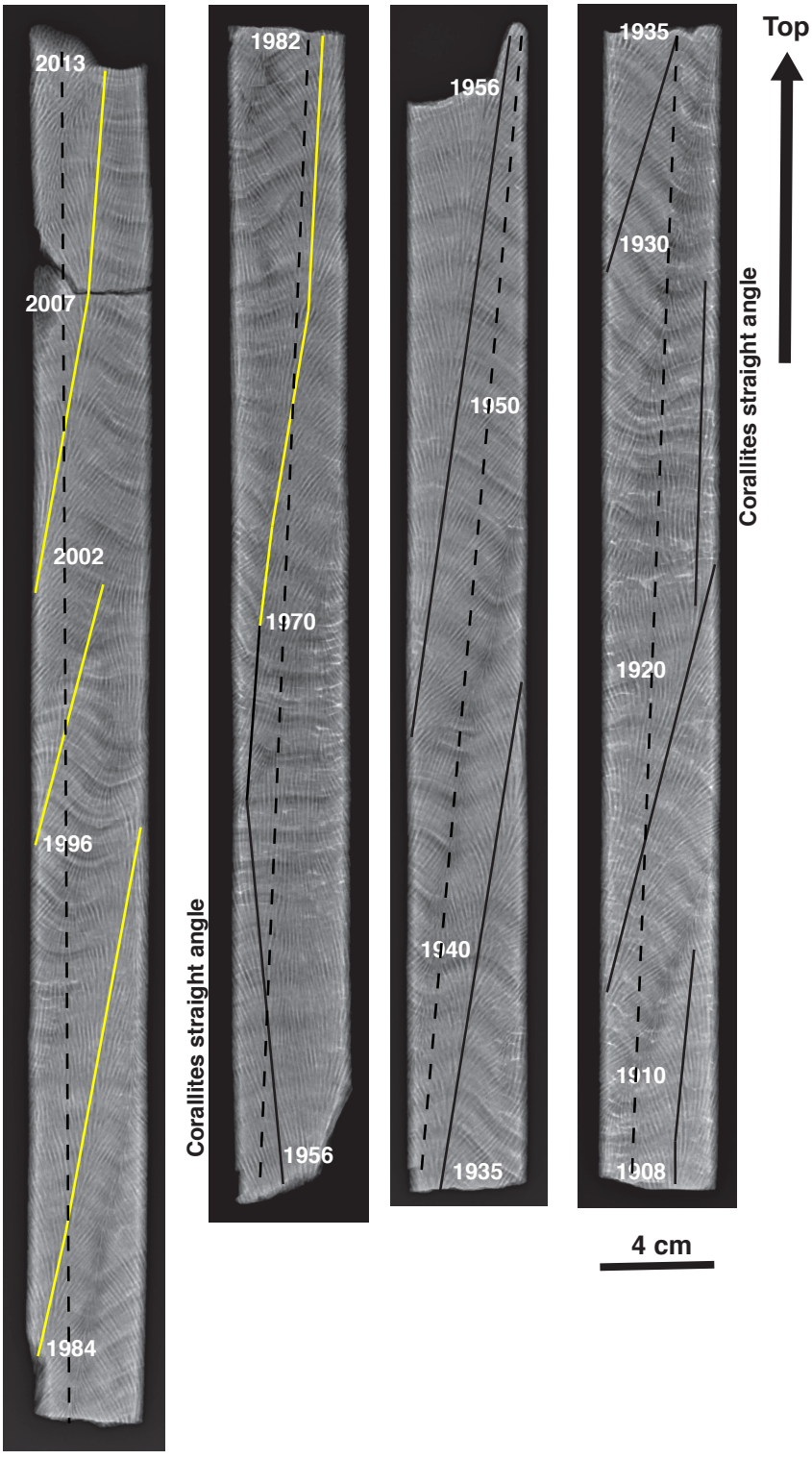

Figure S2 - X-ray of core EU3 with geochemical (solid black line) and coral-XDS (dashed line) sampling tracks indicated. Coral growth parameters were measured up to 1911, while geochemical proxies were analysed between 1970 and 2013 (yellow line indicates sampling path).

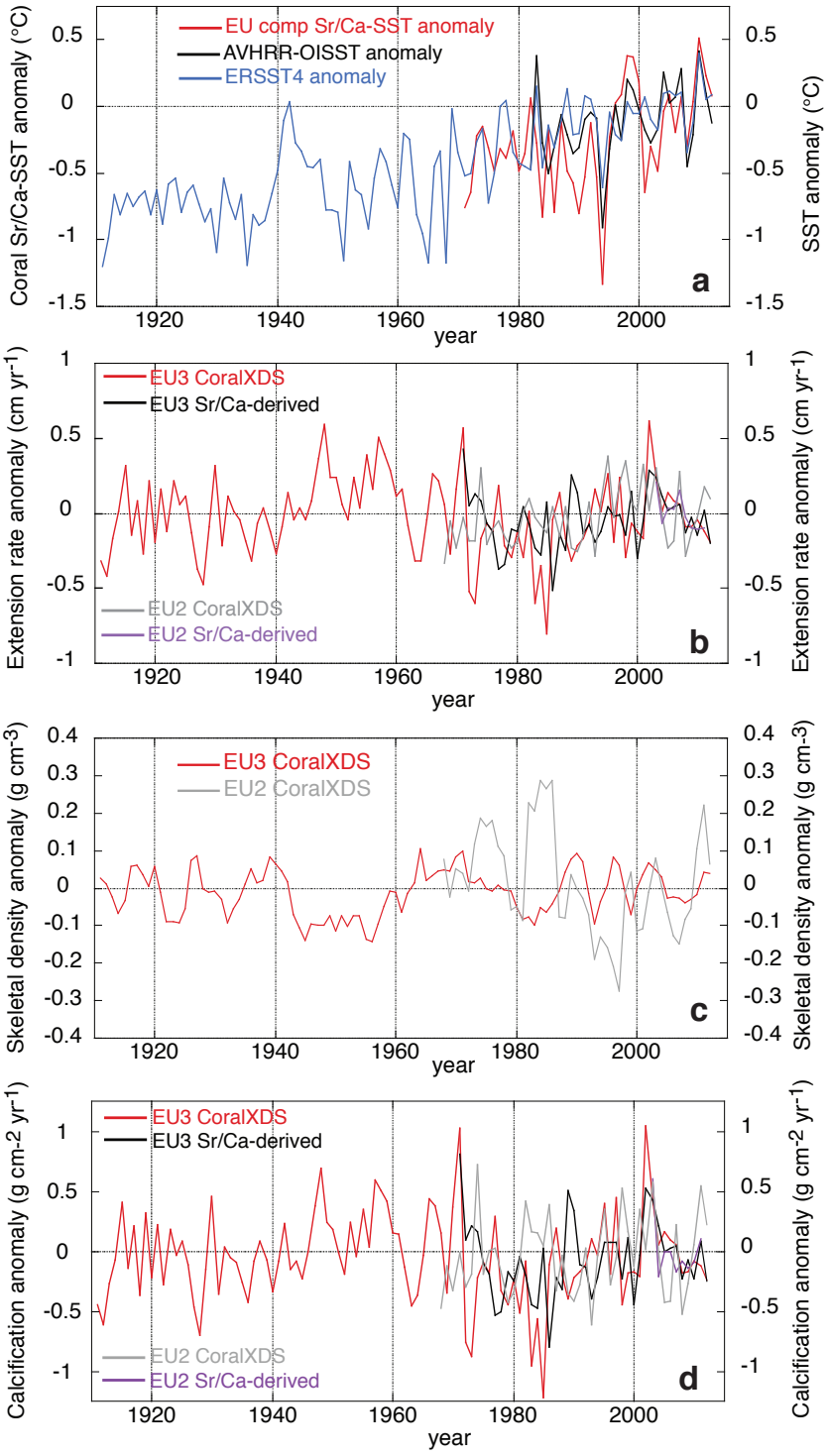

Figure S3 - Mean annual coral growth parameters of cores EU2 and EU3 compared to coral composite Sr/Ca-SST reconstruction, AVHRR-OISSTv2 and ERSSTv4. Anomaly time series relative to 1961-1990 for a) SST, b) linear extension rate, c) skeletal density and d) calcification rate.

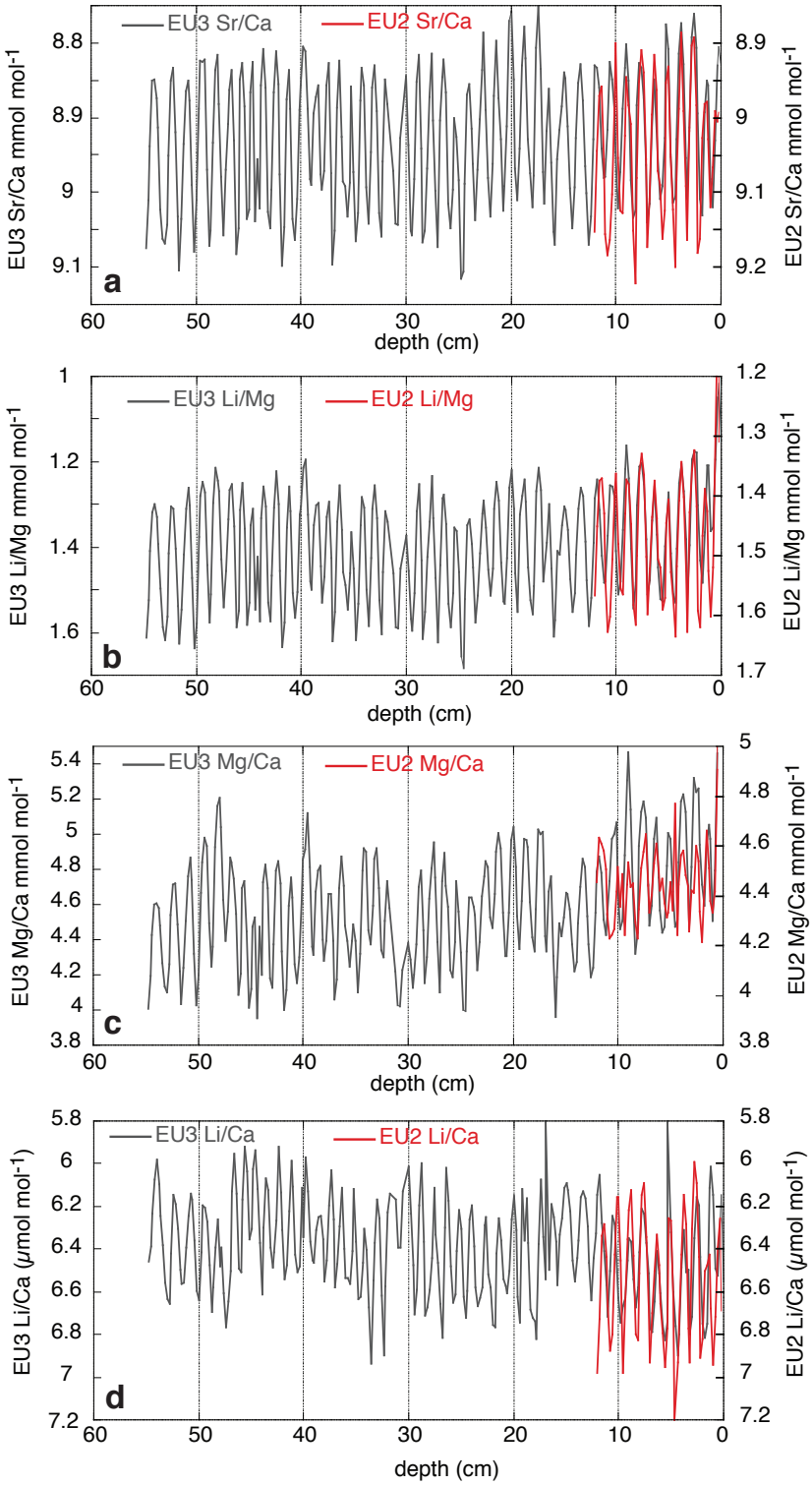

Figure S4 - Bimonthly (not interpolated) time series of trace element/Ca proxies versus depth from cores EU3 and EU2. a) Sr/Ca, b) Li/Mg, c) Mg/Ca, d) Li/Ca.

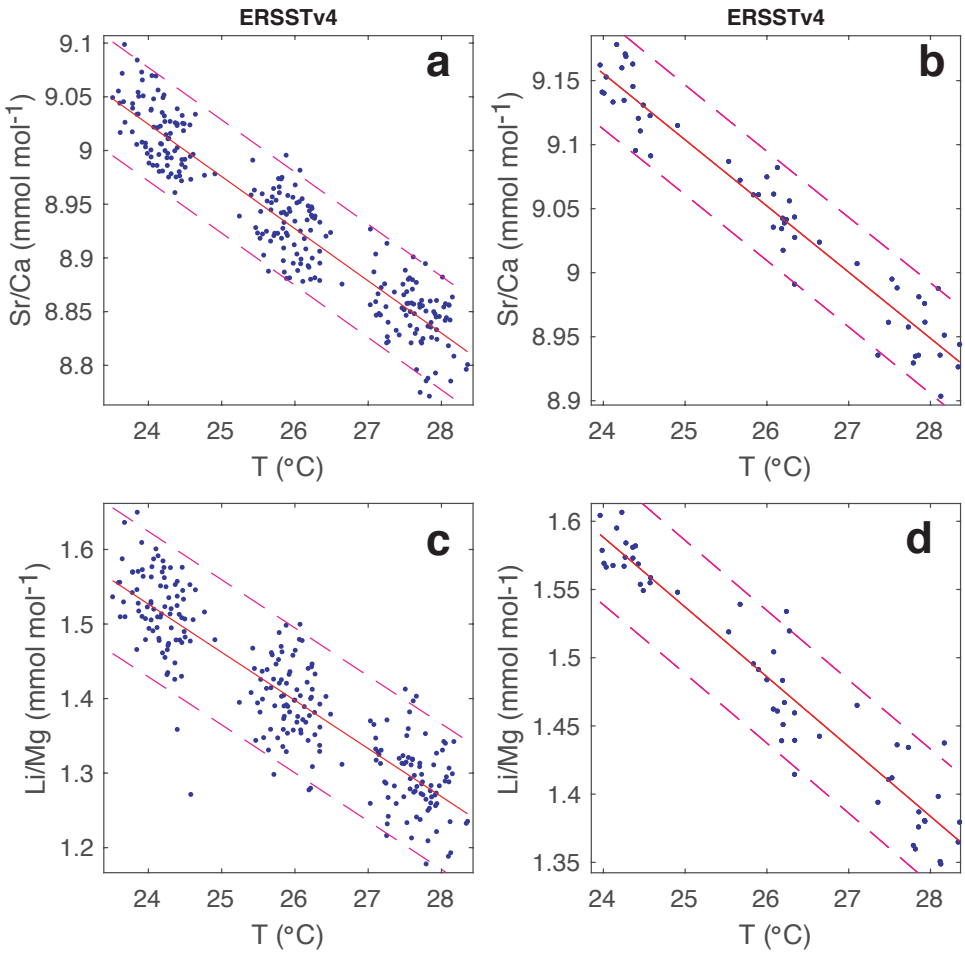

Figure S5 - Linear regressions of trace element (TE)/Ca proxies with ERSSTv4 for core EU3 (a,c) and EU2 (b,d). The TE/Ca records were calibrated using the respective linear regression equations of the bimonthly correlations obtained for each of the core records from the two sites. The 95% confidence intervals of the regressions are indicated. Regression equations are provided in Table 2.

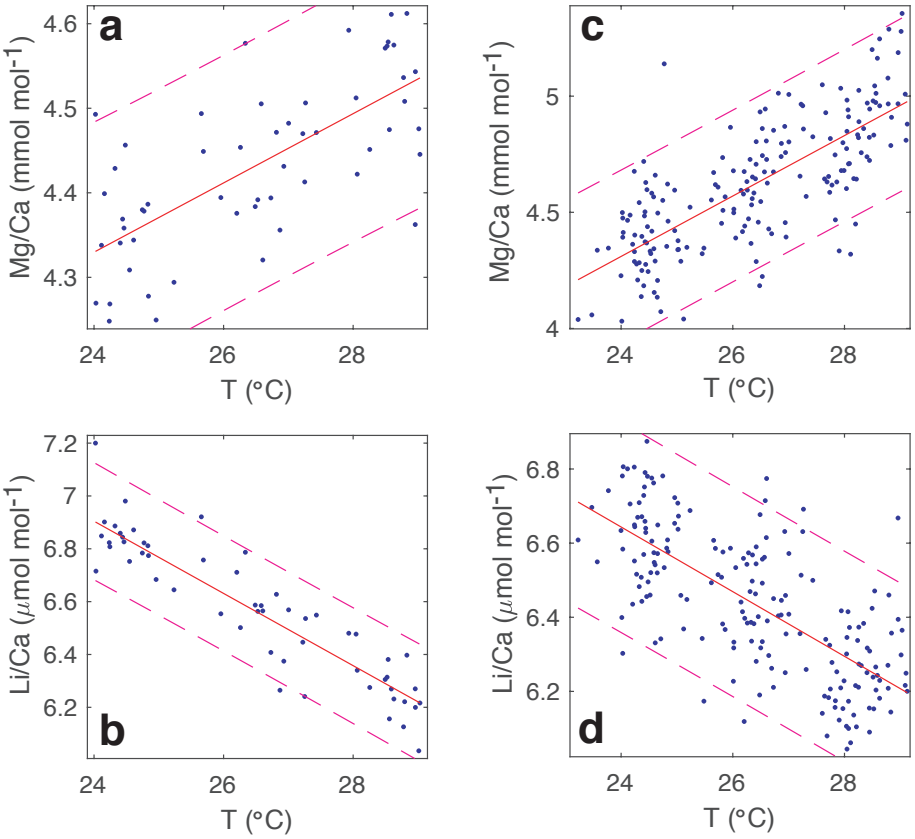

Figure S6 - Linear regressions of Mg/Ca and Li/Ca with AVHRR-OISSTv2 for core EU2 (a,b) between 2003 and 2012 and (c,d) EU3 between 1981 and 2012. The TE/Ca records were calibrated using the respective linear regression equations of the bimonthly correlations obtained for each of the core records from the two sites. The 95% confidence intervals of the regressions are indicated. Regression equations are provided in Supplementary Table 1.

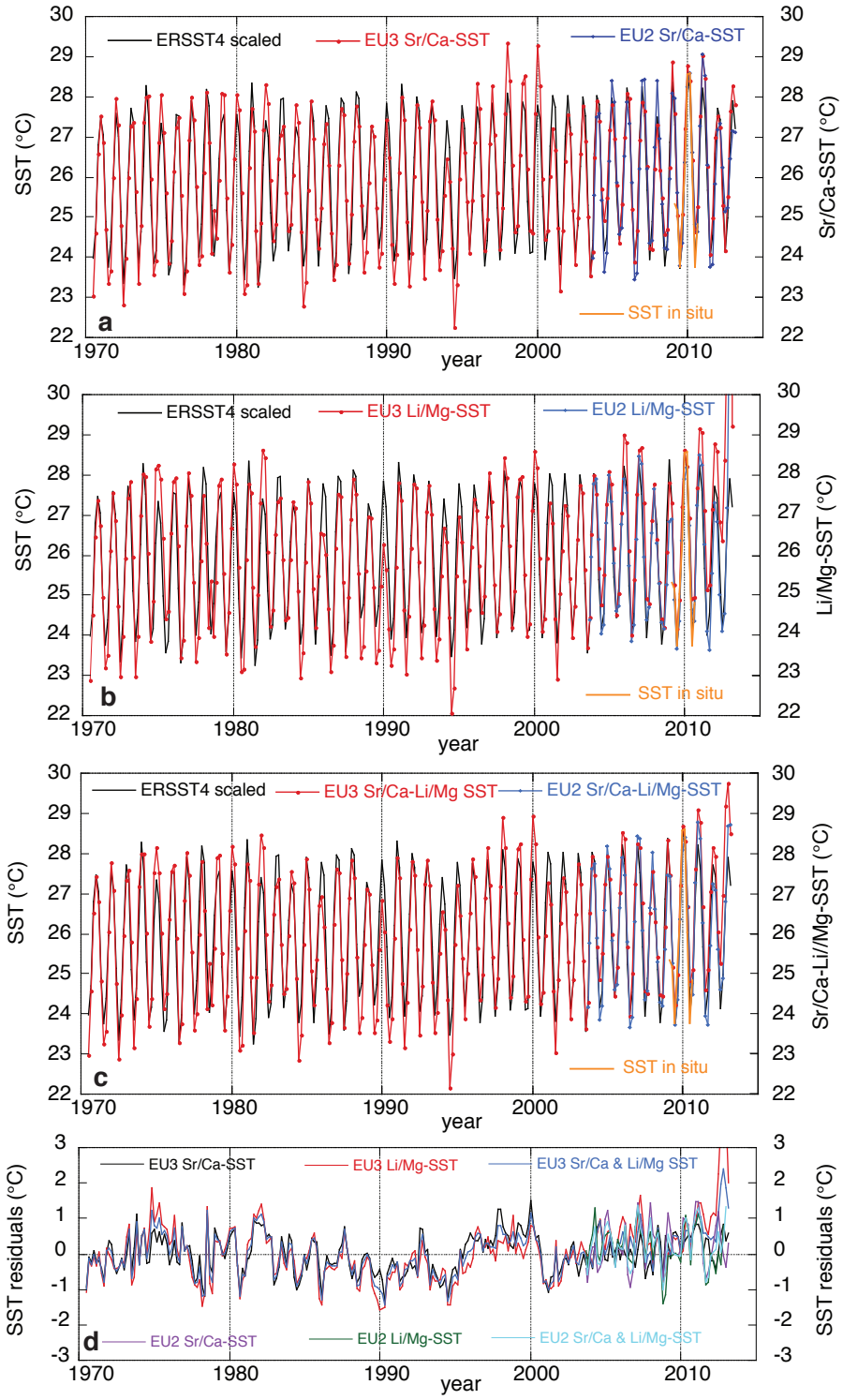

Figure S7 - Absolute SST reconstructions for cores EU2 (blue) and EU3 (red) with SST residuals based on the calibration period 1981 to 2013 for a) Sr/Ca-SST, b) Li/Mg-SST and c) their combination in comparison to ERSSTv4 (black) scaled to *in situ* SST (orange; 2009-2010). d) residuals for Sr/Ca-SST, Li/Mg-SST and their combination for cores EU2 and EU3 with respect to the ERSSTv4 data.

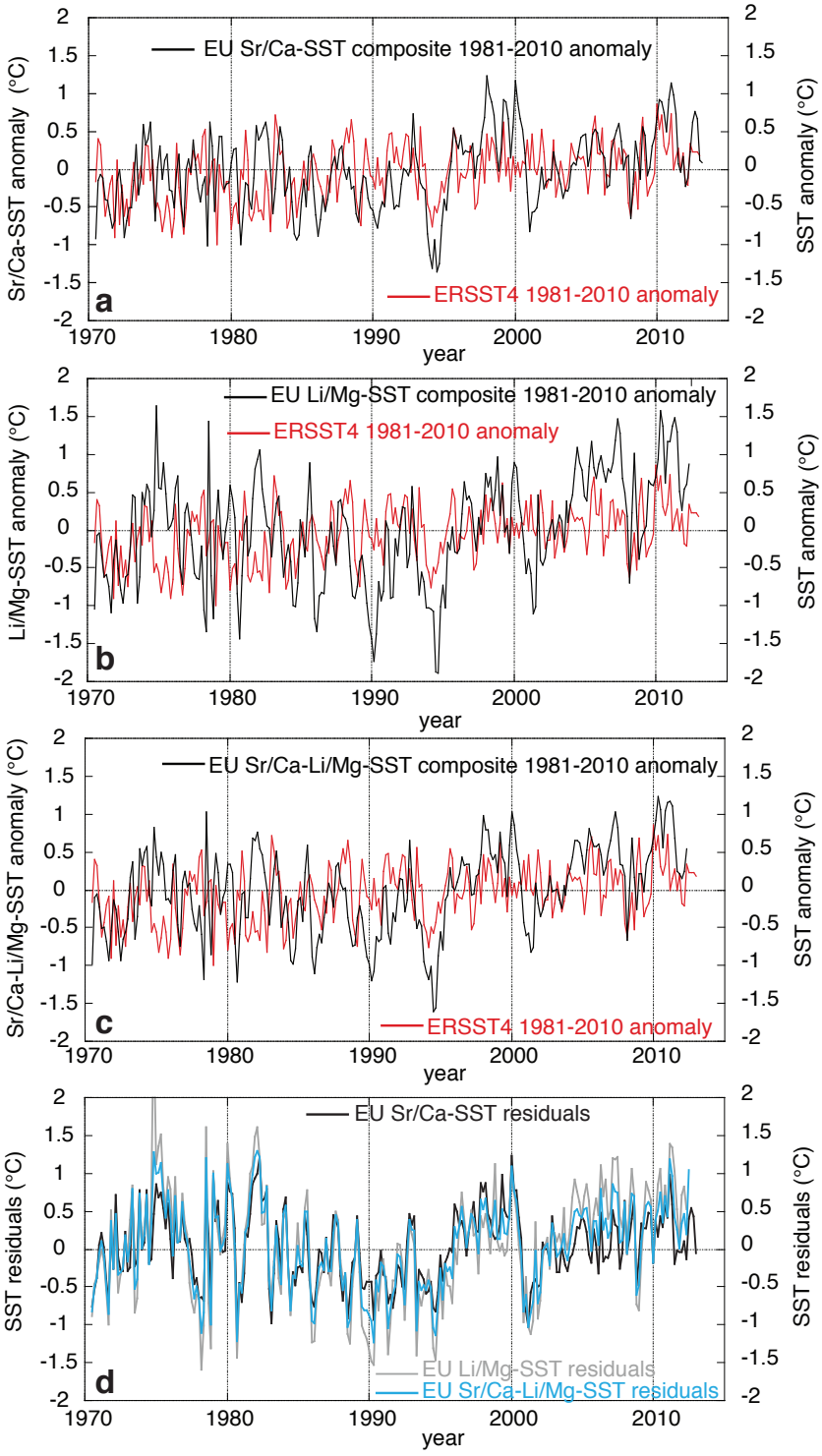

Figure S8 - SST anomaly reconstructions with SST residuals relative to ERSSTv4 for a) EU composite Sr/Ca, b) EU composite Li/Mg and c) EU composite Sr/Ca and Li/Mg-SST combined. d) residuals for SST anomalies of Sr/Ca-SST, Li/Mg-SST and their combination for cores EU2 and EU3 with respect to the ERSSTv4. Anomalies were calculated relative to the 1981 to 2010 average bimonthly seasonal cycle.

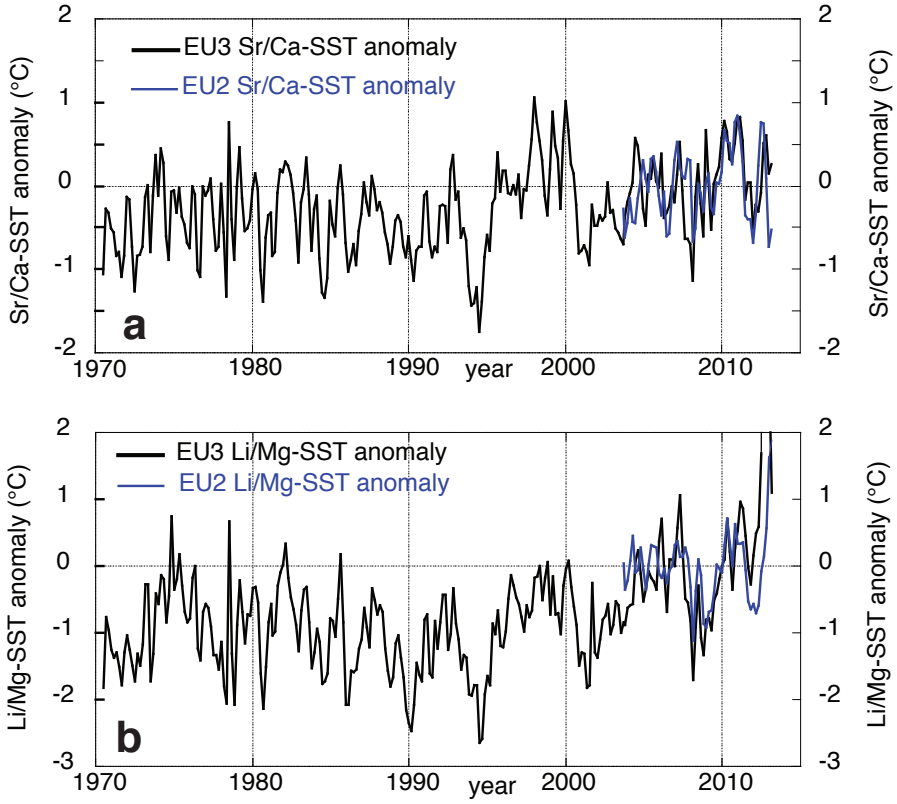

Figure S9 – SST anomaly reconstructions for a) EU3 and EU2 Sr/Ca and b) EU3 and EU2 Li/Mg. Anomalies were calculated relative to the 2003 to 2012 average bimonthly seasonal cycle where both cores overlap.

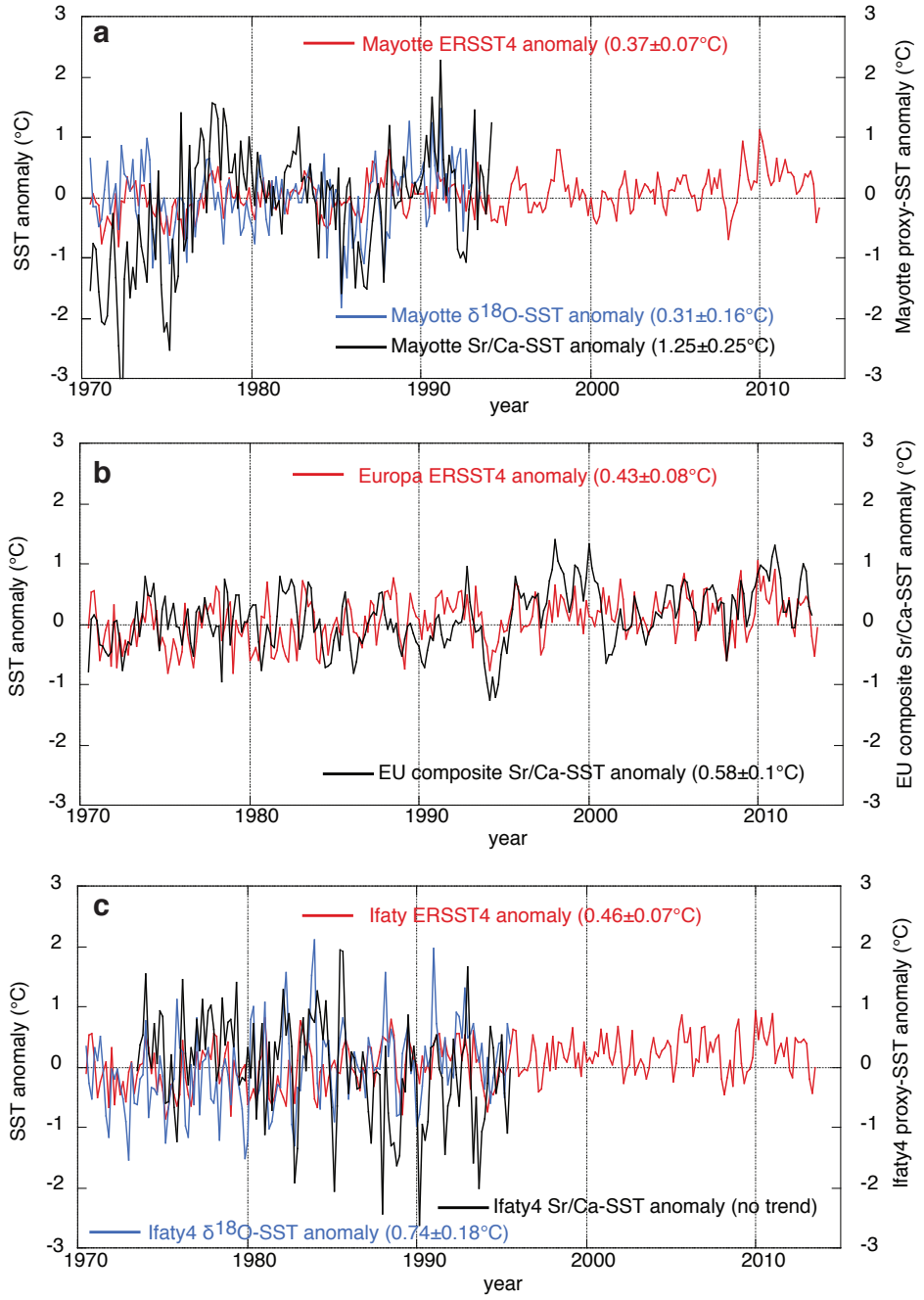

Figure S10 - Regional comparison of Mozambique Channel ERSSTv4 anomalies (red line) and coral proxy-derived SST anomalies (Sr/Ca = black line; $d^{18}O$ = blue line) between 1970 and 2013 for a) Mayotte, Comoros b) Europa and c) Ifaty Reef, southwest Madagascar. Anomalies calculated relative to 1973-1993 period. Linear warming trends indicated in brackets for ERSSTv4 (1970-2013) and proxy-SST for individual record length. Proxy data taken from Zinke et al. (2004, 2008).

core	proxy	slope	Conf. interval	intercept	Conf. interval	r^2	r^2 adj.	SSE	RMSE	DF
EU2	Sr/Ca vs Li/Mg	0.964	0.079	-7.244	0.720	0.91	0.91	0.040	0.027	54
	Sr/Ca vs. Mg/Ca	-1.028	0.236	13.735	2.138	0.60	0.60	0.354	0.081	54
	Sr/Ca vs. Li/Ca	2.730	0.381	-18.155	3.452	0.82	0.82	0.924	0.130	54
	Li/Mg vs Mg/Ca	-1.089	0.217	6.040	0.322	0.67	0.66	0.299	0.074	54
	Li/Mg vs Li/Ca	2.803	0.324	2.393	0.480	0.87	0.87	0.665	0.111	54
	Li/Ca vs Mg/Ca	-1.341	0.530	12.481	2.356	0.34	0.32	3.429	0.252	54
EU3	Sr/Ca vs Li/Mg	1.350	0.047	-10.658	0.419	0.92	0.92	0.286	0.033	259
	Sr/Ca vs. Mg/Ca	-3.117	0.213	32.424	1.909	0.76	0.76	5.931	0.151	259
	Sr/Ca vs. Li/Ca	1.730	0.239	-9.053	2.136	0.41	0.41	7.429	0.169	259
	Li/Mg vs Mg/Ca	-2.355	0.125	7.891	0.176	0.84	0.84	4.027	0.124	259
	Li/Mg vs Li/Ca	1.233	0.172	4.668	0.242	0.40	0.40	7.564	0.171	259
	Li/Ca vs Mg/Ca	-0.259	0.085	7.588	0.392	0.03	0.03	12.25	0.217	259

Table S1 – Robust linear regression equations for core EU2 and EU3 trace element ratios. Conf. interval= 95% confidence interval of the regression slopes and intercepts; r^2 adj.= r^2 adjusted; SSE= Standard Error; RMSE= Root Mean Square Error; DF= degrees of freedom (N-2).

year	EU3 extension*	EU3 extension°	EU3 density*	EU3 calcification*	EU3 calcification°	EU2 extension*	EU2 extension°	EU2 density*	EU2 calcification*	EU2 calcification°
1968	1.346		1.526	2.054		0.762		1.653	1.259	
1969	1.016		1.523	1.547		1.041		1.552	1.616	
1970	1.448		1.562	2.262		0.864		1.629	1.407	
1971	1.854	1.757	1.577	2.925	2.771	1.067		1.615	1.722	
1972	0.762	1.378	1.493	1.138	2.058	0.914		1.570	1.435	
1973	0.686	1.461	1.492	1.023	2.180	0.914		1.693	1.548	
1974	1.118	1.417	1.503	1.679	2.130	1.397		1.762	2.461	
1975	1.219	1.261	1.477	1.801	1.863	0.889		1.740	1.547	
1976	1.168	1.210	1.468	1.715	1.776	0.991		1.758	1.742	
1977	1.473	0.961	1.486	2.188	1.429	1.041		1.687	1.757	
1978	1.067	0.988	1.474	1.572	1.457	0.940		1.664	1.564	
1979	0.991	1.223	1.468	1.454	1.795	0.864		1.518	1.311	
1980	1.168	1.208	1.424	1.664	1.720	0.914		1.529	1.398	
1981	0.991	1.376	1.395	1.382	1.920	1.106		1.491	1.649	
1982	1.295	1.260	1.402	1.816	1.766	1.194		1.804	2.154	
1983	0.686	1.098	1.380	0.946	1.516	1.067		1.781	1.900	
1984	0.940	1.049	1.424	1.338	1.494	1.016		1.863	1.893	
1985	0.483	1.407	1.413	0.682	1.989	0.965		1.841	1.777	
1986	1.245	0.813	1.434	1.784	1.166	1.140		1.862	2.123	
1987	1.422	1.191	1.468	2.089	1.749	0.940		1.499	1.409	
1988	1.118	1.085	1.521	1.700	1.651	1.140		1.495	1.705	
1989	0.965	1.587	1.554	1.500	2.467	0.864		1.612	1.392	
1990	1.067	1.471	1.569	1.674	2.308	0.838		1.576	1.321	
1991	1.118	1.197	1.549	1.731	1.854	0.940		1.549	1.456	
1992	1.219	1.254	1.463	1.784	1.835	1.168		1.507	1.761	
1993	1.448	1.137	1.381	1.999	1.570	0.813		1.386	1.126	
1994	1.295	1.211	1.440	1.865	1.744	1.168		1.447	1.691	
1995	1.549	1.372	1.484	2.299	2.036	1.473		1.417	2.088	
1996	1.092	1.309	1.561	1.705	2.043	1.067		1.369	1.460	
1997	1.524	1.321	1.540	2.347	2.035	1.293		1.303	1.685	
1998	0.991	1.185	1.465	1.451	1.736	1.447		1.563	2.261	
1999	1.219	1.479	1.408	1.717	2.082	1.174		1.618	1.900	
2000	1.169	1.031	1.477	1.726	1.523	1.106		1.461	1.616	
2001	1.118	1.280	1.512	1.689	1.936	1.422		1.467	2.087	
2002	1.905	1.614	1.545	2.944	2.494	1.118		1.566	1.750	
2003	1.524	1.567	1.525	2.324	2.390	1.397		1.656	2.313	
2004	1.295	1.446	1.508	1.954	2.181	1.092	1.530	1.580	1.726	2.270
2005	1.422	1.351	1.450	2.063	1.959	0.864	1.086	1.512	1.306	1.761
2006	1.372	1.370	1.453	1.993	1.991	0.914	1.274	1.448	1.324	1.837
2007	1.346	1.386	1.451	1.953	2.011	1.372	1.333	1.427	1.957	1.794
2008	1.194	1.205	1.438	1.717	1.733	0.813	1.234	1.494	1.214	2.069
2009	1.194	1.305	1.448	1.729	1.889	0.965	1.240	1.523	1.470	1.831
2010	1.245	1.189	1.459	1.815	1.735	1.067	1.173	1.681	1.793	1.907
2011	1.169	1.350	1.520	1.776	2.052	1.270	1.091	1.799	2.284	2.017
2012	1.092	1.130	1.515	1.654	1.712	1.194	1.132	1.640	1.958	1.862
mean 2003-2012	**1.285**	**1.330**	**1.477**	**1.898**	**1.965**	**1.095**	**1.232**	**1.576**	**1.735**	**1.928**
mean 1968-2012	**1.201**	**1.283**	**1.481**	**1.782**	**1.899**	**1.067**		**1.591**	**1.696**	
STDV 1968-2012	**0.273**	**0.187**	**0.053**	**0.429**	**0.314**	**0.188**		**0.138**	**0.323**	

By using *coralXDS °Sr/Ca

Table S2 – Mean annual coral growth parameters (linear extension rate in cm yr^{-1}, density in g cm^{-3} and calcification rate in g cm^{-2} yr^{-1}) for cores EU2 and EU3 determined as distance between annual density bands in CoralXDS and the distance between Sr/Ca maxima in both cores. Mean values are indicated for the periods 2003-2012 and 1968-2012 for which both core time series overlap.