Supplementary Table 1. Analytical data for Cariaco Basin sediments. Core depths are reported as centimeters below the seafloor (cmbsf). Average calculated values for the authigenic Cr isotope composition ($\delta^{53}Cr_{auth}^{avg}$) use the mean Cr/Ti value from lower oxic sediments as a detrital background. Isotope values for acid leach experiments are reported as $\delta^{53}Cr_{leach}$, along with the acid strength employed during each leaching experiment ($[HNO_3]$). External reproducibility (uniform 2σ) is 0.09‰.

Depth	**Cr**	**Ti**	f_{auth}^{avg}	$\delta^{53}Cr_{bulk}$	$\delta^{53}Cr_{auth}^{avg}$	$\delta^{53}Cr_{leach}$	$[Cr]_{leach}$	$[HNO_3]$	$[Ti]_{leach}$	$[Al]_{leach}$
cmbsf	**μg g^{-1}**	**μg g^{-1}**	-	**‰**	**‰**	**‰**	μg g^{-1}	**N**	μg g^{-1}	wt%
10	94	2700	0.41							
15	91	2700	0.39							
20	96	2200	0.53	0.33	0.51	0.57	35.67	1.20	0.009	0.45
25	95	2600	0.44							
30	98	2600	0.46							
35	98	2360	0.51	0.35	0.57	0.56	37.21	1.20	0.009	0.46
45	100	2800	0.43							
55	97	2600	0.45							
85	106	2700	0.48							
115	104	2470	0.51	0.32	0.50	0.53	37.06	1.20	0.009	0.43
125	101	2600	0.47							
155	113	2900	0.47							
200	113	2830	0.49	0.34	0.56	0.56	37.41	1.20	0.009	0.43
215	120	3000	0.49							
245	108	2470	0.53	0.38	0.60					
260	132	2880	0.55	0.27	0.38	0.57	37.11	1.20	0.007	0.40
275	121	2750	0.53	0.24	0.33	0.48	39.53	0.60	0.008	0.42
275	121	2750	0.53	0.24	0.33	0.54	51.08	3.00	0.012	0.57
290	135	3100	0.53							
340	114	3200	0.43							
380	107	3000	0.43							
420	76	2160	0.42	0.38	0.74	0.54	26.05	1.20	0.007	0.28
440	71	2000	0.42							
450	73	1930	0.46	0.32	0.55	0.66	26.73	0.60	0.006	0.30
450	73	1930	0.46	0.32	0.55	0.66	35.59	3.00	0.010	0.43
450	73	1930	0.46	0.32	0.55	0.66	36.77	6.00	0.008	0.45
470	62	1620	0.47	0.37	0.65	0.65	25.73	0.60	0.007	0.31
470	62	1620	0.47	0.37	0.65	0.62	32.96	3.00	0.009	0.43
490	77	2300	0.39							

510	89	2410	0.45	0.28	0.47	0.55	36.31	1.20	0.009	0.40
530	96	2700	0.42							
550	83	2200	0.46							
570	93	2800	0.38							
590	104	2600	0.49							
600	107	3100	0.41							
610	111	3900	0.28							
615	106	2840	0.45	0.34	0.60	0.59	33.56	0.60	0.010	0.44
615	106	2840	0.45	0.34	0.60	0.56	42.16	3.00	0.012	0.57
615	106	2840	0.45	0.34	0.60	0.60	45.08	6.00	0.010	0.57
620	101	3200	0.35							
625	99	2970	0.39	0.26	0.47	0.54	27.34	0.60	0.008	0.33
625	99	2970	0.39	0.26	0.47	0.55	39.94	3.00	0.012	0.56
625	99	2970	0.39	0.26	0.47	0.52	39.31	6.00	0.009	0.55
635	94	3400	0.26							
648.75	110	3200	0.40							
651.25	117	4500	0.21							
660	93	3400	0.25							
665	77	3250	0.14			0.27	27.00	0.60	0.006	0.60
665	77	3250	0.14			0.25	26.51	3.00	0.010	0.57
665	77	3250	0.14			0.24	27.15	6.00	0.008	0.62
670	72	3700	0.00							
675	81	3590	0.09			0.24	21.47	3.00	0.005	0.30
675	81	3590	0.09			0.20	13.94	6.00	0.008	0.58
680	91	3320	0.25	0.17	0.27					
685	81	3900	0.01							
710	100	4900	0.00			-0.04	16.96	1.20	0.009	0.34
725	82	5000	0.00							
730	59	5600	0.00							
740	83	5400	0.00							
755	123	4900	0.18	0.12	0.02					
760	105	5500	0.00							
770	100	4970	0.00	0.09	0.09					
785	79	4300	0.00							