[Geochemistry, Geophysics, Geosystems]

Supporting Information for

Variable crustal production originating from mantle source heterogeneity beneath the South East Indian Ridge and Amsterdam-St. Paul Plateau

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Introduction

- This supporting information provides magnetic anomalies and residual depth of the St. Paul Amsterdam Plateau and two tables with geochemical data used in this study.

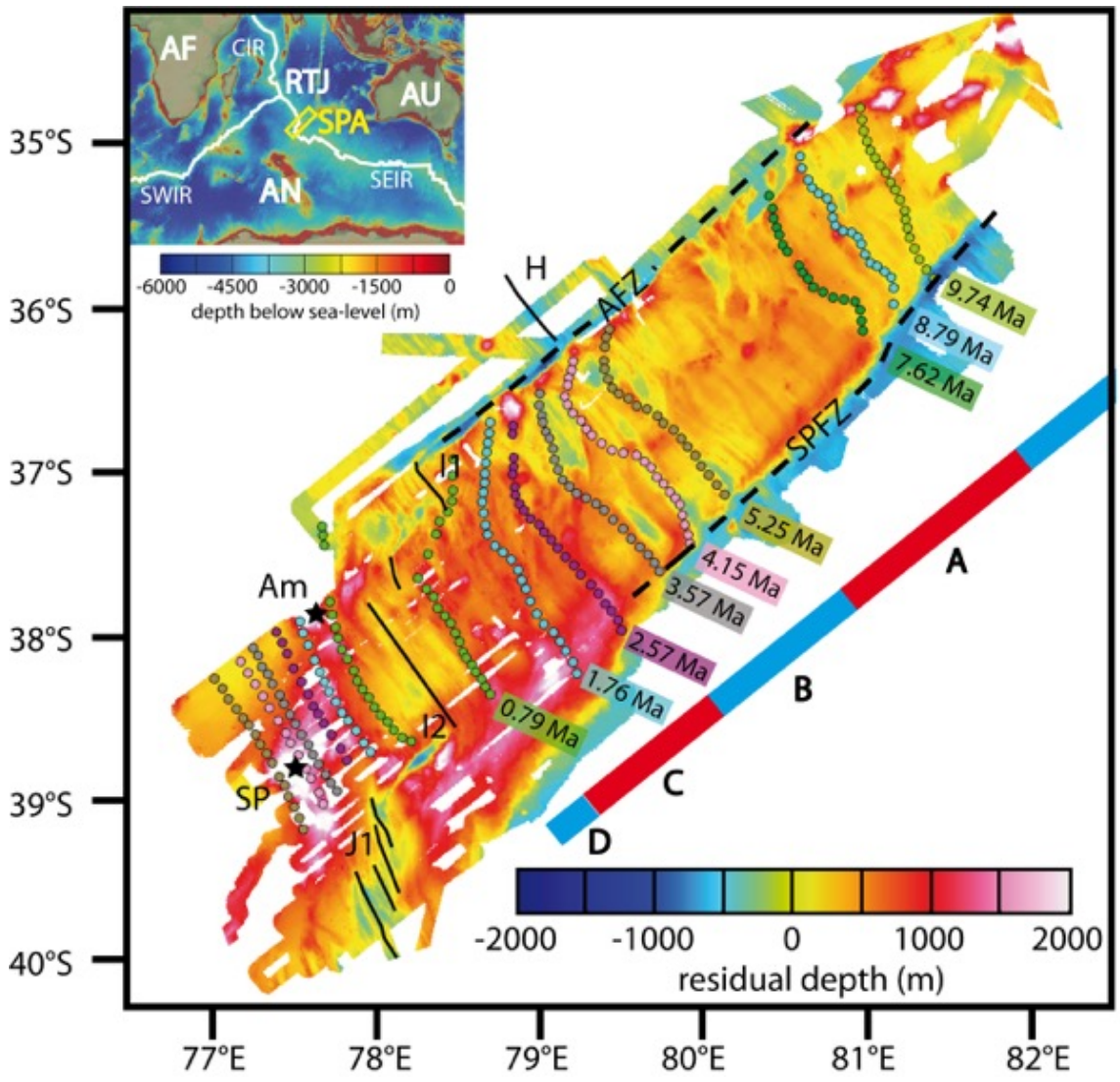

Figure S1. Magnetic anomalies and Residual depths computed from the multibeam bathymetry and the removal of a subsidence trend with the square root of age. Depth around "zero" correspond to normal depths for the considered age. Black lines and dashed lines as for Figure 1.

Sample	Segment	Lat (°S)	Long (°E)	$^{3}He/^{4}He$ (R/Ra)	2σ	[He] 10^{-6} cm^3 STP/g
d65-a	I2N	37.93	78.10	10.77	0.26	0.12
wc36a	I2S	38.31	78.48	12.16	0.26	0.084
wc32a	J1	38.9	78.08	10.48	0.09	5.76
d50-a	J2	39.98	78.55	9.46	0.09	7.12
wc23a	J2	40.10	78.59	8.57	0.14	0.33

Table S1. New helium isotope results for Southeast Indian Ridge basalt glasses recovered by the Boomerang 06 expedition.

Sample	Segment	Lat (°S)	Long (°E)	K/Ti	Na_8	Δ8/4Pb	H_2O/Ce	$^3He/^4He$ (R/Ra)	2σ	[He] 10^{-6} cm^3 STP/g
d72-a	H	36.34	79.12	0.08	2.04					
d72-b	H	36.34	79.12	0.08	2.14					
d72-c	H	36.34	79.12	0.08	2.05					
d73-1	H	36.07	78.83	0.47	2.47					
d73-2	H	36.07	78.83	0.45	2.41					
d73-3	H	36.07	78.83	0.45	2.46	65.00	223	13.53	0.07	4.39
d73-4	H	36.07	78.83	0.05	1.99	71.38				
d73-5	H	36.07	78.83	0.05	1.89			10.43	0.05	18.60
d73-6	H	36.07	78.83	0.37	2.24	64.16	198	10.69	0.06	3.01
d74-a	H	35.84	78.61	0.12	2.31					
d74-c	H	35.84	78.61	0.12	2.28					
wc46a	H	36.18	78.95	0.24	2.43	60.84	215	12.63	0.07	2.36
wc46b	H	36.18	78.95	0.21	2.38					
wc46c	H	36.18	78.95	0.17	2.37					
wc47c	H	35.94	78.71	0.17	2.21					
wc47H	H	35.94	78.71	0.18	2.70	57.39	330	14.13	0.07	3.34
wc48a	H	35.80	78.60	0.20	2.11					
wc48b	H	35.80	78.60	0.18	2.17	66.11		11.94	0.07	1.66
wc48c	H	35.80	78.60	0.19	2.14					
wc49a	H	35.64	78.46	0.25	2.16			11.85	0.06	6.63
wc49b	H	35.64	78.46	0.25	2.12					
wc50a	H	35.53	78.35	0.14	2.03			12.86	7.00	1.07
wc50b	H	35.53	78.35	0.14	2.06					
wc50c	H	35.53	78.35	0.14	2.09					
d70-1	I1	37.17	78.40	0.26	2.18	50.69		9.63	0.06	1.55
d70-2	I1	37.17	78.40	0.26	2.09					
d70-3	I1	37.17	78.40	0.26	2.13					
d70-4	I1	37.17	78.40	0.27	2.15					
d70-5	I1	37.17	78.40	0.26	2.23					
d70-a	I1	37.17	78.40	0.26	2.15					
d71-1	I1	37.06	78.24	0.21	2.19			9.56	0.06	0.30
d71-2	I1	37.06	78.24	0.23	2.29					
d71-3	I1	37.06	78.24	0.23	2.24	82.38		9.57	0.05	2.20
d71-4	I1	37.06	78.24	0.23	2.25					
d71-5	I1	37.06	78.24	0.22	2.29					

wc43a	I1	37.12	78.33	0.24	2.31	83.41	220	9.47	0.05	9.80
wc43b	I1	37.12	78.33	0.25	2.26	83.41		9.47	0.05	9.80
wc43c	I1	37.12	78.33	0.25	2.27	83.41		9.47	0.05	9.80
d65-a	I2N	37.93	78.10	0.51	2.18			10.77	0.26	0.12
d65-b	I2N	37.93	78.10	0.47	2.19					
d65-c	I2N	37.93	78.10	0.48	2.16					
d66-1	I2N	37.80	77.99	0.32	2.32	69.57		9.67	0.07	0.38
d66-2	I2N	37.80	77.99	0.33	2.30					
d66-3	I2N	37.80	77.99	0.33	2.30					
d66-4	I2N	37.80	77.99	0.32	2.26					
d67-1	I2N	37.58	78.10	0.33	2.33	82.68		9.86	0.13	0.08
d67-2	I2N	37.58	78.10	0.33	2.29					
d67-3	I2N	37.58	78.10	0.34	2.23					
wc38a	I2N	37.86	78.19	0.36	2.27	65.81		11.34	0.06	0.57
wc38b	I2N	37.86	78.19	0.36	2.26	65.81				
wc38c	I2N	37.86	78.19	0.37	2.28	65.81				
wc39a	I2N	37.97	78.06	0.48	2.31					
wc39b	I2N	37.97	78.06	0.47	2.20					
wc39c	I2N	37.97	78.06	0.47	2.29					
d62-a	I2S	38.39	78.54	0.41	2.10					
d62-b	I2S	38.39	78.54	0.40	2.16					
d63-1	I2S	38.20	78.37	0.35	2.21	91.87	185	11.57	0.06	4.58
d63-2	I2S	38.20	78.37	0.36	2.18					
d63-3	I2S	38.20	78.37	0.36	2.20					
d63-4	I2S	38.20	78.37	0.35	2.17					
d63-5	I2S	38.20	78.37	0.35	2.16					
d64-1	I2S	37.98	78.16	0.49	2.24					
d64-2	I2S	37.98	78.16	0.61	2.23	75.23	204	11.11	0.06	4.58
d64-3	I2S	37.98	78.16	0.49	2.22					
d64-4	I2S	37.98	78.16	0.61	2.25					
d64-5	I2S	37.98	78.16	0.61	2.17					
d64-6	I2S	37.98	78.16	0.49	2.18					
d64-7	I2S	37.98	78.16	0.49	2.31					
d64-8	I2S	37.98	78.16	0.48	2.28	81.60	199	11.72	0.08	0.60
d64-9	I2S	37.98	78.16	0.49	2.28					
d64-10	I2S	37.98	78.16	0.48	2.26					
d64-11	I2S	37.98	78.16	0.58	2.23					

wc35a	I2S	38.43	78.59	0.33	2.24	91.10		10.27	0.06	0.88
wc35b	I2S	38.43	78.59	0.33	2.21	91.10				
wc35c	I2S	38.43	78.59	0.32	2.22	91.10				
wc36a	I2S	38.31	78.48	0.39	2.27			12.16	0.26	0.08
wc36b	I2S	38.31	78.48	0.40	2.29					
wc36c	I2S	38.31	78.48	0.41	2.21					
wc37a	I2S	38.09	78.25	0.41	2.31	72.54	189	12.21	0.08	0.11
wc37b	I2S	38.09	78.25	0.42	2.21	72.54				
wc37c	I2S	38.09	78.25	0.42	2.23	72.54				
d55-1	J1	39.29	78.19	0.28	2.39	124.58		10.56	0.08	0.31
d55-2	J1	39.29	78.19	0.27	2.39					
d59-1	J1	39.12	78.14	0.33	2.42	124.25	182	11.89	0.08	0.61
d59-2	J1	39.12	78.14	0.34	2.42					
d59-3	J1	39.12	78.14	0.35	2.39					
d59-4	J1	39.12	78.14	0.32	2.30					
d59-5	J1	39.12	78.14	0.33	2.34					
d59-6	J1	39.12	78.14	0.34	2.39					
d59-7	J1	39.12	78.14	0.33	2.38					
d60-1	J1	38.96	78.11	0.26	2.33	119.10		10.44	0.08	2.12
d60-2	J1	38.96	78.11	0.28	2.26					
d60-3	J1	38.96	78.11	0.27	2.23					
d60-4	J1	38.96	78.11	0.26	2.30					
d61-1	J1	38.95	78.13	0.28	2.41	114.75		10.02	0.10	0.09
d61-2	J1	38.95	78.13	0.27	2.43					
d61-3	J1	38.95	78.13	0.27	2.38					
d61-4	J1	38.95	78.13	0.27	2.40					
wc26a	J1	39.42	78.22	0.24	2.47					
wc26b	J1	39.42	78.22	0.25	2.46					
wc26c	J1	39.42	78.22	0.24	2.51					
wc30a	J1	39.21	78.18	0.30	2.47					
wc30b	J1	39.21	78.18	0.29	2.33					
wc30c	J1	39.21	78.18	0.29	2.42					
wc31a	J1	39.02	78.14	0.31	2.49					
wc31b	J1	39.02	78.14	0.31	2.49					
wc31c	J1	39.02	78.14	0.31	2.45					
wc32a	J1	38.90	78.08	0.25	2.50			10.48	0.09	5.76
wc32b	J1	38.90	78.08	0.26	2.54					

wc32d	J1	38.90	78.08	0.26	2.56					
wc32e	J1	38.90	78.08	0.25	2.53					
wc32c	J1	38.90	78.08	0.25	2.48					
wc33a	J1	38.84	78.05	0.23	2.47					
wc33b	J1	38.84	78.05	0.23	2.53					
wc33c	J1	38.84	78.05	0.24	2.44					
d48-1	J2	39.81	78.40	0.16	2.44					
d48-2	J2	39.81	78.40	0.17	2.41	98.74		9.36	0.05	6.78
d48-3	J2	39.81	78.40	0.16	2.42					
d48-4	J2	39.81	78.40	0.16	2.44			8.61	0.05	3.21
d49-1	J2	39.82	78.60	0.23	2.40					
d49-3	J2	39.82	78.60	0.25	1.87					
d50-a	J2	39.98	78.55	0.23	2.40	103.57				
d50-b	J2	39.98	78.55	0.25	2.47					
d50-c	J2	39.98	78.55	0.25	2.43					
d51-1	J2	40.21	78.63	0.24	2.35	115.49	179	8.93	0.06	0.39
d51-a	J2	40.21	78.63	0.24	2.33					
d51-b	J2	40.21	78.63	0.23	2.35					
d51-c	J2	40.21	78.63	0.23	2.34					
d53-1	J2	39.54	78.18	0.25	2.46					
d54-1	J2	39.43	78.09	0.21	2.38					
d54-2	J2	39.43	78.09	0.26	2.42					
d54-3	J2	39.43	78.09	0.27	2.39					
d54-4	J2	39.43	78.09	0.22	2.40					
d54-5	J2	39.43	78.09	0.26	2.38					
d54-6	J2	39.43	78.09	0.26	2.42					
wc21a	J2	39.89	78.48	0.20	2.33					
wc21b	J2	39.89	78.48	0.22	2.35					
wc21c	J2	39.89	78.48	0.20	2.32					
wc23a	J2	40.10	78.59	0.18	2.32			8.57	0.14	0.33
wc23b	J2	40.10	78.59	0.18	2.33					
wc23c	J2	40.10	78.59	0.18	2.41					
wc25a	J2	39.65	78.24	0.34	2.46					
wc25b	J2	39.65	78.24	0.34	2.52					
wc25c	J2	39.65	78.24	0.33	2.50					
wc29a	J2	39.32	77.99	0.24	2.25					
wc29b	J2	39.32	77.99	0.24	2.21					

wc29c	J2	39.32	77.99	0.24	2.25

Table S2. K/Ti, Na_8, Δ8/4Pb, H_2O/Ce and $^3He/^4He$ compiled data for basalts glass samples along the Southeast Indian Ridge (Graham et al., 1999; Douglas Priebe, 1998; Nicolaysen et al., 2007; Loewen et al., 2019).