

Table S5. Whole rock major and trace element data

	analysis at NASA, Johnson Space Center (1984)													
	analysis Hamilton College (2021)													
Type I Xenoliths									Composite Xenoliths					
Sample XRF major elements	pk-G-20-1	pk-G-20-7	pk-G-20-12	pk-G-21-12	pk-G-23B-2	pk-G-23B-4	pk-G-23B-5	pk-G-ZH1	pk-G-21-6a	pk-G-21-6b	pk-G-20-10B	pk-G-20-10V	pk-G-20-10H	
	Type Ia	Type Ia	Type Ib	Type Ib	Type Ia	Type Ia	Type Ia	Type Ib	Type Ib/	Type Ib/	Type II/	Type II/	Type II/	
	Iherzolite	Iherzolite	harzburgite	Iherzolite	Iherzolite	Iherzolite	websterite	Iherzolite	Type Ib	Type Ib	Type Ia	Type Ia	Type Ia	
	SiO ₂	43.15	47.16	45.50	45.09	43.28	43.98	43.90	44.30	42.87	44.34	44.88	50.92	44.32
	TiO ₂	0.04	0.135	0.073	0.096	0.10	0.10	0.10	0.08	0.095	0.095	0.143	0.521	0.130
	Al ₂ O ₃	1.69	4.16	1.82	2.59	3.06	3.02	3.41	2.57	1.39	1.36	3.99	7.44	3.73
	FeO*	8.15	8.01	8.07	7.60	8.25	7.91	8.24	8.61	9.99	10.38	9.04	4.70	9.03
	MnO	0.11	0.139	0.132	0.128	0.13	0.12	0.13	0.10	0.159	0.164	0.142	0.125	0.148
	MgO	44.80	35.85	41.92	40.32	39.36	40.68	40.54	41.21	38.69	40.52	37.35	19.63	37.68
	CaO	1.23	3.34	1.46	2.71	3.70	2.78	2.59	2.09	2.53	2.60	3.34	14.73	3.41
	Na ₂ O	0.14	0.25	0.06	0.15	0.33	0.28	0.25	0.30	0.17	0.18	0.19	0.97	0.19
	K ₂ O	bd	0.00	0.04	0.00	0.01	bd	bd	0.02	0.01	0.00	0.00	0.00	0.00
P ₂ O ₅	0.01	0.015	0.030	0.017	bd	bd	bd	0.02	0.030	0.030	0.020	0.010	0.018	
LOI (%)	0.45	-0.05	-0.34	0.10	0.38	0.65	0.49	bd	3.03	-0.39	-0.05	0.23	-0.11	
Total (wt%)	99.77	99.53	99.33	99.44	98.60	99.52	99.65	99.30	99.45	99.78	99.51	99.43	99.06	
Fe ²⁺ /(Fe ₂₊ +Fe ³⁺)	0.974	0.957	n.d.	0.927	0.899	0.965	0.911	n.d.	n.d.	0.954	n.d.	n.d.	0.953	
Mg number	0.91	0.89	0.90	0.90	0.89	0.90	0.90	0.90	0.87	0.87	0.88	0.88	0.88	
XRF Trace Elements (ppm)														
Ni		1842	2378	2194					2031	2122	1976	506	2030	
Cr		3108	3181	3322					2583	2716	2385	569	2729	
V		88	54	63					49	52	84	280	89	
Sc		17	10	14					11	12	16	47	16	
Cu		16	7	2					3	2	23	43	14	
Zn		55	56	55					61	62	65	26	69	
Ba		4	26	4					14	9	6	5	3	
Sr		6	17	7					23	20	9	31	9	
Y		6	1	4					3	3	4	12	5	
Zr		2	3	1					4	3	1	16	3	
Hf		2.1	2.4	0.8					3.0	2.6	1.8	3.2	1.5	
Nb		0.8	2.1	0.1					0.4	1.6	0.7	1.5	1.3	
Type I Xenoliths									Composite Xenoliths					
Sample	pk-G-20-1	pk-G-20-7	pk-G-20-12	pk-G-21-12	pk-G-23B-2	pk-G-23B-4	pk-G-23B-5	pk-G-ZH1	pk-G-21-6a	pk-G-21-6b	pk-G-20-10B	pk-G-20-10V	pk-G-20-10H	
	Type Ia	Type Ia	Type Ib	Type Ib	Type Ia	Type Ia	Type Ia	Type Ib	Type Ib/	Type Ib/	Type II/	Type II/	Type II/	
	Iherzolite	Iherzolite	harzburgite	Iherzolite	Iherzolite	Iherzolite	websterite	Iherzolite	Type Ib	Type Ib	Type Ia	Type Ia	Type Ia	
LA-ICP-MS														
Major elements (wt%)														
K ₂ O		0.006	0.043	0.006					0.017	0.008	0.008	0.006	0.004	
P ₂ O ₅		0.014	0.030	0.017					0.024	0.025	0.017	0.016	0.015	
Trace elements (ppm)														
Ag		0.06	0.12	0.02					0.49	0.56	0.05	0.09	0.40	
As		0.72	0.31	0.21					0.55	0.54	0.34	0.23	0.24	
Ba		4.3	25	4.8					13	10	5.2	5.5	4.4	
Bi		nd	0.028	0.041					0.005	0.008	0.018	0.040	nd	
Cd		0.07	0.07	0.10					0.08	0.08	0.06	0.12	0.09	
Cr		2763	2768	2827					2179	2266	2070	560	2341	
Cs		0.015	0.018	0.013					0.011	0.007	0.010	0.015	0.013	
Cu		18.8	8.9	6.2					6.7	6.4	26.1	40.2	17.2	
Ga		3.5	1.5	2.2					1.5	1.5	4.0	7.5	3.6	
Ge		0.8	0.6	0.8					0.6	0.6	0.8	1.3	0.8	
Hf		0.21	0.16	0.14					0.25	0.22	0.22	0.76	0.22	
Mo		0.87	1.28	0.90					1.01	1.03	1.01	0.92	0.74	
Nb		1.37	3.12	0.88					1.60	1.40	1.26	1.41	0.91	
Ni		1950	2447	2207					2155	2187	2027	510	2061	
Pb		0.29	0.23	2.13					0.33	0.28	0.44	0.67	0.57	
Rb		0.20	0.74	0.15					0.26	0.10	0.15	0.18	0.09	
Sb		0.51	0.59	0.63					0.65	0.59	0.58	0.70	0.72	
Sc		17.3	11.3	14.0					11.0	11.4	15.7	49.2	15.9	
Sn		0.38	0.70	0.36					0.43	0.49	0.38	1.42	0.62	
Sr		7.4	18.5	7.9					23.8	21.5	10.5	34.4	9.6	
Ta		1.66	2.16	2.68					1.80	1.83	2.47	3.05	1.91	
Th		0.053	0.153	0.036					0.111	0.073	0.089	0.075	0.084	
Tl		0.015	0.001	0.030					0.007	0.013	0.002	0.003	0.009	
U		0.023	0.048	0.011					0.025	0.017	0.027	0.023	0.028	
V		91	56	68					52	53	90	294	85	
Y		3.39	1.06	2.75					1.95	1.94	3.29	11.89	3.38	
Zn		53	55	52					61	63	65	26	69	
Zr		6.1	6.8	4.2					8.3	7.6	6.7	20.3	6.8	
La		0.28	1.14	0.41					1.00	0.89	0.52	1.12	0.46	
Ce		0.71	2.14	0.89					2.74	2.52	1.27	3.68	1.09	
Pr		0.12	0.27	0.15					0.43	0.40	0.20	0.68	0.16	
Nd		0.68	1.00	0.73					1.97	1.82	0.99	4.02	0.85	
Sm		0.29	0.19	0.24					0.46	0.42	0.35	1.41	0.31	
Eu		0.104	0.061	0.093					0.133	0.134	0.118	0.550	0.112	
Gd		0.42	0.20	0.33					0.43	0.49	0.47	2.09	0.42	
Tb		0.078	0.028	0.071					0.068	0.071	0.087	0.334	0.077	
Dy		0.51	0.17	0.47					0.36	0.37	0.55	2.19	0.51	
Ho		0.120	0.034	0.099					0.074	0.070	0.120	0.455	0.122	
Er		0.38	0.087	0.26					0.18	0.20	0.36	1.24	0.33	
Tm		0.065	0.016	0.044					0.025	0.028	0.052	0.185	0.060	
Yb		0.40	0.10	0.30					0.17	0.18	0.36	1.06	0.33	
Lu		0.067	0.019	0.043					0.031	0.029	0.054	0.146	0.054	

nd - not determined
bd - below detection

Table S5. Whole rock major and trace element data

Type II Xenoliths												
Sample	pk-G-21-8H	pk-G-21-8V	pk-G-20-5	pk-G-20-6	pk-G-20-8	pk-G-20-8	pk-G-21-4	pk-G-22-1	pk-G-22-1	pk-G-22-11	pk-G-22-12	pk-G-23B-7
XRF major elements	Type IIa/ Type IIa	Type IIa/ Type IIa	Type II wehrlite	Type IIa wehrlite	Type IIb ol cpxenite	Typ IIb ol cpxenite	Type II ol cpxenite	Type II amph cpxenite	Type II amph cpxenite	Type II amph cpxenite	Type II amph cpxenite	Type II ol cpxenite
SiO ₂	39.20	40.97		37.34	44.32	44.34		43.46	43.62		39.44	
TiO ₂	0.086	1.188		0.23	1.98	1.914		1.99	1.937		2.081	
Al ₂ O ₃	1.90	14.14		2.40	11.63	11.79		11.7	11.52		15.62	
FeO*	16.13	9.38		18.30	9.78	8.78		9.55	9.06		10.97	
MnO	0.244	0.160		0.23	0.18	0.176		0.2	0.176		0.164	
MgO	40.64	17.21		37.52	13.39	13.33		15.28	15.16		15.14	
CaO	0.57	15.41		2.70	17.94	17.67		15.2	15.06		14.03	
Na ₂ O	-0.03	0.58		0.18	1.25	1.24		1.38	1.44		1.09	
K ₂ O	0.02	0.06		bd	bd	0.01		0.32	0.37		0.22	
P ₂ O ₅	0.056	0.064		bd	0.02	0.028		0.01	0.077		0.061	
LOI (%)	-0.30	0.08		0.39	0.50	0.19		1.17	0.99		0.65	
Total (wt%)	98.90	99.45		99.29	100.99	99.59		100.26	99.68		99.64	
Fe ²⁺ /(Fe ₂₊ +Fe ³⁺)	n.d.	0.942		0.932	0.792	0.792		0.859	0.859			
Mg number	0.82	0.77		0.79	0.71	0.73		0.74	0.75		0.71	
XRF Trace Elements												
Ni	1554	390	742.4	850.6	58.8	70	444	225.2	229	87.2	342	244
Cr	2137	796	2298.7	141.6	13.5	18	238.4	510.1	453	81.8	42	777.1
V	44	386	174.3	70.3	395.2	405	256.7	362.3	380	455.3	414	340
Sc	4	51				57			48		50	
Cu	1	12				8			79		71	
Zn	126	159	165.4	135.4	63.9	63	144.2	85	77	58.9	133	94.5
Ba	20	62				3			79		115	
Sr	8	60	15.4	10.2	106	101	54.9	211.9	209	363	174	83.5
Y	3	19	5.5	2.2	26.1	29	14.6	22.3	25	22.1	23	17.4
Zr	0	40	18.8	8.9	80.5	75	51	79.2	74	63.9	58	51.2
Hf	2.7	3.5				3.4			4.6		2.4	
Nb	0.0	1.3	1.3	1.4	2.7	3.6	4.8	15.1	12.9	15.6	10.3	2.4
Type II Xenoliths												
Sample	pk-G-21-8H	pk-G-21-8V	pk-G-20-5	pk-G-20-6	pk-G-20-8	pk-G-20-8	pk-G-21-4	pk-G-22-1	pk-G-22-1	pk-G-22-11	pk-G-22-12	pk-G-23B-7
	Type IIa/ Type IIa	Type IIa/ Type IIa	Type II wehrlite	Type IIa wehrlite	Type IIb ol cpxenite	Typ IIb ol cpxenite	Type II ol cpxenite	Type II amph cpxenite	Type II amph cpxenite	Type II amph cpxenite	Type II amph cpxenite	Type II ol cpxenite
LA-ICP-MS												
Major elements (ppm)												
K ₂ O	0.019	0.052				0.020			0.362		0.220	
P ₂ O ₅	0.038	0.058				0.025			0.075		0.054	
Trace elements (ppm)												
Ag	0.06	0.12				0.11			0.07		0.05	
As	0.48	0.45				0.28			0.64		1.33	
Ba	27	58				7.7			84		113	
Bi	0.009	0.021				nd			0.028		0.028	
Cd	0.05	0.05				0.15			0.12		0.09	
Cr	1811	776				38			462		61	
Cs	0.012	0.031				0.007			0.055		0.023	
Cu	7.0	16.7				14.5			71.9		70.7	
Ga	4.4	25.3				15.6			15.3		23.9	
Ge	0.7	1.5				1.5			1.5		1.4	
Hf	0.10	1.70				3.11			2.49		2.09	
Mo	0.28	0.18				1.05			1.40		1.38	
Nb	0.22	0.62				2.35			13.09		9.14	
Ni	1422	385				78			227		321	
Pb	0.37	1.09				0.20			0.98		0.57	
Rb	0.37	1.06				0.28			5.25		1.51	
Sb	0.83	0.60				0.44			0.73		0.79	
Sc	4.0	54.7				63.8			51.0		50.3	
Sn	0.45	0.84				1.42			1.01		1.07	
Sr	9.9	58.8				108			209		174	
Ta	0.29	0.33				2.14			3.27		0.86	
Th	0.074	0.199				0.152			0.569		0.299	
Tl	0.007	0.007				0.018			0.124		0.012	
U	0.018	0.047				0.038			0.131		0.097	
V	42	399				433			392		419	
Y	1.17	17.09				27.79			23.53		20.98	
Zn	124	152				63			78		126	
Zr	3.6	41.1				74.6			77.7		59.7	
La	0.83	3.10				4.44			8.43		7.91	
Ce	1.35	8.20				14.47			22.11		17.53	
Pr	0.20	1.49				2.73			3.44		2.91	
Nd	0.85	8.39				15.11			16.67		14.30	
Sm	0.22	2.79				4.83			4.58		4.07	
Eu	0.079	1.002				1.688			1.492		1.368	
Gd	0.24	3.34				5.68			4.90		4.56	
Tb	0.035	0.556				0.922			0.783		0.715	
Dy	0.23	3.35				5.42			4.58		4.10	
Ho	0.040	0.662				1.092			0.912		0.792	
Er	0.12	1.66				2.83			2.32		2.07	
Tm	0.016	0.231				0.401			0.324		0.279	
Yb	0.12	1.33				2.35			1.88		1.70	
Lu	0.019	0.182				0.330			0.272		0.231	

nd - not determined
bd - below detection limit