Table S2.1. Run conditions of the AxiosMax WD-XRF

				Background Offset									PHD		Counting Time	
Element	**Sample**	**Line**	**Angle (2Th)**	**Bg1**	**Bg2**	**Tube**	**KV**	**mA**	**Tube Filter**	**Collimator**	**Crystal**	**Detector**	**LL**	**UL**	**Peak**	**Bg**
Fe	Bead	KA	57.5344	-	1.5000	Rh	40	90	No	100	LiF 200	Duplex	35	70	20	20
Mn	Bead	KA	62.9922	-1.5000	1.5000	Rh	40	90	No	300	LiF 200	Duplex	35	70	240	240
Ti	Bead	KA	86.1786	-1.2000	2.6000	Rh	40	90	No	300	LiF 200	Flow	30	70	60	120
Ca	Bead	KA	113.1368	-3.1600	-	Rh	40	90	No	300	LiF 200	Flow	34	68	60	60
K	Bead	KA	136.7132	-5.0000	4.0000	Rh	40	90	No	300	LiF 200	Flow	32	72	120	120
P	Bead	KA	140.9872	-6.0000	2.5000	Rh	40	90	No	300	Ge 111	Flow	36	70	120	120
Si	Bead	KA	109.1064	-	4.0000	Rh	40	90	No	300	PE 002	Flow	30	75	30	60
Al	Bead	KA	144.9052	-5.0000	-	Rh	40	90	No	300	PE 002	Flow	30	78	60	60
Mg	Bead	KA	22.0352	-1.6000	2.0000	Rh	40	90	No	100	PX1	Flow	28	66	240	240
Na	Bead	KA	26.6148	-1.5000	1.5000	Rh	40	90	No	300	PX1	Flow	28	66	240	240
Ba	Bead	LA	87.1496	-2.1500	1.7000	Rh	40	90	No	300	LiF 200	Flow	30	65	240	240
Mo	Pressed Powder	KA	20.2800	-	0.7000	Rh	60	60	No	100	LiF 200	Scint.	28	70	300	300
Nb	Pressed Powder	KA	21.3750	-0.3950	1.8000	Rh	60	60	No	100	LiF 200	Scint.	28	70	300	240
Zr	Pressed Powder	KA	22.5000	Nb Bg1	Nb Bg2	Rh	60	60	No	100	LiF 200	Scint.	28	70	300	240
Y	Pressed Powder	KA	23.7500	-0.5750	0.9500	Rh	60	60	No	100	LiF 200	Scint.	28	70	300	240
Sr	Pressed Powder	KA	25.1060	Y Bg2	0.5940	Rh	60	60	No	100	LiF 200	Scint.	28	70	300	240
U	Pressed Powder	LA	26.1250	Sr Bg2	Rb Bg2	Rh	60	60	No	100	LiF 200	Scint.	28	70	300	240
Rb	Pressed Powder	KA	26.5730	Sr Bg2	0.4770	Rh	60	60	No	100	LiF 200	Scint.	28	70	300	240
Th	Pressed Powder	LA	27.4500	Rb Bg2	Pb Bg2	Rh	60	60	No	100	LiF 200	Scint.	28	70	300	240
Pb	Pressed Powder	LB1	28.2350	Rb Bg2	0.3650	Rh	60	60	No	100	LiF 200	Scint.	28	70	300	240
Ga	Pressed Powder	KA	38.9000	-2.1600	0.5800	Rh	60	60	No	300	LiF 200	Duplex	37	63	300	300
Zn	Pressed Powder	KA	41.7800	-0.8800	0.7200	Rh	60	60	No	300	LiF 200	Duplex	37	63	300	300
W	Pressed Powder	LA	43.0100	Zn Bg2	Ni Bg1	Rh	60	60	No	300	LiF 200	Duplex	37	63	300	300
Ta	Pressed Powder	LA	44.4100	Ni Bg1	Ni Bg2	Rh	60	60	No	300	LiF 200	Duplex	37	63	300	300
Cu	Pressed Powder	KA	45.0100	Ni Bg1	Ni Bg2	Rh	60	60	No	300	LiF 200	Duplex	37	63	300	300
Hf	Pressed Powder	LA	45.8700	Ni Bg1	Ni Bg2	Rh	60	60	No	300	LiF 200	Duplex	37	63	300	300
Er	Pressed Powder	LB1	46.4200	Ni Bg1	Ni Bg2	Rh	60	60	No	300	LiF 200	Duplex	37	63	300	300
Ni	Pressed Powder	KA	48.6500	-5.2500	1.2500	Rh	60	60	No	300	LiF 200	Duplex	37	63	300	300
Yb	Pressed Powder	LA	49.0600	Ni Bg1	Ni Bg2	Rh	60	60	No	300	LiF 200	Duplex	37	63	300	300
Dy	Pressed Powder	LB1	50.2700	Ni Bg1	Ni Bg2	Rh	60	60	No	300	LiF 200	Duplex	37	63	300	300
La	Pressed Powder	LA	82.9228	-0.8000	1.1000	Rh	60	60	No	300	LiF 200	Flow	35	65	300	150
Ce	Pressed Powder	LB1	71.5926	-0.8000	-	Rh	60	60	No	300	LiF 200	Duplex	35	65	300	300
Pr	Pressed Powder	LB1	68.2256	-	0.4200	Rh	60	60	No	300	LiF 200	Duplex	35	65	300	300
Nd	Pressed Powder	LB1	65.0930	-0.5000	0.6500	Rh	60	60	No	300	LiF 200	Duplex	35	65	300	150
Sm	Pressed Powder	LA	66.2442	-0.4000	-	Rh	60	60	No	300	LiF 200	Duplex	35	65	300	300
V	Pressed Powder	KA	123.1798	-2.3700	8.8300	Rh	60	60	No	300	LiF 220	Duplex	28	75	300	200
Cr	Pressed Powder	KA	107.1280	-1.4100	2.8900	Rh	60	60	No	300	LiF 220	Duplex	30	66	300	200
Co	Pressed Powder	KA	77.8710	-3.3900	-	Rh	60	60	No	300	LiF 220	Duplex	36	66	300	300
Sc	Pressed Powder	KA	97.7000	-7.7000	-2.7000	Rh	60	60	No	300	LiF 200	Flow	25	75	300	200

Table S2.2a. Precision and accuracy of major-elements measured by WD-XRF.

AGV-2							BCR-2						
	Average (N samples)	**St. Dev.**	**Recommended value**	**CV (%)**	**Delta (%)**	**N**		**Average (N samples)**	**St. Dev.**	**Recommended value**	**CV (%)**	**Delta (%)**	**N**
Fe2O3	6.785	0.02	6.78	0.288	-1.141	25	**Fe2O3**	13.748	0.035	13.77	0.254	-0.409	23
MnO	0.1	0.001	0.1004	0.581	-1.529	25	**MnO**	0.197	0.001	0.197	0.259	0.243	23
TiO2	1.045	0.003	1.051	0.294	-1.744	25	**TiO2**	2.246	0.007	2.265	0.303	-1.084	23
CaO	5.254	0.02	5.15	0.381	0.749	25	**CaO**	7.097	0.016	7.114	0.219	-0.489	23
K2O	2.92	0.011	2.898	0.384	-0.461	25	**K2O**	1.773	0.005	1.774	0.293	-0.267	23
P2O5	0.486	0.003	0.483	0.691	-0.663	25	**P2O5**	0.356	0.002	0.3593	0.573	-1.159	23
SiO2	59.91	0.338	59.14	0.563	0.049	25	**SiO2**	53.97	0.226	54.00	0.419	-0.302	23
Al2O3	17.099	0.102	17.03	0.595	-0.833	25	**Al2O3**	13.465	0.045	13.48	0.333	-0.354	23
MgO	1.793	0.011	1.8	0.595	-1.635	25	**MgO**	3.58	0.013	3.60	0.355	-0.782	23
Na2O	4.269	0.033	4.204	0.767	0.28	25	**Na2O**	3.177	0.019	3.12	0.588	1.562	23
BaO	0.127	0	0.128	0.344	-1.123	25	**BaO**	0.075	0	0.08	0.564	-2.373	23
BHVO-2							**GSP-2**						
	Average (N samples)	**St. Dev.**	**Recommended value**	**CV (%)**	**Delta (%)**	**N**		**Average (N samples)**	**St. Dev.**	**Recommended value**	**CV (%)**	**Delta (%)**	**N**
Fe2O3	12.295	0.03	12.39	0.246	-0.766	25	**Fe2O3**	4.906	0.011	4.961	0.223	-1.11	25
MnO	0.169	0	0.169	0.258	-0.142	25	**MnO**	0.041	0.001	0.041	1.232	-0.976	25
TiO2	2.728	0.007	2.731	0.263	-0.098	25	**TiO2**	0.663	0.002	0.668	0.263	-0.79	25
CaO	11.307	0.035	11.4	0.307	-0.815	25	**CaO**	2.107	0.007	2.213	0.346	-4.782	25
K2O	0.509	0.002	0.513	0.384	-0.764	25	**K2O**	5.422	0.019	5.457	0.346	-0.65	25
P2O5	0.265	0.002	0.268	0.597	-0.94	25	**P2O5**	0.29	0.002	0.294	0.536	-1.293	25
SiO2	49.376	0.239	49.599	0.484	-0.45	25	**SiO2**	66.933	0.295	67.429	0.441	-0.736	25
Al2O3	13.444	0.065	13.44	0.484	0.027	25	**Al2O3**	14.997	0.071	15.086	0.473	-0.587	25
MgO	7.187	0.038	7.257	0.534	-0.965	25	**MgO**	0.965	0.006	0.972	0.622	-0.695	25
Na2O	2.213	0.016	2.219	0.722	-0.279	25	**Na2O**	2.832	0.02	2.815	0.706	0.62	25
BaO	0.014	0	0.015	2.875	-2.74	25	**BaO**	0.15	0.001	0.152	0.389	-0.673	25

Precision (given as 1 RSD) and accuracy (difference between [the measured value-reference value]/reference value) *100%. The reference values are derived from Jochum et al., 2016 and the values published on georem.mpch-mainz.de.

Table S2.2b. Precision and accuracy of trace-elements measured by WD-XRF.

AGV-2							BCR-2						
	Average (N)	**St. Dev.**	**Recommended**	**CV (%)**	**Delta (%)**	**N**		Average (N)	St. Dev.	Recommended	CV (%)	Delta (%)	N
Sc	18.5	0.41	13.11	2.24	41.11	18	**Sc**	37.16	0.84	33.53	2.25	10.83	18
V	113.13	1.74	118.5	1.54	-4.53	18	**V**	417.98	5.37	417.6	1.28	0.09	18
Cr	14.03	0.93	16.22	6.63	-13.48	18	**Cr**	14.08	0.87	15.85	6.2	-11.15	18
Mn	832.03	15.47	777	1.86	7.08	18	**Mn**	1551.91	22.42	1523	1.44	1.9	18
Co	15.2	0.5	15.46	3.29	-1.68	18	**Co**	35.19	0.89	37.33	2.52	-5.72	18
Ni	16.95	0.55	18.87	3.27	-10.17	18	**Ni**	11.48	0.35	12.57	3.05	-8.64	18
Cu	56.54	1.81	51.51	3.2	9.76	18	**Cu**	20.37	1.13	19.66	5.54	3.59	18
Zn	97.97	2.65	86.7	2.71	13	18	**Zn**	144.78	2.59	129.5	1.79	11.8	18
Ga	21.91	0.94	20.42	4.3	7.28	18	**Ga**	24.43	0.87	22.07	3.57	10.71	18
Rb	67.36	2.79	67.79	4.14	-0.64	18	**Rb**	46.79	1.79	46.02	3.83	1.68	18
Sr	626.85	19.74	659.5	3.15	-4.95	18	**Sr**	324.84	9.48	337.4	2.92	-3.72	18
Y	18.16	0.76	19.14	4.2	-5.14	18	**Y**	32.78	1.2	36.07	3.65	-9.11	18
Zr	230.91	7.65	232	3.31	-0.47	18	**Zr**	184.71	5.74	186.5	3.11	-0.96	18
Nb	12.33	0.53	14.12	4.34	-12.65	18	**Nb**	11.14	0.39	12.44	3.49	-10.46	18
Mo	2.04	0.18	2	8.75	2.22	18	**Mo**	228.67	5.91	250.6	2.58	-8.75	18
Ba	1273.67	37.2	1134	2.92	12.32	18	**Ba**	761.96	18.55	683.9	2.44	11.41	18
La	50.34	4.22	38.21	8.39	31.74	18	**La**	37.24	3.69	25.08	9.9	48.48	18
Ce	72.99	2.85	69.43	3.91	5.13	18	**Ce**	59.24	2.98	53.12	5.02	11.52	18
Nd	32.79	1.74	30.49	5.3	7.56	18	**Nd**	32.21	1.65	28.26	5.13	13.96	18
Sm	3.89	2.05	6.55	52.65	-40.6	18	**Sm**	5.1	1.91	6.55	37.36	-22.1	18
Hf	6.13	0.69	5.14	11.3	19.4	18	**Hf**	6.09	0.86	4.97	14.07	22.46	18
Ta	0.45	0.38	0.79	83.93	-42.68	18	**Ta**	0.04	0.54	0.79	1380.93	-95.05	18
W	1.01	0.67	0.55	65.86	82.84	18	**W**	0.99	0.98	0.47	99.04	113.86	18
Pb	11.07	0.6	13.14	5.41	-15.78	18	**Pb**	9.53	0.65	10.59	6.82	-9.98	18
Th	9.35	0.81	6.17	8.65	51.44	18	**Th**	7.07	0.5	5.83	7.12	21.25	18
U	3.93	0.34	1.89	8.54	108.66	18	**U**	2.73	0.31	1.68	11.5	62.41	18

BHVO-2							GSP-2						
	Average (N)	**St. Dev.**	**Recommended**	**CV (%)**	**Delta (%)**	**N**		**Average (N)**	**St. Dev.**	**Recommended**	**CV (%)**	**Delta (%)**	**N**
Sc	40.48	0.72	31.83	1.77	27.17	18	**Sc**	7.89	0.45	22	5.75	-64.14	18
V	307.83	3.04	318.2	0.99	-3.26	18	**V**	47.08	0.75	52	1.6	-9.47	18
Cr	298.34	3.2	287.2	1.07	3.88	18	**Cr**	19.69	0.58	20	2.97	-1.56	18
Mn	1365.89	17.76	1309	1.3	4.35	18	**Mn**	323.01	5.95	314	1.84	2.87	18
Co	43.89	0.71	44.89	1.61	-2.22	18	**Co**	6.24	0.43	7.3	6.89	-14.54	18
Ni	119.79	1.31	119.8	1.09	-0.01	18	**Ni**	15.14	0.36	17	2.36	-10.95	18
Cu	132.86	2.37	129.3	1.78	2.75	18	**Cu**	41.79	1.07	43	2.56	-2.82	18
Zn	115.56	2.38	103.9	2.06	11.22	18	**Zn**	124.37	1.76	120	1.42	3.64	18
Ga	22.8	0.73	15.46	3.21	47.48	18	**Ga**	23.47	0.72	22	3.09	6.67	18
Rb	9.54	0.36	9.26	3.74	3	18	**Rb**	234.19	7.2	245	3.08	-4.41	18
Sr	368.77	9.9	394.1	2.68	-6.43	18	**Sr**	224.12	4.82	240	2.15	-6.62	18
Y	23.57	0.84	25.91	3.58	-9.02	18	**Y**	23.42	0.62	28	2.63	-16.35	18
Zr	165.83	4.76	171.2	2.87	-3.13	18	**Zr**	552.01	14.6	550	2.64	0.36	18
Nb	16.28	0.54	18.1	3.3	-10.07	18	**Nb**	23.89	0.55	27	2.32	-11.5	18
Mo	3.7	0.21	0.07	5.71	5341.18	18	**Mo**	1.89	0.13	2.1	7.12	-9.79	18
Ba	97.48	14.45	130.9	14.83	-25.53	18	**Ba**	1458.19	31.07	1340	2.13	8.82	18
La	25.89	2.88	0.63	11.13	4029.01	18	**La**	195.32	5.27	180	2.7	8.51	18
Ce	40.09	2.45	37.53	6.12	6.83	18	**Ce**	408.28	5.96	410	1.46	-0.42	18
Nd	26.58	1.41	24.27	5.31	9.53	18	**Nd**	202.24	2.33	200	1.15	1.12	18
Sm	4.83	1.97	6.02	40.85	-19.75	18	**Sm**	22.41	1.9	27	8.5	-17.02	18
Hf	5.37	0.74	0.58	13.84	821.79	18	**Hf**	14.65	0.96	14	6.54	4.64	18
Ta	0.66	0.74	1.15	112.61	-43.19	18	**Ta**	0.22	0.52	0.8	240.74	-72.92	18
W	1.09	0.86	0.25	78.69	336.03	18	**W**	0.92	0.64	0.34	69.54	169.26	18
Pb	0.36	0.37	1.65	103.55	-78.49	18	**Pb**	40.39	1.81	42	4.47	-3.84	18
Th	3.57	0.5	1.22	14.07	191.85	18	**Th**	108.48	3.95	105	3.64	3.32	18
U	1.47	0.34	0.41	22.92	257.34	18	**U**	3.54	0.32	2.4	9.15	47.45	18

Precision (given as 1 RSD) and accuracy (difference between the measured value-reference value/reference value) *100%. The reference values are derived from Jochum et al., 2016 and the values published on georem.mpch-mainz.de.