

GeoPT20 - OPY-1, fine grained ultramafic rock

Veranstalter: International Association of Geoanalysts and Geostandards Newsletter - GeoPT20

Ringversuchsmaterial: OPY-1, fine grained ultramafic rock

RV geschlossen: 2007 – 2

Literatur: Proficiency Testing Report GeoPT20 (Laborcode CRB = U3)

Hauptelemente [MA%]

	CRB	RV	1sRV	Z-Score
Na ₂ O	0,11	0,11	0,022	
MgO	21,1	21,43	0,27	
Al ₂ O ₃	8,12	7,95	0,116	
SiO ₂	44,3	44,05	0,498	
P ₂ O ₅	0,026			
K ₂ O	0,05			
CaO	7,79	7,9	0,115	
TiO ₂	0,387	0,38	0,009	
Fe ₂ O ₃ tot	11,86	11,84	0,163	
MnO	0,176	0,18	0,005	

Spurenelemente [µg/g]

	CRB	RV	1sRV	Z-Score
Co	84	86,5	3,5	
Cr	2357	2421	60	
Cu	53	44	2	
Ga	10	9,01	0,5	
Ni	568	871	25	
Rb	3	1,04	0,08	
Sr	14	15,99	0,8	
V	181	168	6,21	
Y	10	9,4	0,5	
Zn	56	61,8	2,7	
Zr	16	16,9	0,9	

Legende

CRB: Ergebnisse CRB – **RV:** Ergebnisse Ringversuch -- **1s-RV:** Standardabweichung Ringversuch

Z-Score: Differenz des Messwertes vom Mittelwert des Ringversuchs -- * Wert nicht zertifiziert

GEOPT20 – AN INTERNATIONAL PROFICIENCY TEST FOR ANALYTICAL GEOCHEMISTRY LABORATORIES – REPORT ON ROUND 20 / January 2007 (Ultramafic rock, OPY-1)

**Peter C. Webb^{1*}, Michael Thompson², Philip J. Potts¹
and Marcus Burnham³**

¹Department of Earth Sciences, The Open University, Walton Hall, Milton Keynes, MK7 6AA, UK.

²Department of Chemistry, Birkbeck College, Gordon House, London, WC1H 0PP, UK.

³Geoscience Laboratories, Ontario Geological Survey, 933 Ramsey Lake Road, Sudbury, ON P3E 6B5, Canada.

*Corresponding author: e-mail p.c.webb@open.ac.uk

Keywords: Proficiency testing, quality assurance, GeoPT, GeoPT20 round, OPY-1, Ultramafic rock

Abstract

Results are presented for GeoPT20, round twenty of the GeoPT international proficiency testing programme for analytical geochemistry laboratories. The sample distributed for this round was OPY-1, an ultramafic rock, supplied by M. Burnham of the Ontario Geological Survey, Canada. In this report, contributed data are listed, together with an assessment of assigned values, z-scores and charts showing both the distribution of contributed results and the overall performance of participating laboratories.

Introduction

This twentieth round of the international proficiency testing programme, GeoPT20, was conducted in a similar manner to earlier rounds. The programme is designed to be part of the routine quality assurance scheme of analytical geochemistry laboratories and the aims of the programme can be reviewed at <http://www.geoanalyst.org/geopt.html>. The programme is organised by the International Association of Geoanalysts and is conducted in accordance with a published protocol (<http://www.geoanalyst.org/GeoPt-protocol.pdf>). The overall aim of the programme is to provide

participating laboratories with z-score information for each reported elemental determination, from which the laboratories can decide whether the quality of their data is satisfactory in relation to both their chosen fitness-for-purpose criterion and results submitted by all the other laboratories contributing to the round and, therefore, choose to take corrective action if this appears justified.

Full details of the programme have been included in reports of previous rounds, the current publication status of which is listed in Appendix 1.

Steering Committee for Round 20: M. Thompson (Chair), P.J. Potts (Secretary) and P.C. Webb (Results coordinator).

Sample GeoPT20: OPY-1, an ultramafic rock, was supplied ready packaged and was distributed by the Ontario Geological Survey under the direction of Dr M. Burnham (Ontario Geological Survey, Sudbury, Canada).

The test material was tested for homogeneity by the originating laboratory and was considered suitable for use in the GeoPT proficiency testing programme.

Timetable for GeoPT20:

Distribution of sample: September 2006.

Deadline for submission of analytical results: 15th December 2006.

Distribution of draft report: February 2007

Submission of results

Results submitted by the 73 laboratories that participated in this round are listed in Table 1. All of these data were used for the assessment of assigned values.

Assigned values

Following procedures described in earlier rounds, a robust statistical procedure was used to derive assigned concentration values [X_a], these being judged to be the best estimates of the true composition of this sample. Data in Table 2 lists assigned values for 9 major components and assigned and provisional values for 34 trace elements. Values were assigned on the basis that: (i) sufficient laboratories had contributed data for an element, (ii) the statistical assessment gave confidence that the results showed a central portion approximating to a normal distribution. Part of this assessment involved examining a bar chart for each element to judge the distribution of results. Bar charts for 43 elements/components shown in Figure 1 were judged to have satisfactory distributions and values were assigned, namely:

SiO₂, TiO₂, Al₂O₃, Fe₂O₃T, MnO, MgO, CaO, Na₂O, LOI, Be, Cd, Ce, Co, Cr, Cs, Cu, Dy, Er, Eu, Ga, Gd, Hf, Ho, La, Li, Lu, Nd, Ni, Pr, Rb, Sc, Sm, Sr, Ta, Tb, Th, Tm, U, V, Y, Yb, Zn, and Zr. Of these, the elements Be, Cd, Li and Ta were assigned only provisional values.

Bar charts in Figure 2 show distribution data for the elements/components, K₂O and P₂O₅, that were not judged to be sufficiently satisfactory in the statistical analysis to assign values, and z-scores are plotted for guidance only. Thus, values were not assigned to them

despite the availability of a sufficient number of analytical results.

Bar charts in Figure 3 are plotted for information only, for those elements/components, i.e. CO₂, H₂O⁺, As, Ba, Ge, Mo, Nb, Pb, S, Sb, Sn and W, where the statistical analysis was sufficiently unsatisfactory to be able to assign values or insufficient data were reported to allow any assessment to be made.

Z-score analysis

As in previous rounds, laboratories were invited to choose one of two performance standards against which their analytical results would be judged:

Data quality 1 for laboratories working to a 'pure geochemistry' standard of performance, where analytical results are designed for geochemical research and where care is taken to provide data of high precision and accuracy, sometimes at the expense of a reduced sample throughput rate.

Data quality 2 for laboratories working to an 'applied geochemistry' standard of performance, where, although precision and accuracy are still important, the main objective is to provide results on large numbers of samples collected, for example, as part of geochemical mapping projects or geochemical exploration programmes.

The target standard deviation (H_a) for each element assessed was calculated from a modified form of the Horwitz function as follows:

$$H_a = k.X_a^{0.8495}$$

Where X_a is the concentration of the element expressed as a *fraction*, and the factor $k = 0.01$ for pure geochemistry labs and $k=0.02$ for applied geochemistry labs.

Z-scores were calculated for each elemental result submitted by each laboratory from:

$$z = [X - X_a] / H_a$$

where

X is the contributed result, X_a is the assigned value and H_a is the target standard deviation.

Z-score results are listed in Table 3 and participating laboratories are invited to assess their performance using the following criterion:-

Z-score results in the range $-2 < z < 2$ are considered to be 'satisfactory' (in the sense that no action is called for by the participant). If the z-score for any element falls outside this range, contributing laboratories are advised to examine their procedures to ensure that determinations are not subject to unsuspected analytical bias.

Overall performance

A summary of the overall performance of individual laboratories in this round is plotted in Figure 4 as a multiple z-score chart. In this chart, the z-score performance for each element is distinguished by symbols that make it simple to identify whether the results were satisfactory or gave z-scores that exceeded the action limits. This chart is designed to help individual laboratories to judge their overall performance in this proficiency testing round.

For this sample there were a larger range of elements than usual for which no assigned value could be given. There also appear to be many higher z-scores than is usual. Initial indications are that the high Ca content of this sample may pose problems that are not usually encountered, and possibly that more elements than usual were close to detection limits for some techniques.

Participation in future rounds

The benefit from proficiency testing arises from regular participation and laboratories are invited to contribute to the GeoPT21 round, the sample for which will be distributed during March 2007.

Acknowledgements

The authors thank John Watson and Liz Lomas (OU) for valued assistance with the production of this report. The GeoPT programme is organised on behalf of the International Association of Geoanalysts.

Appendix 1

Publication status of proficiency testing reports

GeoPT1

Thompson M., Potts P.J., Kane J.S. and Webb P.C. (1996)
GeoPT1. International proficiency test for analytical geochemistry laboratories - Report on round 1. Geostandards Newsletter: The Journal of Geostandards and Geoanalysis, 20, 295-325.

GeoPT2

Thompson M., Potts P.J., Kane J.S., Webb P.C. and Watson, J.S. (1998)
GeoPT2. International proficiency test for analytical geochemistry laboratories - Report on round 2. Geostandards Newsletter: The Journal of Geostandards and Geoanalysis, 22 127-156.

GeoPT3

Thompson M., Potts P.J., Kane J.S. and Chappell B.W. (1999a)
GeoPT3. International proficiency test for analytical geochemistry laboratories - Report on round 3. Geostandards Newsletter: The Journal of Geostandards and Geoanalysis, 23, 87-121.

GeoPT4

Thompson M., Potts P.J., Kane J.S., Webb P.C. and Watson J.S. (1999b)
GeoPT4. International proficiency test for analytical geochemistry laboratories - Report on round 4. Published in the electronic version of Geostandards Newsletter: The Journal of Geostandards and Geoanalysis (Summer 2000).

GeoPT5

Thompson M., Potts P.J., Kane J.S., and Wilson S. (1999c)
GeoPT5. International proficiency test for analytical geochemistry laboratories - Report on round 5. Published in the electronic version of Geostandards Newsletter: The Journal of Geostandards and Geoanalysis (Summer 2000).

GeoPT6

Potts P.J., Thompson M., Kane J.S., Webb P.C. and Carignan J. (2000)
GEOPT6 - an international proficiency test for analytical geochemistry laboratories - report on round 6 (OU-3: Nanhoron microgranite) and 6A (CAL-S: CRPG limestone). International Association of Geoanalysts: Unpublished report.

GeoPT7

Potts P.J., Thompson M., Kane J.S., and Petrov L.L. (2000)
GEOPT7 - an international proficiency test for analytical geochemistry laboratories - report on round 7 (GBPG-1 Garnet-biotite plagiogneiss). International Association of Geoanalysts: Unpublished report.

GeoPT8

Potts P.J., Thompson M., Kane J.S., Webb, P.C. and Watson J.S. (2000)
GEOPT8 - an international proficiency test for analytical geochemistry laboratories - report on round 8 / February 2001 (OU-4 Penmaenmawr microdiorite). International Association of Geoanalysts: Unpublished report.

GeoPT9

Potts P.J., Thompson M., Webb, P.C. and Watson J.S. (2001)
GEOPT9 - an international proficiency test for analytical geochemistry laboratories - report on round 9 / July 2001 (OU-6 Penrhyn slate). International Association of Geoanalysts: Unpublished report.

GeoPT10

Potts P.J., Thompson M., Webb, P.C., Watson J.S. and Wang Yimin (2001)
GEOPT10 - an international proficiency test for analytical geochemistry laboratories - report on round 10 / December 2001 (CH-1 Marine sediment). International Association of Geoanalysts: Unpublished report.

GeoPT11

Potts P.J., Thompson M., Chenery S.R., Webb, P.C. and Watson J.S. (2002)
GEOPT11 - an international proficiency test for analytical geochemistry laboratories - report on round 11 / July 2002 (OU-5 Leaton dolerite). International Association of Geoanalysts: Unpublished report.

GeoPT12

Potts P.J., Thompson M., Chenery S.R., Webb, P.C. and Batjargal B. (2003)
GEOPT12 - an international proficiency test for analytical geochemistry laboratories - report on round 12 / January 2003 (GAS Serpentinite). International Association of Geoanalysts: Unpublished report.

GeoPT13

Potts P.J., Thompson M., Chenery S.R., Webb, P.C. and Kaspar H.U. (2003)
GEOPT13 - an international proficiency test for analytical geochemistry laboratories - report on round 13 / July 2003 (Köln Loess). International Association of Geoanalysts: Unpublished report.

GeoPT14

Potts P.J., Thompson M., Chenery S.R., Webb, P.C. and B. Batjargal (2004)
GeoPT14 - an international proficiency test for analytical geochemistry laboratories - report on round 14 / January 2004 (OShBO - alkaline granite). International Association of Geoanalysts: Unpublished report.

GeoPT15

Potts P.J., Thompson M., Chenery S.R., Webb, P.C. and WANG Yimin (2004)
GeoPT15 - an international proficiency test for analytical geochemistry laboratories - report on round 15 / June 2004 (Ocean floor sediment MSAN). International Association of Geoanalysts: Unpublished report.

GeoPT16

Potts P.J., Thompson M., Webb, P.C. and S.Wilson (2005)
GeoPT16 - an international proficiency test for analytical geochemistry laboratories - report on round 16 / February 2005 (Nevada basalt, BNV-1). International Association of Geoanalysts: Unpublished report.

GeoPT17

Potts P.J., Thompson M., Webb, P.C. and J. Nicholas Walsh (2005)
GeoPT17 - an international proficiency test for analytical geochemistry laboratories - report on round 17 / July 2005 (Calcareous sandstone, OU-8). International Association of Geoanalysts: Unpublished report.

GeoPT18

Webb, P.C., Thompson M., Potts P.J. and L. Paul Bedard (2006)
GeoPT18 - an international proficiency test for analytical geochemistry laboratories - report on round 18 / Jan 2006 (Quartz Diorite, KPT-1). International Association of Geoanalysts: Unpublished report.

GeoPT19

Webb, P.C., Thompson M., Potts P.J. and B. Batjargal (2006)
GeoPT19 - an international proficiency test for analytical geochemistry laboratories - report on round 19 / July 2006 (Gabbro, MGR-N). International Association of Geoanalysts: Unpublished report.

Table 1		GeoPT20 Analytical results submitted (Dec 2006)														
		OPY-1, ultramafic rock										Note: No U49				
Round identifier		U39	U40	U41	U42	U43	U44R	U45	U46	U47	U48	U50	U51	U52	U53	U53
Data quality		1	1	2	1	2	2	1	1	2	2	2	1	2	1	2
SiO2	% m/m	41.62		44.41		42.2	44.29		43.30		43.4	44.18	44.25	43.9		
TiO2	% m/m	0.37	0.42	0.39		0.37	0.38		0.40		0.378	0.37	0.379	0.36		0.372
Al2O3	% m/m	5.79	8.2	8.03		7.92	7.97		7.75		7.76	7.83	7.96	7.82		7.58
Fe2O3	% m/m	11.88	11.75	11.94	11.82	11.6	11.59		12.40	7.85	12.3	11.87	11.9	11.46		11.7
Fe(II)O	% m/m					8.4										
MnO	% m/m	0.1712	0.174	0.18		0.17	0.17		0.15	0.15	0.179	0.18	0.185	0.17		0.179
MgO	% m/m	20.55	22.3	21.08		21.5	21.53		21.55		22.1	21.24	21.46	21.9		20.6
CaO	% m/m	7.33		7.61		7.46	7.84		7.96		7.91	7.82	8.29	7.7		7.18
Na2O	% m/m	0.62	1.14	1.12		1.28	1.09		1.08		0.787	1.20	1.15	1.13		
K2O	% m/m	0.031		0.03		0.05	0.02		0.04		0.121	0.05	0.05			
P2O5	% m/m	0.026		0.03		0.02	0.03		0.03				0.033			
H2O+	% m/m					4.8										
CO2	% m/m					0.07										
LOI	% m/m			4.98		4.36	4.60		5.02		4.36		4.37	5.09		
Ag	mg kg-1															
As	mg kg-1	0.8									0.55					
Au	mg kg-1		0.00092	0.16							0.00084					
B	mg kg-1															
Ba	mg kg-1	4.94		9		10	6.19	5.93			109		6.6	49.0		
Be	mg kg-1						0.07				1.22					
Bi	mg kg-1									310	0.0019					
Br	mg kg-1															
Cd	mg kg-1	1.0				0.08					0.086					
Ce	mg kg-1	7.2			2.3	1.3	1.28	1.28			1.258		1.4	1.30		
Cl	mg kg-1					100										
Co	mg kg-1		90	90	89.7	92.9	85.8		55		78.48		90.9		85.7	
Cr	mg kg-1	2360		2406	2381	2396	2261				2580		2087	2430		
Cs	mg kg-1					0.2	0.203	0.19			0.228		0.19	0.179		
Cu	mg kg-1	40.9	39	45		54.8	44.9			38	43.84		34.8	43		41.9
Dy	mg kg-1					1.56	1.56	1.68			1.464			1.6	1.626	
Er	mg kg-1					1.1	1.02	1.04			0.974			1.03	1.051	
Eu	mg kg-1		0.295		0.32	0.37	0.313	0.305			0.278			0.33	0.301	
F	mg kg-1					60										
Ga	mg kg-1	8.0		10		9	8.92				8.54		8.6	9.06		
Gd	mg kg-1					1.13	1.11	1.21			0.99			1.03	1.203	
Ge	mg kg-1										1.43			0.17		
Hf	mg kg-1				0.55		0.54	0.471			0.582				0.554	
Hg	mg kg-1															
Ho	mg kg-1					0.36	0.359	0.365			0.334			0.37	0.358	
I	mg kg-1															
In	mg kg-1													0.029		
Ir	mg kg-1		0.00095													
La	mg kg-1		0.42		0.38	0.4	0.407	0.412			0.482				0.459	
Li	mg kg-1			7.6		6							3.8		4.27	
Lu	mg kg-1		0.15		0.14	0.17	0.152	0.158			0.148			0.152		
Mo	mg kg-1					0.29					0.842			0.31	0.27	
N	mg kg-1															
Nb	mg kg-1						0.408	0.346			0.805					0.475
Nd	mg kg-1	9.1				1.6	1.5	1.51			1.405			1.6	1.523	
Ni	mg kg-1	905	822	873		847	899				732		928	903		856
Os	mg kg-1		0.00079													
Pb	mg kg-1	3.1						0.276		104	0.59				0.39	
Pd	mg kg-1		0.01085								0.0112					
Pr	mg kg-1					0.28	0.239	0.233			0.238				0.244	
Pt	mg kg-1		0.01016								0.0056					
Rb	mg kg-1	1.3				1.1	1.03	0.879			2.66				0.93	
Re	mg kg-1															
Rh	mg kg-1		0.00135													
Ru	mg kg-1		0.00417													
S	mg kg-1	84.1	237			0.02										
Sb	mg kg-1	1.7									0.18					
Sc	mg kg-1		28.4		28.5	30.7	27.6		29					26.6		
Se	mg kg-1															
Sm	mg kg-1		0.72		0.70	0.7	0.707	0.689			0.676				0.708	
Sn	mg kg-1	1.7									0.683					
Sr	mg kg-1	15.3		14		13.1	16.6	16.03	27		14.87		24.5	15.9	16.03	
Ta	mg kg-1						0.098	0.038			0.045					0.022
Tb	mg kg-1				0.24	0.24	0.249	0.227			0.21			0.22	0.224	
Te	mg kg-1															
Th	mg kg-1					0.02	0.03	0.029			0.154				0.035	
Tl	mg kg-1										0.031					
Tm	mg kg-1					0.16	0.144	0.155			0.148				0.152	
U	mg kg-1						0.012	0.01			0.087				0.010	
V	mg kg-1	163	170	163		170	165		153		134		119	130		
W	mg kg-1										0.263					
Y	mg kg-1	9.3		9		9.2	9.8	9.88			7.97		11.2	9.1	8.810	
Yb	mg kg-1		0.98		1.1	1	0.992	0.997			0.95				1.002	
Zn	mg kg-1	56.2	57	59	64	55	64.41		55	52	81.88		71.5	64		79.2
Zr	mg kg-1	15.8		16		16.6	17.96	15.02	13		19.23		18.5	19	18.03	

Table 1		GeoPT20 Analytical results submitted (Dec 2006)														
		OPY-1, ultramafic rock														
Round identifier		U54	U54	U55	U56	U57	U58	U59	U60	U61	U62	U63	U64	U64	U65	U66
Data quality		1	2	2	1	1	1	2	1	1	1	1	1	2	2	2
SiO2	% m/m		47.06	42.91	43.9	44.82	43.46	43.906		38.41	44.43	43.87	44.5		44.65	
TiO2	% m/m	0.39		0.392	0.38	0.433	0.35	0.361	0.62	0.006	0.38	0.466	0.38		0.39	0.38
Al2O3	% m/m	7.77		8.103	7.893	7.52	7.86	8.178		0.2	8.02	7.56	8.01		8.05	
Fe2O3	% m/m	11.8		11.57	11.667	9.82	11.73	12.143		7.78	11.93	12.65	11.7		11.81	11.72
Fe(II)O	% m/m						9.54	9.042							8.54	
MnO	% m/m	0.18		0.18	0.18	0.148	0.18	0.152	0.3	0.09	0.18	0.164	0.177		0.19	0.167
MgO	% m/m	20.06		20.22	20.867	22.67	20.49	21.506		46.26	21.37	21.35	21.2		21.57	
CaO	% m/m	7.14		7.788	7.79	7.58	7.46	7.721		0.19	7.91	8.04	7.79		7.95	7.62
Na2O	% m/m	1.14		1.151	0.873	1	0.92	1.063		0.01	1.15	1.00	1.05		0.99	
K2O	% m/m	0.04		0.101	0.051	0.04	0.05	0.056		0.01	0.05	0.036	0.050		0.05	
P2O5	% m/m			0.033	0.032	0.02	0.02	0.034		0.003	0.03	0.034	0.04		0.02	
H2O+	% m/m						4.8				5.37		0.23			
CO2	% m/m						0.1	0.220			0.53				0.1	
LOI	% m/m				4.397		4.87	4.840		5.61	4.5	4.81	6.30		4.76	
Ag	mg kg-1					0.026			0.21							
As	mg kg-1				0.36	0.525	12		2.3			29				
Au	mg kg-1					0.184									0.00141	
B	mg kg-1															
Ba	mg kg-1		90	9.55	6.667	6.39	14	12	6		6					
Be	mg kg-1			0.3	0.08	0.069										
Bi	mg kg-1					0.0023	0									
Br	mg kg-1															
Cd	mg kg-1				0.057	0.045	5									
Ce	mg kg-1			1.31	1.417	1.248	0	1.26								
Cl	mg kg-1		120				41	23								
Co	mg kg-1	89.7		85.66	89.967	94.96	84	82	115		91	51	90.5			
Cr	mg kg-1	2590		2489	2536.7	1874	3104	2509	3565		2473		2357			2740
Cs	mg kg-1			0.2	0.182	0.18	0	0.16								
Cu	mg kg-1			44.5	42.333	44.42	43	60.3			46	10	47.8			51
Dy	mg kg-1		1.5	1.58	1.417	1.595		1.69	1.7							
Er	mg kg-1			0.99	0.877	1.02		1.37	1.2							
Eu	mg kg-1	0.34		0.31	0.33	0.308		0.30	0.3							
F	mg kg-1						145									
Ga	mg kg-1	9.2		4.23	8.667	9.55	7	8.23			9			13.6		
Gd	mg kg-1			1.06	1.317	1.133		1.65								
Ge	mg kg-1					1.4		0.39								
Hf	mg kg-1	0.63		0.48	0.597	0.53	2	0.69								
Hg	mg kg-1															
Ho	mg kg-1			0.33	0.366	0.349		0.42								
I	mg kg-1															
In	mg kg-1															
Ir	mg kg-1		0.007												0.00097	
La	mg kg-1			0.81	0.419	0.343	0	0.44								
Li	mg kg-1				4.433	5.14		54.1								
Lu	mg kg-1	0.15		0.14	0.168	0.152		0.20								
Mo	mg kg-1					0.29	1		1.2							
N	mg kg-1															
Nb	mg kg-1			0.23		0.39	5	0.39				9				
Nd	mg kg-1			1.41	1.637	1.496	0	1.54								
Ni	mg kg-1	1700		920	937.67	757	931	685	2821		904	401	910			915
Os	mg kg-1															
Pb	mg kg-1					0.26	3	0.28	0.6			8				
Pd	mg kg-1														0.01174	
Pr	mg kg-1			0.25	0.203	0.231		0.24								
Pt	mg kg-1														0.01136	
Rb	mg kg-1			1.04	0.923	0.942	2	0.90	1.2			1				
Re	mg kg-1															
Rh	mg kg-1														0.00146	
Ru	mg kg-1														0.00454	
S	mg kg-1						111	356			140	161				
Sb	mg kg-1	0.49			0.078	0.073	0		2							
Sc	mg kg-1	29.5		27.9	30.033	32.31	32	25.9			31		26.4			
Se	mg kg-1				0.193	0.427										
Sm	mg kg-1	0.7		0.65	0.798	0.703		0.81								
Sn	mg kg-1					0.265	4	0.25	30							
Sr	mg kg-1			15.03	15.7	17.5	17	15.54	17		13	32	18.7			14
Ta	mg kg-1					0.056	0	0.02								
Tb	mg kg-1		0.21	0.22	0.247	0.222		0.28								
Te	mg kg-1					0.03										
Th	mg kg-1			0.04		0.0288	1	0.04								
Tl	mg kg-1					0.013										
Tm	mg kg-1			0.14		0.151			0.22							
U	mg kg-1					0.011	0									
V	mg kg-1	178		159.3	169.67	196	158	190	271		159	134	180			
W	mg kg-1					0.092	0	0.01								
Y	mg kg-1			7.89	9.367	8.481	8	10.45			10	13				
Yb	mg kg-1	0.89		0.96	1.137	0.995		1.25								
Zn	mg kg-1			69.2	60.33	50.58	56	67			63	62	66.5			63
Zr	mg kg-1			15.14	16	14.12	22	14.84	7		27	15				

Table 1		GeoPT20 Analytical results submitted (Dec 2006)							
		OPY-1, ultramafic rock							
Round identifier		U67	U68	U69R	U70	U71	U72	U73	U74
Data quality		2	2	2	2	2	2	1	2
SiO2	% m/m	44.27	44.31	43.1		43.9	44.1		44.04
TiO2	% m/m	0.3755	0.40	0.36		0.37	0.37		0.384
Al2O3	% m/m	7.57	7.95	7.7		7.94	8.04		7.549
Fe2O3	% m/m	11.835	11.88	12.2		12.57	11.7		12.066
Fe(II)O	% m/m								
MnO	% m/m	0.1765	0.19	0.22		0.18	0.18		0.167
MgO	% m/m	21.695	21.23	22.4		21.39	21.3		21.286
CaO	% m/m	7.685	7.74	8		7.85	7.84		8.077
Na2O	% m/m	1.21	1.15	0.9		0.93	1.1		0.988
K2O	% m/m	0.075	0.05			0.04			0.033
P2O5	% m/m	0.0275	0.043			0.02			
H2O+	% m/m								
CO2	% m/m			0.06					
LOI	% m/m		4.29	4.32		4.53	4.59		4.053
Ag	mg kg-1								
As	mg kg-1		3	4.6					
Au	mg kg-1								
B	mg kg-1			18	7.26				
Ba	mg kg-1				6.07	6.3	6.2	6.05	10.80
Be	mg kg-1				0.061			0.08	
Bi	mg kg-1								
Br	mg kg-1	4							
Cd	mg kg-1					0.13			
Ce	mg kg-1			1.3	1.27	1.17	1.3	1.26	
Cl	mg kg-1			100					
Co	mg kg-1	79.5	101.5	82	87.9	85.3	82	73.1	48.0
Cr	mg kg-1	2453	2531	2700	2250	1957		2679	2056
Cs	mg kg-1				0.186	0.31		0.17	
Cu	mg kg-1	241	41	34	45	41.86	41	37.4	60.0
Dy	mg kg-1			1.5	1.61	1.55	1.5	0.918	
Er	mg kg-1			1	1.01	1.02	1	0.697	
Eu	mg kg-1			0.3	0.288	0.29		0.184	
F	mg kg-1								
Ga	mg kg-1	8		10	8.77			8.39	
Gd	mg kg-1			1	1.19	1.15	1.1	0.629	
Ge	mg kg-1			1.1					
Hf	mg kg-1			0.5	0.565			0.63	
Hg	mg kg-1								
Ho	mg kg-1			0.4	0.368	0.34		0.22	
I	mg kg-1								
In	mg kg-1								
Ir	mg kg-1								
La	mg kg-1			0.5	0.408	0.37		0.445	
Li	mg kg-1			3.5		4.86		3.31	
Lu	mg kg-1			0.2	0.158	0.15		0.148	
Mo	mg kg-1			0.2	0.475				
N	mg kg-1								
Nb	mg kg-1			0.5	0.386			0.345	
Nd	mg kg-1			1.4	1.525	1.42	1.4	1.45	
Ni	mg kg-1	927.5	890	800	852	817	820	837	617
Os	mg kg-1								
Pb	mg kg-1		2.4		0.334	0.36		0.25	
Pd	mg kg-1								
Pr	mg kg-1			0.3	0.24	0.24		0.228	
Pt	mg kg-1								
Rb	mg kg-1	10		1.2	0.93	1.23		0.78	
Re	mg kg-1								
Rh	mg kg-1								
Ru	mg kg-1								
S	mg kg-1		233	200					
Sb	mg kg-1								
Sc	mg kg-1			26	27.4	28		14.9	
Se	mg kg-1								
Sm	mg kg-1			0.7	0.757	0.69		0.469	
Sn	mg kg-1				0.254				
Sr	mg kg-1	13	55	17	16	16	14	14.2	19.96
Ta	mg kg-1				0.026			0.04	
Tb	mg kg-1				0.23	0.22		0.127	
Te	mg kg-1								
Th	mg kg-1		4.5		0.033			0.035	
Tl	mg kg-1				0.017				
Tm	mg kg-1			0.2	0.159	0.15		0.121	
U	mg kg-1				0.012	0.013		0.012	
V	mg kg-1	165.5		178	173	153	150	170	139.91
W	mg kg-1								
Y	mg kg-1	12		9.3	10	8.97	7.9	8.82	
Yb	mg kg-1			0.9	1.02	0.94	0.9	0.899	
Zn	mg kg-1	67	62.3	76	64.6	57.3	42	69.5	88.0
Zr	mg kg-1	23			17.2	17.9		14.7	

**Table 2 GeoPT20 Assigned values and robust statistical analysis of contributed data
(Ultramafic rock, OPY-1)**

	X_a	H_a	sdm	sdm/ H_a	status		X_a	H_a	sdm	sdm/ H_a	status
	% m/m	% m/m	% m/m				% m/m	% m/m	% m/m		
SiO ₂	44.05	0.498	0.081	0.162	Assigned	Hf	0.55	0.048	0.009	0.179	Assigned
TiO ₂	0.38	0.009	0.002	0.215	Assigned	Ho	0.35	0.033	0.004	0.122	Assigned
Al ₂ O ₃	7.95	0.116	0.026	0.225	Assigned	La	0.42	0.038	0.010	0.256	Assigned
Fe ₂ O ₃	11.84	0.163	0.032	0.197	Assigned	Li	4.43	0.283	0.254	0.897	Provisional
MnO	0.18	0.005	0.001	0.138	Assigned	Lu	0.15	0.016	0.002	0.144	Assigned
MgO	21.43	0.270	0.072	0.267	Assigned	Nd	1.49	0.112	0.021	0.183	Assigned
CaO	7.80	0.115	0.028	0.243	Assigned	Ni	870.62	25.141	9.419	0.375	Assigned
Na ₂ O	1.11	0.022	0.011	0.521	Assigned	Pr	0.24	0.024	0.004	0.155	Assigned
LOI	4.65	0.074	0.037	0.505	Assigned	Rb	1.04	0.082	0.036	0.437	Assigned
	mg/kg	mg/kg	mg/kg			Sc	28.07	1.359	0.381	0.281	Assigned
Be	0.08	0.009	0.008	0.892	Provisional	Sm	0.70	0.059	0.004	0.075	Assigned
Cd	0.06	0.007	0.008	1.122	Provisional	Sr	15.99	0.843	0.351	0.416	Assigned
Ce	1.33	0.102	0.032	0.313	Assigned	Ta	0.03	0.004	0.003	0.798	Provisional
Co	86.46	3.534	0.971	0.275	Assigned	Tb	0.23	0.023	0.003	0.131	Assigned
Cr	2420.74	59.930	26.520	0.440	Assigned	Th	0.03	0.004	0.001	0.352	Assigned
Cs	0.18	0.019	0.004	0.198	Assigned	Tm	0.15	0.016	0.002	0.129	Assigned
Cu	43.65	1.978	0.884	0.447	Assigned	U	0.01	0.002	0.000	0.267	Assigned
Dy	1.56	0.117	0.016	0.140	Assigned	V	167.85	6.210	2.249	0.362	Assigned
Er	1.02	0.082	0.013	0.154	Assigned	Y	9.44	0.538	0.164	0.305	Assigned
Eu	0.31	0.029	0.004	0.147	Assigned	Yb	1.01	0.080	0.016	0.196	Assigned
Ga	9.01	0.518	0.144	0.279	Assigned	Zn	61.81	2.658	1.125	0.423	Assigned
Gd	1.15	0.090	0.025	0.274	Assigned	Zr	16.85	0.881	0.396	0.449	Assigned

Table 3 GeoPT20 Z-scores for analytical results submitted (December 2006)															
OPY-1, Ultramafic rock															
Labcode	U1	U2	U3	U4	U5	U6	U7	U8	U9	U10	U11	U11	U12	U13	U13
Sample	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1
Quality	1	2	2	2	1	2	2	1	1	2	1	2	2	1	2
SiO ₂	-0.04	0.49	0.25	2.60	-0.09	0.77	-0.10	3.54	2.52	3.57	0.00	*	0.02	0.79	*
TiO ₂	-0.43	0.23	0.18	0.97	-1.45	0.57	-0.16	1.94	0.02	-1.74	-1.11	*	0.91	*	0.63
Al ₂ O ₃	1.80	0.21	0.74	2.72	1.31	1.13	0.44	2.78	0.97	-17.82	-0.18	*	0.27	-2.04	*
Fe ₂ O ₃	0.72	0.46	-0.03	1.38	2.82	0.58	-0.33	3.68	-0.24	-0.89	-0.53	*	0.12	*	0.25
MnO	0.43	0.65	-0.32	0.67	-6.25	0.43	0.11	0.22	-0.43	1.62	0.00	*	0.00	0.43	*
MgO	-0.22	-0.13	-0.62	1.70	-0.12	*	0.33	2.39	-3.45	14.93	-0.88	*	-0.84	*	-0.21
CaO	0.32	-0.07	-0.05	1.61	0.43	1.00	0.13	3.05	0.78	-1.05	0.36	*	1.35	*	1.84
Na ₂ O	1.88	-0.07	0.00	-2.29	3.66	-4.58	0.69	5.49	-3.20	*	2.33	*	-0.92	*	0.50
LOI	0.69	-4.32	-0.66	-0.80	*	0.49	-0.46	2.47	*	*	0.44	*	0.35	0.44	*
Be	*	*	*	*	*	*	*	-2.14	*	*	*	*	0.00	*	*
Cd	*	*	*	*	*	*	*	*	*	98.24	*	*	-0.21	*	*
Ce	0.04	*	*	*	*	*	*	-0.80	*	1.81	*	*	-0.50	*	0.78
Co	3.27	*	-0.35	*	*	*	-1.20	0.44	-0.27	*	*	1.05	-0.25	*	2.34
Cr	-0.26	0.79	-0.53	*	*	*	-3.98	-0.25	-1.83	-1.01	*	1.64	*	*	-0.97
Cs	0.17	*	*	*	*	*	*	0.80	*	*	*	*	-0.36	*	*
Cu	3.77	*	2.36	*	*	*	-2.69	-1.34	2.35	-0.92	-1.29	*	0.62	*	-2.19
Dy	-0.07	*	*	*	*	*	*	-0.16	*	*	*	*	0.18	0.96	*
Er	-0.31	*	*	*	*	*	*	-0.53	*	*	*	*	0.10	0.33	*
Eu	0.44	*	*	*	*	*	*	-0.59	*	*	*	*	-0.28	0.78	*
Ga	2.72	*	0.95	*	*	*	*	-0.22	*	*	*	0.95	-0.32	*	0.37
Gd	1.03	*	*	*	*	*	*	-0.19	*	*	*	*	-0.15	0.58	*
Hf	0.37	*	*	*	*	*	*	-0.91	*	*	*	*	*	*	*
Ho	-0.50	*	*	*	*	*	*	-0.11	*	*	*	*	0.10	0.20	*
La	0.29	*	*	*	*	*	*	-0.24	19.66	18.08	*	*	-0.03	14.16	*
Li	*	*	*	*	*	*	*	0.59	*	*	*	*	1.53	5.53	*
Lu	0.12	*	*	*	*	*	*	-1.42	*	*	*	*	0.06	-0.19	*
Nd	0.33	*	*	*	*	*	*	-0.34	*	-0.39	*	*	0.01	1.09	*
Ni	-1.80	*	-0.05	*	*	*	-3.59	0.05	5.15	-0.81	1.88	*	0.78	*	-0.63
Pr	0.30	*	*	*	*	*	*	-0.12	*	*	*	*	-0.14	-0.12	*
Rb	-0.10	*	11.93	*	*	*	*	-1.52	*	*	2.00	*	-1.18	*	1.00
Sc	*	*	*	*	*	*	-0.76	0.39	0.17	*	*	0.67	-0.65	*	2.18
Sm	0.35	*	*	*	*	*	*	0.31	*	*	*	*	-0.06	1.50	*
Sr	1.01	*	-1.18	-9.49	*	*	*	-0.34	1.68	-1.95	0.25	*	-0.29	*	-0.59
Ta	-1.43	*	*	*	*	*	*	0.24	*	*	*	*	*	*	*
Tb	-0.08	*	*	*	*	*	*	0.09	*	*	*	*	0.02	0.09	*
Th	-0.59	*	*	*	*	*	*	-1.30	*	*	*	*	*	*	*
Tm	-0.07	*	*	*	*	*	*	-0.07	*	*	*	*	0.28	-0.07	*
U	*	*	*	*	*	*	*	-1.77	*	*	*	*	*	*	397.32
V	2.10	*	-0.55	*	*	*	-1.84	-0.30	-0.14	-0.63	*	1.18	0.50	*	-0.87
Y	0.40	*	0.52	*	*	*	*	0.67	1.23	-1.34	2.90	*	-1.24	*	-0.59
Yb	0.22	*	*	*	*	*	*	-1.19	5.04	*	*	*	-0.03	0.56	*
Zn	4.12	*	-1.09	*	*	-0.34	-3.16	*	5.38	-1.28	0.56	*	0.11	*	-1.66
Zr	2.04	*	-0.48	*	*	*	8.60	-3.92	12.66	-0.65	4.82	*	-4.46	*	-0.09

Table 3 GeoPT20 Z-scores for analytical results submitted (December 2006)															
	OPY-1, Ultramafic rock														
Labcode	U14	U15	U16	U17	U17	U18	U19	U20	U21	U22	U23	U24	U25	U25	U26
Sample	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1
Quality	2	2	2	1	2	2	1	2	1	1	1	1	1	2	1
SiO ₂	0.19	-0.67	0.32	-0.65	*	-1.01	-0.35	-0.08	*	-0.09	4.04	*	0.21	*	-0.39
TiO ₂	-0.22	-0.22	-0.16	-2.58	*	-0.16	2.62	-0.16	1.94	-0.66	0.81	1.37	0.70	*	-0.66
Al ₂ O ₃	0.26	-0.16	0.61	-0.58	*	1.34	0.61	0.10	*	-0.36	1.49	2.95	0.02	*	0.28
Fe ₂ O ₃	0.18	-0.15	-1.10	-1.89	*	-0.43	-1.34	0.31	*	-0.67	-1.16	0.49	-3.00	*	0.07
MnO	0.00	-2.37	-0.22	-1.94	*	-1.83	-0.22	0.11	-1.94	1.08	-1.94	0.22	*	-0.22	-0.22
MgO	0.03	1.09	0.57	-0.05	*	-0.14	-1.16	-0.19	*	-0.14	0.58	-7.30	1.28	*	-0.57
CaO	0.43	0.43	0.21	-0.80	*	-1.36	-0.59	-0.27	*	-0.26	-0.97	-7.00	0.25	*	0.34
Na ₂ O	1.58	0.00	-0.23	3.66	*	0.92	1.83	-1.37	*	1.65	3.66	*	4.12	*	3.66
LOI	-0.53	-3.17	0.56	*	-0.12	-0.66	-4.72	0.62	*	2.06	-45.79	*	*	-0.32	2.88
Be	*	*	*	*	*	*	*	*	*	*	*	*	*	30.46	-2.14
Cd	*	*	*	*	*	-0.82	*	*	0.00	*	*	*	*	-1.36	*
Ce	-6.53	*	*	*	*	*	-1.10	*	-1.29	*	*	80.09	*	*	-1.25
Co	*	*	*	-2.11	*	-0.90	-0.72	0.64	2.42	*	*	-3.27	*	0.64	0.66
Cr	2.31	*	*	-4.95	*	-2.33	2.78	0.20	2.17	0.59	*	-2.06	*	-1.21	-0.16
Cs	*	*	*	*	*	*	-0.36	*	-0.25	*	*	*	*	*	*
Cu	2.44	*	*	0.18	*	-0.80	-1.34	-2.94	1.70	*	*	4.27	*	-1.18	0.53
Dy	*	*	*	*	*	*	-0.59	*	-0.24	*	*	*	*	*	0.02
Er	*	*	*	*	*	*	-1.11	*	-0.16	*	*	*	*	*	0.14
Eu	*	*	*	*	*	*	-0.96	*	-0.25	*	*	*	*	*	-0.38
Ga	-0.50	*	*	1.90	*	-3.39	-0.27	0.95	-0.80	*	*	2.10	*	*	0.21
Gd	*	*	*	*	*	*	-2.23	*	0.58	*	*	*	*	*	-0.19
Hf	*	*	*	-11.44	*	*	-0.50	*	-1.12	*	*	*	*	*	0.33
Ho	*	*	*	*	*	*	0.20	*	-0.71	*	*	*	*	*	-0.29
La	-5.48	*	*	67.56	*	*	-0.31	*	-0.76	*	*	164.42	*	*	-0.26
Li	*	*	*	*	*	*	*	*	*	*	*	*	-5.06	*	-0.47
Lu	*	*	*	*	*	*	-0.56	*	-0.19	*	*	*	*	*	-0.50
Nd	*	*	*	-4.35	*	*	-0.56	*	-0.25	*	*	*	*	*	-0.22
Ni	1.65	*	*	3.75	*	0.07	0.35	0.70	2.60	*	*	-6.18	*	-2.00	1.09
Pr	*	*	*	*	*	*	-0.28	*	-0.53	*	*	*	*	*	*
Rb	19.82	*	*	-0.43	*	*	-0.84	*	-1.64	*	*	*	*	*	-1.15
Sc	0.53	*	*	-1.52	*	*	0.75	-0.76	1.42	*	*	0.10	*	-4.44	-1.23
Sm	*	*	*	21.94	*	*	0.16	*	-0.36	*	*	*	*	*	-0.03
Sr	1.67	*	*	1.20	*	0.01	0.19	-2.37	0.01	*	*	6.30	*	-1.18	1.79
Ta	*	*	*	*	*	*	-0.33	*	9.33	*	*	*	*	*	-1.67
Tb	*	*	*	*	*	*	-0.61	*	-0.35	*	*	*	*	*	0.23
Th	-3.72	*	*	*	*	*	7.67	*	-0.35	*	*	*	*	*	-0.59
Tm	*	*	*	*	*	*	-0.07	*	-0.07	*	*	*	*	*	-0.19
U	-3.18	*	*	*	*	*	0.00	*	-0.63	*	*	*	*	*	-0.74
V	1.04	*	*	0.19	*	1.94	0.20	0.33	3.08	*	*	1.86	*	1.54	1.96
Y	-1.52	*	*	-0.81	*	0.52	1.54	-0.41	-1.37	*	*	5.13	*	3.77	-1.07
Yb	*	*	*	*	*	*	-0.90	*	-0.44	*	*	*	*	*	0.13
Zn	0.37	*	*	0.07	*	-2.00	-1.78	0.98	13.24	*	*	-6.63	*	0.04	0.26
Zr	5.19	*	*	3.58	*	0.71	-2.04	-1.05	-2.10	*	*	*	*	4.34	0.96

Table 3 GeoPT20 Z-scores for analytical results submitted (December 2006)															
	OPY-1, Ultramafic rock														
Labcode	U26	U27	U28	U29	U30	U31	U32	U33	U34	U35	U36	U37	U37	U38	U39
Sample	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1
Quality	2	1	2	2	2	2	2	2	2	2	2	1	2	2	1
SiO ₂	*	-0.19	*	0.00	*	-2.41	*	0.07	-0.17	0.00	-0.76	1.07	*	-0.52	-4.87
TiO ₂	*	-1.45	-0.84	0.40	*	1.37	*	-0.67	1.37	-0.33	-0.10	1.15	*	0.12	-1.45
Al ₂ O ₃	*	-0.06	0.11	1.05	*	-0.62	*	-0.37	4.05	0.06	-0.46	-1.01	*	0.10	-18.54
Fe ₂ O ₃	*	-0.12	-0.12	0.62	*	2.60	-1.25	0.16	0.37	-0.08	0.00	0.56	*	1.41	0.25
MnO	*	0.43	-0.54	-0.11	*	1.94	*	0.32	*	0.22	-1.51	0.65	*	-0.65	-1.68
MgO	*	-1.57	1.97	-0.40	*	2.13	*	-0.38	1.62	-0.39	0.22	-1.90	*	-0.76	-3.27
CaO	*	3.22	-1.33	0.27	*	2.43	*	-0.23	0.30	0.35	-0.83	0.69	*	0.17	-4.11
Na ₂ O	*	0.00	-1.99	-1.99	*	4.16	-1.60	-1.60	1.37	1.03	-1.60	-0.92	*	0.92	-22.42
LOI	*	3.42	*	-0.05	*	3.00	*	1.51	0.01	0.46	0.15	-0.38	*	1.03	*
Be	*	*	*	*	*	*	*	*	*	7.91	*	*	*	*	*
Cd	*	*	-0.68	*	*	*	*	*	*	*	*	*	*	*	128.26
Ce	*	7.54	-0.84	8.52	-0.39	*	*	*	*	-0.02	-0.74	*	336.62	*	57.54
Co	*	1.74	0.37	*	*	-0.14	0.06	0.22	*	-0.11	-0.40	1.00	*	-1.76	*
Cr	*	1.64	1.41	-0.47	*	-3.53	-0.36	0.62	*	0.87	-0.53	1.69	*	0.41	-1.01
Cs	*	*	0.14	*	-0.15	*	*	*	*	*	-0.91	*	*	*	*
Cu	*	3.01	-0.08	-7.75	*	0.17	*	0.85	*	-1.15	-0.52	0.68	*	1.61	-1.39
Dy	*	-0.24	*	10.36	-0.44	*	*	*	*	-0.15	-0.46	*	*	0.18	*
Er	*	4.13	*	8.83	-0.51	*	*	*	*	-0.13	-0.20	*	*	0.47	*
Eu	*	0.78	*	6.57	0.01	*	0.73	*	*	-0.14	-0.63	*	*	*	*
Ga	*	*	*	*	*	0.57	*	-0.01	*	-1.08	-0.77	*	0.95	-0.01	-1.96
Gd	*	9.26	*	8.06	-0.35	*	*	*	*	0.46	0.51	*	*	-0.82	*
Hf	*	*	*	*	0.27	*	*	*	*	0.11	-0.25	*	*	*	*
Ho	*	*	*	9.47	-0.45	*	*	*	*	-0.07	-0.05	*	*	*	*
La	*	*	1.06	8.25	1.31	130.64	-0.38	*	*	-0.25	-0.12	*	*	*	*
Li	*	*	-0.23	*	*	*	*	*	*	-0.18	*	*	*	*	*
Lu	*	5.97	*	9.29	*	*	-0.10	*	*	-0.37	-0.40	*	*	*	*
Nd	*	*	*	9.36	0.26	*	*	*	*	-0.36	-0.84	*	87.04	*	67.92
Ni	*	0.93	0.37	-3.41	*	-0.25	*	0.64	*	0.32	0.45	0.53	*	0.29	1.37
Pr	*	*	*	7.08	0.57	*	*	*	*	0.34	-1.10	*	*	*	*
Rb	*	*	0.70	5.86	0.27	14.36	*	24.07	*	-0.46	-1.18	*	*	*	3.22
Sc	*	-1.89	*	*	3.98	-1.68	-0.28	0.34	*	0.56	0.23	0.68	*	-1.50	*
Sm	*	28.02	*	8.82	0.12	*	-0.01	*	*	-0.06	-0.86	*	*	*	*
Sr	*	-3.55	4.58	-4.74	*	3.63	*	0.01	*	0.13	-0.35	-5.92	*	0.60	-0.82
Ta	*	*	*	*	-0.12	32.16	*	*	*	*	*	*	*	*	*
Tb	*	*	*	7.01	0.24	*	*	*	*	0.11	-0.61	*	*	*	*
Th	*	936.08	*	*	-0.18	*	*	*	*	*	*	*	*	*	*
Tm	*	*	*	7.16	-0.34	*	*	*	*	-0.13	-0.66	*	*	*	*
U	*	*	8.27	*	3.69	*	*	*	*	*	*	*	*	*	*
V	*	2.33	-0.92	11.93	*	*	*	-0.47	*	-0.55	-0.23	1.64	*	-1.28	-0.78
Y	*	-1.18	-0.63	*	-0.74	0.43	*	-0.41	*	0.24	-0.24	2.90	*	1.45	-0.26
Yb	*	2.67	*	10.27	-0.57	*	0.15	*	*	0.02	-0.03	*	*	0.59	*
Zn	*	-0.83	-7.63	-3.54	*	0.75	*	-0.34	*	-0.23	0.68	1.95	*	0.79	-2.11
Zr	*	-3.80	*	-1.62	0.36	4.11	*	2.36	*	-0.20	-0.60	*	4.06	0.09	-1.19

Table 3 GeoPT20 Z-scores for analytical results submitted (December 2006)															
	OPY-1, Ultramafic rock														
Labcode	U40	U41	U42	U43	U44	U45	U46	U47	U48	U50	U51	U52	U53	U53	U54
Sample	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1
Quality	1	2	1	2	2	1	1	2	2	2	1	2	1	2	1
SiO ₂	*	0.36	*	-1.85	0.24	*	-1.50	*	-0.65	0.13	0.41	-0.15	*	*	*
TiO ₂	4.20	0.40	*	-0.73	-0.16	*	1.94	*	-0.27	-0.73	-0.43	-1.29	*	-0.61	0.81
Al ₂ O ₃	2.17	0.36	*	-0.12	0.10	*	-1.69	*	-0.80	-0.50	0.11	-0.55	*	-1.58	-1.52
Fe ₂ O ₃	-0.55	0.31	-0.12	-0.73	-0.76	*	3.44	-12.22	1.41	0.09	0.37	-1.16	*	-0.43	-0.24
MnO	-1.08	0.11	*	-0.97	-0.97	*	-6.25	-3.13	0.00	0.11	1.29	-0.97	*	0.00	0.22
MgO	3.21	-0.65	*	0.12	0.18	*	0.43	*	1.23	-0.36	0.10	0.86	*	-1.54	-5.08
CaO	*	-0.83	*	-1.49	0.17	*	1.39	*	0.48	0.08	4.27	-0.44	*	-2.71	-5.77
Na ₂ O	1.37	0.23	*	3.89	-0.46	*	-1.37	*	-7.39	2.06	1.83	0.46	*	*	1.37
LOI	*	2.25	*	-1.95	-0.32	*	5.04	*	-1.95	*	-3.77	3.00	*	*	*
Be	*	*	*	*	-0.53	*	*	*	60.91	*	*	*	*	*	*
Cd	*	*	*	1.36	*	*	*	*	1.77	*	*	*	*	*	*
Ce	*	*	9.50	-0.15	-0.25	-0.50	*	*	-0.36	*	*	0.34	-0.31	*	*
Co	1.00	0.50	0.92	0.91	-0.09	*	-8.90	*	-1.13	*	*	0.63	*	-0.11	0.92
Cr	*	-0.12	-0.66	-0.21	-1.33	*	*	*	1.33	*	-5.57	0.08	*	*	2.82
Cs	*	*	*	0.40	0.48	0.27	*	*	1.13	*	*	0.14	-0.30	*	*
Cu	-2.35	0.34	*	2.82	0.32	*	*	-1.43	0.05	*	-4.47	-0.16	*	-0.44	*
Dy	*	*	*	0.01	0.01	1.04	*	*	-0.40	*	*	0.18	0.58	*	*
Er	*	*	*	0.47	-0.02	0.20	*	*	-0.30	*	*	0.04	0.34	*	*
Eu	-0.42	*	0.44	1.07	0.10	-0.07	*	*	-0.50	*	*	0.39	-0.21	*	1.12
Ga	*	0.95	*	-0.01	-0.09	*	*	*	-0.46	*	-0.80	0.04	*	*	0.36
Gd	*	*	*	-0.10	-0.21	0.70	*	*	-0.88	*	*	-0.65	0.62	*	*
Hf	*	*	-0.08	*	-0.14	-1.71	*	*	0.29	*	*	*	0.00	*	1.57
Ho	*	*	*	0.10	0.08	0.35	*	*	-0.30	*	*	0.25	0.14	*	*
La	0.03	*	-1.02	-0.25	-0.16	-0.18	*	*	0.83	*	*	*	1.05	*	*
Li	*	5.59	*	2.76	*	*	*	*	*	*	*	-1.12	*	-0.29	*
Lu	-0.19	*	-0.81	0.52	-0.03	0.30	*	*	-0.16	*	*	*	-0.07	*	-0.19
Nd	*	*	*	0.50	0.06	0.20	*	*	-0.37	*	*	0.50	0.32	*	*
Ni	-1.93	0.05	*	-0.47	0.56	*	*	*	-2.76	*	2.28	0.64	*	-0.29	32.99
Pr	*	*	*	0.77	-0.08	-0.41	*	*	-0.10	*	*	*	0.05	*	*
Rb	*	*	*	0.39	-0.03	-1.89	*	*	9.87	*	*	*	-1.28	*	*
Sc	0.24	*	0.32	0.97	-0.17	*	0.68	*	*	*	*	-0.54	*	*	1.05
Sm	0.31	*	-0.03	-0.01	0.05	-0.21	*	*	-0.22	*	*	*	0.11	*	-0.03
Sr	*	-1.18	*	-1.71	0.36	0.05	13.07	*	-0.66	*	10.10	-0.05	0.05	*	*
Ta	*	*	*	*	8.01	1.67	*	*	1.67	*	*	*	*	-1.08	*
Tb	*	*	0.53	0.27	0.46	-0.04	*	*	-0.39	*	*	-0.17	-0.17	*	*
Th	*	*	*	-1.36	-0.18	-0.59	*	*	14.45	*	*	*	0.83	*	*
Tm	*	*	*	0.28	-0.22	0.25	*	*	-0.09	*	*	*	0.06	*	*
U	*	*	*	*	0.26	-0.63	*	*	21.71	*	*	*	-0.63	*	*
V	0.35	-0.39	*	0.17	-0.23	*	-2.39	*	-2.73	*	-7.87	-3.05	*	*	1.64
Y	*	-0.41	*	-0.22	0.34	0.82	*	*	-1.36	*	3.27	-0.31	-1.17	*	*
Yb	-0.32	*	1.18	-0.03	-0.08	-0.10	*	*	-0.34	*	*	*	-0.04	*	-1.44
Zn	-1.81	-0.53	0.82	-1.28	0.49	*	-2.56	-1.85	3.78	*	3.65	0.41	*	3.27	*
Zr	*	-0.48	*	-0.14	0.63	-2.08	-4.37	*	1.35	*	1.87	1.22	1.34	*	*

Table 3 GeoPT20 Z-scores for analytical results submitted (December 2006)															
	OPY-1, Ultramafic rock														
Labcode	U54	U55	U56	U57	U58	U59	U60	U61	U62	U63	U64	U64	U65	U66	U67
Sample	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1
Quality	2	2	1	1	1	2	1	1	1	1	1	2	2	2	2
SiO ₂	3.02	-1.14	-0.29	1.55	-1.18	-0.14	*	-11.31	0.77	-0.35	0.91	*	0.61	*	0.22
TiO ₂	*	0.52	-0.32	5.67	-3.71	-1.23	26.81	-42.60	-0.32	9.40	-0.32	*	0.40	-0.16	-0.42
Al ₂ O ₃	*	0.67	-0.47	-3.67	-0.75	0.99	*	-66.59	0.63	-3.33	0.54	*	0.44	*	-1.62
Fe ₂ O ₃	*	-0.82	-1.06	-12.37	-0.67	0.93	*	-24.87	0.56	4.97	-0.85	*	-0.09	-0.37	-0.01
MnO	*	0.11	0.22	-6.68	0.22	-2.91	26.09	-19.19	0.22	-3.23	-0.43	*	1.19	-1.29	-0.27
MgO	*	-2.24	-2.09	4.58	-3.49	0.13	*	91.87	-0.23	-0.31	-0.86	*	0.25	*	0.48
CaO	*	-0.06	-0.10	-1.93	-2.98	-0.35	*	-66.46	0.95	2.09	-0.10	*	0.65	-0.79	-0.51
Na ₂ O	*	0.94	-10.85	-5.03	-8.69	-1.08	*	-50.34	1.83	-5.03	-2.75	*	-2.75	*	2.29
LOI	*	*	-3.40	*	3.01	1.30	*	13.04	-2.00	2.20	22.40	*	0.76	*	*
Be	*	11.75	0.00	-1.18	*	*	*	*	*	*	*	*	*	*	*
Cd	*	*	-0.41	-2.05	674.04	*	*	*	*	*	*	*	*	*	*
Ce	*	-0.11	0.84	-0.82	-13.05	-0.35	*	*	*	*	*	*	*	*	*
Co	*	-0.11	0.99	2.41	-0.70	-0.63	8.08	*	1.29	-10.03	1.14	*	*	*	-0.98
Cr	*	0.57	1.93	-9.12	11.40	0.74	19.09	*	0.87	*	-1.06	*	*	2.66	0.27
Cs	*	0.40	-0.15	-0.25	-9.70	-0.65	*	*	*	*	*	*	*	*	*
Cu	*	0.22	-0.66	0.39	-0.33	4.21	*	*	1.19	-17.01	2.10	*	*	1.86	49.90
Dy	-0.25	0.09	-1.21	0.32	*	0.57	1.22	*	*	*	*	*	*	*	*
Er	*	-0.20	-1.79	-0.04	*	2.12	2.17	*	*	*	*	*	*	*	*
Eu	*	0.05	0.78	0.03	*	-0.12	-0.25	*	*	*	*	*	*	*	*
Ga	*	-4.62	-0.67	1.04	-3.89	-0.76	*	*	-0.03	*	*	4.43	*	*	-0.98
Gd	*	-0.49	1.89	-0.16	*	2.79	*	*	*	*	*	*	*	*	*
Hf	*	-0.76	0.89	-0.50	29.86	1.40	*	*	*	*	*	*	*	*	*
Ho	*	-0.36	0.38	-0.14	*	1.01	*	*	*	*	*	*	*	*	*
La	*	5.12	0.00	-1.99	-10.97	0.28	*	*	*	*	*	*	*	*	*
Li	*	*	0.00	2.49	*	87.63	*	*	*	*	*	*	*	*	*
Lu	*	-0.40	0.92	-0.07	*	1.44	*	*	*	*	*	*	*	*	*
Nd	*	-0.35	1.33	0.07	-13.27	0.23	*	*	*	*	*	*	*	*	*
Ni	*	0.98	2.67	-4.52	2.40	-3.69	77.58	*	1.33	-18.68	1.57	*	*	0.88	1.13
Pr	*	0.15	-1.66	-0.49	*	-0.06	*	*	*	*	*	*	*	*	*
Rb	*	0.03	-1.36	-1.13	11.72	-0.82	2.00	*	*	-0.43	*	*	*	*	54.43
Sc	*	-0.06	1.44	3.12	2.89	-0.80	*	*	2.16	*	*	-0.61	*	*	*
Sm	*	-0.44	1.63	0.03	*	0.92	*	*	*	*	*	*	*	*	*
Sr	*	-0.57	-0.34	1.79	1.20	-0.27	1.20	*	-3.55	19.00	3.22	*	*	-1.18	-1.77
Ta	*	*	*	5.98	-7.41	-1.32	*	*	*	*	*	*	*	*	*
Tb	-0.39	-0.17	0.84	-0.26	*	1.14	*	*	*	*	*	*	*	*	*
Th	*	1.00	*	-0.64	228.45	1.00	*	*	*	*	*	*	*	*	*
Tm	*	-0.34	*	0.00	*	2.15	*	*	*	*	*	*	*	*	*
U	*	*	*	-0.06	-6.35	*	*	*	*	*	*	*	*	*	*
V	*	-0.69	0.29	4.53	-1.59	1.78	16.61	*	-1.42	-5.45	1.96	*	*	*	-0.19
Y	*	-1.44	-0.13	-1.78	-2.67	0.94	*	*	1.04	6.62	*	*	*	*	2.38
Yb	*	-0.28	1.64	-0.13	*	1.52	*	*	*	*	*	*	*	*	*
Zn	*	1.39	-0.56	-4.23	-2.19	0.98	*	*	0.45	0.07	1.76	*	*	0.22	0.98
Zr	*	-0.97	-0.96	-3.10	5.85	-1.14	-11.18	*	11.52	-2.10	*	*	*	*	3.49

Table 3 GeoPT20 Z-scores for analytical results submitted (December 2006)							
	OPY-1, Ultramafic rock						
Labcode	U68	U69	U70	U71	U72	U73	U74
Sample	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1	OPY-1
Quality	2	2	2	2	2	1	2
SiO ₂	0.26	-0.95	*	-0.15	0.05	*	-0.01
TiO ₂	0.97	-1.29	*	-0.73	-0.73	*	0.07
Al ₂ O ₃	0.01	-1.06	*	-0.03	0.40	*	-1.71
Fe ₂ O ₃	0.12	1.11	*	2.24	-0.43	*	0.69
MnO	1.19	4.42	*	0.11	0.11	*	-1.29
MgO	-0.38	1.79	*	-0.08	-0.25	*	-0.27
CaO	-0.27	0.87	*	0.21	0.17	*	1.20
Na ₂ O	0.92	-4.80	*	-4.12	-0.23	*	-2.79
LOI	-2.43	-2.22	*	-0.80	-0.39	*	-4.03
Be	*	*	-1.02	*	*	0.00	*
Cd	*	*	*	4.78	*	*	*
Ce	*	-0.15	-0.30	-0.79	-0.15	-0.70	*
Co	2.13	-0.63	0.20	-0.16	-0.63	-3.78	-5.44
Cr	0.92	2.33	-1.42	-3.87	*	4.31	-3.04
Cs	*	*	0.03	3.29	*	-0.78	*
Cu	-0.67	-2.44	0.34	-0.45	-0.67	-3.16	4.13
Dy	*	-0.25	0.22	-0.04	-0.25	-5.49	*
Er	*	-0.14	-0.08	-0.02	-0.14	-4.00	*
Eu	*	-0.12	-0.33	-0.29	*	-4.20	*
Ga	*	0.95	-0.24	*	*	-1.20	*
Gd	*	-0.82	0.24	0.01	-0.26	-5.77	*
Hf	*	-0.56	0.11	*	*	1.57	*
Ho	*	0.70	0.22	-0.20	*	-4.04	*
La	*	1.06	-0.14	-0.64	*	0.68	*
Li	*	-1.65	*	0.75	*	-3.96	*
Lu	*	1.44	0.15	-0.10	*	-0.31	*
Nd	*	-0.39	0.17	-0.30	-0.39	-0.34	*
Ni	0.39	-1.40	-0.37	-1.07	-1.01	-1.34	-5.04
Pr	*	1.19	-0.06	-0.06	*	-0.62	*
Rb	*	1.00	-0.64	1.18	*	-3.10	*
Sc	*	-0.76	-0.25	-0.03	*	-9.69	*
Sm	*	-0.01	0.47	-0.10	*	-3.93	*
Sr	23.15	0.60	0.01	0.01	-1.18	-2.12	2.36
Ta	*	*	-0.60	*	*	2.15	*
Tb	*	*	0.05	-0.17	*	-4.43	*
Th	527.01	*	0.18	*	*	0.83	*
Tm	*	1.52	0.25	-0.03	*	-1.87	*
U	*	*	0.26	0.54	*	0.52	*
V	*	0.82	0.42	-1.20	-1.44	0.35	-2.25
Y	*	-0.13	0.52	-0.43	-1.43	-1.15	*
Yb	*	-0.66	0.09	-0.41	-0.66	-1.32	*
Zn	0.09	2.67	0.52	-0.85	-3.73	2.89	4.93
Zr	*	*	0.20	0.60	*	-2.44	*

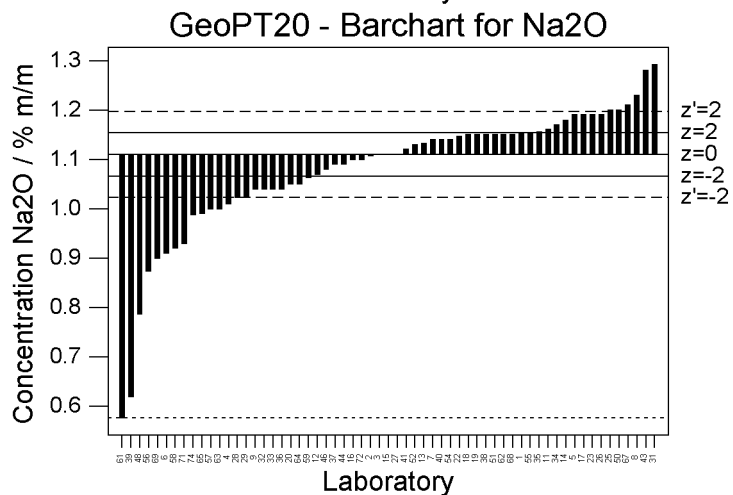
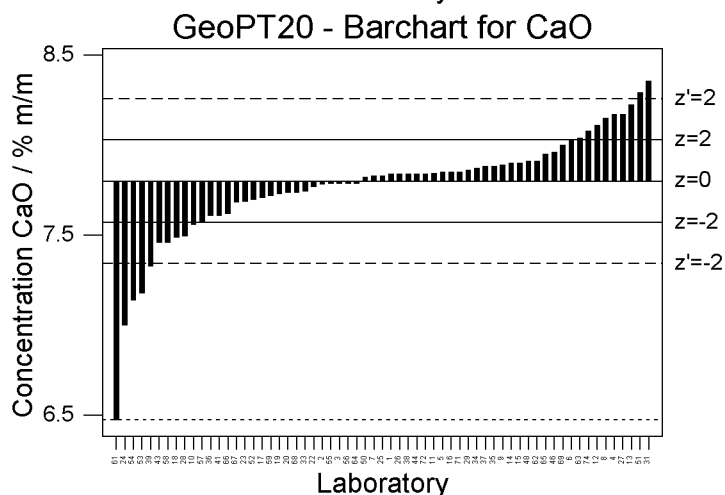
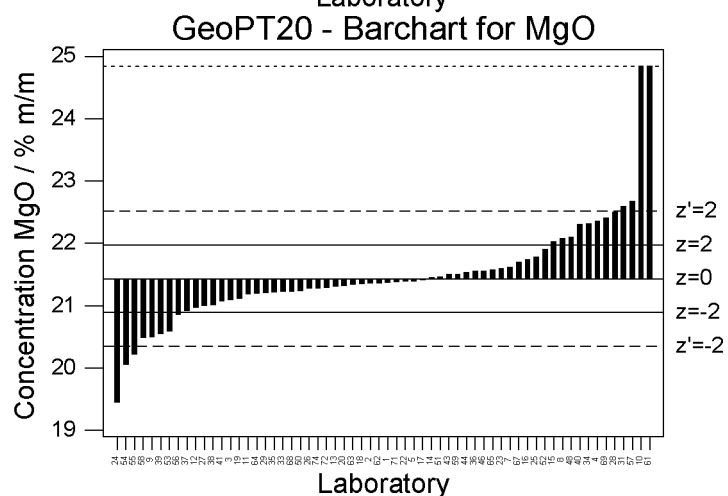
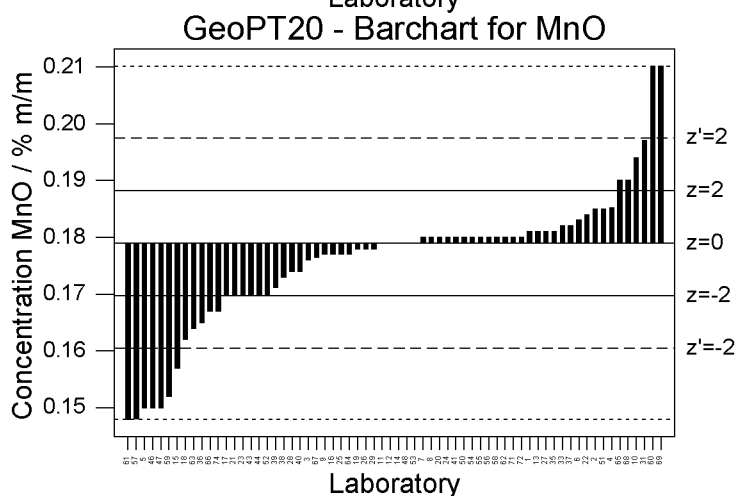
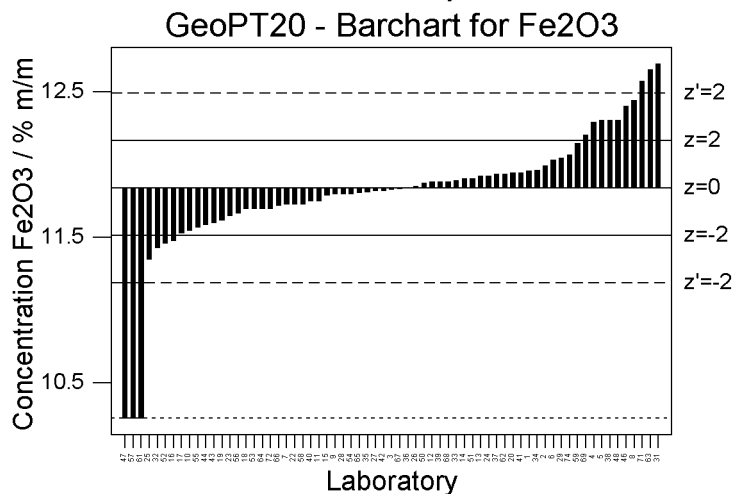
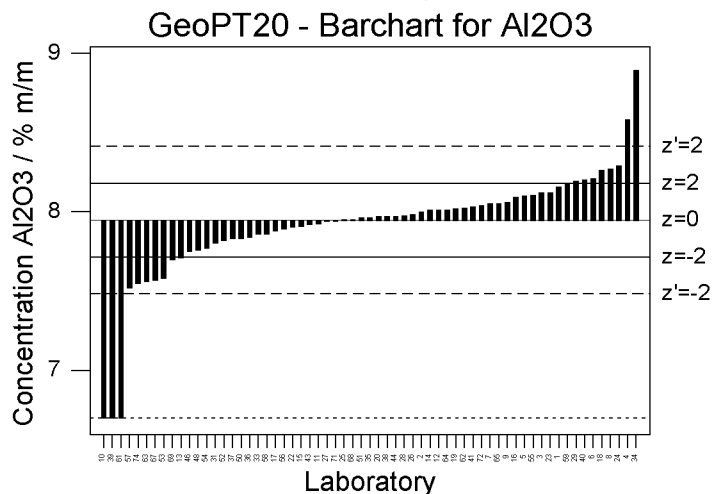
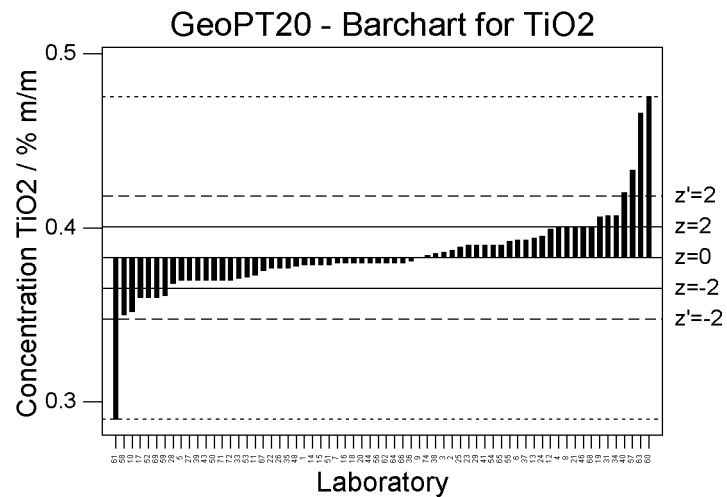
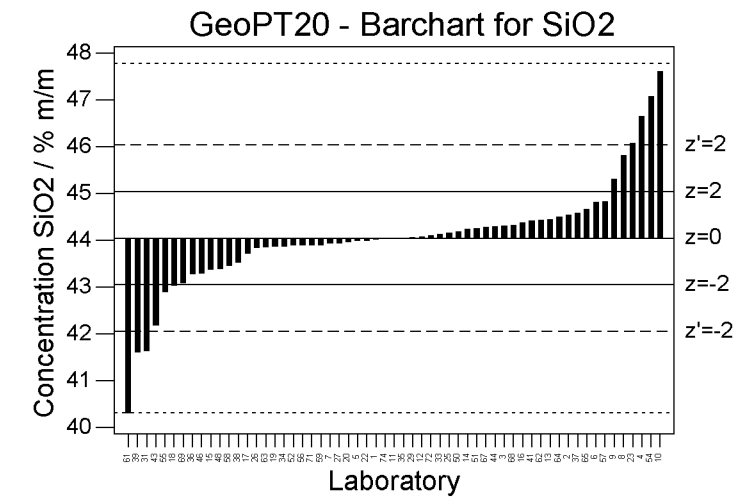


Figure 1: GeoPT20 – Ultramafic rock OPY-1. Data distribution charts for elements for which values were assigned. Horizontal lines show the limits for $-2 < z < 2$ for pure geochemistry labs (solid lines) and $-2 < z' < 2$ for applied geochemistry labs (pecked lines).

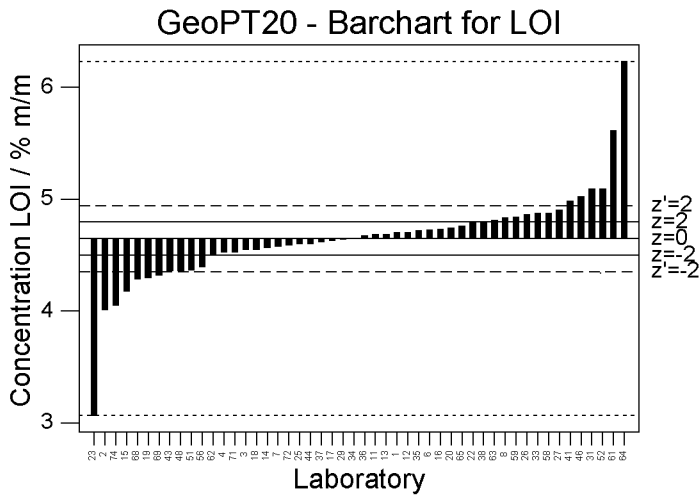


Figure 1: GeoPT20 – Ultramafic rock, OPY-1. Data distribution charts for elements for which values were assigned. Horizontal lines show the limits for $-2 < z < 2$ for pure geochemistry labs (solid lines) and $-2 < z' < 2$ for applied geochemistry labs (pecked lines).

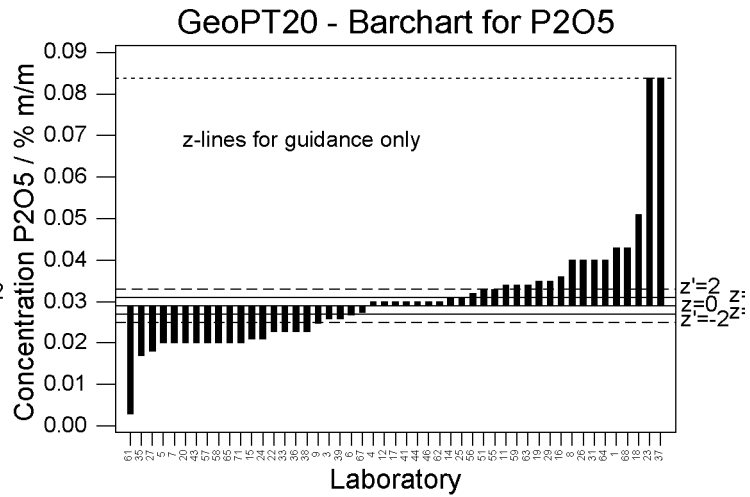
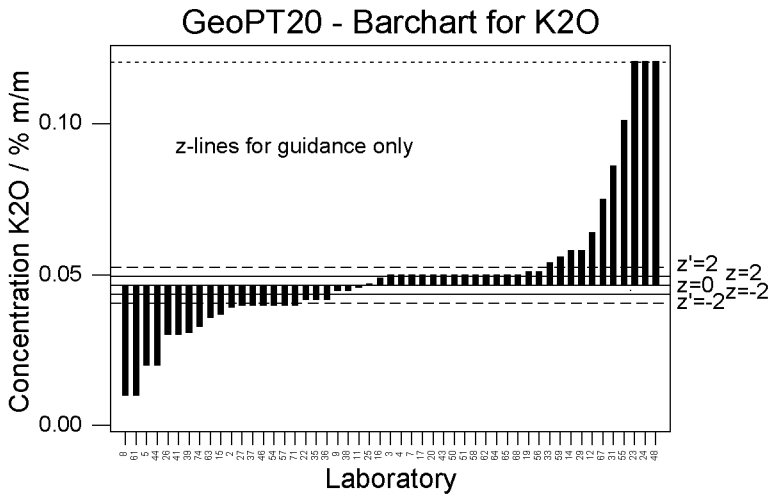


Figure 2: GeoPT20 – Ultramafic rock, OPY-1. Data distribution charts for elements for which z scores are shown for guidance only. Horizontal lines show the limits for $-2 < z < 2$ for pure geochemistry labs (solid lines) and $-2 < z' < 2$ for applied geochemistry labs (pecked lines)

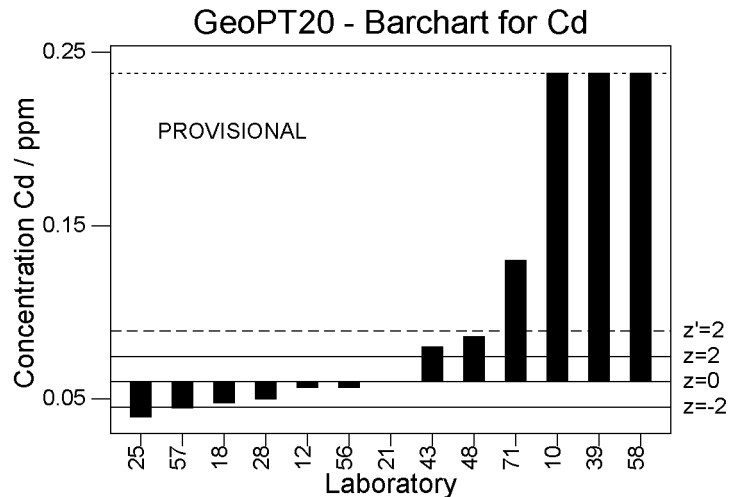
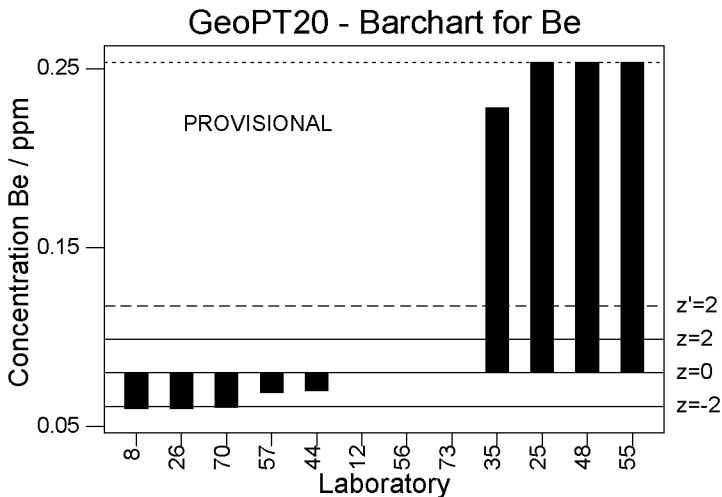


Figure 1 (contd): GeoPT20 – Ultramafic rock, OPY-1. Data distribution charts for elements for which values were assigned. Horizontal lines show the limits for $-2 < z < 2$ for pure geochemistry labs (solid lines) and $-2 < z' < 2$ for applied geochemistry labs (pecked lines).

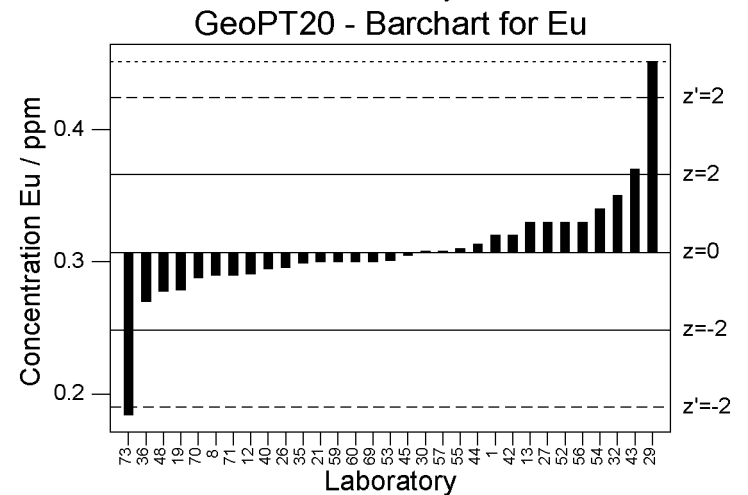
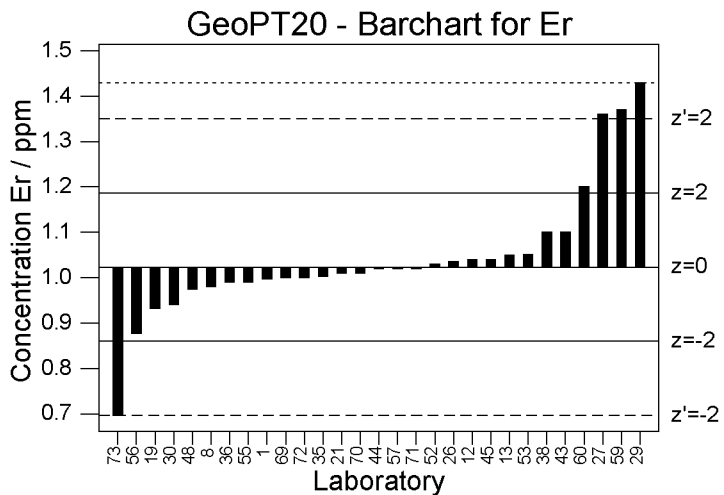
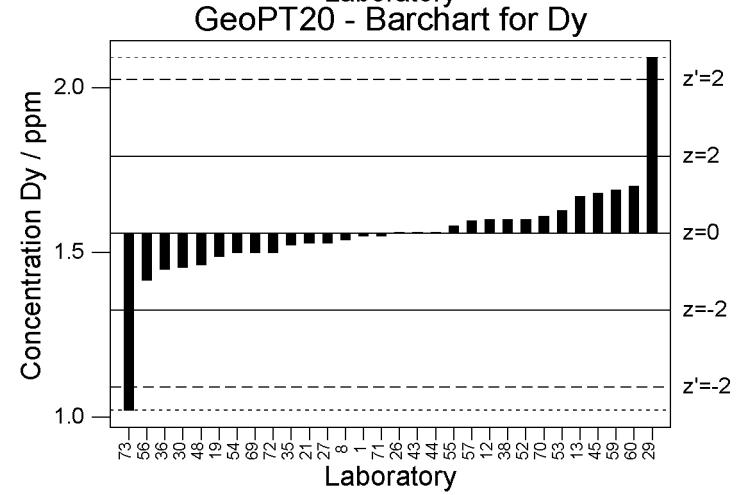
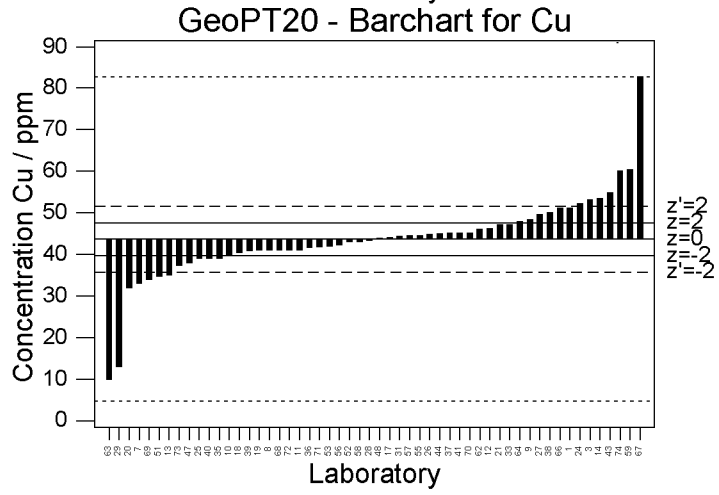
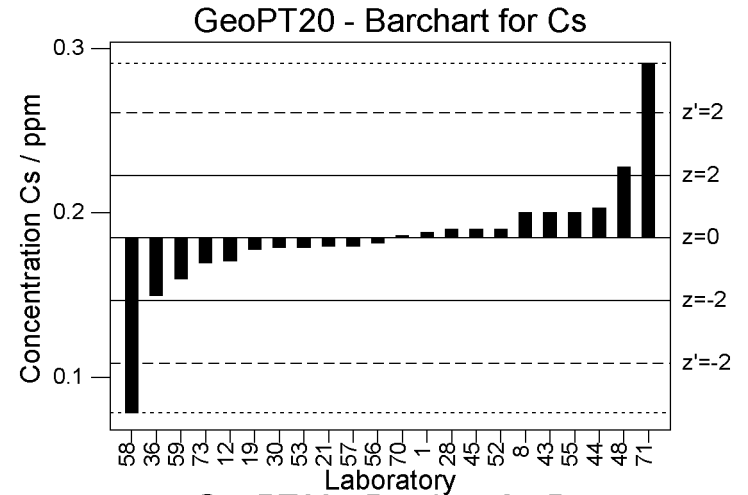
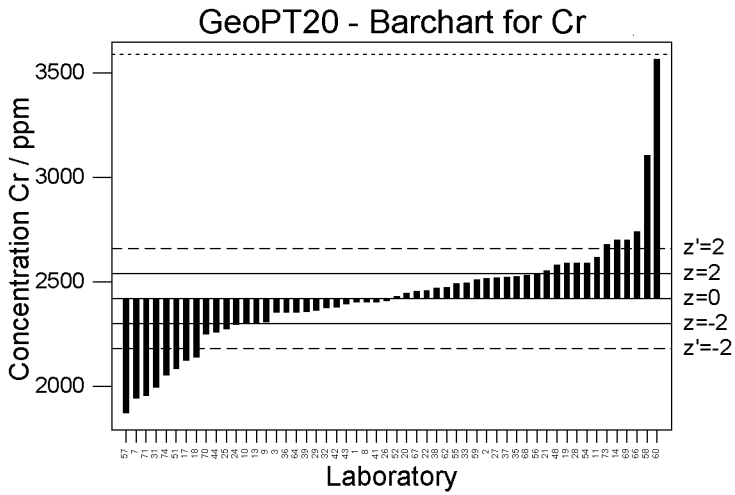
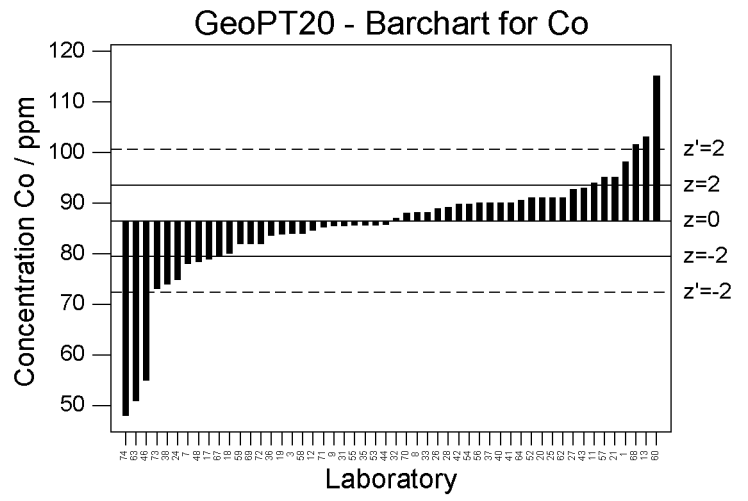
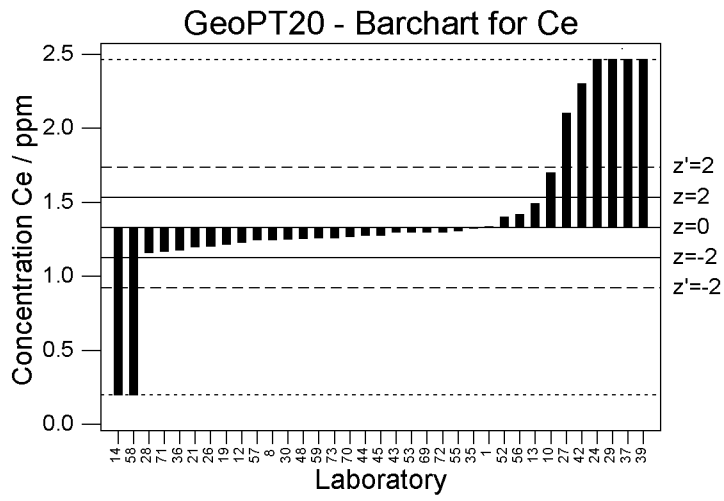


Figure 1 (contd): GeoPT20 – Ultramafic rock OPY-1. Data distribution charts for elements for which values were assigned. Horizontal lines show the limits for $-2 < z < 2$ for pure geochemistry labs (solid lines) and $-2 < z' < 2$ for applied geochemistry labs (pecked lines).

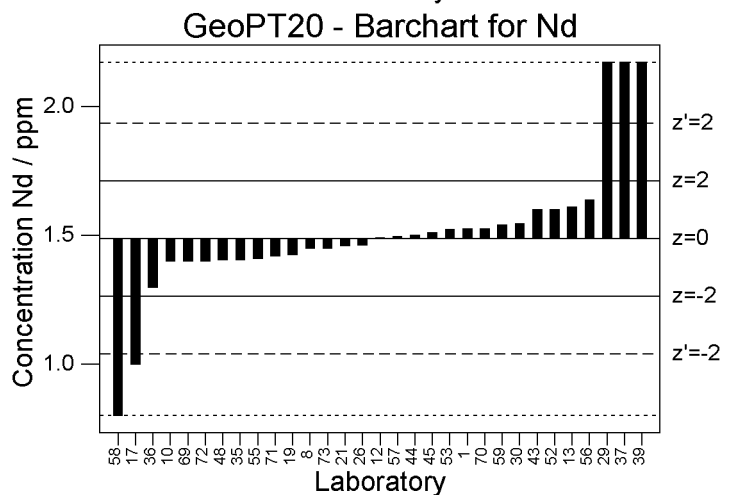
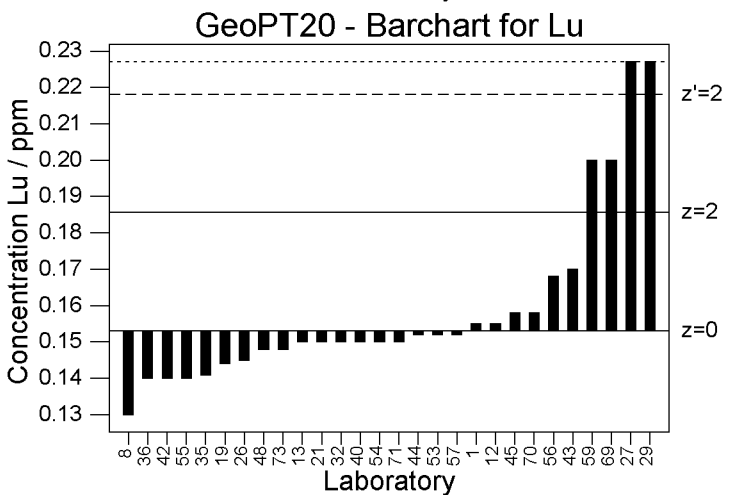
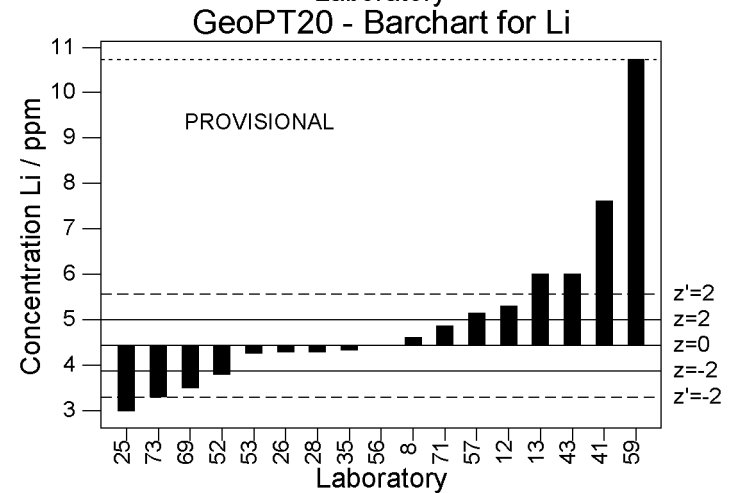
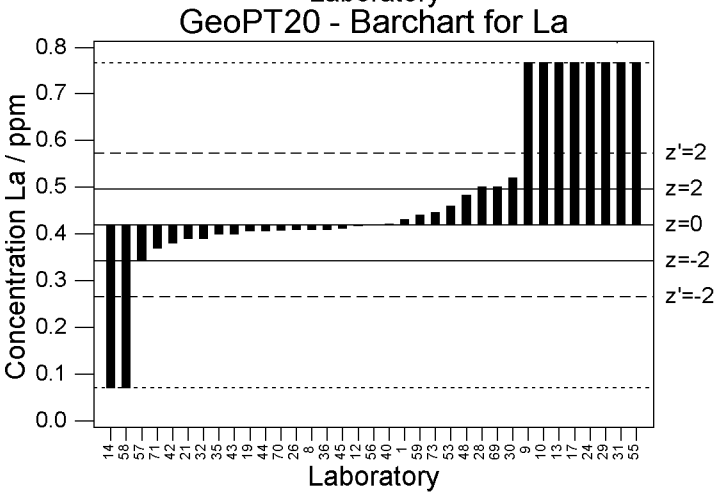
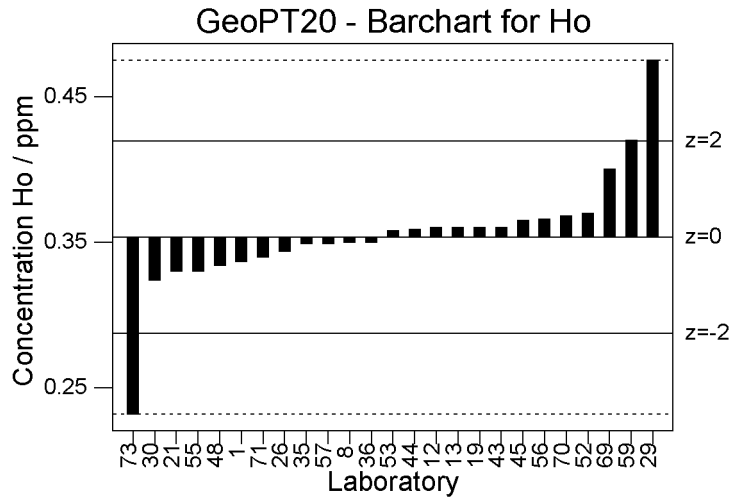
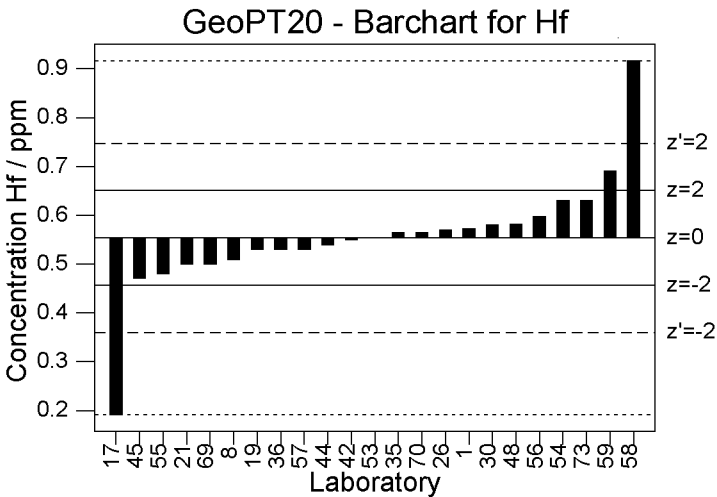
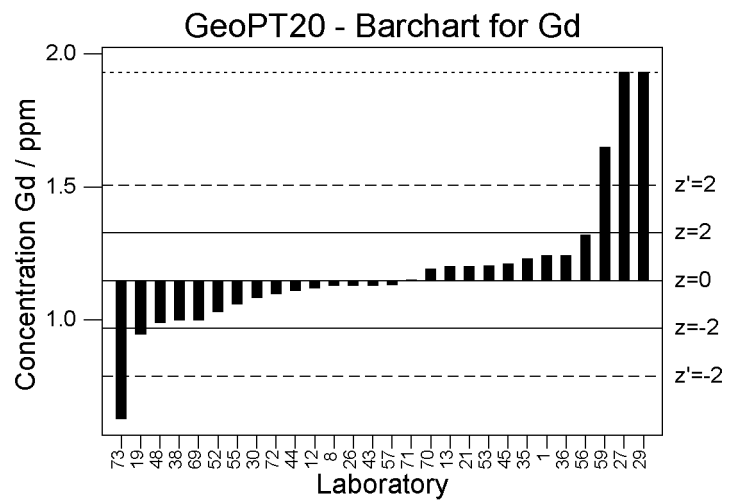
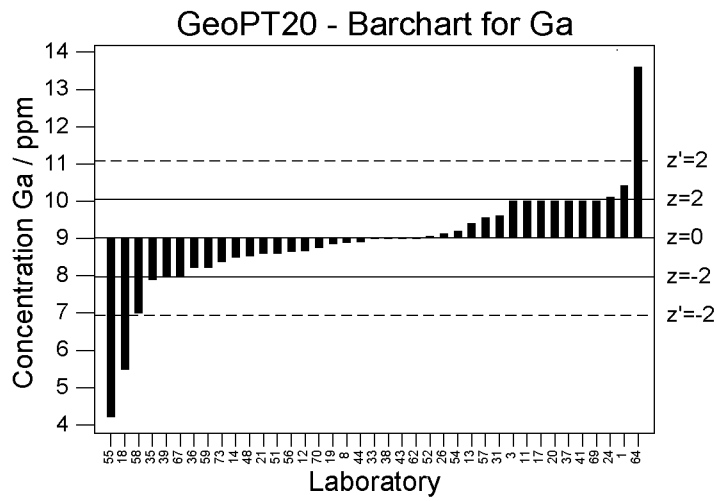


Figure 1 (contd): GeoPT20 – Ultramafic rock OPY-1. Data distribution charts for elements for which values were assigned. Horizontal lines show the limits for $-2 < z < 2$ for pure geochemistry labs (solid lines) and $-2 < z' < 2$ for applied geochemistry labs (pecked lines).

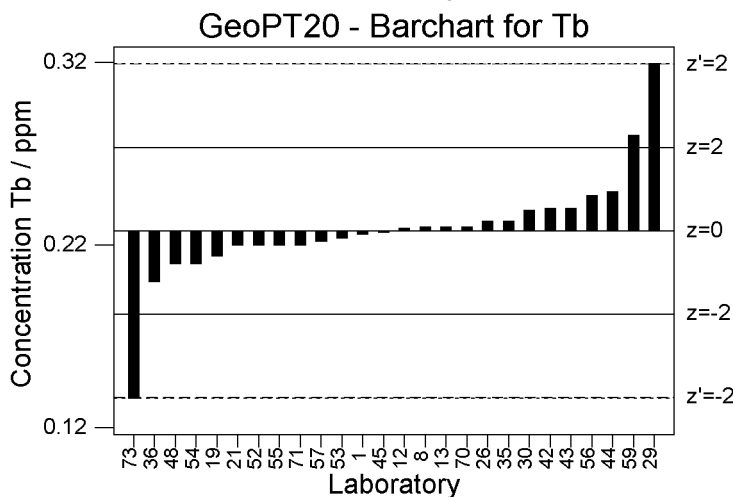
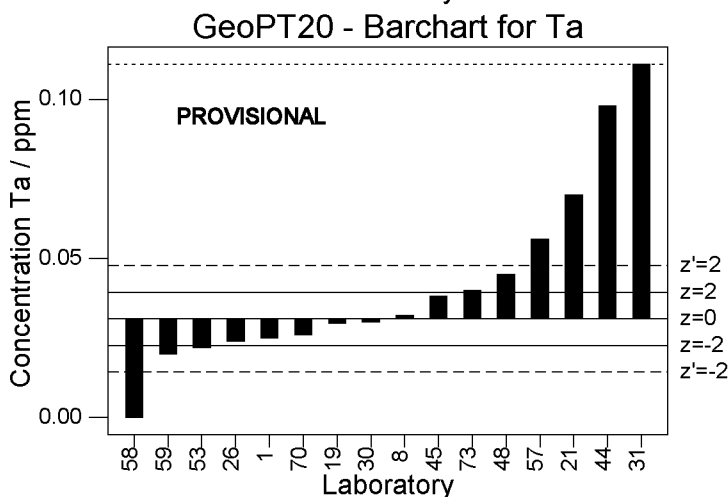
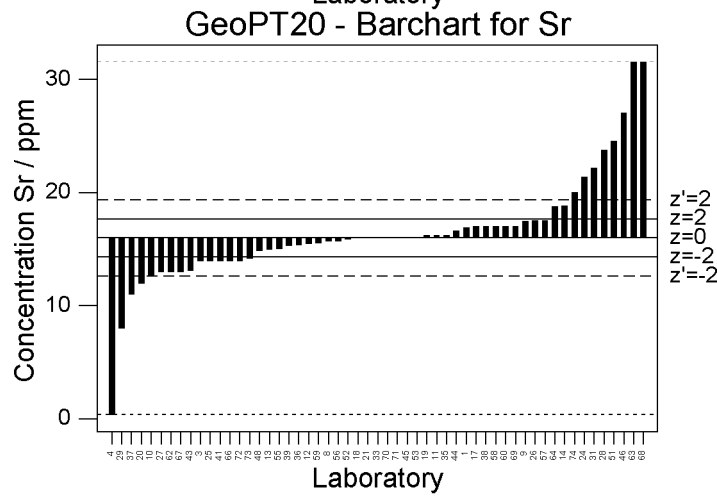
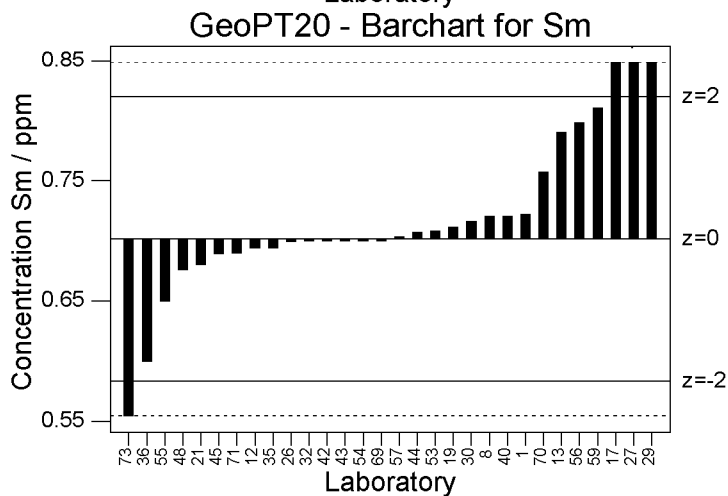
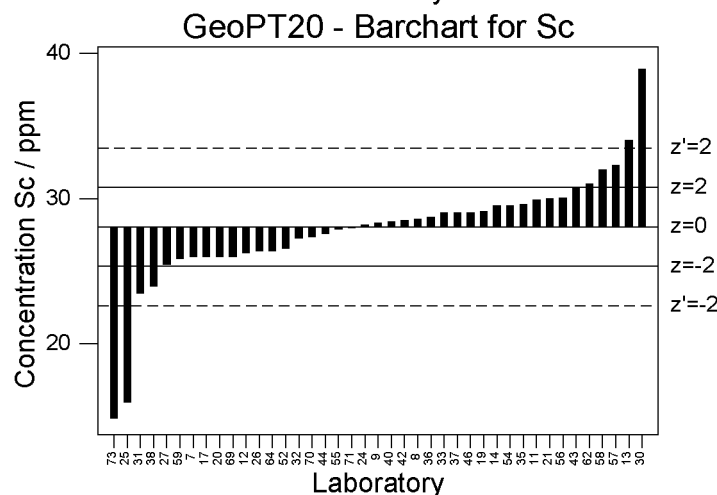
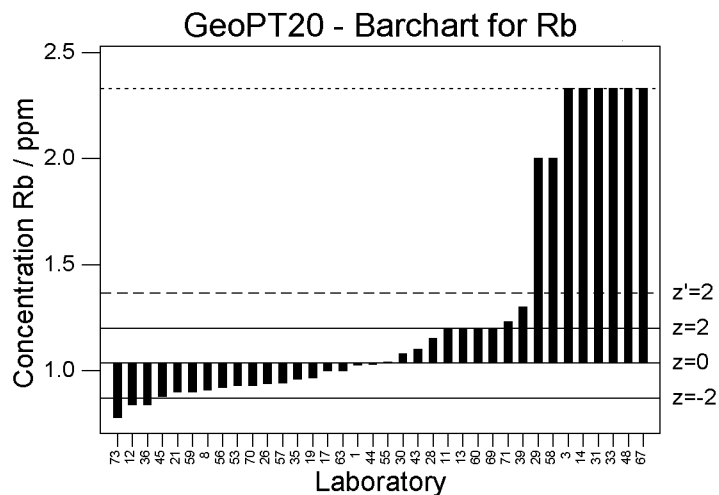
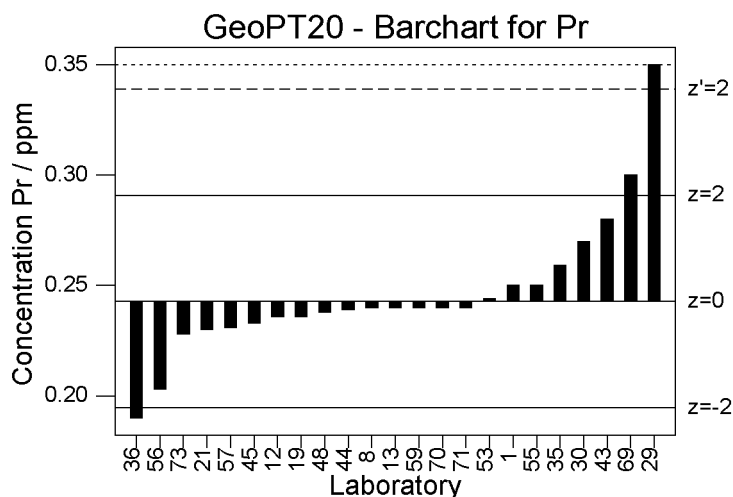
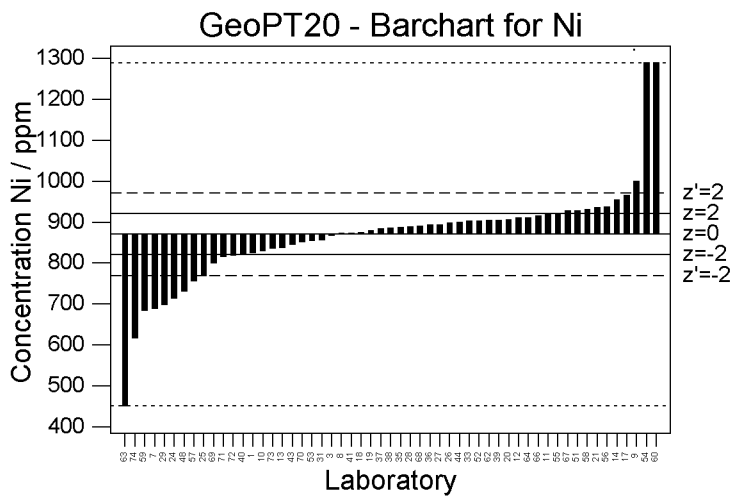


Figure 1 (contd): GeoPT20 – Ultramafic rock OPY-1. Data distribution charts for elements for which values were assigned. Horizontal lines show the limits for $-2 < z < 2$ for pure geochemistry labs (solid lines) and $-2 < z' < 2$ for applied geochemistry labs (pecked lines).

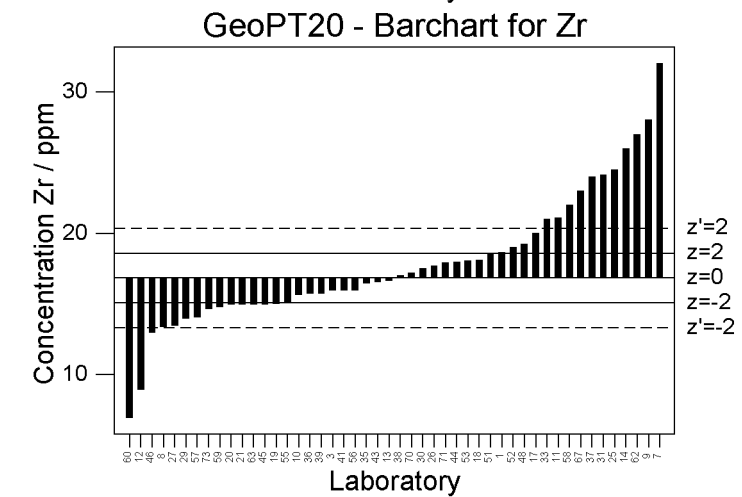
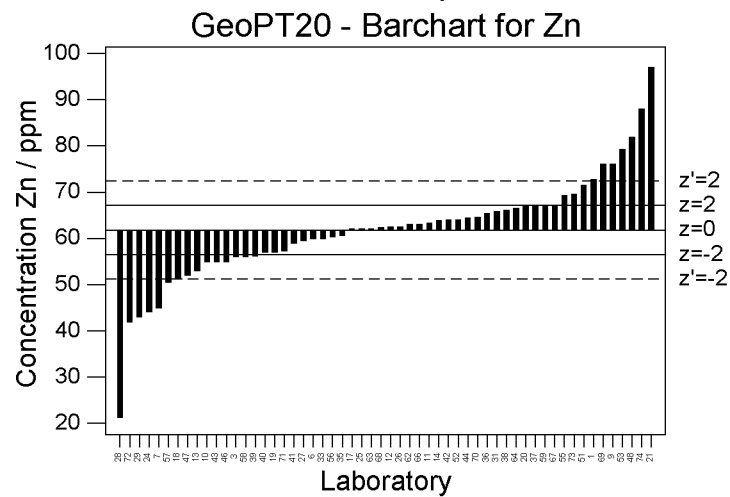
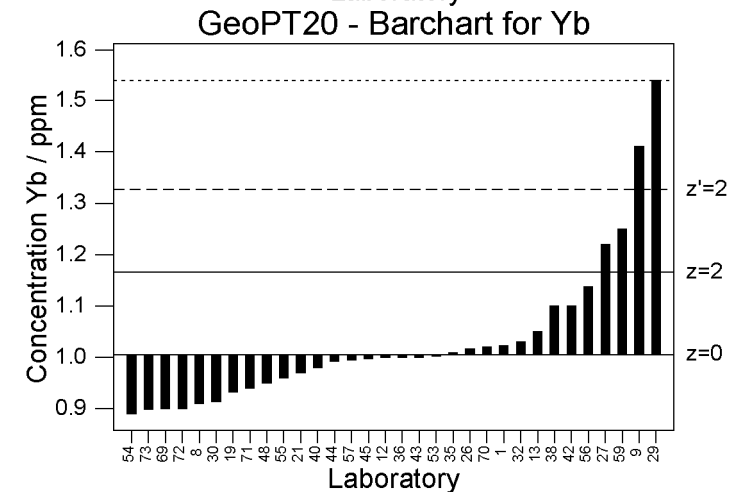
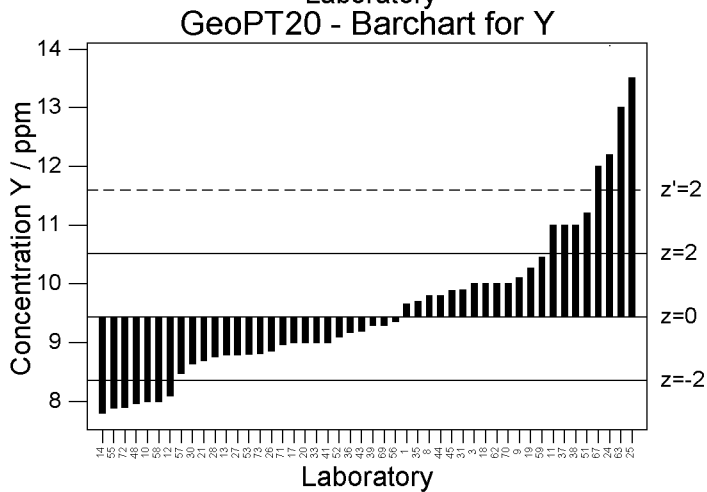
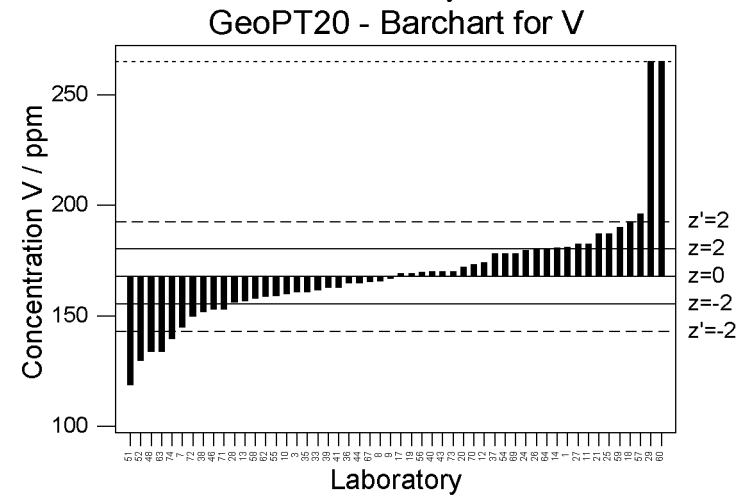
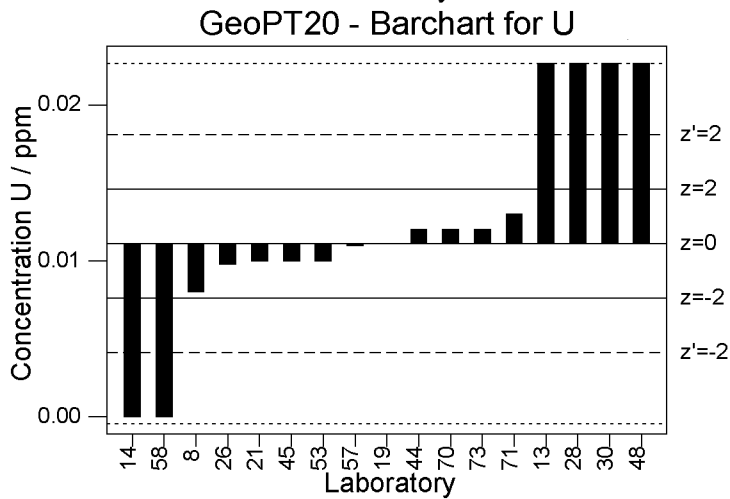
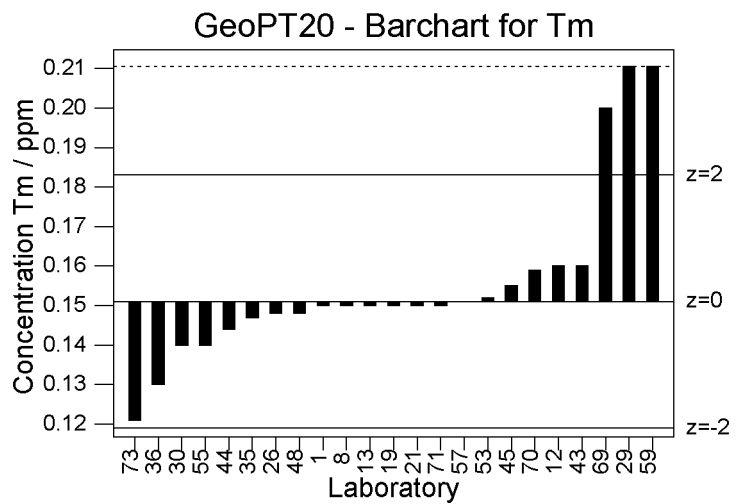
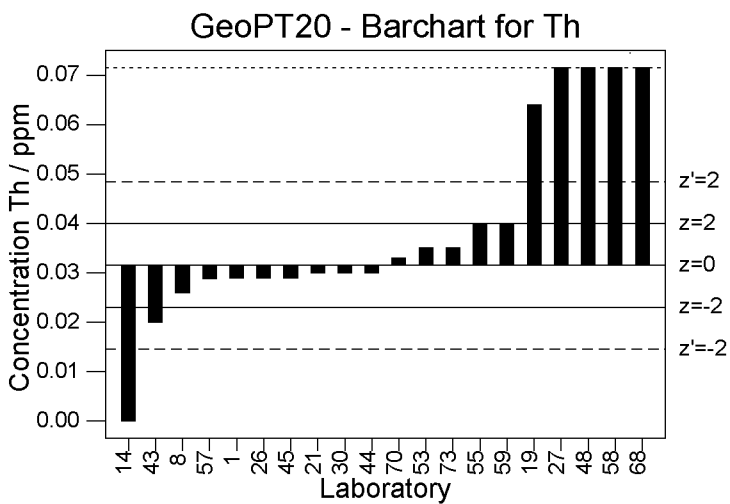


Figure 1 (contd): GeoPT20 – Ultramafic rock OPY-1. Data distribution charts for elements for which values were assigned. Horizontal lines show the limits for $-2 < z < 2$ for pure geochemistry labs (solid lines) and $-2 < z' < 2$ for applied geochemistry labs (pecked lines).

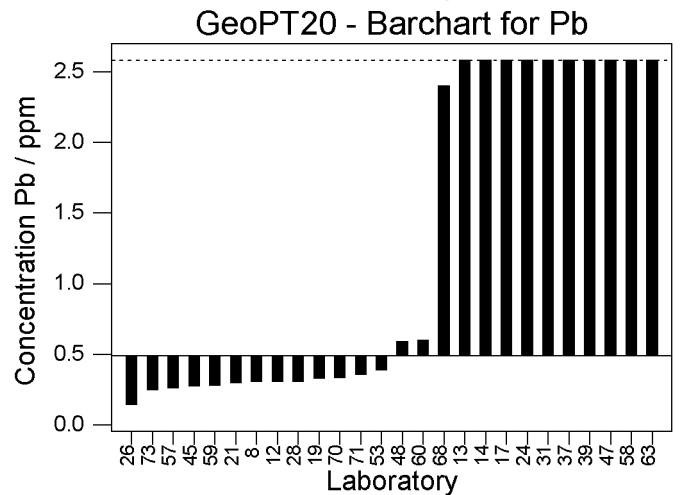
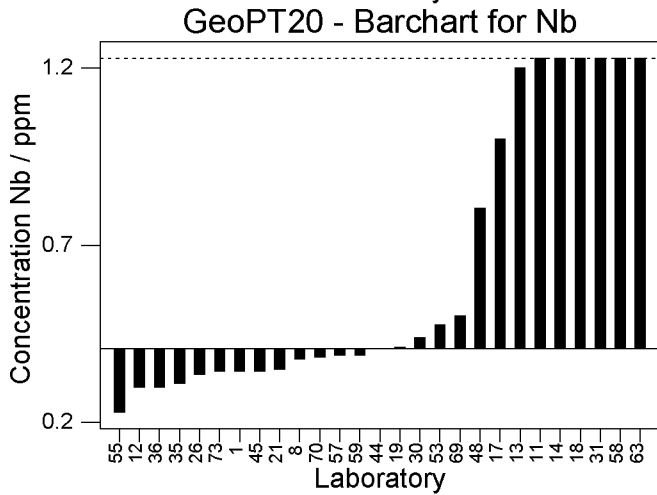
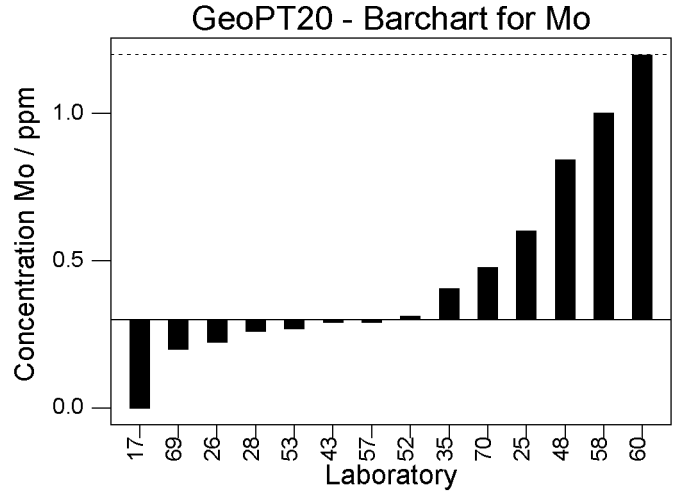
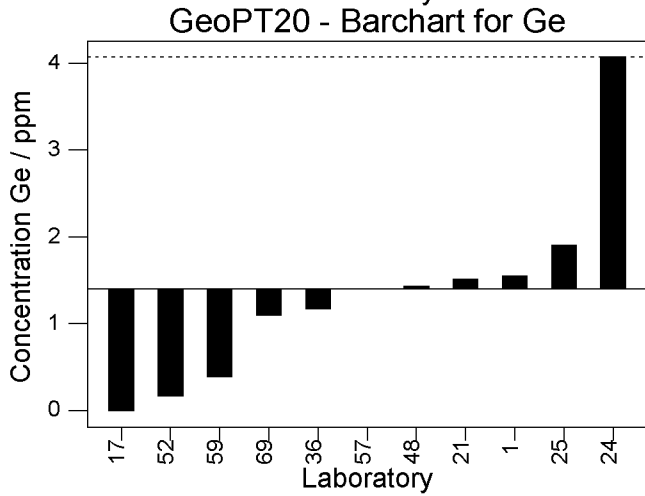
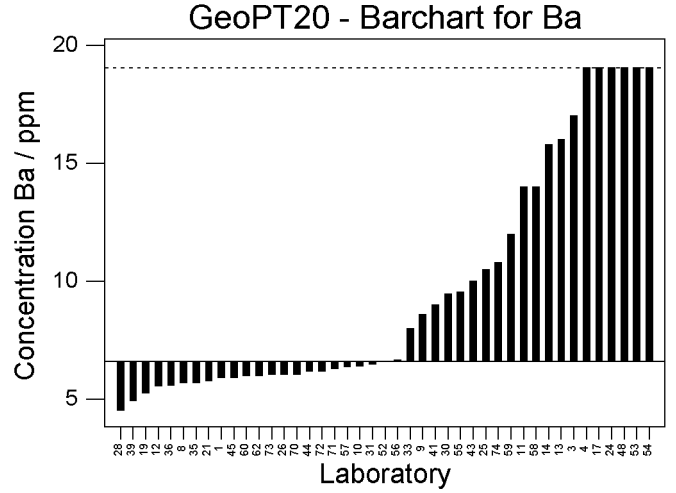
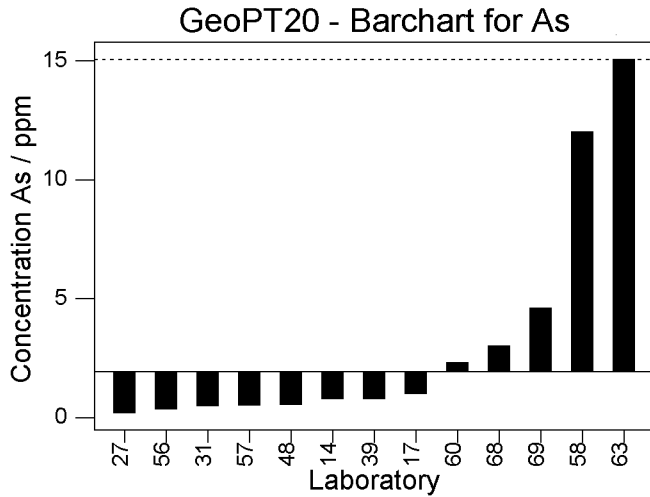
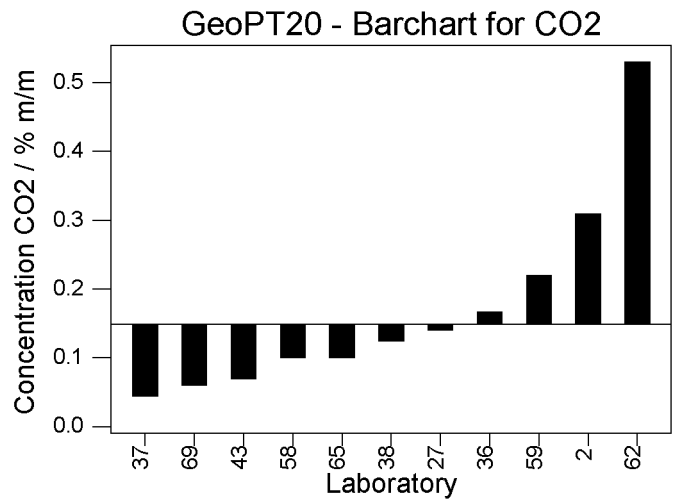
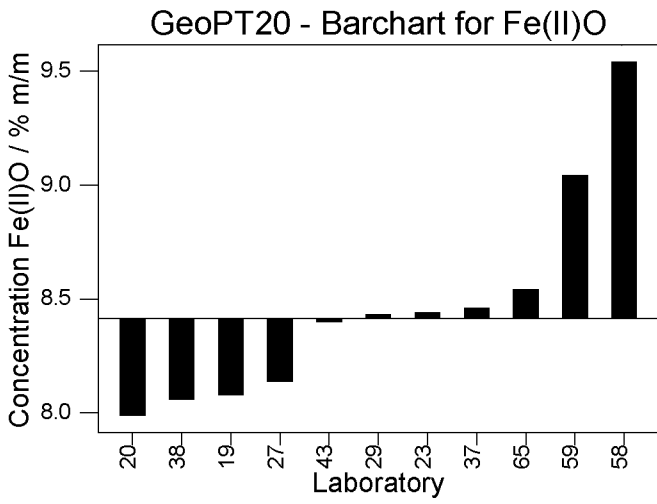


Figure 3: GeoPT20 – Ultramafic rock, OPY-1. Data distribution charts for information only for elements for which values could not be assigned.

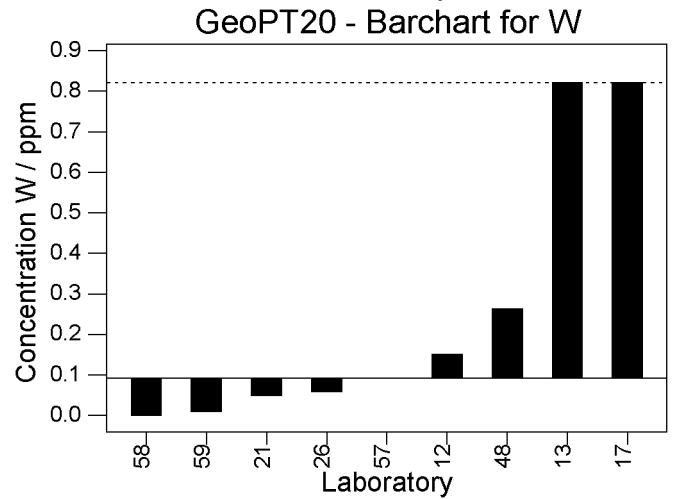
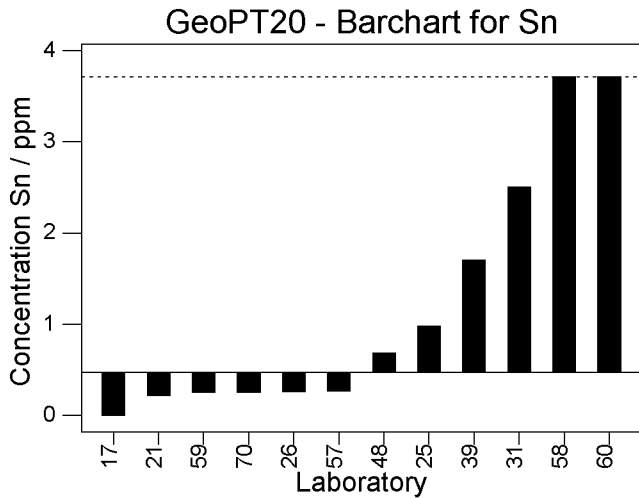
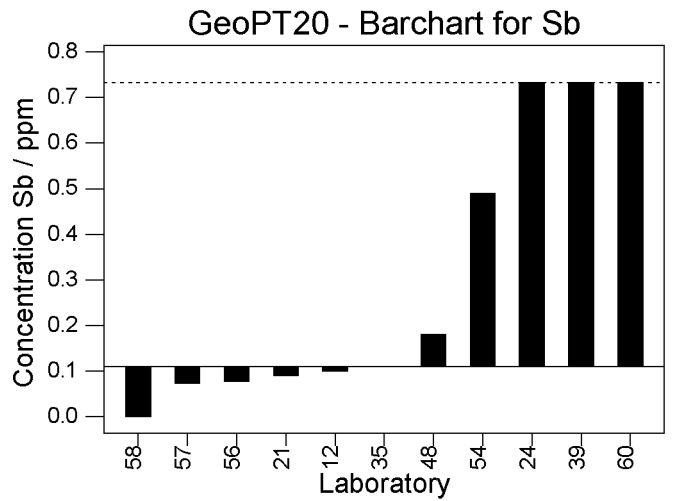
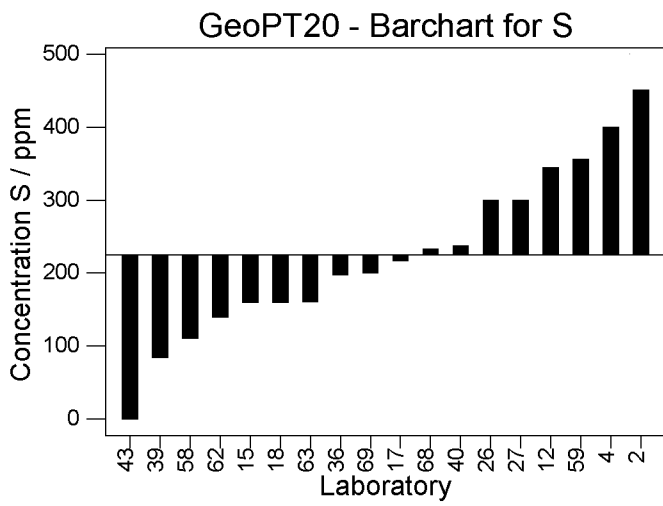


Figure 3 (contd): GeoPT20 – Ultramafic rock, OPY-1. Data distribution charts for information only for elements for which values could not be assigned.

Multiple z-score chart for GeoPT20

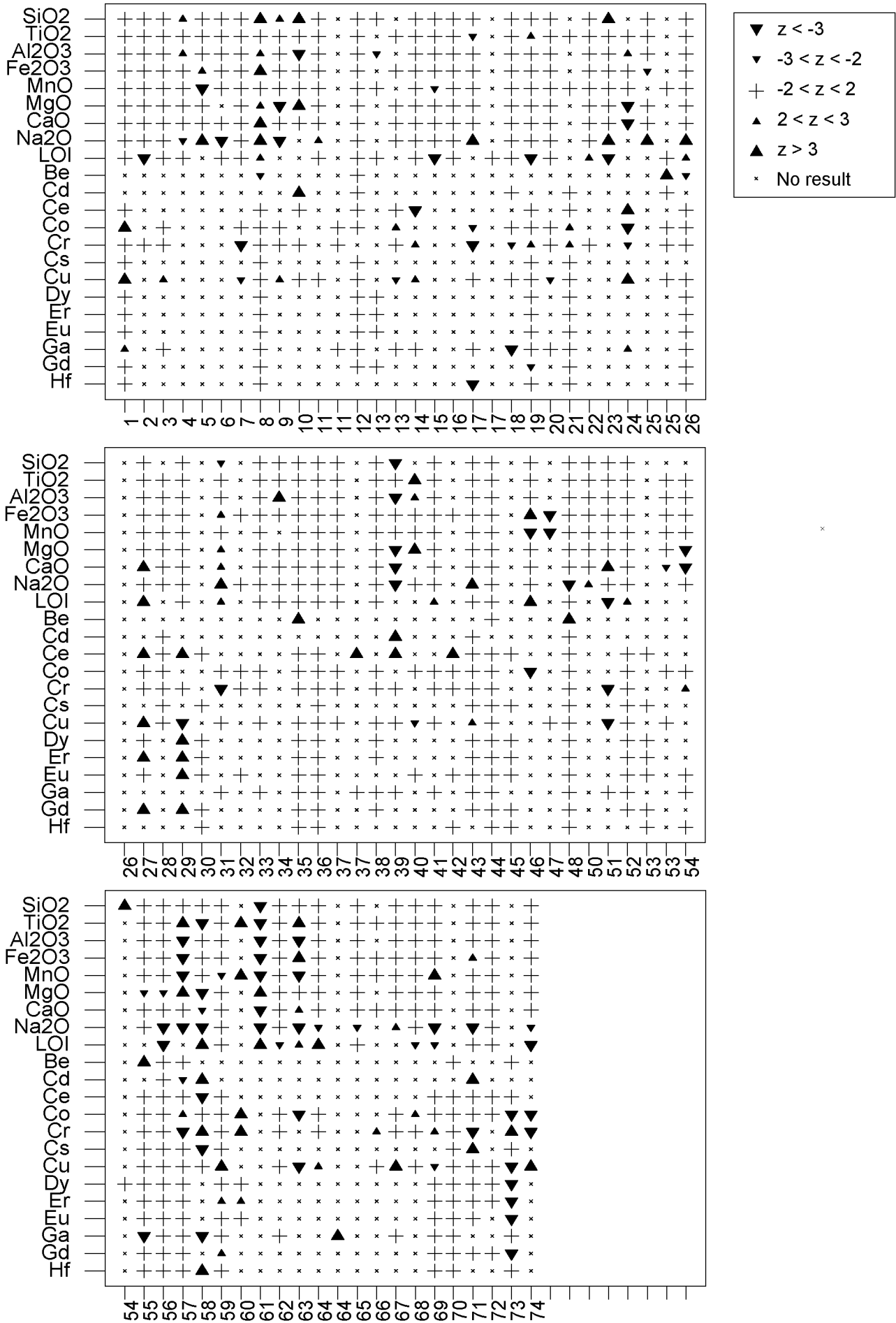


Figure 4: GeoPT20 – Ultramafic rock OPY-1. Multiple z-score charts for laboratories participating in the GeoPT20 round. Symbols indicate whether or not an elemental result complies with the $-2 < z < +2$ criteria. Satisfactory data are plotted as '+'. Data for other categories are plotted as follows: $z < -3$ (▼), $-3 < z < -2$ (▽), $+2 < z < +3$ (▲), $Z > +3$ (▲).

Multiple z-score chart for GeoPT20

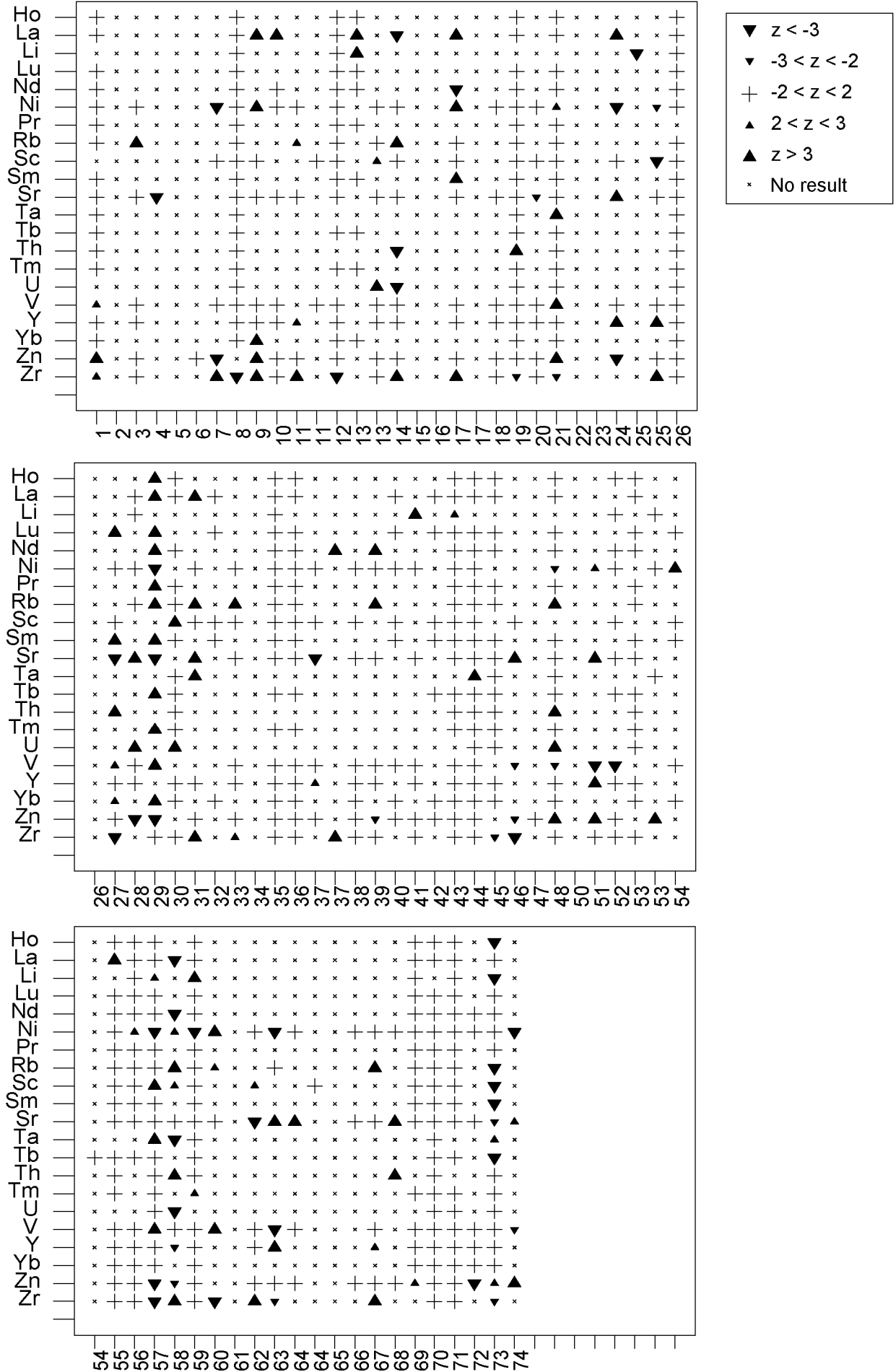


Figure 4: GeoPT20 – Ultramafic rock OPY-1. Multiple z-score charts for laboratories participating in the GeoPT20 round. Symbols indicate whether or not an elemental result complies with the $-2 < z < 2$ criteria. Satisfactory data are plotted as '+'. Data for other categories are plotted as follows: $z < -3$ (▼), $-3 < z < -2$ (▽), $-2 < z < 2$ (+), $2 < z < 3$ (▲), $Z > +3$ (▲).