

GeoPT8 - OU-4, Microdiorite

Veranstalter: International Association of Geoanalysts and Geostandards Newsletter - GeoPT8

Ringversuchsmaterial: OU-4, Microdiorite

RV geschlossen: 2001 – 3

Literatur: Proficiency Testing Report GeoPT8 (Laborcode CRB = I1)

Hauptelemente [MA%]

	CRB	RV	1sRV	Z-Score
Na ₂ O	3,56	3,61	0,06	
MgO	2,27	2,3	0,041	
Al ₂ O ₃	14,93	14,83	0,2	
SiO ₂	63,4	63,34	0,68	
P ₂ O ₅	0,177	0,173	0,005	
SO ₃	0,02			
K ₂ O	2,7	2,7	0,047	
CaO	4,49	4,48	0,072	
TiO ₂	0,791	0,077	0,016	
Fe ₂ O ₃ tot.	5,82	5,86	0,09	
MnO	0,14	0,14	0,004	

Spurenelemente [µg/g]

	CRB	RV	1sRV	Z-Score
Ba	355	360,1	12	
Ce	53	55,7	2,4	
Co	16	13,5	0,7	
Cr	56	54,7	2,4	
Cu	26	27,3	1,3	
Ga	18	17,4	0,9	
Hf	4,8	5,54	0,34	
La	32	25	1,2	
Nb	11	12,8	0,07	
Nd	27	27,9	1,35	
Ni	25	21	0,76	
Pb	18	14,1	0,76	
Pr	9	6,85	0,41	
Rb	102	98,5	3,9	
Sr	106	99,9	4	
Th	9	8,42	0,49	
V	79	82,7	3,4	
Y	47	47,1	2,1	
Zn	71	69,5	2,9	
Zr	197	195,1	7,1	

Legende

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

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

GEOPT8 - AN INTERNATIONAL PROFICIENCY TEST FOR ANALYTICAL GEOCHEMISTRY LABORATORIES - REPORT ON ROUND 8 / February 2001 (OU-4 Penmaenmawr microdiorite).

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Abstract

Results are presented for round eight, GeoPT8, of the international proficiency testing programme for analytical geochemistry laboratories. The sample distributed for this round was OU-4 Penmaenmawr microdiorite, a proficiency testing sample collected and prepared by The Open University. 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 eighth round of the international proficiency testing programme, GeoPT8, 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. The trial involves distributing a sample of established homogeneity to participating laboratories, which are required to analyse the sample using a well-characterised technique or techniques operated under routine analytical conditions. Results are then tabulated by the organisers and z-scores

calculated by comparing each analysed result submitted with the value assigned to be the best estimate of the true composition. These assigned values were estimated by robust statistical analysis of all the contributed data. By examining the magnitude of the z-score, participating laboratories can decide whether the quality of their data is satisfactory in relation to both their chosen fitness-for-purpose criteria and results submitted by all the other laboratories contributing to the round and 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. In this report, therefore, only the features of the present round are included and readers interested in further details are invited to review the previously published reports.

Steering Committee for Round 8: M. Thompson (Chair), P.J. Potts (Secretary), J.S. Kane, P.C Webb and J.S. Watson.

Sample: OU-4 is a microdiorite which was collected from Graig Llwyd Quarry, Penmaenmawr, North Wales. (UK grid reference SH 715 750). The igneous body which comprises the Penmaenmawr microdiorite is a minor intrusion, oval in shape and 3 x 1.5 km² in size. It is thought to be part of the Ordovician-age Llewelyn volcanic group, located near Conway, on the North Wales coast. The rock is fine grained with an average crystal size of 0.2 mm, consisting of plagioclase feldspar, chlorite, clinopyroxene and quartz. A small number of phenocrysts, mainly plagioclase, range up to 2 mm in length. Although this rock was originally chilled rapidly, the igneous mineralogy has been partially over-printed as a result of low-grade greenschist facies metamorphism.

A broken block of fresh rock was selected from the quarry floor. Sample preparation followed procedures at the Open University that have been described in detail in earlier proficiency testing reports (see in particular the GeoPT1 report). The sample was formally tested for homogeneity by selecting at random ten packets of the sample prepared for distribution, and analysing them by WD-XRF at the OU. An analysis of the results is listed in Appendix 2.

Timetable for GeoPT8:

Distribution of sample: September 2000.

Deadline for submission of analytical results: 15th December 2000.

Distribution of preliminary report: February 2001

Submission of results

Results submitted by the seventy-seven laboratories that participated in this round are listed in Table 1. All these data contributed to the full assessment of assigned values as well as the calculation of z-scores.

Assigned values

Following procedures described in earlier rounds, a robust statistical procedure was used to derive assigned value concentrations [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 12 major and 39 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 tendency 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 elements shown in Figure 1 were judged to have satisfactory distributions :

SiO₂, TiO₂, Al₂O₃, Fe₂O₃T, FeO, MnO, MgO, CaO,
Na₂O, K₂O, P₂O₅, LOI, Ba, Be, Ce, Co, Cr, Cs, Cu, Dy,
Er, Eu, Ga, Gd, Hf, Ho, La, Li, Lu, Nb, Nd, Ni, Pb, Pr,
Rb, Sb, Sc, Sm, Sn, Sr, Ta, Tb, Th, Tl, Tm, U, V, Y,
Yb, Zn, Zr.

Charts in Figure 2 show distribution data for elements that were not judged to be satisfactory in the statistical analysis to assign values. In the present round, values could not be assigned to the following elements:

H₂O⁺, CO₂, Ag, As, Au, Bi, Br, Cd, Cl, F, Ge, Hg I, In,
PGE, Mo, Re, S, Se, Te, W.

The most common reasons for elements failing the assessment of assigned values were as follows:

- (i) Insufficient number of contributed results.
- (ii) Results showing a strong positive skew in the frequency distribution diagram, sometimes with hints of multimodality.
- (iii) A robust mean clearly different from the mode, which makes the determination of a consensus impracticable.
- (iv) A very wide distribution of results as judged by the sigma value, so that no matter where the consensus

were placed most of the participants would receive an 'unsatisfactory' classification if z-scores were calculated.

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 pure geochemistry laboratories, 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 rates.

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

The target precision [H_a] for each element assessed was calculated from a modified version 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 precision.

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. 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.

Participating laboratories

Laboratories that contributed data to this proficiency testing round are listed in Table 4

Overall performance

As a summary of the overall performance of individual laboratories in this round, a multiple z-score chart is plotted in Figure 3. 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-score values that were greater or lower than the acceptable z-score limits. These data are designed to help individual laboratories to judge their overall performance in this proficiency testing round.

Participation in future rounds

The benefit from proficiency testing arises from regular participation and laboratories are invited to contribute to the GeoPT9 round, the sample for which will be distributed during March 2001.

Acknowledgments

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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. Submitted for publication to 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. Submitted for publication to 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.

Appendix 2

GeoPT8 Homogeneity Report

Homogeneity testing was based on analysis of duplicate test portions taken from each of 10 packets. These samples were analysed in duplicate by WD-XRF at the Open University for the major and minor elements (SiO₂, Al₂O₃, Fe₂O₃, MnO, MgO, CaO, Na₂O, K₂O, P₂O₅, TiO₂, LOI, Ba, Cr, Ni) on glass discs and the trace elements (As, Ba, Co, Cr, Cu, Ga, Mo, Nb, Ni, Pb, Rb, S, Sc, Sr, Th, U, V, Zn, Zr) on powder pellets, following the procedures described in the GeoPT1 report. Results for the major/minor and trace elements were analysed using standard analysis of variance (ANOVA) procedures.

The power of the ANOVA test depends on the inherent measurement precision of the individual elements determined and is poorest for those elements whose concentrations approach the method detection limits. Among the trace elements for the GeoPT8 homogeneity test, U, Mo, As, and S all occurred at concentrations in the detection limit range (<2dl), and Pb, Th, and Sc occurred at only slightly higher concentrations (2dl-5dl). Homogeneity conclusions for these elements were not reached because measurements could not be made with adequate precision. Homogeneity is demonstrated most reliably for Rb, Sr, Y, Zr, V, Cr, and Zn, all occurring at concentrations >10 times the detection limit. Ba, is also present at a concentration >10dl but gave inconsistent results indicating that there were significant differences between splits when test portions were prepared as powder pellets, but not so when tested in glass discs. Homogeneity is also demonstrated for the trace elements occurring at concentrations between 5 and 10 times the detection limit, Nb, Co, Ni, Cu, and Ga.

As can be seen from the 'probability homogeneous' data listed in the tables below, statistically significant differences between packets were detected at the 95% confidence level for SiO₂, Fe₂O₃, CaO determined in the major oxide package and Ba determined as a trace element. The homogeneity results for Ba as measured in the powder pellets are probably more reliable, because detection limit considerations affect the power of the test for Ba as determined in the glass disc.

The differences noted for Fe₂O₃, CaO and Ba are not significant at the 99% level, while for SiO₂ they are. However, taking account of the mineralogical nature of the sample, any analytical technique, if sufficiently precise, may produce results that show significant differences between packets. In the context of proficiency testing, the important issue is whether these differences are likely to have any significant effect on the analytical results submitted by laboratories and the derived z-scores. As a general rule, if the standard deviation that characterises differences between splits (s_{sampling}) is less than 0.4 of the target precision (H_a), the effect on proficiency test results can be considered to be insignificant (Thompson and Lowthian 1996, Analyst, 121, 1593-1596). The results listed in the tables below indicate that this critical ratio is not exceeded by the results of the homogeneity measurements, although the Ni results lie at this limit. On this basis, the sample can be considered fit-for-purpose as far as homogeneity for the GeoPT8 round is concerned.

Summary of homogeneity analysis using WD-XRF results for major oxides on glass disks and trace elements on powder pellets.

Oxide	Mean (% m/m)	H_a (% m/m)* for data quality:		s_{sampling} (% m/m)	Probability homogeneous	$s_{\text{sampling}} / H_a$
		1	2			
SiO ₂	63.29	0.678	1.36		0.00009	
Al ₂ O ₃	14.86	0.198	0.395		0.9978	
Fe ₂ O ₃	5.79	0.089	0.179	0.0094	0.0106	0.11
MgO	2.52	0.041	0.081	0.0031	0.146	0.08
CaO	4.52	0.072	0.143	0.0047	0.0345	0.07
Na ₂ O	3.66	0.060	0.119		0.152	
K ₂ O	2.71	0.009	0.0178		0.079	
MnO	0.139	0.0038	0.0076		0.806	
TiO ₂	0.771	0.0160	0.0320	0.0019	0.0581	0.12
P ₂ O ₅	0.175	0.005	0.010	0.0009	0.524	0.17
Ba	0.0360	0.0012	0.0024	0.0002	0.213	0.19

Element	Mean ($\mu\text{g g}^{-1}$)	H_a ($\mu\text{g g}^{-1}$)* for data quality:		S_{sampling} ($\mu\text{g g}^{-1}$)	Probability homogeneous	$S_{\text{sampling}} / H_a$
		1	2			
Rb	100.4	3.9	7.9		0.052	
Sr	99.1	4.0	8.0	0.20	0.150	0.05
Y	49.1	2.1	4.2	0.14	0.355	0.07
Zr	195.5	7.1	14.1		0.312	
Ba	356.2	11.9	23.8	2.62	0.042	0.22
V	79.1	3.4	6.8	0.42	0.598	0.07
Cr	55.4	2.4	4.8		0.344	
Zn	64.4	2.9	5.9		0.276	
Nb	12.8	0.7	1.4	0.16	0.588	0.23
Co	15.0	0.7	1.5		0.077	
Ni	21.1	1.1	2.1	0.43	0.143	0.40
Cu	24.0	1.3	2.7	0.41	0.096	0.31
Ga	16.2	0.9	1.8		0.094	

* H_a data taken from Table 2. Mean is the mean of the XRF homogeneity data.

Probability homogeneous data are representative at 95% confidence.

Figure captions

Figure 1

GeoPT8 - OU-4 Penmaenmawr microdiorite: 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

GeoPT8 - OU-4 Penmaenmawr microdiorite: Data distribution charts for elements for which values were not 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

GeoPT8 - OU-4 Penmaenmawr microdiorite: Multiple z-score charts for laboratories participating in the GeoPT8 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: $z < -3$ (▼), $-3 < z < -2$ (▼), $+2 < z < +3$ (▲), $Z > +3$ (▲).

Table 4

Analysts and laboratories participating in the GeoPT8 proficiency testing round.

John Pyke

Australian Geological Survey Organisation, Canberra City, ACT, Australia.

Helen Waldron

Becquerel Laboratories Pty Ltd., Lucas Heights, NSW, Australia.

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Royal Holloway, University of London, Egham, Surrey, UK.

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Dr. Philip R. Kyle / Mr Chris McKee

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Arthur R. Jurgensen

Savannah River Site, Aiken, SC, USA.

Prof John Wolff

Department of Geology, Washington State University, Pullman, WA, USA.

Table 1 GeoPT8

Round identifier	OU-4: Penmaenmawr microchlorite - Results submitted to the GeoPT8 round																								
	11	12	13	14	15	16	17	18	19	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Technique codes	X	X	X	X	M	A.M	A.Ign.	I	A	X.Ign.	X	M.X	X	M.X	M.V.	M.X	A.M	Ign.	X	X	X	X	M	M	AA
Test portion (g)	0.45	1	1.2-10	10	0.5	0.1	0.1	0.2-7.5	0.2-7.5	1.0-10	1.0-10	1.6-5	1	2	1	1	1	1	2	2	2	2	2	2	1
Data quality	2	2	1	2	1	2	1	2	1	2	1	1	1	2	1	1	1	2	2	2	2	2	2	2	1
SiO2 % m/m	63.4	65.8	63.22	63.7	63.7	61.8	63.46	62.7	62.82	63.48	64.103	63.44	61.66	63.58	63.49	61.27	63.34	63.65	63.63	63.28	57.6	63.28	57.6	63.54	
TiO2 % m/m	0.791	0.82	0.77	0.77	0.78	0.78	0.79	0.76	0.765	0.747	0.766	0.76	0.76	0.76	0.805	0.76	0.753	0.749	0.7642	0.79	0.79	0.72	0.72	0.77	
Al2O3 % m/m	14.93	15.1	14.78	14.9	15.5	14.86	14.86	14.5	14.72	14.747	14.96	14.80	15.71	14.91	14.85	14.51	14.92	14.92	14.82	14.91	13.2	14.91	13.2	14.9	
Fe2O3 % m/m	5.86	6.17	5.798	5.81	6.2	5.88	5.88	6.1	5.807	0.747	5.817	5.82	6.26	6.033	5.75	5.988	5.77	5.878	5.9	5.87	5.94	5.87	5.94	5.88	
Fe(II)O % m/m	0.14	0.14	0.14	0.14	0.14	0.14	0.149	0.14	0.136	0.146	0.143	0.136	0.11	0.163	0.13	0.142	0.141	0.1450	0.14	0.14	0.127	0.14	0.127	0.14	
MgO % m/m	2.27	2.25	2.28	2.30	2.47	2.34	2.34	2.33	2.315	2.32	2.326	2.28	2.09	2.292	2.28	2.331	2.24	2.275	2.23	2.3	2.56	2.3	2.56	2.29	
CaO % m/m	4.49	4.62	4.547	4.47	4.8	4.55	4.55	4.52	4.6	4.372	4.507	4.48	4.42	4.414	4.342	4.51	4.478	4.5	4.44	4.44	3.78	4.44	3.78	4.46	
Na2O % m/m	3.56	3.48	3.654	3.61	3.63	3.61	3.61	1.946	3.56	3.512	3.628	3.56	3.81	3.589	3.61	3.399	3.58	3.527	3.56	3.57	3.39	3.57	3.39	3.52	
K2O % m/m	2.7	2.75	2.706	2.73	2.7	2.73	2.73	2.41	2.65	2.693	2.681	2.66	2.64	2.752	2.7	2.65	2.7	2.701	2.67	2.72	2.56	2.72	2.56	2.67	
P2O5 % m/m	0.177	0.13	0.175	0.17	0.18	0.18	0.18	0.2	0.1654	0.166	0.157	0.177				0.171	0.19	0.17	0.183	0.1794	0.19	0.17		0	
H2O+ % m/m							0.27																		2.14
CO2 % m/m	1.62	1.7	1.76	1.72	1.7	1.7	1.82	1.75	1.697	1.78	1.65			1.67	1.61			1.688	1.82	1.71				0.18	
LOI % m/m											0.055		0.94		0.015										1.73
Ag mg kg-1																									
As mg kg-1											1.25	19													
Au mg kg-1																									
B mg kg-1																									
Ba mg kg-1	355				357.3		380	345		324	349	372	353	542	355	351.4	361		358	362	360	368.6		0	
Be mg kg-1	25										3		1.68	1.79	1.7					1.64				349	
Bi mg kg-1	1.5										0.1		0.05	0.093					13	0.09		0.10		145	
Br mg kg-1	0.22																								
Cd mg kg-1	53										0.17		0.29		0.036										
Ce mg kg-1	148				55.18		61	55.9		48.5	55.53		49	45.74	56.6	62	61.8		47	51.7		58.1		13	
Cl mg kg-1	16																								
Co mg kg-1	16																								
Cr mg kg-1	56																								
Cs mg kg-1	26																								
Cu mg kg-1	16																								
Dy mg kg-1	53																								
Er mg kg-1	148																								
Eu mg kg-1	16																								
F mg kg-1	490																								
Ga mg kg-1	18																								
Gd mg kg-1	0.8																								
Ge mg kg-1	4.8																								
Hf mg kg-1																									
Hg mg kg-1																									
Ho mg kg-1																									
I mg kg-1	0.05																								
In mg kg-1																									
Ir mg kg-1																									
La mg kg-1	32																								
Li mg kg-1																									

GeoPT8 Table 1

Round identifier	11	12	13	14	15	16	17	17	17	18	18	19	110	111	112	113	114	115	116	117	118	119	120	120	121	122	123	124
Technique codes	X	X	X	X	M	M	A,M	A,ign	A,ign	I	I	A	X,ign	X	M,X	X	M,X	M,V	M,X	A,M	ign	X	X	X	X	M	M	A,A
Test portion (g)	0.4-5	1	1.2-10	10	0.5	0.1	0.1	0.2-7.5	0.2-7.5	1.0-10	1.0-10	0.5-1	0.1-2	1.6	1.6	0.28-10	1.6-5	1	0.2-7	0.1-10	0.25	0.3-5.4	0.8-3	0.6-6	0.04-10	5	0.1	0.01-0.7
Data quality	2	2	1	2	1	2	2	1	2	1	2	2	2	1	2	1	2	1	1	2	2	2	1	2	1	2	1	2
Lu mg kg-1					0.694		0.68	0.69		0.67		0.43					0.51	0.57	0.72	0.78					0.68			
Mo mg kg-1						1.15					21					1.65	2	1.03	0.88									
N mg kg-1																												
Nb mg kg-1		12.6			12.5	10.8	14				23		3		13.4	15	13.45	12	12.6	12.15	10.3		14	12.7			11.5	19
Nd mg kg-1					28.23	26.4	26.2		29.33		25.3				27.89		24.9	23.87	29.5	31.66	24		32	26.3			29.1	53
Ni mg kg-1		21.9				20	24				26		14.5		15.6	22	18.39	20	20.2	24.7	22		20	20.1			19.2	12
Os mg kg-1																												
Pb mg kg-1		11.3			13.32	12.8	14				41		24.5		12.1	12	14.07	14	14								13.1	14
Pd mg kg-1																	1.71								0.0003			
Pr mg kg-1						6.87	6.4								6.84		6.76	6.17	7.11	8.27							7.1	0
Rb mg kg-1					98.6	94.6	94			100			101.5		103.2	100.3	107	90	96.6	104.7	102	101.7	103				105	103
Re mg kg-1																												
Rh mg kg-1																												
Ru mg kg-1																												
S mg kg-1			35						68					75	180	44	0.08											
Sb mg kg-1		2.1				0.27				0.21	1				0.3	0.37			0.22									
Sc mg kg-1			17.7			19.8	18.4			19.6																		
Se mg kg-1											2																	
Sm mg kg-1		4.2			6.89	6.52	7.36		6.82		8.36																	
Sn mg kg-1		2				1.86																						
Sr mg kg-1		106			100.3	85	111				89.9		100.5		99.2	99.8	102	107	100	111.1	91	102.2	104				104.4	79
Ta mg kg-1		1.7			1.238	1.17	1.3		1.21		4.64				1		0.6	1.08	1.01	1.37	1.29							
Tb mg kg-1																												
Te mg kg-1																												
Th mg kg-1		9			8.33	7.6	9			8.35																		
Ti mg kg-1		0.4																										
Tm mg kg-1					0.706	0.68																						
U mg kg-1		0.9			2.165	1.9																						
V mg kg-1		79				83	81																					
W mg kg-1		5.5				1.35	1.48																					
Y mg kg-1		47			45.00	4.2	4.44																					
Yb mg kg-1					4.752	70	60																					
Zn mg kg-1		71																										
Zr mg kg-1		197				214	180	189																				

Technique codes: A: ICP-AES; AAA: AAS; E: emission spectrometry; G: gravimetric; I: INAA; ign: ignition; IR: infra red detection; ISE: ion selective electrodes; M: CP-IMS; O: other; T: titrimetry; W: wet chemistry; X: X-ray fluorescence.

Round Identifier	E, I, SE, T, X	125	126	127	128	129	130	131	132	133	134	135	136	137	138	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152		
Technique codes		AA.M, T.X	AA.M, T.X	AA.M, T.X	AA.A, T.X	AA.A, T.X	T.X	ign, M.X	X	X	I, OX	A.M, OX	M, AA, X	M	X	X	X	X	X	AA, IR, T	A	X	X	AA, ign, V	X	A	AA, X	X	A.O	A.X		
Test portion (g)		0.15-10	0.1-0.75	0.25-6	0.7-5	0.2-1	0.1-0.8	0.2-7	1.2	1.9	1.0-2.0	0.1	0.25-5	0.1	1.0-10	1.0-10	1	0.46	0.1-1	0.25	1.0-5	0.7	0.4	0.004-2	0.174	0.2	1	1.0-5	0.3-0.5	1.0-6		
Data quality		2	1	2	1	2	1	2	1	1	2	2	2	1	2	2	1	1	1	1	1	2	1	1	2	2	2	2	2	2		
SiO ₂ % m/m		63.2	63.495	63.48	63.26	63.5	63.4	63.33	63.87		63.9	62.7	62.7	60.71	60.71	63.13	63.16	63.16	64.61	62.88	63.5	63.5	63.23	62.84	63.11	64.28	65.09	63.25	61.15			
TiO ₂ % m/m		0.59	0.77	0.763	0.79	0.838	0.77	0.814	0.77		0.78	0.75	0.77	0.81	0.81	0.73	0.81	0.81	0.81	0.77	0.768	0.77	0.82	0.81	0.74	0.78	0.78	0.76	0.76			
Al ₂ O ₃ % m/m		14.35	14.883	14.91	14.7	14.69	14.84	14.48	14.92	15.12	14.6	15.2	14.9	14.19	14.19	15	14.7	14.34	15.14	14.8	14.8	14.8	15.18	15.08	14.93	13.62	13.99	14.67	14.3			
Fe ₂ O ₃ % m/m		5.63	5.738	5.782	5.87	5.71	5.78	5.81	5.81	5.49	5.9	6.12	6.12	6.36	6.36	5.74	6.27	5.81	5.76	5.95	5.8	5.8	5.8	6.04	5.77	6.06	4.94	5.601	5.67			
Fe ₃ O ₄ % m/m			4.6	4.26	4.34	4.34					4.47							3.98				4.69										
MnO % m/m		0.144	0.142	0.1414	0.139	0.137	0.143	0.139	0.141	0.14	0.14	0.16	0.16	0.13	0.16	0.14	0.14	0.14	0.13	0.138	0.14	0.14	0.14	0.11	0.144	0.14	0.13	0.13	0.136			
MgO % m/m		2.11	2.325	2.300	2.22	2.37	2.31	2.25	2.32	2.4	2.2	2.22	2.33	2.22	2.22	2.22	2.31	2.24	2.28	2.26	2.27	2.32	2.25	2.64	2.27	1.97	2.14	2.368	2.3			
CaO % m/m		4.96	4.414	4.470	4.4	4.22	4.5	4.42	4.47	4.5	4.5	4.1	4.1	4.93	4.93	4.33	4.53	4.59	4.56	4.38	4.49	4.43	4.76	4.90	4.42	4.74	4.48	4.242	4.42			
Na ₂ O % m/m		3.42	3.66	3.746	3.53	3.49	3.57	3.66	3.72	3.61	3	3.33	3.33	3.86	3.86	3.67	3.73	3.61	3.57	3.57	3.62	3.42	3.42	3.42	3.12	3.43	3.3	4.07	3.74	3.65		
K ₂ O % m/m		2.59	2.753	2.691	2.76	2.65	2.71	2.67	2.77	2.55	2.55	2.77	2.77	3.02	3.02	2.82	2.9	2.53	2.80	2.92	2.7	2.76	2.68	2.73	2.61	2.85	2.8	2.767	2.6			
P ₂ O ₅ % m/m		0.154	0.18	0.177	0.17	0.166	0.19	0.167	0.18	0.18	0.18	0.17	0.17	0.18	0.18	0.18	0.17	0.17	0.18	0.18	0.174	0.17	0.17	0.166	0.174	0.15	0.09	0.18	0.17			
H ₂ O+ % m/m																																
CO ₂ % m/m		2.1	1.46	1.60	1.75	1.75	1.7	1.8	1.71		1.87	1.78	1.78	1.69	1.69	2	1.62	1.72	1.72	1.72	1.73		0.06	1.62	1.62	1.78		1.796	1.75			
LOI % m/m																																
Ag mg kg-1		0.06										6.6																				
As mg kg-1					1.17			1.26		1.1		2	5.58										0.025									
Au mg kg-1																																
B mg kg-1		25									42																					
Ba mg kg-1		350			376	385	351	356	389	352	334	361.7	392	366		385	368	385								358	360	429				
Be mg kg-1		3			2.5			1.84						0.062																		
Bi mg kg-1																																
Br mg kg-1																																
Cd mg kg-1		60				56.5	61	57.5	71	64.6	60	51.46		2.4	0.142											3.23	66				53.3	
Ce mg kg-1																																
Cl mg kg-1																153																
Co mg kg-1		15			12	14	17	13.5		12.6	15	10.4	14.7	25		12	18.7									13	35.9				13	
Cr mg kg-1		80		70.4	49	67.5	54	60	57	80.5	57	37.2	56.7	68		59	59.6									53	42.7	64			54	
Cs mg kg-1																																
Cu mg kg-1		35		27.1	29	31		2.09		1.89	3	2.091	2.13													29						28
Dy mg kg-1						8.27		8.06		7.1	9.3	7.669	8.34																			7.8
Er mg kg-1					4.7	4.23		5.06			5.5	4.53	5.12																			5.4
Eu mg kg-1						1.57		1.61		1.6	2	1.533	1.64																			1.54
F mg kg-1		521				590					470					163											623					
Ga mg kg-1		18		17.7	19	19	21				18	17	18.8	16																		17
Gd mg kg-1				7.1	8.09	8.55		8.55		8.9	6.831	7.41																				7.2
Ge mg kg-1						1.64		1.64			2	1.88																				
Hf mg kg-1				5.7				6.06		5.38	5.4	6.08																				5
Hg mg kg-1				1.6		1.36		1.78			1.9	1.56	1.79																			1.5
Ho mg kg-1													0.058																			
In mg kg-1																																
Ir mg kg-1																																
La mg kg-1		40		21.7	23.7	26.1		26.1		25.2	27	22.91	25.6																			24.3
Li mg kg-1		33			33						31		37.8																	39		

GeoPT8 Table 1

Round identifier	125	126	127	127	127	128	129	130	131	132	133	134	135	136	137	138	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	
Technique codes	E,ISE, T.X	AA,M, T.X	T.X	T.X	T.X	X	AA,A, ISE,T	T,X	gn, M,X	X	I	A,M, OX	M	AA,X	M	X	X	X	X	X	AA, IRT	A	X	X	X	AA, IRT,V	X	A	AA	X	A,O	
Test portion (g)	0.15-10	0.1-0.75	0.25-6	0.25-6	0.7-5	0.2-1	0.2-1	0.1-0.8	0.2-7	1.2	1.9	1.0-2.0	0.1	0.25-5	0.1	1.0-10	1.0-10	1	0.4-6	0.1-1	0.25	1.0-5	0.7	0.4	0.004-2	0.174	0.2	1	1.0-5	0.3-0.5		
Data quality	2	1	2	1	2	1	1	2	2	1	1	2	2	2	2	1	2	1	1	1	1	1	1	2	1	1	2	2	2	2		
Lu mg kg-1		0.7				0.751		0.71			0.74	0.8	0.675		0.71																	
Mo mg kg-1	1							2.19				0.7		2	1.11	2																0.8
Nb mg kg-1	12	10.3	13.2					14	12.8	21		10	11.45	12	13.7	13						13	15					13			11	
Nd mg kg-1	50	25.2	19.9	22.7		29.7	18	20	28.3	24	29.2	31	26.25	28.6				26	19.8	12		21				21	40.5	24		26.6		
Os mg kg-1	10	13.3	12.7																													23
Pb mg kg-1						13	17	16	14.9				14.93	15	13.9	4							13								15	
Pd mg kg-1		6.2					8.06		7.12			7.2	6.969		6.79										0.021							
Pr mg kg-1																																6.3
Rb mg kg-1	99	101.3	99.9			80	95.1	106	102	116	96	90	89.3	104.3	102	90		107	97.2	83		91	102				97			96		
Re mg kg-1																																
Rh mg kg-1																																
Ru mg kg-1																																
S mg kg-1	184						55						59.8			100																
Sb mg kg-1							0.09				0.25				0.37																	
Sc mg kg-1	25	16.4						21.8			20		18.49		20.8	19							20									
Se mg kg-1																																
Sm mg kg-1		6.2					5.52		7.19		6.68	7.9	8.425		7.28																	
Sr mg kg-1	3.2							1.69				3		2.31																		6.9
Str mg kg-1	99	108.6	99.8			192	101	103	103	115		100	104.4	103	109	93		86	99.3	102		97	101				99				91	
Ta mg kg-1		0.8						0.9			0.8	0.6		0.96																		
Tb mg kg-1		1.2					1.11		1.36		1.25	1.5	1.213		1.31																	1.4
Te mg kg-1																																
Th mg kg-1	8	9				9		8.24			8.8	10	7.097	8	8.43							7									7.3	
Ti mg kg-1																																
Tm mg kg-1		0.7					0.831		0.77			0.8	0.663		0.76																	
U mg kg-1		2.2				1.5		2.08			2.07	2.7	1.858	2.5	2.23																	
V mg kg-1	100	88	83.1				70.5	82	84.8		86	85	101	83.3	79													2			3	
W mg kg-1															3.37													87				74
Y mg kg-1	49	48.5	45.8			42	44.1	48	52.5	53		46	40.73	44	47.2	48		45	51.7								51				44	
Yb mg kg-1	5	4.6					4.93		5.14		4.98	5.4	4.555		4.96													50				4.62
Zn mg kg-1	69	64	70.9			72	78.1	73	76	67		74	79.4	66.5	64													67			68	
Zr mg kg-1	213	203	191.2				194	203	211			176	203.2	195	199			187	202.7								79.6				193	

Round Identifier	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	
Technique codes	AA	1	A.M.	A.M.	A	M,X	X	A.M.	X	AA	AA	AA	M	I	X	X	AA	X	AA	A.I.	M,X	AA	XRF	AA	A.O.	
Test portion (g)	0.1	0.15	0.24	0.24	0.25	0.2-1	1.2-9	0.1-12	4	0.1-1.2	0.1-1.2	0.1-0.5	0.2-0.5	0.25	0.2	4	0.4-8	1.5	0.1	1.0-7	0.2-3	0.1-0.8	0.5	1.5	0.3-0.5	0.01-5
Data quality	1	1	1	2	1	1	2	2	2	1	2	2	1	1	2	2	2	1	1	2	1	1	1	1	2	2
SiO2 % m/m	66.7	63.22	62.88	63.52	63.50	63.52	63.50	63.35	63.4	63.4	63.5	63.4	63.5	63.4	63.47	63.48	62.01	64.79	63.5	63.2	64.393	63.42	63.13	63.23	63.23	
TiO2 % m/m	0.84	0.76	0.79	0.775	0.776	0.76	0.763	0.798	0.765	0.75	0.765	0.75	0.78	0.72	0.77	0.783	0.78	0.766	0.77	0.7849	0.8	0.78	0.769	0.748	0.748	
Al2O3 % m/m	14.68	14.93	14.87	15.05	14.92	14.52	14.12	15.06	14.83	14.19	15.89	15.1	14.62	14.65	14.37	14.85	14.8	14.8	15.121	14.8	14.69	14.84	14.73	14.73	14.73	
Fe2O3 % m/m	4.96	5.56	5.92	5.89	5.886	5.8	6.795	5.92	5.78	5.74	5.73	5.71	5.83	5.93	5.87	5.82	5.78	5.989	5.9	5.79	5.711	5.82	5.82	5.82	5.82	
Fe(II)C % m/m									4.21									4.4								
MnO % m/m	0.1	0.14	0.14	0.14	0.139	0.14	0.15	0.14	0.139	0.138	0.14	0.14	0.14	0.13	0.14	0.143	0.41	0.17	0.14	0.108	0.1633	0.16	0.15	0.134	0.132	
MgO % m/m	2.57	2.29	2.36	2.3	2.307	2.23	2.88	2.28	2.288	2.37	2.32	2.24	2.24	2.24	2.24	2.26	2.24	2.29	2.42	2.278	2.34	2.24	2.194	2.3	2.3	
CaO % m/m	4.36	4.52	4.54	4.53	4.485	4.45	4.48	4.482	4.52	4.39	4.31	3.98	4.39	4.55	4.65	4.52	4.67	4.47	4.586	4.45	4.47	4.607	4.56	4.56	4.56	
Na2O % m/m	4.41	3.73	3.71	3.61	3.666	3.65	3.461	3.66	3.74	3.62	3.81	3.92	3.49	3.67	2.6	3.56	3.65	3.53	3.661	3.3	3.59	3.657	3.49	3.49	3.49	
K2O % m/m	2.87	2.82		2.73	2.705	2.65	2.86	2.66	2.69	2.6	2.75	2.69	2.70	2.72	2.8	2.7	2.59	2.7	2.746	2.45	2.76	2.719	2.84	2.84	2.84	
P2O5 % m/m	7.808	0.16	0.19	0.18	0.179	0.17	0.158	0.14	0.176	0.173	0.14	0.14	0.18	0.18	0.26	0.174	1.078	0.17	0.23	0.1761	0.14	0.179	0.176	0.176	0.176	
H2O+ % m/m		1.9																0.13	2.2					0.24	0.24	
CO2 % m/m		0.18																1.64	1.65	1.77				0.075	0.075	
LOI % m/m		1.77	10.49			1.70	1.855		1.79	1.69						1.84								1.64	1.70	1.74
Ag mg kg-1																										
As mg kg-1																										
Au mg kg-1		1.4					4		0.048			1.3			3				2.9	1.13						
B mg kg-1																			4	47				46	41	
Ba mg kg-1		356	343	354	374	340.1	333.2	377	325	351	388	404	407	408					364	365	365.4	350	290	330	363	
Be mg kg-1							1.5		1.75										2.2	1.91				1.6	1.65	
Bi mg kg-1		2.2					1.8												0.16							
Br mg kg-1																			1.4							
Cd mg kg-1																										
Ce mg kg-1		58.2	56.84				47	52.9	48	61.2									56.75	53.7	54.367			53.1	56	
Cl mg kg-1																			225							
Co mg kg-1		13.1					11	13	14	13.5									14	14					13.5	
Cr mg kg-1		52					57.5	59	52										55	59.7	50.7				55	
Cs mg kg-1		2.0	2.26				8	2											2.2	2.05	2.707					
Cu mg kg-1		29	23	23	25.4	28.6	26.1	66	33										26	27.4	25.9				30	
Dy mg kg-1							7.78		8.26										7.7	8.33	9.114				30	
Er mg kg-1							4.72		4.77										4.83	4.72	5.333				7.79	
Eu mg kg-1		1.68	1.66				1.63		1.79										1.667	1.6	1.814				4.44	
F mg kg-1																			493						1.67	
Ga mg kg-1																			19	16.63	18.9				16.5	
Gd mg kg-1																			7.4	7.64	7.802				6.99	
Ge mg kg-1																			4.4	1.41					8.15	
Hf mg kg-1																			5.6	5.15	5.563					
Hg mg kg-1																			1.63		1.887				0.008	
I mg kg-1																									1.54	
In mg kg-1																				0.31						1.63
Ir mg kg-1																										
La mg kg-1		24.9	26.13				20.9	22.9	28	27.85										25.4	24.3	26.112			23.9	27
Li mg kg-1							34.3		35										36	35.2					32	

GeoPT8 Table 1

Round identifier	153	154	155	155	155	156	157	158	158	159	160	161	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177					
Technique codes	AA	I	A.M.	A.M.	A	M.X	M.X	X	X	A.M.	X	AAA	AAA	AAA	AM	M	I	X	X	X	AA	X	A.I.	A.I.	M.X	AAA	XRF	AA	A.O.					
Test portion (g)	0.1	0.15	0.2-4	0.2-4	0.25	0.2-1	1.2-9	1.2-9	1.2-9	0.1-12	4	0.1-12	0.1-12	0.1-50	0.2-0.5	0.25	0.2	4	0.4-8	1.5	0.1	1.0-7	0.2-3	0.1-0.8	0.125-3.5	0.5	1.5	0.3-0.5	0.01-5					
Data quality	1	1	2	1	1	1	1	2	2	2	2	1	2	2	2	1	1	2	2	2	1	2	1	1	1	1	2	2	2					
Lu						0.76				0.654		0.76										0.768	0.68	0.745					0.666	0.775				
Mo		1.54					0.726				3		1.27		0.9		0.7	0.714				1.9			3									
Nb			13.19		12.5	12.7	13.6			13.4	12	13.83				12.7						15	12.7	12.86							12			
Nd			30.94		29.2	29.2	18.3			20.1	30	33.17			24	28	29.6					27.5	27.1	27.258						26.7	28.5			
Ni		20		26	21					20.8	30		19.92		22.6				19			34	20.8	21.9	22	15	120	19						
Os																																		
Pb			14.54			13.7	16.6			12.3	13		18		9			11.3	30			19	15.2	15.184	14					12.6				
Pd						7.06				6.47		7.06			5.8	6.9						6.89	7.12	6.364						6.52	7.25			
Pr			7.35																															
Rb		97	103.2			108	98.6			97.6	84	98		98	79.5	95.5	96.7	69			95	95	102.7	101.15	102						102			
Re																																		
Rh																																		
Ru																																		
S																																		
Sb		0.28			18	20	17.3	17.4		16.4		20.2			4.7		0.34					0.34	0.24											
Sc		18.3														19.6						18	20	23.16									19.5	
Se																			6															
Sm		7.13	7.36			7.23				6.5		7.62		2.7	5.5	6.84	7.67					7.75	7.5	7.312										
Sn																																		
Sr		99	110.2		96	104	98.0			100.4	81	102		95.4	86.9		99.7	86			90.4	106	100.4	97	110	75	405	103						
Ta		1.01	0.96			0.94				0.947					0.969	0.98						1.5	1.03	0.999										
Tb		1.16	1.26			1.31				1.21		1.3		1.1	1.32	1.27						1.16	1.16	-1.441										
Te																																		
Th		8.37	8.5			8.86	7.8			8.06	1	9.18			9.04	8.86	8.9	20				8.2	8.12	8.085									7.6	
Ti					0.47								0.4									0.45	0.47											
Tm			0.75		0.746					0.686		0.8			0.685							0.733	0.74	0.769									0.660	0.68
U		2.13	2.21		2.24					2.09	3	2.4		0.9	2.28							2.3	2.25	2.099									5	
V					90	83				69.4	71			100			89.5	80				95	81.6	84.6	92	65							74	
W		1.2		1.49							6		1.35									3												
Y		4.9	4.95		50	45.3	46.2			40.7	51	51.98		43.5	45.9		48	50				50	49.3	51.201	40	38	45.8							
Yb		62			4.88					4.52	69	61		3.8	4.98	5.24						4.21	4.48	4.803										
Zn			81		72		69.9			71.8	69	61		64								65	68.67	70.6	86	55	69	71						
Zr		200	199.8		192	164	204.8			193.8	197		200	167	176	190	197	178				194	197	190.9	230	210								

Table 2 GeoPT 8

Assigned values and robust statistical analysis of contributed data

	X _a	H _a	s	s/H _a		X _a	H _a	s	s/H _a
	% m/m	% m/m	% m/m	ratio		mg kg ⁻¹	mg kg ⁻¹	mg kg ⁻¹	ratio
SiO ₂	63.34	0.679	0.057	0.08	Ho	1.63	0.12	0.03	0.28
TiO ₂	0.77	0.016	0.002	0.11	La	24.96	1.23	0.35	0.28
Al ₂ O ₃	14.83	0.198	0.025	0.13	Li	35.0	1.6	0.7	0.42
Fe ₂ O ₃	5.82	0.089	0.014	0.16	Lu	0.71	0.06	0.01	0.16
FeO	4.52	0.072	0.041	0.57	Nb	12.8	0.70	0.22	0.31
MnO	0.14	0.004	0.001	0.19	Nd	27.9	1.35	0.40	0.30
MgO	2.30	0.041	0.008	0.20	Ni	21.0	1.06	0.40	0.38
CaO	4.48	0.072	0.013	0.19	Pb	14.1	0.76	0.40	0.53
Na ₂ O	3.61	0.060	0.011	0.18	Pr	6.85	0.41	0.11	0.26
K ₂ O	2.70	0.047	0.009	0.19	Rb	98.5	3.9	0.8	0.20
P ₂ O ₅	0.173	0.005	0.002	0.34	Sb	0.30	0.029	0.024	0.83
LOI	1.72	0.03	0.01	0.33	Sc	19.1	0.98	0.26	0.27
	mg kg ⁻¹	mg kg ⁻¹	mg kg ⁻¹		Sm	6.94	0.41	0.12	0.30
Ba	360.8	11.9	2.7	0.22	Sn	2.42	0.17	0.14	0.80
Be	1.79	0.13	0.07	0.52	Sr	99.9	4.0	1.0	0.26
Ce	55.7	2.4	0.8	0.32	Ta	1.00	0.08	0.03	0.37
Co	13.5	0.73	0.27	0.37	Tb	1.25	0.10	0.02	0.22
Cr	54.7	2.4	1.0	0.41	Th	8.42	0.49	0.12	0.25
Cs	2.07	0.15	0.03	0.23	Ti	0.46	0.04	0.01	0.23
Cu	27.3	1.3	0.51	0.38	Tm	0.72	0.06	0.01	0.21
Dy	7.81	0.46	0.11	0.23	U	2.19	0.16	0.07	0.47
Er	4.83	0.30	0.09	0.30	V	82.7	3.4	1.2	0.35
Eu	1.64	0.12	0.02	0.15	Y	47.1	2.1	0.5	0.25
Ga	17.4	0.91	0.19	0.21	Yb	4.70	0.30	0.06	0.21
Gd	7.39	0.44	0.12	0.28	Zn	69.5	2.9	0.8	0.28
Hf	5.54	0.34	0.08	0.22	Zr	195.1	7.1	1.7	0.24

X_a=assigned value

s=standard deviation of submitted results calculated using 'robust' statistics

H_a=target precision calculated using a modified version of the Horwitz equation

GeoPT8 Table 3

Table 3 - GeoPT8															
Z-scores for data submitted to the GeoPT8 round (OU-4 Penmaenmawr microdiorite).															
Round identifier	I1	I2	I3	I3	I4	I5	I5	I6	I7	I7	I8	I8	I9	I10	I11
Technique codes	X	X	X	X	X	M	M	A,M	A,ign, X,T	A,ign, X,T	I	I	A	X,ign	X
Test portion (g)	0.4-5	1.00	1.2-10	10.00	0.50	0.10	0.10	0.10	0.2-7.5	0.2-7.5	1.0-10	1.0-10	0.5-1	0.1-2	1.60
Data quality	2	2	1	2	1	1	2	2	1	2	1	2	2	2	1
SiO2	0.04	1.81	-0.19	*	0.53	*	*	-1.14	0.17	*	*	*	-0.47	-0.38	0.20
TiO2	0.66	1.56	0.00	*	0.00	*	*	0.31	1.25	*	*	*	-0.31	-0.30	-1.44
Al2O3	0.25	0.68	-0.26	*	0.35	*	*	1.70	0.15	*	*	*	-0.83	-0.29	-71.25
Fe2O3	0.22	1.96	-0.25	*	-0.11	*	*	2.13	0.67	*	*	-1.62	1.57	-0.07	-56.82
Fe(II)O	*	*	*	*	*	*	*	*	1.46	*	*	*	*	*	*
MnO	0.04	0.04	0.08	*	0.08	*	*	0.17	2.48	*	*	*	0.04	-0.49	1.55
MgO	-0.34	-0.59	-0.44	*	0.05	*	*	2.12	1.04	*	*	*	0.40	0.21	0.54
CaO	0.05	0.96	0.90	*	-0.18	*	*	2.22	0.94	*	*	0.26	0.82	-0.77	-30.23
Na2O	-0.42	-1.09	0.74	*	0.00	*	*	0.17	0.00	*	*	-13.98	-0.42	-0.82	0.76
K2O	0.00	0.54	0.13	*	0.65	*	*	0.00	0.65	*	*	-3.12	-0.54	-0.08	-0.43
P2O5	0.42	-4.79	0.40	*	-0.71	*	*	0.76	0.18	*	*	*	2.97	-0.86	-1.71
LOI	-1.59	-0.33	1.24	*	-0.03	*	*	-0.33	3.13	*	*	*	0.46	-0.38	1.87
Ba	-0.24	*	*	-0.06	*	-0.29	*	0.81	-1.32	*	*	0.73	-0.75	*	-3.09
Be	*	*	*	*	*	*	*	*	*	0.80	*	*	-1.11	*	*
Ce	-0.56	*	*	*	*	-0.22	*	1.08	0.07	*	0.42	*	0.88	*	-2.97
Co	1.71	*	*	0.55	*	*	*	-0.89	-2.06	*	*	0.00	5.82	*	-1.37
Cr	0.27	*	*	0.04	*	*	*	0.06	-1.97	*	*	0.27	1.10	*	-4.89
Cs	*	*	*	*	*	-0.48	*	-0.47	*	*	*	0.20	*	*	*
Cu	-0.48	*	-3.82	*	*	*	*	-0.86	0.55	*	*	*	2.54	*	-1.34
Dy	*	*	*	*	*	0.76	*	-0.41	0.20	*	*	*	-7.11	*	*
Er	*	*	*	*	*	0.52	*	-1.00	-1.55	*	*	*	1.21	*	*
Eu	*	*	*	*	*	0.14	*	-0.46	0.24	*	0.32	*	1.31	*	*
Ga	0.31	*	*	-1.12	*	*	*	*	-3.79	*	*	*	*	*	0.62
Gd	*	*	*	*	*	0.17	*	-1.17	-0.29	*	*	*	3.33	*	*
Hf	-1.08	*	*	*	*	*	0.17	-0.95	*	0.30	*	-0.43	*	*	*
Ho	*	*	*	*	*	0.12	*	-0.10	-0.86	*	1.28	*	*	*	*
La	2.86	*	*	*	*	-0.27	*	-0.84	-0.38	*	0.55	*	0.71	*	0.03
Li	*	*	*	*	*	*	*	*	*	*	*	*	0.00	*	*
Lu	*	*	*	*	*	-0.27	*	-0.25	-0.34	*	-0.67	*	-2.34	*	*
Nb	-1.30	*	-0.31	*	*	*	-0.22	-1.44	1.70	*	*	*	7.30	*	-14.06
Nd	-0.33	*	*	*	*	0.26	*	-0.55	-1.24	*	1.07	*	-0.95	*	*
Ni	1.88	*	0.85	*	*	*	*	-0.47	2.82	*	*	*	2.35	*	-6.12
Pb	2.60	*	-3.67	*	*	-0.99	*	-0.84	-0.09	*	*	*	17.81	*	13.80
Pr	2.62	*	*	*	*	0.04	*	-0.55	*	*	*	*	*	*	*
Rb	0.45	*	0.49	*	*	0.03	*	-0.49	-1.13	*	*	0.19	*	*	0.77
Sb	31.04	*	*	*	*	*	*	-0.56	*	*	*	-1.60	12.05	*	*
Sc	*	*	*	-0.69	*	*	*	0.38	-0.67	*	*	0.28	*	*	*
Sm	-3.30	*	*	*	*	-0.11	*	-0.50	1.02	*	-0.28	*	1.72	*	*
Sn	-1.23	*	*	*	*	*	*	-1.84	*	*	*	*	1.73	*	*
Sr	0.77	*	-0.39	*	*	0.11	*	-1.86	2.78	*	*	*	-1.25	*	0.16
Ta	4.39	*	*	*	*	*	*	-0.37	*	*	*	*	22.78	*	*
Tb	*	*	*	*	*	-0.09	*	-0.40	0.55	*	-0.38	*	*	*	*
Th	0.60	*	*	0.60	*	-0.18	*	-0.84	1.19	*	*	-0.07	*	*	*
Tl	-0.73	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Tm	*	*	*	*	*	-0.21	*	-0.32	*	*	*	*	*	*	*
U	-4.15	*	*	-2.87	*	-0.18	*	-0.94	*	*	*	*	*	*	*
V	-0.54	*	*	0.31	*	*	*	0.04	-0.50	*	*	*	6.65	*	-2.41
Yb	-0.01	*	1.26	*	*	-0.97	*	-0.49	0.12	*	*	*	-1.20	*	-1.21
Yb	*	*	*	*	*	0.18	*	-0.84	-0.87	*	-0.30	*	-7.82	*	*
Zn	0.26	*	-1.05	*	*	*	*	0.09	-3.23	*	*	*	1.11	*	-0.68
Zr	0.14	*	0.17	*	*	*	1.34	-1.07	-0.86	*	*	*	*	*	-0.86

GeoPT8 Table 3

Round identifier	I11	I12	I13	I14	I15	I16	I17	I18	I19	I20	I20	I21	I22	I23	I23
Technique codes	X	M,X	X	M,X	M,V, X	M,X	A,M	ign, X,V	X	X	X	IC, M,T,X	X	M	M
Test portion (g)	1.60	0.28-10	1-6.5	1.00	0.2-7	0.1-10	0.25	0.3-5.4	0.8-3	0.6-6	0.6-6	0.04-10	5.00	0.10	0.10
Data quality	2	1	1	2	1	1	2	2	2	1	2	1	2	1	2
SiO2	*	1.12	0.14	-1.24	0.35	0.22	-1.53	0.00	0.23	0.42	*	-0.09	-4.23	*	*
TiO2	*	-0.25	-0.62	*	2.19	-0.62	-0.53	-0.66	-0.18	1.25	*	1.25	-1.56	*	*
Al2O3	*	0.66	-0.15	2.23	0.38	0.10	-0.81	0.23	0.23	-0.05	*	0.40	-4.12	*	*
Fe2O3	*	-0.03	0.00	2.46	2.39	-0.78	0.83	-0.28	0.32	0.90	*	0.56	0.67	*	*
Fe(II)O	*	0.63	*	*	0.07	*	*	0.45	*	*	*	1.88	*	*	*
MnO	*	0.88	-0.98	-3.95	6.20	-2.58	0.31	0.17	0.71	0.08	*	0.08	-1.69	*	*
MgO	*	0.69	-0.44	-2.56	-0.15	-0.44	0.41	-0.71	-0.28	-1.68	*	0.05	3.23	*	*
CaO	*	0.34	-0.04	-0.44	-0.96	0.10	-0.98	0.19	-0.03	0.24	*	-0.60	-4.91	*	*
Na2O	*	0.30	-0.84	1.68	-0.35	0.00	-1.77	-0.25	-0.70	-0.84	*	-0.67	-1.93	*	*
K2O	*	-0.19	-0.86	-0.65	1.12	0.00	-0.54	0.00	0.01	-0.65	*	0.43	-1.51	*	*
P2O5	*	-3.59	0.84	*	-0.49	3.73	-0.35	1.09	0.69	3.73	*	-0.71	*	*	*
LOI	*	*	-2.23	*	-1.60	2.81	*	-0.49	-0.52	3.13	*	-0.34	*	*	*
Ba	*	-0.99	0.95	-0.33	15.24	-0.48	-0.39	0.01	*	-0.23	*	0.11	-0.03	0.66	*
Be	*	9.23	*	-0.42	*	0.00	-0.34	*	*	*	*	-1.14	*	*	*
Ce	*	-0.08	*	-1.38	-4.10	0.36	1.29	1.25	*	-3.59	*	-1.85	*	0.98	*
Co	*	*	*	-1.30	3.43	0.82	-0.14	-0.34	*	*	3.08	-0.41	*	-0.27	*
Cr	*	0.95	-0.30	-2.07	2.62	2.41	-0.31	-2.57	*	-0.30	*	-3.60	*	-0.55	*
Cs	*	-0.54	*	-1.25	*	0.34	2.12	*	*	*	*	-0.47	*	*	*
Cu	*	2.81	-0.21	-0.86	-3.22	-1.11	-0.77	-1.38	*	-3.22	*	-0.88	*	-1.19	*
Dy	*	-0.22	*	-1.61	-2.31	0.65	-0.03	*	*	*	*	0.22	*	0.63	*
Er	*	0.09	*	-1.59	-2.43	0.29	0.83	*	*	*	*	0.13	*	0.55	*
Eu	*	-0.34	*	-0.54	-1.49	0.40	0.32	*	*	*	*	-0.26	*	-0.34	*
Ga	*	0.01	-0.49	-4.43	*	-0.60	-0.19	0.69	*	-0.49	*	-0.04	*	0.62	*
Gd	*	0.93	*	-0.04	-2.96	0.38	-0.70	*	*	*	*	-0.33	*	0.26	*
Hf	*	-0.85	*	-2.66	*	-0.24	-0.16	*	*	1.34	*	-1.43	*	-0.12	*
Ho	*	0.04	*	-1.50	-1.93	0.87	0.80	*	*	*	*	0.13	*	0.54	*
La	*	-0.39	*	-0.43	-3.59	1.33	1.56	0.22	*	*	*	-1.76	*	0.52	*
Li	*	*	*	*	*	*	*	*	*	*	*	0.79	*	*	*
Lu	*	0.16	*	-1.67	-2.35	0.16	0.58	*	*	*	*	-0.84	*	-0.17	*
Nb	*	0.84	3.13	0.46	-1.17	-0.31	-0.48	-1.80	*	1.70	*	-0.16	*	-1.88	*
Nd	*	0.01	*	-1.10	-2.97	1.20	1.40	-1.44	*	3.05	*	-1.17	*	0.90	*
Ni	*	-5.08	0.94	-1.23	-0.94	-0.75	1.74	0.47	*	*	-0.47	-0.85	*	*	-0.85
Pb	*	-2.61	-2.74	0.00	-0.09	-0.09	*	*	*	*	*	-2.61	*	-1.28	*
Pr	*	-0.03	*	-0.11	-1.66	0.63	1.73	*	*	*	*	-0.91	*	0.60	*
Rb	*	1.20	0.46	1.08	-2.15	-0.47	0.79	0.45	0.41	1.15	*	1.65	-0.82	0.46	*
Sb	*	-0.08	*	1.17	*	-2.85	*	*	*	*	*	*	*	-0.08	*
Sc	*	-0.06	*	*	*	1.07	0.12	3.04	*	-0.06	*	-1.59	*	*	*
Sm	*	-0.84	*	-1.11	-2.96	0.71	0.85	*	*	*	*	-1.27	*	-0.09	*
Sn	*	1.09	*	0.16	*	-0.98	*	*	*	*	*	*	*	*	-0.04
Sr	*	-0.17	-0.02	0.27	1.78	0.03	1.40	-1.11	0.29	1.03	*	-2.42	*	1.13	*
Ta	*	0.01	*	-2.50	*	1.39	0.13	*	*	*	*	1.51	*	-3.74	*
Tb	*	1.58	*	-0.87	-2.46	1.27	0.22	*	*	*	*	-0.49	*	0.55	*
Th	*	-1.06	-0.85	-5.65	9.38	0.03	0.74	*	*	*	*	-0.71	*	1.19	*
Tl	*	*	*	-0.24	*	0.24	*	*	*	*	*	0.48	*	-6.29	*
Tm	*	*	*	-1.15	-2.63	*	*	*	*	*	*	-0.15	*	-0.31	*
U	*	-0.21	5.18	-4.18	*	-0.60	0.37	*	*	*	*	-0.21	*	0.04	*
V	*	-1.09	-0.21	-2.16	0.97	-0.91	1.29	-1.38	*	-1.09	*	-0.12	*	*	0.44
Yb	*	0.45	0.92	0.94	-1.92	-1.35	0.30	1.17	*	-0.02	*	-3.91	*	0.64	*
Yb	*	-0.03	*	-1.46	-1.71	0.37	*	34.08	*	*	*	-0.47	*	-0.33	*
Zn	*	-0.17	0.85	-1.28	3.58	-1.36	*	-0.34	*	-1.19	*	2.90	*	2.11	*
Zr	*	0.41	0.55	1.48	-0.01	0.03	-1.15	0.42	0.77	-0.15	*	-4.12	-1.07	2.03	*

GeoPT8 Table 3

Round identifier	I24	I25	I26	I26	I27	I27	I28	I29	I30	I31	I32	I33	I34	I35	I36
Technique	AA	E,ISE	AA	AA	T,X	T,X	X	AA,A	T,X	ign	X	I	A,M	M	AA,X
codes	A,T,X	T,X	M,T,X	M,T,X				ISE,T		M,X			O,X		
Test portion (g)	0.01-0.7	0.15-10	0.1-0.75	0.1-0.75	0.25-6	0.25-6	0.7-5	0.2-1	0.1-0.8	0.2-7	1.20	1.90	1.0-2.0	0.10	0.25-5
Data quality	1	2	1	2	1	2	2	1	2	2	1	1	2	2	2
SiO2	0.29	-0.10	0.23	*	0.20	*	-0.07	0.23	0.04	-0.01	0.78	*	0.41	*	-0.47
TiO2	0.00	-5.62	0.00	*	-0.44	*	0.62	4.12	0.00	1.37	0.00	*	0.31	*	-0.62
Al2O3	0.35	-1.21	0.27	*	0.43	*	-0.33	-0.71	0.03	-0.89	0.46	1.47	-0.58	*	0.94
Fe2O3	0.67	-1.06	-0.92	*	-0.43	*	0.28	-1.23	-0.22	-0.06	1.01	-3.70	0.45	*	1.68
Fe(II)O	0.90	*	1.18	*	-3.54	*	*	-2.43	*	*	*	*	-0.31	*	*
MnO	0.08	0.57	0.61	*	0.45	*	-0.09	-0.72	0.44	-0.09	0.35	0.08	0.04	*	2.70
MgO	-0.20	-2.32	0.67	*	0.05	*	-0.96	1.78	0.15	-0.59	0.54	*	1.26	*	7.79
CaO	-0.32	3.34	-0.96	*	-0.18	*	-0.58	-3.67	0.12	-0.44	-0.18	*	0.12	*	-2.67
Na2O	-1.51	-1.60	0.84	*	2.29	*	-0.67	-2.02	-0.34	0.42	1.85	0.00	-5.13	*	-2.35
K2O	-0.65	-1.18	1.14	*	-0.19	*	0.65	-1.08	0.11	-0.32	1.51	*	-1.61	*	0.75
P2O5	-38.41	-2.13	1.51	*	0.84	*	-0.35	-1.60	1.86	-0.69	1.51	*	0.76	*	-0.35
LOI	0.29	5.98	-8.22	*	-3.81	*	0.46	0.92	-0.33	1.25	-0.34	*	-0.80	*	0.93
Ba	-0.99	-0.45	*	-2.02	-0.48	*	0.64	2.04	-0.41	-0.20	2.38	-0.74	-1.13	0.04	1.31
Be	1091.88	4.61	*	*	*	*	*	5.41	*	0.19	*	*	*	*	*
Ce	-17.56	0.88	*	-1.40	*	0.06	*	0.32	1.08	0.36	6.28	3.65	0.88	-0.88	*
Co	13.02	1.03	*	-0.34	*	*	-1.03	0.69	2.40	0.00	*	-1.23	1.03	*	-2.12
Cr	-6.15	5.27	*	1.73	6.54	*	-1.19	5.33	-0.15	1.10	0.95	10.75	0.47	*	-3.66
Cs	1340.55	*	*	-0.91	*	*	*	*	*	0.07	*	-1.21	3.13	0.07	*
Cu	6.58	2.91	*	1.03	-0.13	*	0.65	2.81	*	0.69	*	*	1.03	*	-0.48
Dy	-17.04	*	*	-0.12	*	*	*	1.00	*	0.27	*	-1.55	1.62	-0.15	*
Er	13.67	*	*	-0.22	*	*	*	-1.97	*	0.37	*	*	1.10	-0.49	*
Eu	*	*	*	-0.58	*	*	*	-0.59	*	-0.13	*	-0.34	1.47	-0.44	*
Ga	0.62	0.31	*	0.14	*	*	*	*	0.86	0.86	3.92	*	0.31	*	-0.24
Gd	-7.74	*	*	-0.33	*	*	*	1.61	*	1.33	*	*	1.73	-0.63	*
Hf	56.81	*	*	0.23	*	*	*	*	*	0.76	*	-0.47	-0.21	*	*
Ho	-5.23	*	*	-0.14	*	*	*	-2.26	*	0.60	*	*	1.09	-0.31	*
La	-20.29	6.11	*	-1.33	*	2.05	*	-1.03	*	0.46	*	0.19	0.83	-0.84	*
Li	-7.32	-0.61	*	*	*	*	*	-1.22	*	*	*	*	-1.22	*	*
Lu	*	*	*	-0.09	*	*	*	0.68	*	0.00	*	0.50	0.75	-0.29	*
Nb	8.86	-0.58	*	-1.80	0.55	*	*	*	0.85	-0.01	11.73	*	-2.02	-0.98	-0.58
Nd	18.59	*	*	-0.99	*	*	*	1.35	-0.33	0.16	*	0.98	1.15	-0.60	*
Ni	-8.47	13.65	*	-0.52	1.60	*	3.29	-2.82	-0.47	-0.61	2.82	18.83	5.18	*	0.56
Pb	-0.09	-2.69	*	-0.51	-1.81	*	-0.71	3.87	1.28	0.55	*	*	*	0.57	0.61
Pr	-16.70	*	*	-0.80	*	*	*	2.94	*	0.33	*	*	0.42	-0.59	*
Rb	1.15	0.07	*	0.36	0.36	*	-2.34	-0.85	0.95	0.45	4.44	-0.63	-1.07	-1.16	0.74
Sb	*	*	*	*	*	*	*	-7.34	*	*	*	-1.81	*	*	*
Sc	-1.08	3.04	*	-1.36	*	*	*	*	*	1.40	*	0.97	*	-0.29	*
Sm	4.98	*	*	-0.89	*	*	*	-3.42	*	0.30	*	-0.62	1.16	-0.62	*
Sn	-14.28	2.32	*	*	*	*	*	*	*	-2.14	*	*	1.73	*	*
Sr	-5.22	-0.11	*	1.09	-0.02	*	11.53	0.28	0.39	0.39	3.79	*	0.02	0.57	0.39
Ta	50.07	*	*	-1.25	*	*	*	*	*	-0.62	*	-2.49	-2.50	*	*
Tb	*	*	*	-0.24	*	*	*	-1.42	*	0.69	*	0.03	1.31	-0.18	*
Th	-0.85	-0.43	*	0.60	*	*	0.60	*	*	-0.18	*	0.78	1.62	-1.35	-0.43
Tl	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Tm	*	*	*	-0.16	*	*	*	1.86	*	0.42	*	*	0.87	-0.46	*
U	18.01	*	*	0.02	*	*	-2.22	*	*	-0.36	*	-0.79	1.63	-1.08	0.98
V	1.26	2.54	*	0.78	0.12	*	*	-3.58	-0.10	0.31	*	0.97	0.34	*	2.69
Yb	4.25	0.46	*	0.34	-0.59	*	-1.20	-1.40	0.23	1.29	2.82	*	-0.25	-1.50	-0.72
Yb	1.01	0.50	*	-0.17	*	*	*	0.77	*	0.74	*	0.94	1.18	-0.24	*
Zn	-2.21	-0.08	*	-0.94	0.48	*	0.43	2.93	0.60	1.11	-0.85	*	0.77	*	1.69
Zr	-1.29	1.27	*	0.56	-0.55	*	*	*	-0.08	0.56	2.26	*	-1.35	*	0.58

GeoPT8 Table 3

Round identifier	I37	I38	I38	I39	I40	I41	I42	I43	I44	I45	I46	I47	I48	I49	I50
Technique	M	X	X	X	X	AA,	A	X	X	X	AA,	X	A	AA,	X
codes						IR,T					ign,V			ISE,X	
Test portion (g)	0.10	1.0-10	1.0-10	1.00	0.4-6	0.1-1	0.25	1.0-5	0.70	0.40	0.004-2	0.17	0.20	1.00	1.0-5
Data quality	1	1	2	1	1	1	1	2	1	2	1	1	2	2	2
SiO2	*	-3.88	*	-0.31	-0.27	*	1.87	-0.34	0.23	0.12	-0.16	-0.74	-0.17	0.69	2.03
TiO2	0.00	2.50	*	-2.50	2.50	*	2.50	0.00	-0.12	0.00	3.12	2.50	-0.94	0.31	0.31
Al2O3	*	-3.24	*	0.86	-0.66	-2.48	*	0.78	-0.15	-0.08	1.77	1.26	0.25	-3.06	-2.13
Fe2O3	*	6.05	*	-0.90	5.04	-0.11	-0.67	0.73	-0.22	-0.11	-2.46	2.46	-0.28	1.34	-4.93
Fe(II)O	*	*	*	*	*	-7.43	*	*	*	*	2.43	*	*	*	*
MnO	-2.58	5.41	*	0.08	0.08	-2.58	-0.45	0.04	0.35	0.04	-7.90	1.15	0.04	-1.29	-1.29
MgO	*	-1.92	*	-1.92	0.30	-1.43	-0.44	-0.47	-0.69	0.27	-1.18	8.44	-0.34	-4.04	-1.95
CaO	*	6.26	*	-2.13	0.66	1.50	1.08	-0.72	0.10	-0.37	3.88	5.84	-0.44	1.80	-0.02
Na2O	*	4.20	*	1.01	2.02	0.00	-0.67	-0.34	0.50	0.08	-3.19	-8.23	-1.51	-2.60	3.86
K2O	*	6.88	*	2.58	4.30	-3.66	2.15	2.37	0.00	0.65	-0.43	0.65	-0.97	1.61	1.08
P2O5	*	1.51	*	1.51	-0.71	*	*	0.76	0.18	-0.35	-0.71	-6.25	-2.57	-9.22	0.76
LOI	*	-0.97	*	8.80	-3.18	-0.03	-0.03	0.15	*	*	-3.18	-3.18	*	0.93	*
Ba	0.44	*	*	2.04	0.61	2.04	*	-1.00	-0.32	*	*	*	-0.12	*	-0.03
Be	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Ce	0.56	*	*	*	*	*	*	*	*	*	*	*	*	*	2.11
Co	1.64	15.76	*	-2.06	7.13	*	*	*	0.69	*	*	*	-0.34	15.35	*
Cr	0.82	5.54	*	1.78	2.03	-0.30	*	*	0.53	*	*	*	-0.36	-2.51	1.93
Cs	0.40	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Cu	1.91	1.30	*	*	-3.67	-0.96	*	*	-0.21	*	*	*	0.65	*	*
Dy	1.16	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Er	0.95	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Eu	-0.01	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Ga	1.50	-1.59	*	*	-0.49	*	*	*	-0.49	*	*	*	*	*	*
Gd	0.06	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Hf	1.57	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Ho	1.28	*	*	*	*	*	*	*	*	*	*	*	*	*	*
La	0.52	*	*	*	-1.60	*	*	*	*	*	*	*	*	*	*
Li	1.71	*	*	*	*	-3.05	*	*	*	*	*	*	1.22	*	*
Lu	0.00	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Nb	1.27	0.27	*	*	1.13	*	*	0.13	3.13	*	*	*	*	*	0.13
Nd	0.53	*	*	*	-0.80	*	*	*	*	*	*	*	*	*	0.78
Ni	1.51	1.88	*	4.71	-1.13	-8.47	*	*	0.00	*	*	*	0.00	9.18	1.41
Pb	-0.23	-13.32	*	*	-1.95	-5.38	*	*	-1.42	*	*	*	*	14.90	*
Pr	-0.15	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Rb	0.89	-2.15	*	2.16	-0.32	-3.92	*	-0.95	0.89	*	*	*	*	*	-0.19
Sb	2.33	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Sc	1.78	-0.06	*	*	0.97	*	*	*	0.97	*	*	*	-0.03	*	-1.05
Sm	0.83	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Sn	-0.62	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Sr	2.28	-1.72	*	-3.47	-0.14	0.53	*	-0.36	0.28	*	*	*	-0.11	*	*
Ta	-0.49	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Tb	0.65	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Th	0.03	*	*	*	4.06	*	*	-1.45	*	*	*	*	*	*	*
Tl	1.69	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Tm	0.68	*	*	*	*	*	*	*	*	*	*	*	*	*	*
U	0.24	*	*	*	0.04	*	*	*	*	*	*	*	*	*	-0.62
V	0.18	-1.09	*	*	-2.88	*	*	*	-0.21	*	*	*	-1.28	*	0.63
Yb	0.07	0.45	*	-0.97	2.21	*	*	-1.20	0.45	*	*	*	0.94	*	0.70
Yb	0.87	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Zn	-0.34	-1.87	*	*	0.24	-0.51	*	*	0.17	*	*	*	-0.08	1.72	-0.43
Zr	-0.01	0.55	*	-1.15	1.08	*	*	-1.99	-0.44	*	*	*	*	*	0.35

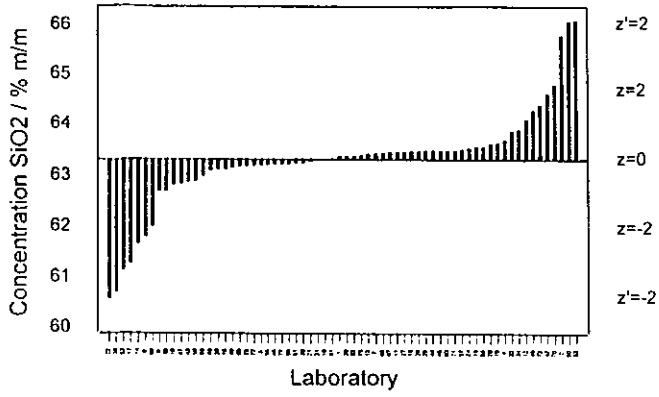
GeoPT8 Table 3

Round identifier	I51	I52	I53	I54	I55	I55	I56	I57	I58	I58	I59	I60	I61	I61	I62
Technique codes	A,O	A,X	AA	I	A,M, O,T,X	A,M, O,T,X	A	M,X	X	X	A,M,X	X	AA,A,E, M,O,X	AA,A,E, M,O,X	AA,ign, T,M
Test portion (g)	0.3-0.5	1.0-6	0.10	0.15	0.2-4	0.2-4	0.25	0.2-1	1.2-9	1.2-9	0.1-12	4.00	0.1-1.2	0.1-1.2	0.1-0.5
Data quality	2	2	1	1	1	2	1	1	1	2	2	2	1	2	2
SiO2	-0.07	-1.62	4.95	*	-0.18	*	-0.67	0.26	0.35	*	-0.08	-0.11	0.01	*	0.04
TiO2	-0.31	-0.31	4.37	*	-0.62	*	1.25	0.31	0.37	*	-0.31	-0.21	1.75	*	-0.16
Al2O3	-0.40	-1.34	-0.76	*	0.51	*	0.20	1.11	0.47	*	-0.78	-1.80	1.16	*	0.00
Fe2O3	-0.11	-0.84	-9.63	-2.91	0.00	*	1.12	0.78	0.74	*	-0.11	5.12	1.12	*	-0.22
Fe(II)O	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-2.12
MnO	*	-0.49	-10.57	*	0.08	*	0.08	0.08	-0.32	*	0.04	1.31	*	-0.09	-0.23
MgO	0.86	0.03	6.71	*	-0.20	*	1.53	0.05	0.22	*	-0.84	7.18	*	-0.12	0.89
CaO	-1.68	-0.44	-1.71	*	0.52	*	0.80	0.66	0.03	*	-0.23	-0.02	-0.01	*	0.26
Na2O	1.09	0.34	13.44	2.02	1.68	*	*	0.00	0.94	*	0.34	-1.25	0.84	*	1.09
K2O	0.72	-1.08	3.66	*	2.58	*	*	0.65	0.11	*	-0.43	1.72	-0.86	*	-0.11
P2O5	*	-0.35	*	*	-2.93	*	3.73	1.51	1.18	*	-0.35	-1.69	*	0.31	-0.02
LOI	1.19	0.46	*	*	1.55	*	276.51	*	-0.66	*	-0.64	2.12	*	1.09	-0.49
Ba	*	2.87	*	-0.40	*	-0.75	-0.57	1.11	-1.74	*	-1.16	0.68	*	-1.50	*
Be	*	*	*	*	*	*	*	*	*	*	-1.11	*	*	-0.15	*
Ce	*	-0.50	*	1.02	0.46	*	*	0.73	*	-1.79	-0.58	-1.59	2.25	*	*
Co	*	-0.34	*	-0.55	*	*	8.91	*	*	*	-1.71	-0.34	*	0.34	*
Cr	*	-0.15	*	-1.14	*	*	-0.30	-1.14	0.53	*	0.58	0.89	*	-0.57	*
Cs	*	*	*	-0.47	1.28	*	*	-0.87	*	*	*	19.98	-0.47	*	*
Cu	*	0.27	*	*	*	0.65	-3.22	-1.41	1.00	*	0.31	14.60	4.32	*	*
Dy	*	-0.01	*	*	0.28	*	*	1.64	*	*	-0.03	*	0.98	*	*
Er	*	0.93	*	*	0.85	*	*	-0.04	*	*	-0.18	*	-0.20	*	*
Eu	*	-0.42	*	0.32	0.15	*	*	0.24	*	*	-0.05	*	1.22	*	*
Ga	*	-0.24	*	*	*	-0.11	0.62	*	0.51	*	-0.41	-3.55	*	-0.63	*
Gd	*	-0.21	*	*	-0.04	*	*	0.88	*	*	-0.30	-0.44	1.89	*	*
Hf	*	-0.79	*	0.03	0.29	*	*	0.93	*	*	0.19	0.67	1.25	*	*
Ho	*	-0.55	*	*	0.95	*	*	1.28	*	*	-0.18	*	1.69	*	*
La	*	-0.27	*	-0.05	0.95	*	*	0.52	*	-1.65	-0.84	1.23	2.35	*	*
Li	*	*	*	*	*	0.52	*	*	*	*	-0.21	*	0.00	*	*
Lu	*	0.75	*	*	0.83	*	*	0.26	*	*	-0.47	*	0.83	*	*
Nb	*	-1.30	*	*	0.54	*	-0.45	-0.16	1.13	*	0.42	-0.58	1.46	*	*
Nd	*	-0.47	*	*	2.26	*	*	0.98	*	-2.88	-0.51	0.78	3.91	*	*
Ni	*	0.94	*	-0.94	*	2.35	0.00	*	-2.54	*	-0.09	4.24	*	-0.51	*
Pb	*	0.61	*	*	*	0.31	*	-0.49	3.35	*	-1.17	-0.71	*	2.60	*
Pr	*	-0.67	*	*	1.21	*	*	0.51	*	*	-0.47	*	0.51	*	*
Rb	*	-0.31	*	-0.37	1.19	*	*	2.41	0.03	*	-0.11	-1.83	-0.12	*	*
Sb	*	*	*	-0.77	*	*	*	*	*	*	*	*	*	*	*
Sc	*	-0.40	*	-0.77	*	-0.54	0.97	-1.80	-1.69	*	-1.36	*	1.17	*	*
Sm	*	-0.05	*	0.46	1.02	*	*	0.71	*	*	-0.53	*	1.65	*	*
Sn	*	*	*	*	*	*	*	*	*	*	*	*	*	0.84	*
Sr	*	-1.11	*	-0.22	2.59	*	-0.97	1.03	-0.47	*	0.07	-2.36	0.53	*	*
Ta	*	*	*	0.14	-0.49	*	*	-0.74	*	*	-0.33	*	*	5.07	*
Tb	*	0.79	*	-0.90	0.13	*	*	0.65	*	*	-0.19	*	0.55	*	*
Th	*	-1.14	*	-0.10	0.17	*	*	0.91	-1.26	*	-0.37	-7.59	1.56	*	*
Tl	*	*	*	*	*	0.12	*	*	*	*	*	*	*	-0.73	*
Tm	*	*	*	*	0.52	*	*	0.45	*	*	-0.27	*	1.34	*	*
U	*	2.59	*	-0.41	0.11	*	*	0.30	*	*	-0.33	2.59	1.33	*	*
V	*	-1.28	*	*	*	1.07	0.09	*	1.62	*	-1.95	-1.72	*	1.07	*
Yb	*	-0.72	*	*	1.29	*	1.40	-0.83	-0.40	*	-1.51	0.94	2.34	*	*
Yb	*	-0.13	*	0.67	0.84	*	*	0.61	*	*	-0.30	*	0.34	*	*
Zn	*	-0.25	*	-2.55	*	1.96	0.85	*	0.14	*	0.39	-0.08	-2.89	*	*
Zr	*	-0.15	*	0.70	0.67	*	-0.44	-4.41	1.38	*	-0.09	0.14	*	0.35	*

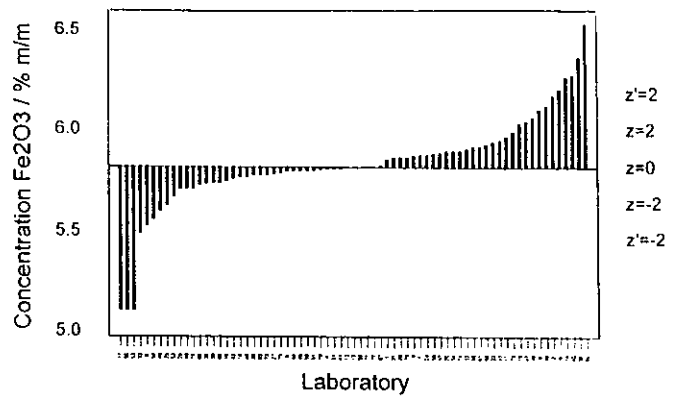
GeoPT8 Table 3

Round identifier	I63	I64	I65	I66	I67	I68	I69	I70	I71	I72	I73	I74	I75	I76	I77
Technique	A,M	M	I	X	X	X	AA	X	A,I,M	A,I	M,X	AA,A	XRF	AA,A	A,O
codes									T,X	M,X				M,X	X
Test portion (g)	0.2-0.5	0.25	0.20	4.00	0.4-8	1.50	0.10	1.0-7	0.2-3	0.1-0.8	0.125-3.5	0.50	1.50	0.3-0.5	0.01-5
Data quality	2	1	1	2	2	2	1	1	2	1	1	1	1	2	2
SiO2	0.12	*	*	-0.25	0.09	0.09	-1.96	2.13	0.12	-0.21	1.55	*	0.12	-0.16	-0.08
TiO2	-0.62	*	0.62	-1.56	0.00	0.41	*	0.62	-0.12	0.00	0.93	1.87	0.62	-0.03	-0.84
Al2O3	-1.62	*	5.36	0.68	-0.53	-0.46	-2.33	0.10	-0.08	-0.15	1.47	-0.15	-0.71	0.03	-0.25
Fe2O3	-0.45	*	-1.01	-0.62	0.06	0.62	*	0.56	0.00	-0.45	1.89	0.90	-0.34	-0.61	0.00
Fe(II)O	*	*	*	*	*	*	*	*	-0.80	*	*	*	-2.15	*	-0.03
MnO	0.04	*	0.08	-1.29	0.04	0.44	71.95	8.07	0.04	-8.44	0.96	5.41	2.74	-0.76	-1.02
MgO	0.27	*	12.88	7.92	-0.96	-0.47	-1.43	-0.20	1.51	-0.20	-0.49	1.04	-1.43	-1.28	0.03
CaO	-0.65	*	-2.41	-3.51	-0.65	0.47	30.30	0.52	1.31	-0.18	1.45	-0.46	-0.18	0.87	0.54
Na2O	0.08	*	3.36	2.60	-1.01	0.50	-16.97	-0.84	0.34	-1.34	0.86	-5.21	-0.34	0.39	-1.01
K2O	-1.08	*	1.08	-0.11	0.00	0.22	2.15	0.00	-1.18	0.00	0.99	-5.38	1.29	0.20	1.51
P2O5	-3.68	*	*	0.76	9.63	0.09	*	200.64	-0.35	12.60	0.64	-7.36	-0.71	0.64	0.31
LOI	*	*	*	*	*	-1.27	*	-2.55	-1.12	1.55	*	*	-2.55	-0.33	0.30
Ba	-0.41	2.29	3.64	1.94	1.99	*	*	*	0.14	0.36	0.39	-0.90	-5.95	-1.29	0.09
Be	*	*	*	*	*	*	*	*	1.56	0.91	*	*	*	-0.72	-0.53
Ce	-0.46	0.03	1.14	*	0.47	*	*	*	0.21	-0.83	-0.56	*	*	-0.54	0.06
Co	-0.34	-2.88	0.00	*	-1.71	*	*	*	0.34	0.69	*	6.17	8.91	*	*
Cr	-3.70	*	-0.22	*	-0.78	*	*	*	0.06	2.07	-1.68	*	-8.23	*	*
Cs	*	-3.30	0.54	*	*	*	*	*	0.44	-0.13	4.29	-10.58	*	*	*
Cu	-0.86	*	*	*	-1.23	*	*	*	-0.48	0.10	-1.04	5.83	-5.48	-1.23	1.03
Dy	-1.10	0.28	1.09	*	*	*	*	*	-0.12	1.13	2.84	*	*	-0.02	-0.50
Er	-1.36	-0.50	*	*	*	*	*	*	0.00	-0.37	1.64	*	*	-0.64	0.34
Eu	-1.40	1.06	0.89	*	*	*	*	*	0.11	-0.34	1.42	*	*	0.12	0.04
Ga	0.31	-0.93	*	*	*	*	*	*	0.86	-0.89	1.61	*	*	*	*
Gd	-1.24	-0.26	*	*	*	*	*	*	0.02	0.58	0.95	*	*	-0.45	0.87
Hf	*	0.14	0.64	*	*	*	*	*	0.09	-1.14	0.06	*	*	*	*
Ho	-0.97	-0.37	*	*	*	*	*	*	-0.02	*	2.08	*	*	-0.39	-0.02
La	-0.39	-0.30	0.27	*	-2.02	*	*	*	0.18	-0.54	0.93	*	*	-0.43	0.83
Li	*	*	*	*	*	*	*	*	0.31	0.12	*	0.61	*	*	-0.92
Lu	*	-0.17	0.06	*	*	*	*	*	0.48	-0.51	0.58	*	*	-0.37	0.54
Nb	*	-0.16	*	*	*	*	*	*	1.57	-0.16	0.07	*	*	*	-0.58
Nd	-1.44	0.09	1.27	*	*	*	*	*	-0.14	-0.58	-0.46	*	*	-0.44	0.23
Ni	0.75	*	*	*	-0.94	*	*	-0.38	6.12	-0.19	0.85	0.94	-5.65	46.60	-0.94
Pb	-3.35	*	*	-1.83	10.54	*	*	*	3.26	1.49	1.47	-0.09	*	*	-0.97
Pr	-1.28	0.12	*	*	6.27	*	*	*	0.05	0.65	-1.19	*	*	-0.41	0.48
Rb	-0.06	-4.81	-0.75	-0.22	-3.73	*	*	-0.88	-0.44	1.07	0.68	0.89	*	*	0.45
Sb	*	*	1.30	*	*	*	*	*	0.65	-2.16	*	*	*	*	*
Sc	-7.34	*	0.56	*	*	*	*	*	-0.54	0.97	4.20	*	0.97	*	0.23
Sm	-1.73	-0.23	1.77	*	*	*	*	*	0.98	1.36	0.90	*	*	-0.29	-0.17
Sn	*	*	*	*	*	*	*	*	1.14	1.45	*	*	*	*	-0.93
Sr	-0.56	-3.25	*	-0.02	-1.74	*	*	-2.37	0.77	0.13	-0.72	2.53	-6.23	36.19	0.39
Ta	*	0.00	-0.24	*	*	*	*	*	3.13	0.39	0.00	*	*	*	*
Tb	-0.76	0.76	0.24	*	*	*	*	*	-0.45	-0.90	2.01	*	*	*	-1.23
Th	*	1.28	0.91	0.49	11.86	*	*	*	-0.22	-0.61	-0.68	*	*	*	-0.84
Tl	*	*	*	*	*	*	*	*	-0.12	0.24	*	*	*	*	*
Tm	*	-0.39	*	*	*	*	*	*	0.12	0.35	0.83	*	*	-0.49	-0.32
U	-4.15	0.56	*	*	*	*	*	*	0.34	0.36	-0.60	*	*	*	9.00
V	2.54	*	2.00	*	-0.40	*	*	*	1.81	-0.32	0.56	2.73	-5.20	*	-1.28
Yb	-0.84	-0.55	*	0.23	0.70	*	*	*	0.70	1.07	1.97	*	-3.35	-2.15	-0.30
Yb	-1.51	0.94	1.81	*	*	*	*	*	-0.82	-0.74	0.35	*	*	-0.34	-0.08
Zn	-0.94	*	*	*	-0.25	*	-23.65	*	-0.77	-0.28	0.38	5.62	-4.94	-0.08	0.26
Zr	-1.99	-2.71	-0.72	0.14	-1.21	*	*	*	-0.08	0.27	-0.59	4.95	2.11	*	0.99

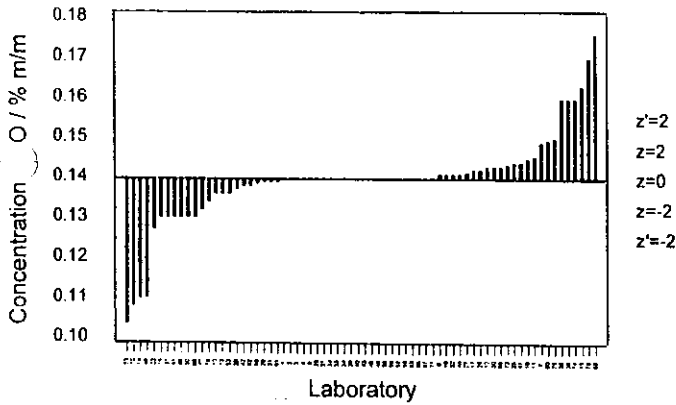
GeoPT8 - Barchart for SiO₂



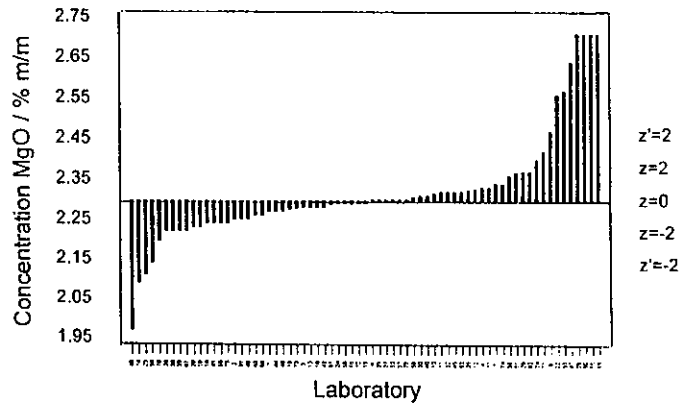
GeoPT8 - Barchart for Fe₂O₃



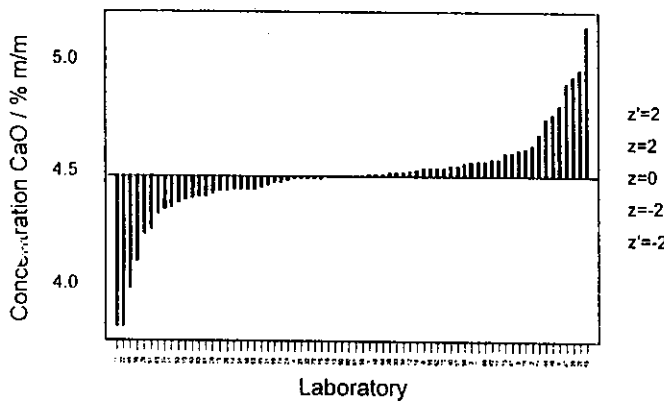
GeoPT8 - Barchart for MnO



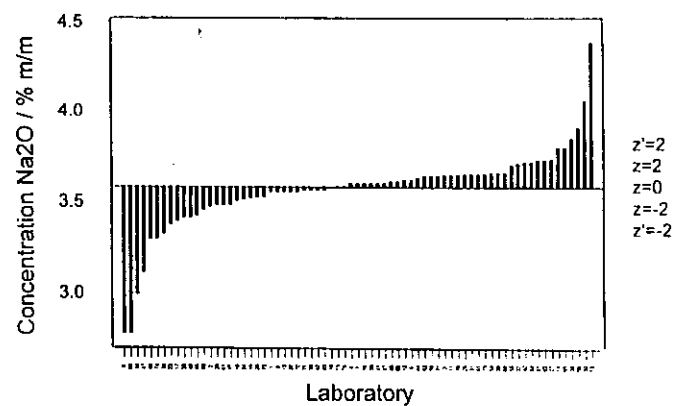
GeoPT8 - Barchart for MgO



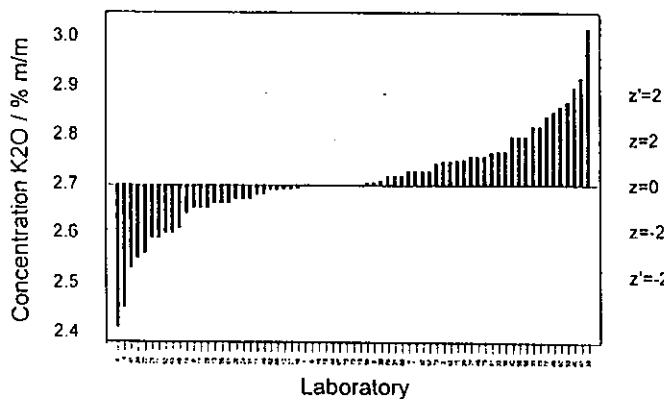
GeoPT8 - Barchart for CaO



GeoPT8 - Barchart for Na₂O



GeoPT8 - Barchart for K₂O



GeoPT8 - Barchart for P₂O₅

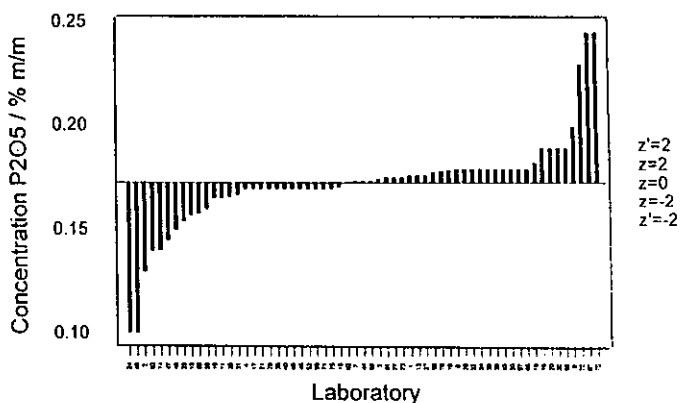
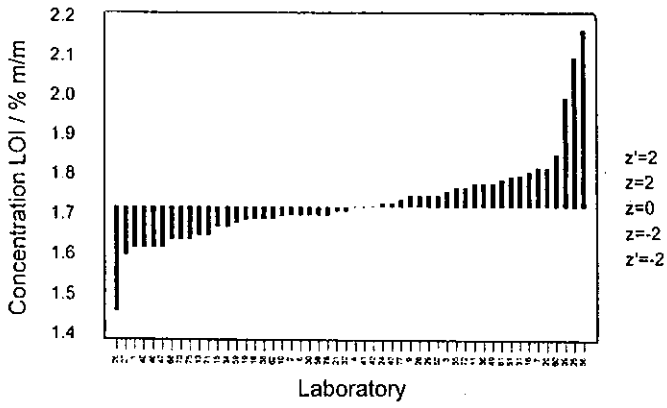
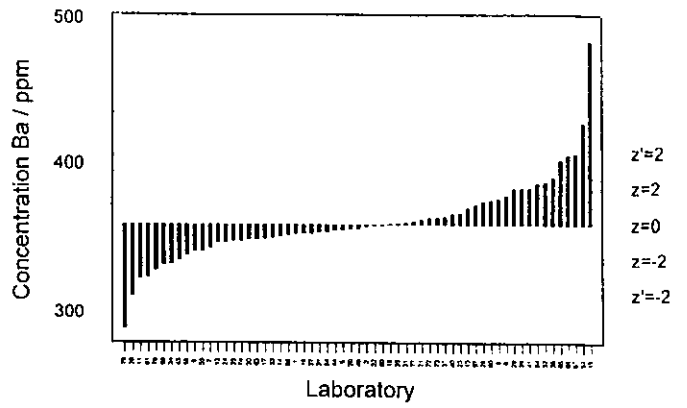


Figure 1 / GeoPT8

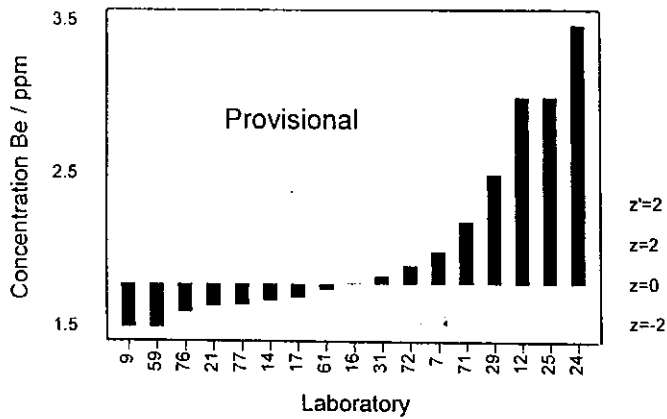
GeoPT8 - Barchart for LOI



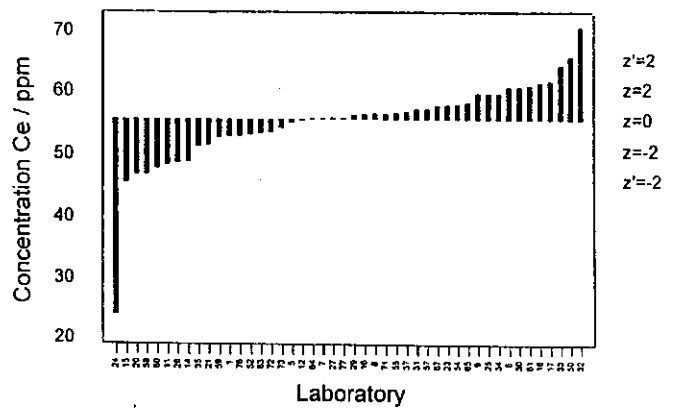
GeoPT - Barchart for Ba



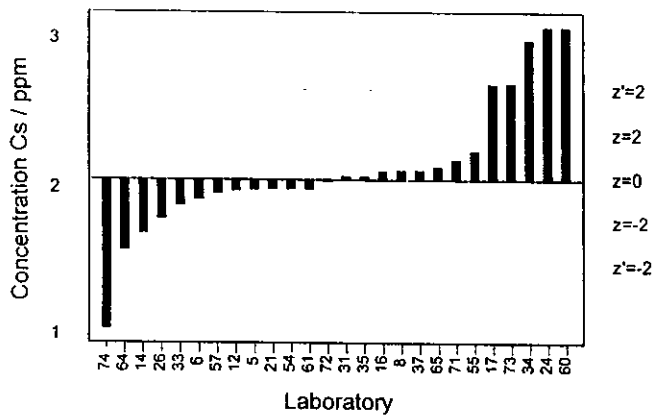
GeoPT - Barchart for Be



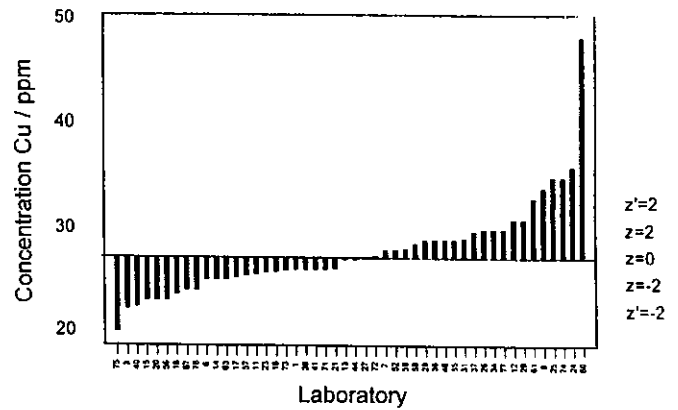
GeoPT - Barchart for Ce



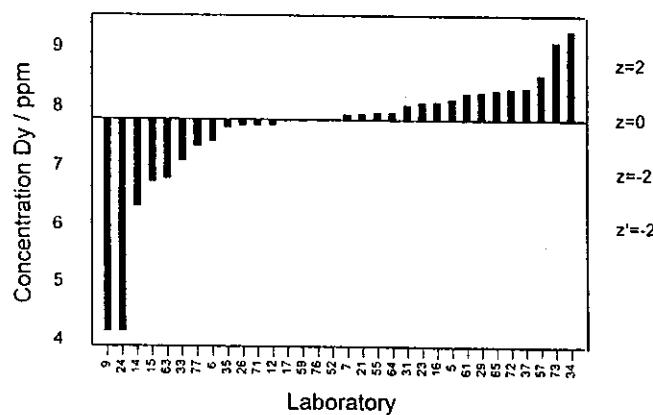
GeoPT - Barchart for Cs



GeoPT - Barchart for Cu



GeoPT - Barchart for Dy



GeoPT - Barchart for Er

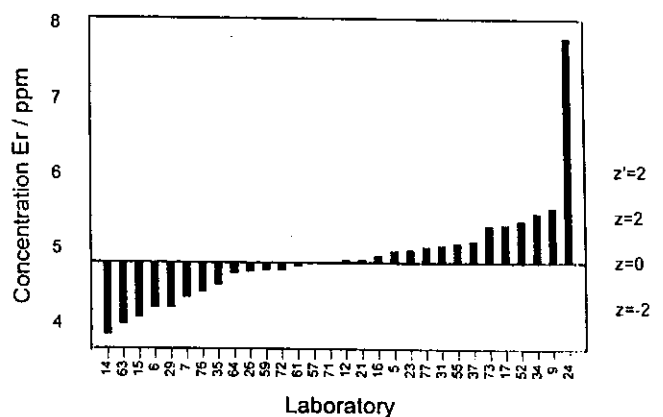
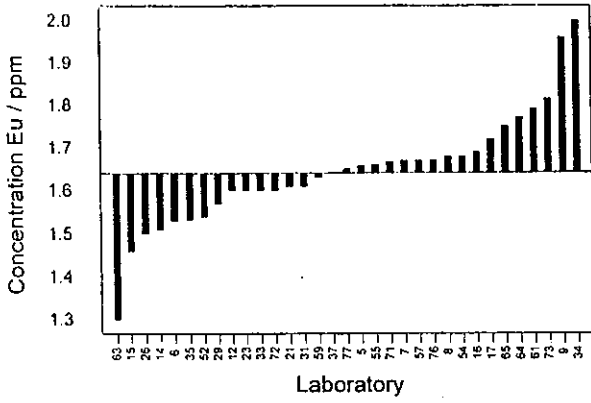
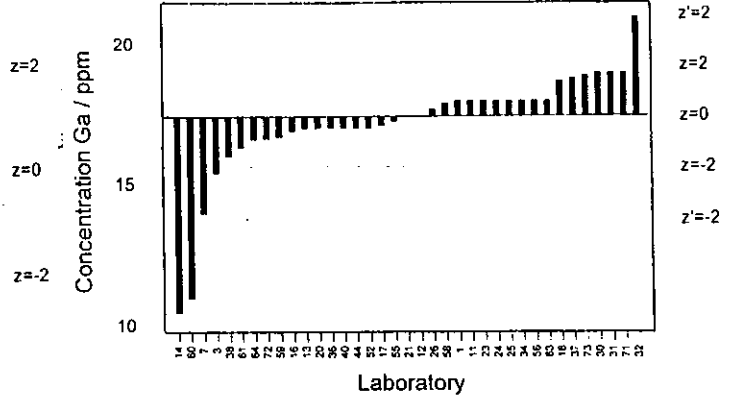


Figure 1 / GeoPT8 (continuation 1)

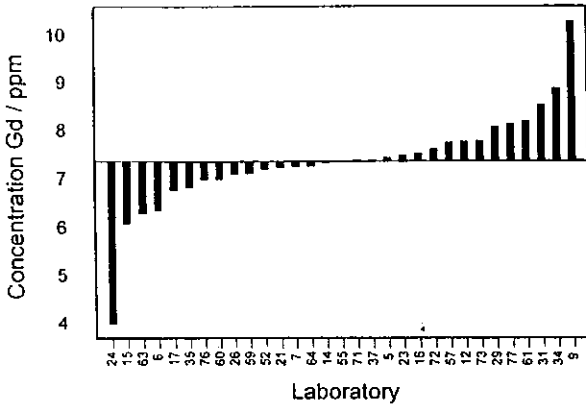
GeoPT - Barchart for Eu



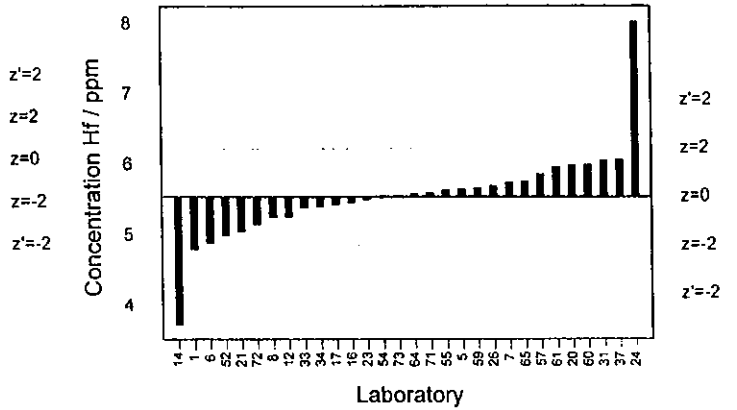
GeoPT - Barchart for Ga



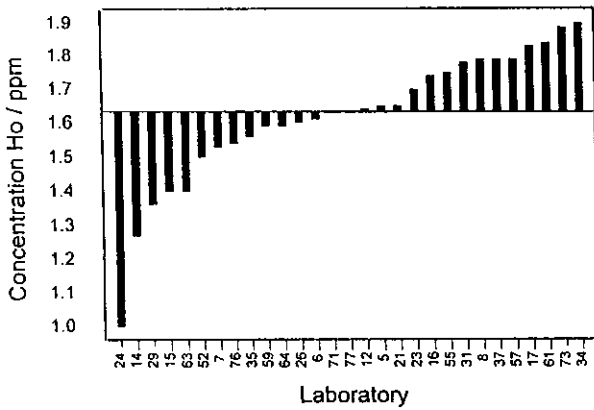
GeoPT - Barchart for Gd



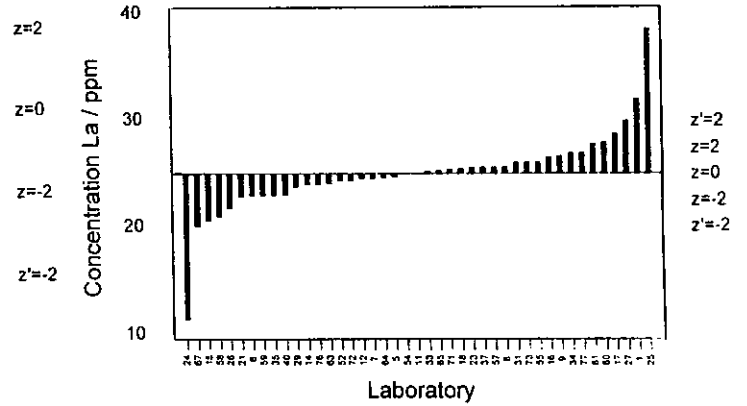
GeoPT - Barchart for Hf



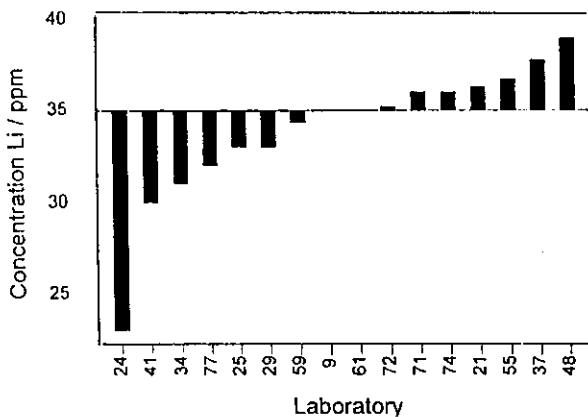
GeoPT - Barchart for Ho



GeoPT - Barchart for La



GeoPT - Barchart for Li



GeoPT - Barchart for Lu

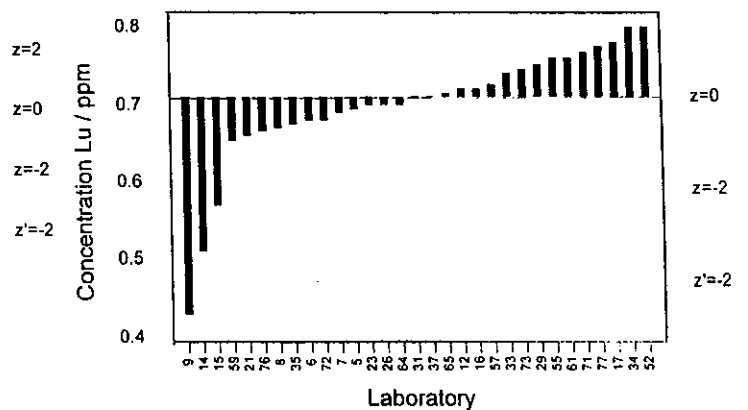
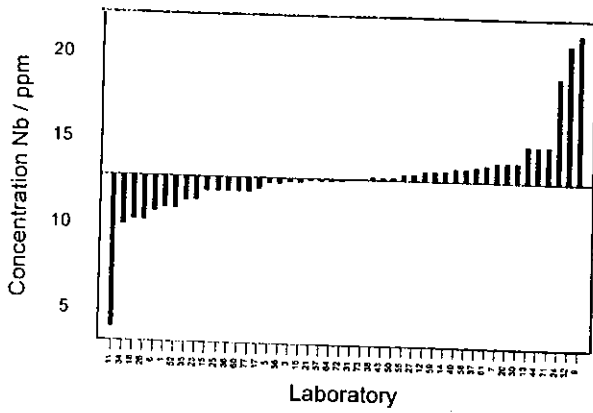
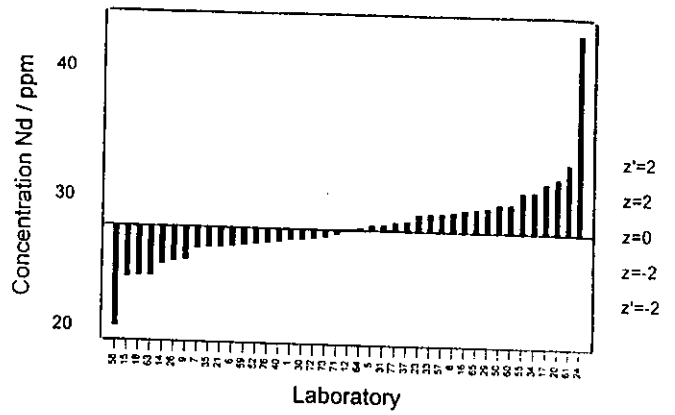


Figure 1 / GeoPT8 (continuation 2)

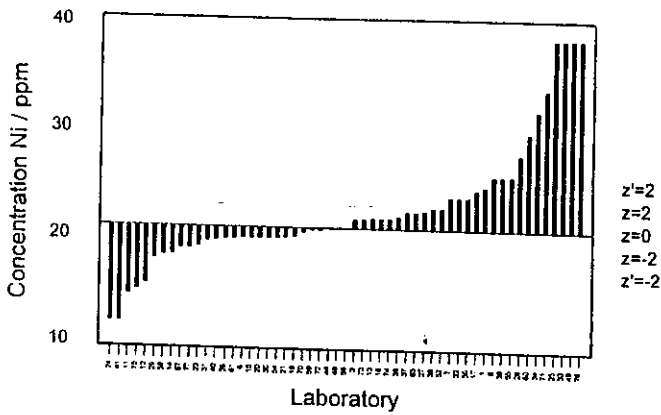
GeoPT - Barchart for Nb



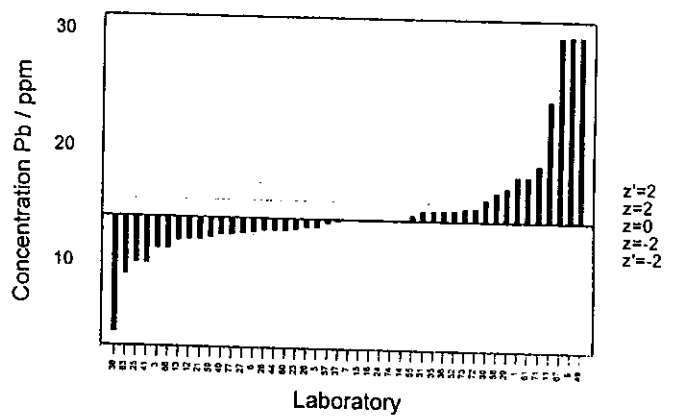
GeoPT - Barchart for Nd



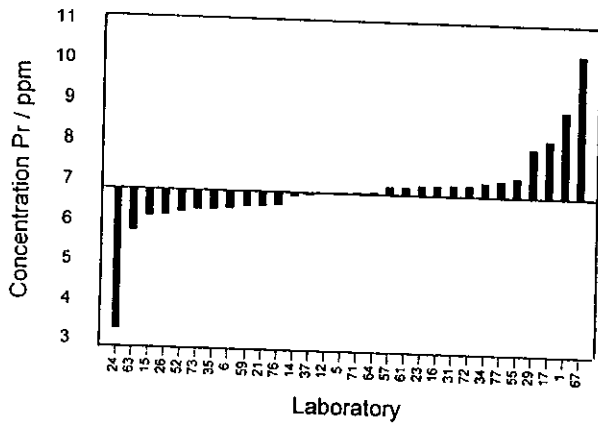
GeoPT - Barchart for Ni



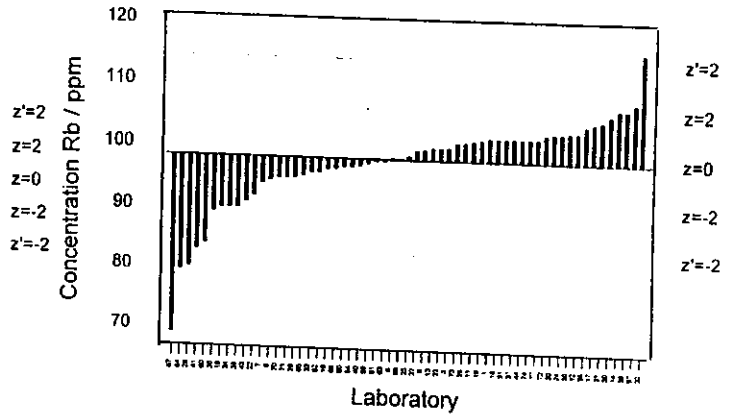
GeoPT - Barchart for Pb



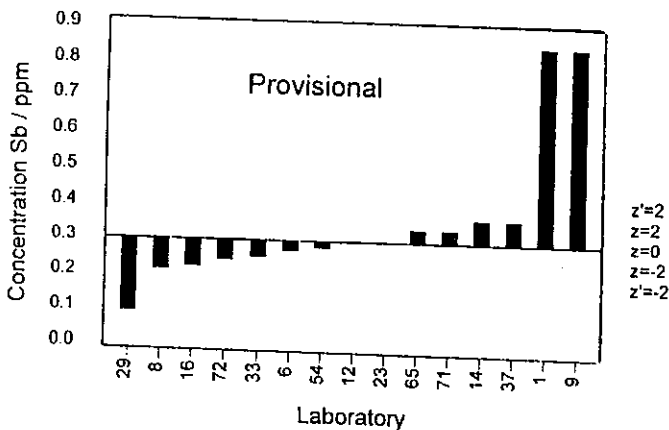
GeoPT - Barchart for Pr



GeoPT - Barchart for Rb



GeoPT - Barchart for Sb



GeoPT - Barchart for Sc

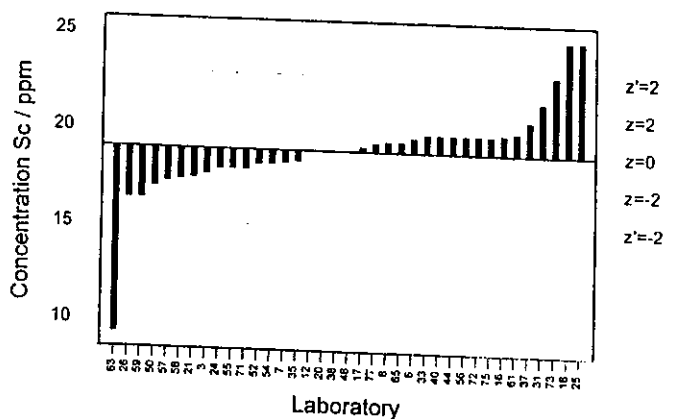
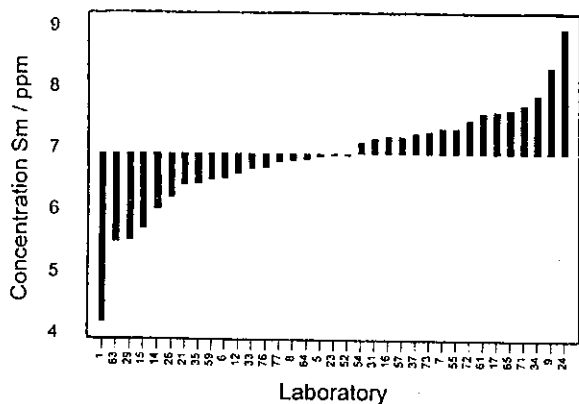
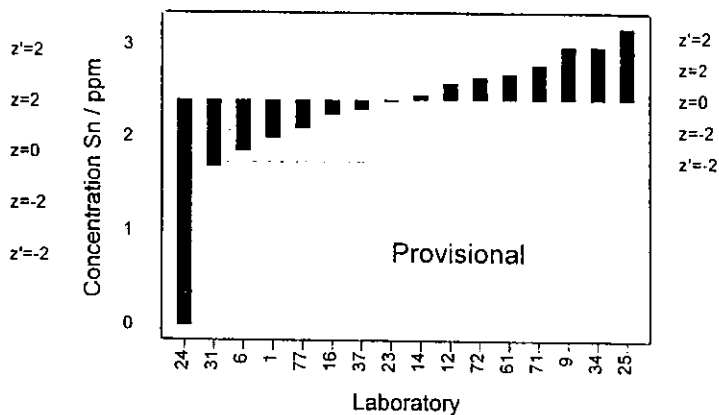


Figure 1 / GeoPT8 (continuation 3)

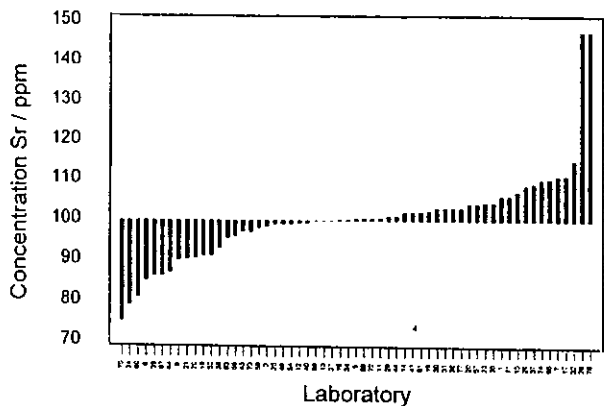
GeoPT - Barchart for Sm



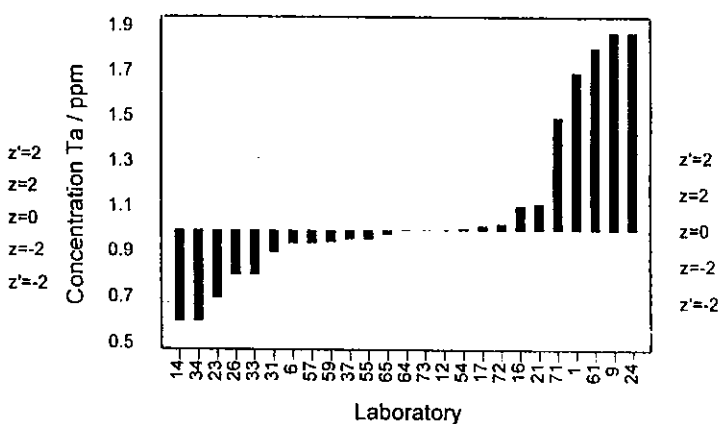
GeoPT - Barchart for Sn



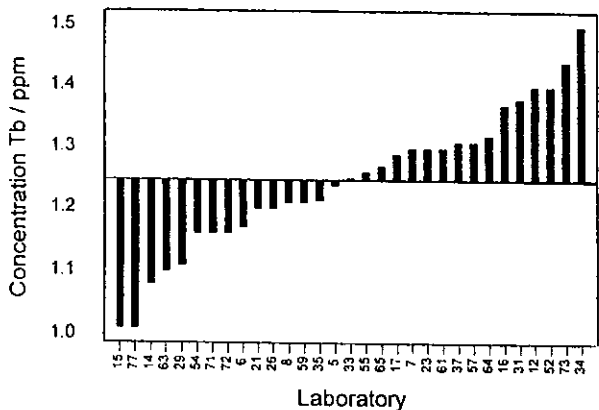
GeoPT - Barchart for Sr



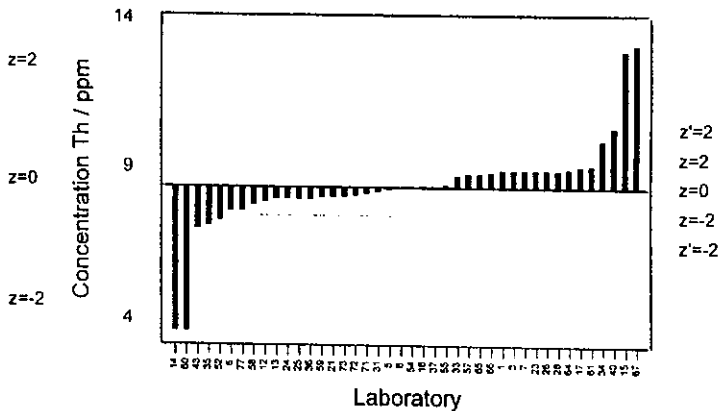
GeoPT - Barchart for Ta



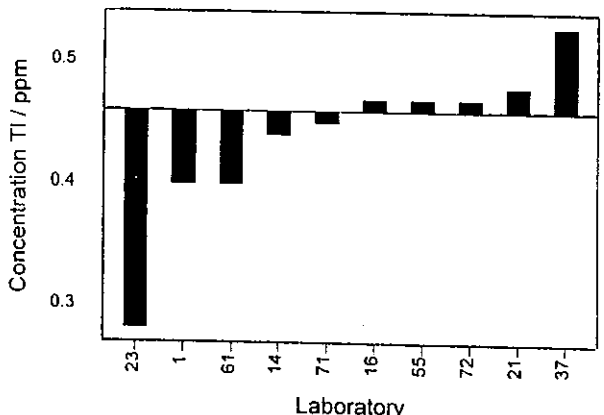
GeoPT - Barchart for Tb



GeoPT - Barchart for Th



GeoPT - Barchart for Tl



GeoPT - Barchart for Tm

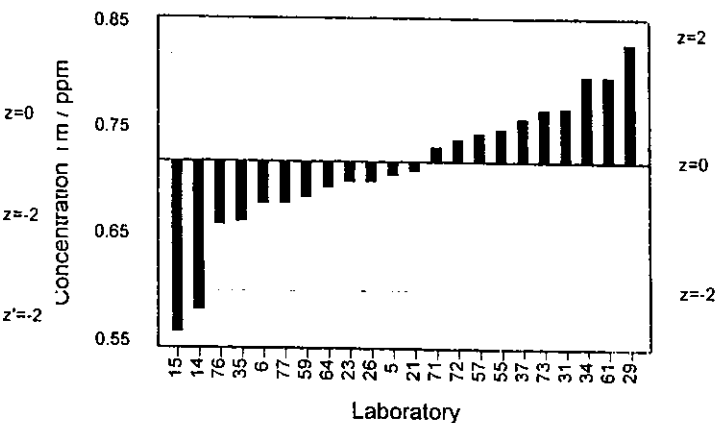
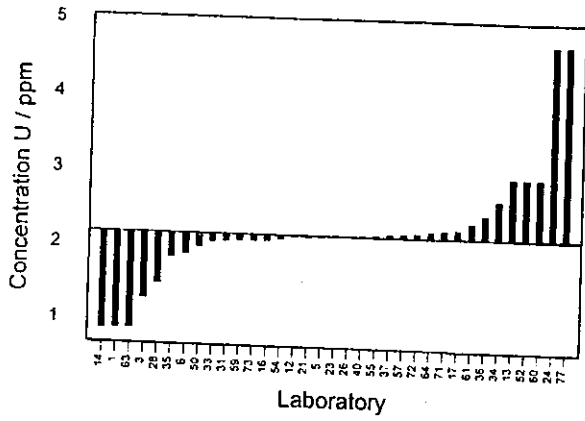
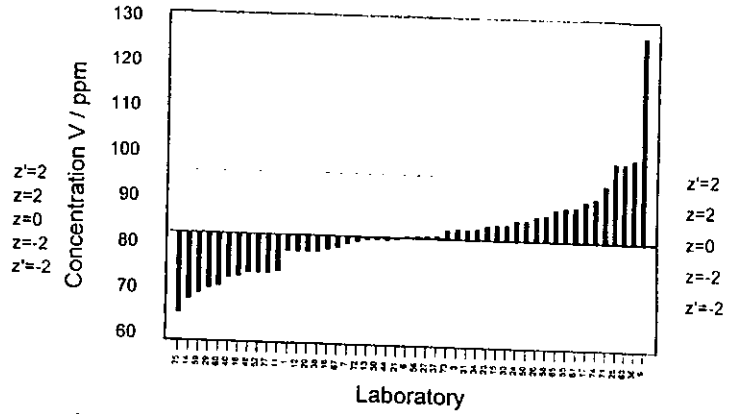


Figure 1 / GeoPT8 (continuation 4)

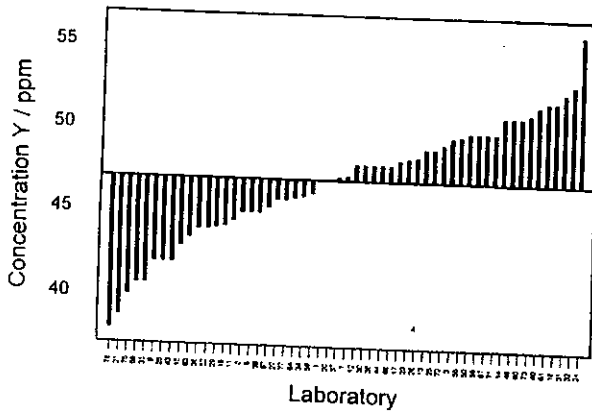
GeoPT - Barchart for U



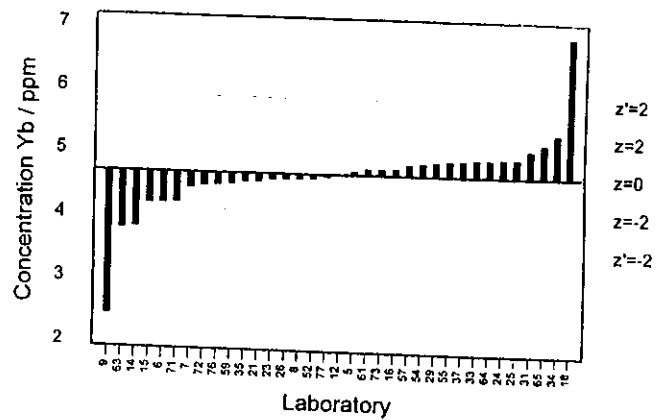
GeoPT - Barchart for V



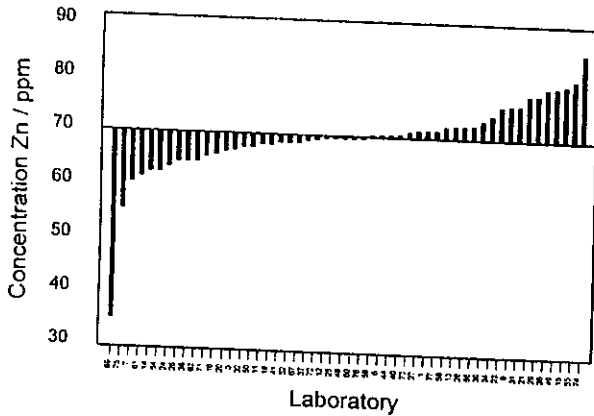
GeoPT - Barchart for Y



GeoPT - Barchart for Yb



GeoPT - Barchart for Zn



GeoPT - Barchart for Zr

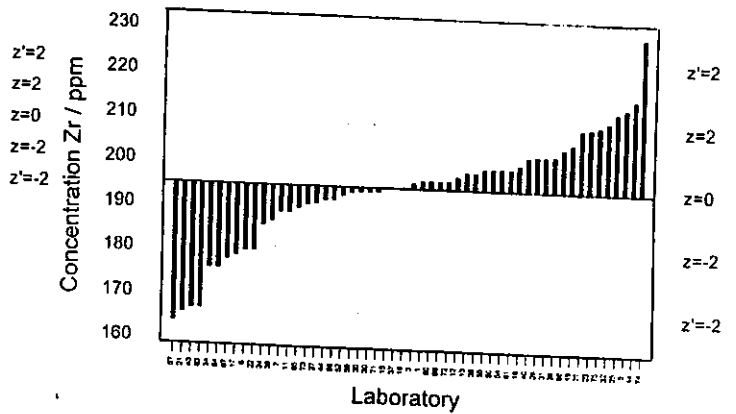
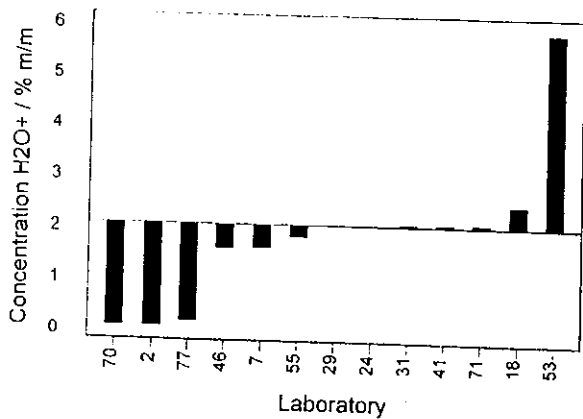
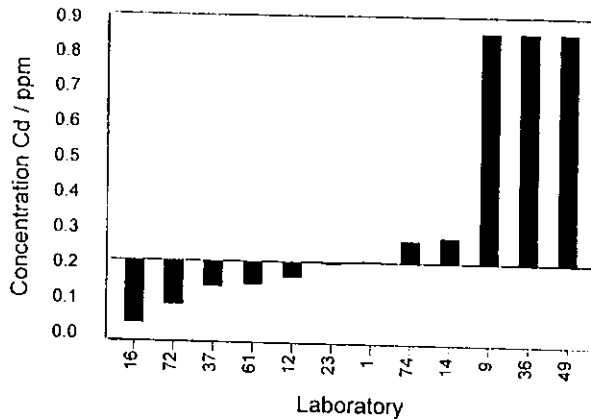


Figure 1 / GeoPT8 (continuation 5)

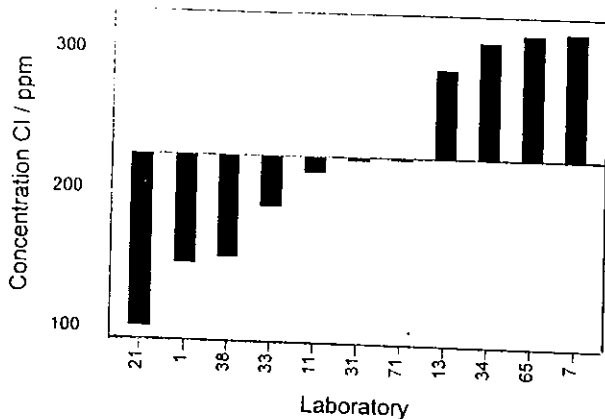
GeoPT8 - Barchart for H2O+



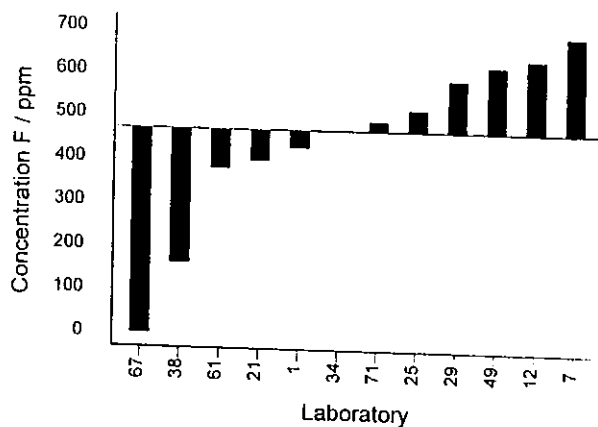
GeoPT - Barchart for Cd



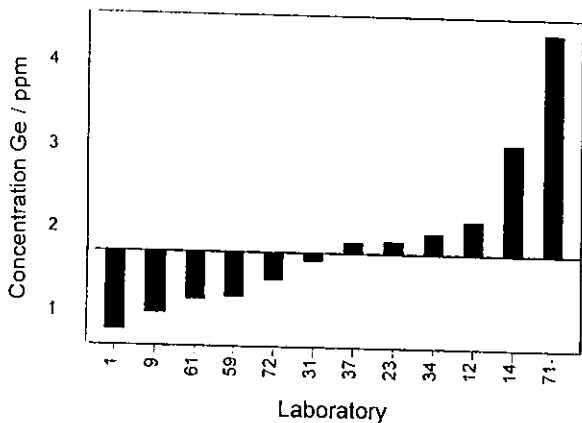
GeoPT - Barchart for Cl



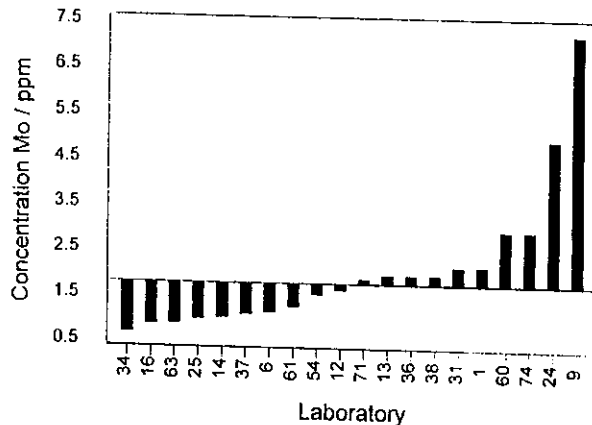
GeoPT - Barchart for F



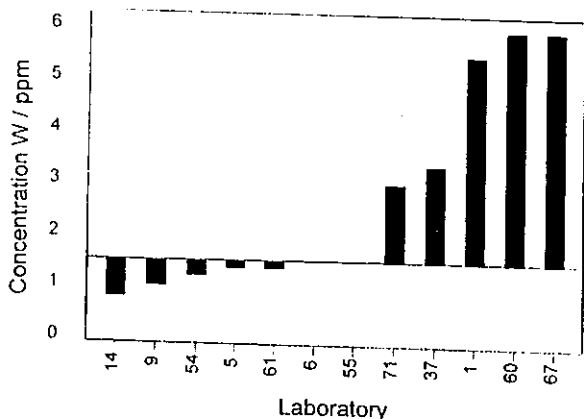
GeoPT - Barchart for Ge



GeoPT - Barchart for Mo



GeoPT - Barchart for W



GeoPT - Barchart for S

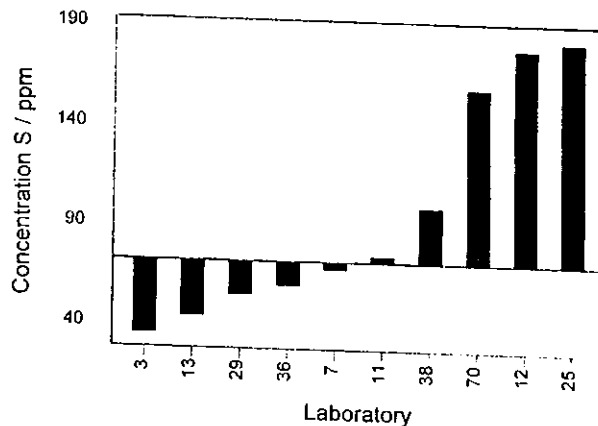
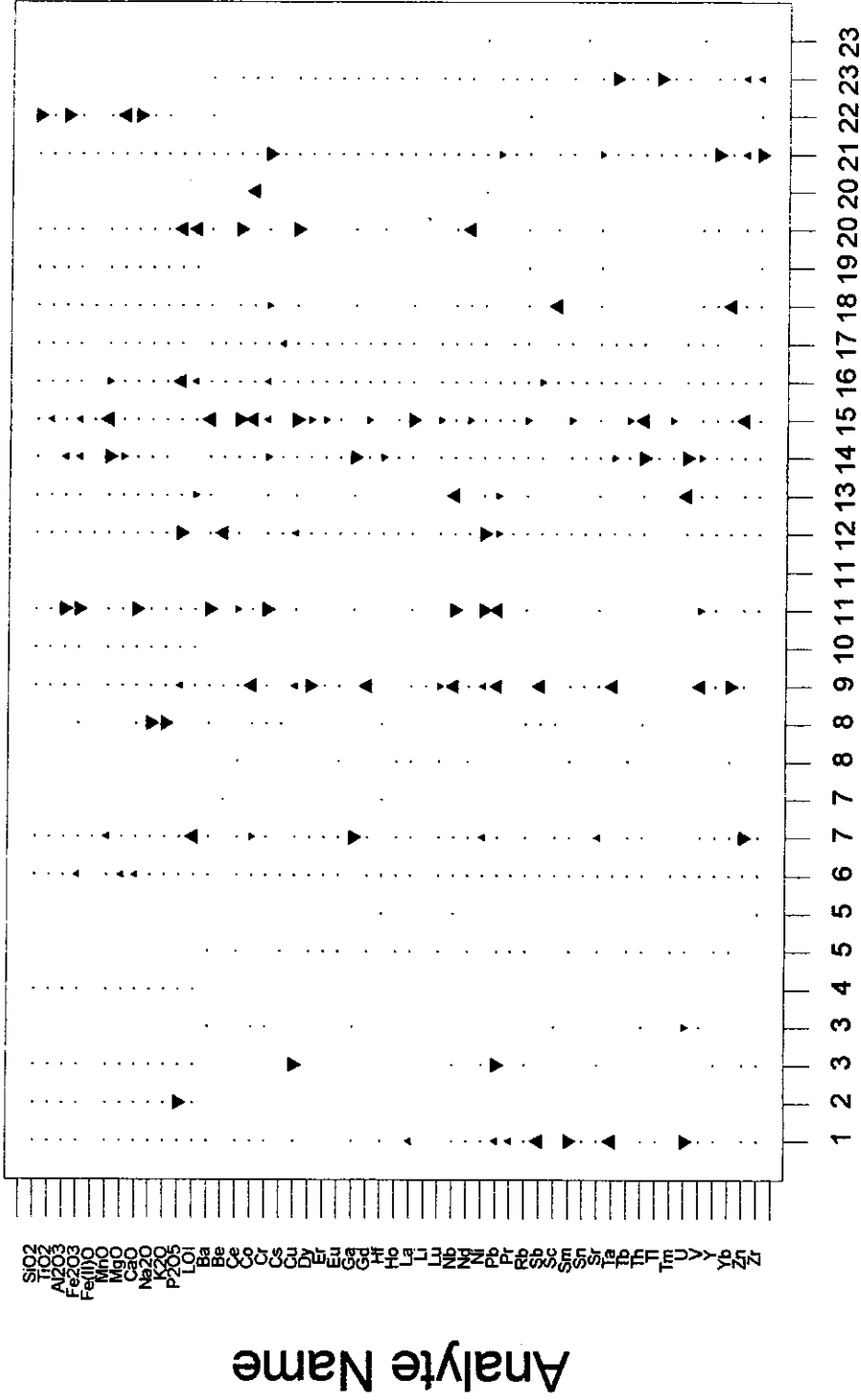
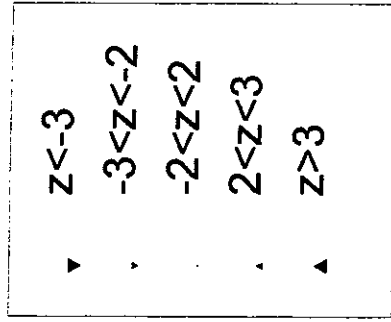


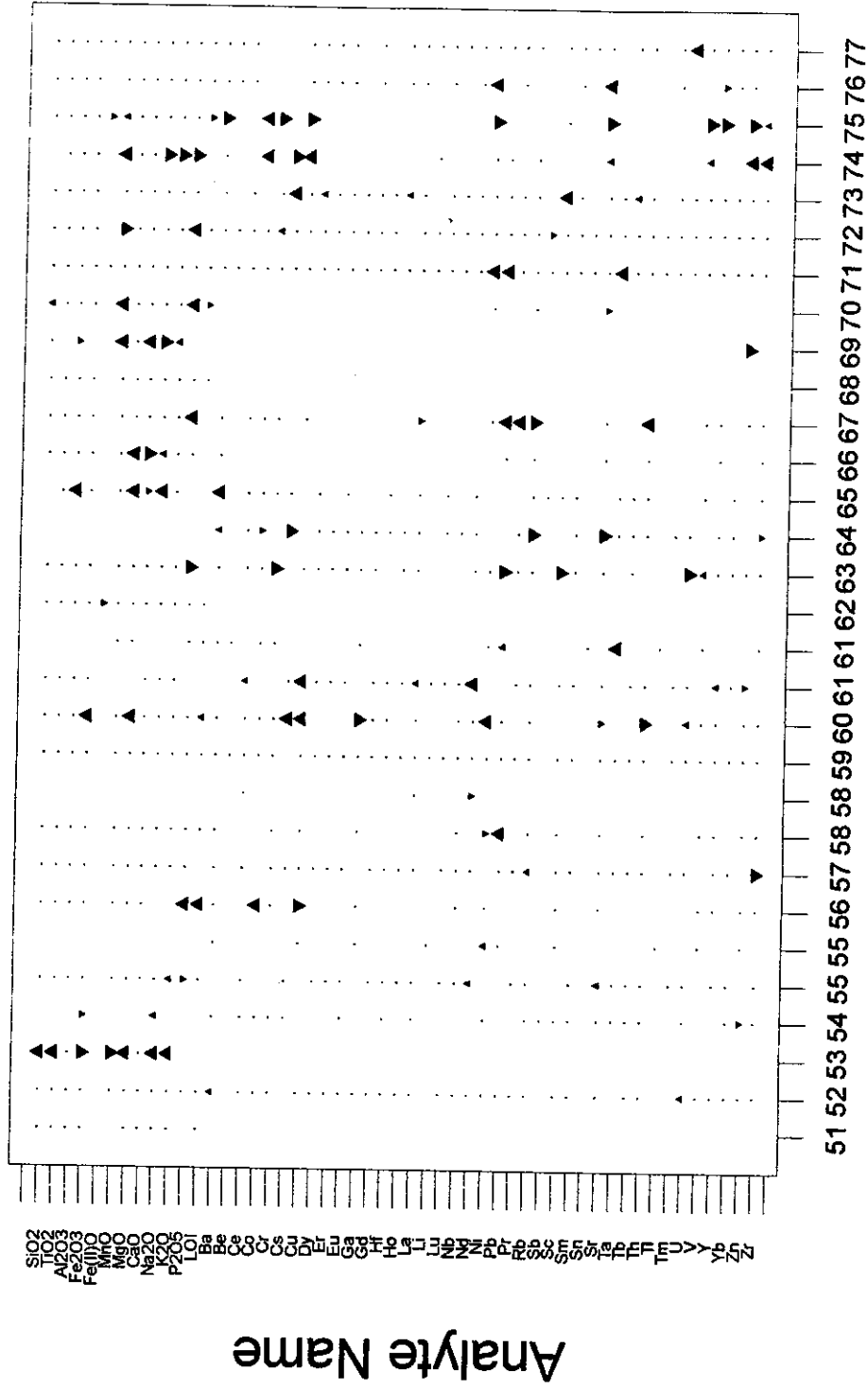
Figure 2 / GeoPT8

GeoPT - Multiple z-score Chart



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GeoPT - Multiple z-score Chart



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Figure 3 / GeoPT8 (continuation 2)