

1993 compilation of analytical data for major elements in seventeen GSJ geochemical reference samples, "Igneous rock series"

Shigeru TERASHIMA*, Noboru IMAI*, Shiro ITOH*,
Atsushi ANDO** and Naoki MITA*

TERASHIMA Shigeru, IMAI Noboru, ITOH Shiro, ANDO Atsushi and MITA Naoki(1994) 1993 compilation of analytical data for major elements in seventeen GSJ geochemical reference samples. *Bull. Geol. Surv. Japan*, vol.45(6), p.305-381, 1fig., 23tables.

Abstract: Analytical data for major elements received by September 1993, have been compiled on seventeen GSJ(Geological Survey of Japan) geochemical reference samples, "Igneous rock series". All the reported data including personal communication were evaluated and tabulated. No significant difference has been observed between the values obtained by the different analytical methods for most reference samples. Based on the selected available data, 1993 recommended or preferable values for fourteen major elements were proposed.

1. Introduction

The Geological Survey of Japan(GSJ) has issued 17 Geochemical reference samples, "Igneous rock series", which have been analyzed for major and minor elements, isotopic compositions and radiometric ages by many research laboratories worldwide. This project was started in 1967 and completed in 1986, and recent compilations of the analytical data for major elements on the 17 samples have been published by Ando *et al.*(1987; 1989a, b) and Govindaraju (1989). Among these compilations, however, concentration of some elements were remained uncertain, being due to the insufficient accumulation of analytical data, especially for the samples recently issued. In addition, the individual data reported were not shown except for K₂O (Ando *et al.*, 1989b).

In this paper, we evaluate all analytical results received by September 1993 for major ele-

ments(Table A-1 to A-17), and a new set of 1993 recommended or preferable values is proposed for the 17 reference samples(Table 1). All raw data are given with references.

2. Note on the samples

The 17 GSJ geochemical reference samples, "Igneous rock series" include three andesites (JA-1, JA-2 and JA-3); four basalts(JB-1, JB-1a, JB-2 and JB-3); two feldspars(JF-1 and JF-2); four granitic rocks(JG-1, JG-1a, JG-2 and JG-3); one gabbro(JGb-1); one peridotite(JP-1); and two rhyolites(JR-1 and JR-2). The sample description and sampling location of these reference samples are summarized in Table 2. Method of sample processing and recent compilation values of major and minor elements have been reported elsewhere(Ando *et al.*, 1987 and 1989a,b; Govindaraju, 1989; and Itoh *et al.*, 1992).

The older four reference samples, JA-1, JB-1, JB-1a and JG-1, have already been exhausted. JB-1a and JG-1a are replacement

* Geochemistry Department

** Present address: Japan Resources Observation System Organization, Nishi-shinbashi, Tokyo.

Keywords: rock reference sample, compilation value, major element

Table 1 1993 recommended values and preferable data (asterisked) for major elements in 17 GSJ geochemical reference samples (in %).

	JA-1	JA-2	JA-3	JB-1	JB-1a	JB-2	JB-3	JF-1	JF-2
SiO ₂	63.97	56.42	62.27	52.37	52.41	53.25	50.96	66.69	65.30
TiO ₂	0.85	0.66	0.70	1.32	1.28	1.19	1.44	0.005	0.005
Al ₂ O ₃	15.22	15.41	15.56	14.53	14.45	14.64	17.20	18.08	18.52
Fe ₂ O ₃	2.59	2.16	1.15	2.33	2.55	3.33	3.20	0.06	0.06
FeO	3.98	3.69	4.83	5.99	5.78	9.98	7.85	<0.04*	<0.03*
MnO	0.157	0.108	0.104	0.153	0.148	0.218	0.177	0.001	0.001
MgO	1.57	7.60	3.72	7.71	7.83	4.62	5.19	0.006	0.004*
CaO	5.70	6.29	6.24	9.25	9.31	9.82	9.79	0.93	0.09
Na ₂ O	3.84	3.11	3.19	2.77	2.73	2.04	2.73	3.37	2.39
K ₂ O	0.77	1.81	1.41	1.43	1.40	0.42	0.78	9.99	12.94
P ₂ O ₅	0.165	0.146	0.116	0.255	0.260	0.101	0.294	0.01	0.003*
H ₂ O+	0.72	1.12	0.20	1.02	0.92	0.25	0.18	0.23	0.24
H ₂ O-	0.30	1.25	0.11	0.95	0.92	0.13	0.07	0.13	0.18
Total	99.832	99.774	99.600	100.078	99.988	99.989	99.861	99.502	99.733
T-Fe ₂ O ₃	7.07	6.21	6.60	8.99	9.05	14.25	11.82	0.08	0.06

	JG-1	JG-1a	JG-2	JG-3	JGb-1	JP-1	JR-1	JR-2
SiO ₂	72.30	72.30	76.83	67.29	43.66	42.38	75.45	75.69
TiO ₂	0.26	0.25	0.044	0.48	1.60	0.006*	0.11	0.07
Al ₂ O ₃	14.24	14.30	12.47	15.48	17.49	0.66	12.83	12.72
Fe ₂ O ₃	0.38	0.51	0.33	1.62	4.79	1.98	0.35	0.27
FeO	1.61	1.36	0.57	1.83	9.43	5.99	0.49	0.44
MnO	0.063	0.057	0.016	0.071	0.189	0.121	0.099	0.112
MgO	0.74	0.69	0.037	1.79	7.85	44.60	0.12	0.04
CaO	2.20	2.13	0.70	3.69	11.90	0.55	0.67	0.50
Na ₂ O	3.38	3.39	3.54	3.96	1.20	0.021	4.02	3.99
K ₂ O	3.98	3.96	4.71	2.64	0.24	0.003	4.41	4.45
P ₂ O ₅	0.099	0.083	0.002	0.122	0.056	0.002*	0.021	0.012
H ₂ O+	0.54	0.59	0.33	0.67	1.28	2.39	1.16	1.19
H ₂ O-	0.07	0.12	0.12	0.17	0.13	0.44	0.20	0.22
Total	99.862	99.740	99.699	99.813	99.815	99.147	99.930	99.704
T-Fe ₂ O ₃	2.18	2.00	0.97	3.69	15.06	8.37	0.89	0.77

samples for JB-1 and JG-1, respectively. JB-1a was prepared from the same rock chip that for JB-1. While, JG-1a was prepared by resampling a rock specimen in the same quarry but at different sampling point from that for JG-1(Ando *et al.*, 1989b).

3. Evaluation of the reported data

We have collected the analytical data from

277 laboratories worldwide(110 publications and 167 personal communications) on major elements of 17 GSJ reference samples. All reported data are tabulated in the appendix(Table A-1 to 17) together with references. Analytical method codes being used in the appendix are shown in Table 3.

Consensus or recommended values for all elements were generally proposed by calculating the mean, after eliminating data lying out

Major elements in 17 GSJ rock reference samples (Terashima *et al.*)

Table 2 List of 17 GSJ geochemical reference samples. Taken from Ando *et al.* (1989b).

Name	Rock	Issued Year	Note	Latitude	Longitude
JA-1	Andesite	(1982)	Hakone volcano, Old Somma lava (Augite-hypersthene andesite), Quaternary, Manazuru-machi, Kanagawa Prefecture.	35° 09' 44" N	139° 08' 04" E
JA-2	Andesite	(1985)	Goshikidai sanukitoid (Olivine andesite), 13 Ma, Sakaide, Kagawa Prefecture.	34° 18' 30" N	133° 55' 37" E
JA-3	Andesite	(1986)	Asama volcano (Olivine-bearing augite-hypersthene andesite) erupted in 1783, Oni-Oshidashi, Tsumagoi-mura, Gunma Prefecture.	36° 26' 25" N	138° 31' 85" E
JB-1	Basalt	(1968)	Kitamatsuura basalt (Alkali basalt, Titanaugite-olivine basalt), 7.6 Ma, Myokanji Toge, Sasebo, Nagasaki Prefecture.	33° 13' 58" N	129° 41' 41" E
JB-1a	Basalt	(1984)	Replacement sample of JB-1.		
JB-2	Basalt	(1982)	Ō-shima volcano (Tholeiitic basalt, Augite-bronzite basalt) erupted in 1950-1951, northern rim of Mihara crater, Ō-shima, Tokyo.	34° 43' 41" N	139° 23' 46" E
JB-3	Basalt	(1983)	Fuji volcano (High alumina basalt, Hypersthene-augite-olivine basalt) erupted in 864, Aokigahara lava flow, Narusawa-mura, Yamanashi Prefecture.	35° 28' 31" N	138° 41' 58" E
JF-1	Feldspar	(1985)	Ō-hira feldspar (Mixture of orthoclase and albite), Nagiso-machi, Nagano Prefecture.	35° 33' 37" N	137° 40' 16" E
JF-2	Feldspar	(1986)	Kurosaka feldspar (Orthoclase), Kurosaka, Ibaraki Prefecture.	36° 41' 33" N	140° 32' 36" E
JG-1	Granodiorite	(1967)	Sori granodiorite (Biotite granodiorite), 85 Ma, Azuma-mura, Gunma Prefecture.	36° 34' 13" N	139° 23' 30" E
JG-1a	Granodiorite	(1984)	Replacement sample of JG-1.		
JG-2	Granite	(1985)	Naegi granite (Biotite granite), Cretaceous, Hirukawa-mura, Gifu Prefecture.	35° 29' 22" N	137° 24' 65" E
JG-3	Granodiorite	(1986)	Mitoya granodiorite (Hornblende-biotite granodiorite), Cretaceous-Paleogene, Mitoya-cho, Shimane Prefecture.	35° 16' 41" N	132° 52' 19" E
JGb-1	Gabbro	(1983)	Utsushigatake (Augite-hypersthene hornblende gabbro), 86 Ma, Funehikimachi, Fukushima Prefecture.	37° 28' 53" N	140° 36' 48" E
JP-1	Peridotite	(1984)	Horoman peridotite (Dunite). Horoman, Hokkaido.	42° 04' 43" N	143° 02' 31" E
JR-1	Rhyolite	(1982)	Wada Toge obsidian, 0.8 Ma, north of Wada Toge, Wada-mura, Nagano Prefecture.	36° 09' 04" N	138° 08' 43" E
JR-2	Rhyolite	(1983)	Wada Toge obsidian, south of Wada Toge, Shimosuwa-machi, Nagano Prefecture.	36° 08' 08" N	138° 08' 36" E

of the range which are two times greater than the standard deviation (Gladney *et al.*, 1991; Ando *et al.*, 1989a). In some cases, however, the method gives unreasonable values for several elements especially in very low concentrations.

For example, collected all the values for Na₂O and K₂O in JP-1 peridotite are listed in Table 4. Large disagreements are seen for both the elements. In this case, therefore, as an arbitrarily chosen procedure, values for the statistical cal-

Table 3 Code for analytical methods.

Code	Method
AAS	Atomic absorption spectrometry
Calc.	Calculated
Chem.	Conventional chemical method
Color	Colorimetry
Coul.	Coulometry
EPMA	Electron-probe micro-analyzer
Fl.phot.	Flame photometry
Grav.	Gravimetry
ICP	Inductively coupled plasma atomic emission spectroscopy
ICP-MS	Inductively coupled plasma mass spectrometry
IDMS	Isotope dilution mass spectrometry
INAA	Instrumental neutron activation analysis
KF	Karl Fischer method
NAA	Neutron activation analysis
OES	Optical emission spectrometry
PAA	Photon activation analysis
Photom.	Absorption spectrophotometry
γ cntg.	γ -ray counting
SIMS	Secondary ion mass spectrometry
Vol.	Volumetry
XRF	X-ray fluorescence spectrometry

ulation were selected after eliminating data lying out of the range 40% greater or smaller than our values; 0.021% for Na₂O, and 0.003% for K₂O(Terashima and Ando, 1987; Table 4). The same procedure was adopted for MnO and MgO in the two reference samples JF-1 and JF-2. Our analytical results indicate that TiO₂ in JP-1, and P₂O₅ in JP-1 and JF-2 are certainly less than 0.01%(Terashima and Ando, 1987). Therefore the data only smaller than 0.01% were selected for statistical calculation.

The 1993 compilation values listed in Table 5 are the mean and standard deviation which are calculated when the number of available data is more than two after the elimination described above. The data for carbon, sulfur and loss on ignition are not evaluated in this study because the insufficient accumulation of reported data, but the individual values are listed in the appendix tables.

4. Comparison of the method means

In order to examine the variation among analytical methods, analytical results for eleven major elements in the three samples, JG-1, JB-1 and JB-2, are given in Table 6. Very small deviation among the mean values of the methods suggests that significant difference has not been observed between different analytical methods such as conventional chemical method, x-ray fluorescence spectrometry, inductively coupled plasma atomic emission spectroscopy and atomic absorption spectrometry. It is generally known that analytical errors are increased toward lower elemental concentration region. As shown in Fig. 1, the same increasing tendency is recognized in this compilation data. The analytical errors in the determination of Fe₂O₃, FeO, H₂O⁺ and H₂O⁻ are significantly larger than those of other elements(Fig. 1).

Table 4 Comparison of Na₂O and K₂O values in GSJ JP-1 peridotite. Asterisked values were selected for calculation of recommended values.

Na ₂ O (%)	Method	Ref.	K ₂ O (%)	Method	Ref.
0.01	Chem	B-39	0.003*	AAS	B-167
0.015*	XRF	B-40	0.003*	AAS	B-224
0.018*	AAS	B-216	0.003*	AAS	B-328
0.02*	XRF	B-129	0.003*	XRF	B-247
0.02*	AAS	B-15	0.004*	Fl.Phot.	B-279
0.02*	ICP	B-476	0.006	XRF	B-34
0.021*	AAS	B-167	0.006	XRF	B-270
0.021*	AAS	B-328	0.0075	AAS	B-216
0.021*	XRF	B-247	0.009	XRF	B-40
0.022*	INAA	B-270	0.01	XRF	B-16
0.026*	AAS	B-224	0.01	Chem.	B-39
0.027*	Fl.Phot.	B-279	0.01	XRF	B-70
0.03	XRF	B-44	0.015	AAS	B-134
0.03	XRF	B-64	0.02	XRF	B-19
0.035	NAA	B-277	0.02	XRF	B-25
0.04	XRF	B-31	0.02	AAS	B-312
0.05	XRF	B-201	0.03	XRF	B-15
0.051	INAA	B-447	0.03	XRF	B-64
0.06	AAS	B-312	0.044	ycntg.	B-41
0.07	AAS	B-134	<0.01	XRF	B-36
0.07	XRF	B-270	<0.01	XRF	B-44
0.10	XRF	B-70	<0.01	XRF	B-201
0.30	XRF	B-25	<0.01	ICP	B-476
<0.01	XRF	B-43	<0.1	Chem.	B-52
<0.08	XRF	B-16	<0.48	INAA	B-270
<0.1	Chem.	B-52			
<0.10	XRF	B-36			
Avg.	0.047 ± 0.059	(n=23)	Avg.	0.013 ± 0.011	(n=19)
Recom.	0.021 ± 0.003	(n=11)	Recom.	0.003 ± 0.0004	(n=5)

Ref. B-167 : Terashima and Ando (1987).

5. Presentation of the recommended and preferable values

In the 1993 compilation values, the mean values calculated from the available data of more than five are considered to be the recommended values. The mean value calculated from less than four data is proposed as the preferable value. The recommended and preferable values which agreed with compiled mean values listed in Table 5, are presented in Table 1 for the convenience of the users of the reference samples.

Geologists, geochemists or analytical chemists who are interested in participating in our program are invited to write to Dr. Noboru Imai, Geochemistry Section, Geological Survey of Japan, 1-1-3 Higashi, Tsukuba, 305 Japan.

Acknowledgments: The authors are indebted to all analysts who contributed data for the GSJ geochemical reference samples.

References

Ando, A., Mita, N. and Terashima, S. (1987)

Table 5 1993 compilation values for major elements in 17 GSJ geochemical reference samples(in %). Mean values are given with standard deviation. Number of dataavailable is indicated in parentheses.

	JA-1	JA-2	JA-3	JB-1	JB-1a	JB-2
SiO ₂	63.97±0.60(66)	56.42±0.63(26)	62.27±0.34(19)	52.37±0.44(59)	52.41±0.70(32)	53.25±0.35(61)
TiO ₂	0.85±0.04(70)	0.66±0.04(27)	0.70±0.06(22)	1.32±0.06(59)	1.28±0.04(33)	1.19±0.05(66)
Al ₂ O ₃	15.22±0.34(72)	15.41±0.36(27)	15.56±0.20(20)	14.53±0.20(63)	14.45±0.39(34)	14.64±0.27(68)
Fe ₂ O ₃	2.59±0.20(31)	2.16±0.14(13)	1.15±0.18(10)	2.33±0.13(28)	2.55±0.21(17)	3.33±0.27(31)
FeO	3.98±0.20(29)	3.69±0.12(14)	4.83±0.18(13)	5.99±0.16(33)	5.78±0.24(21)	9.98±0.31(37)
MnO	0.157±0.011(67)	0.108±0.007(27)	0.104±0.010(22)	0.153±0.011(59)	0.148±0.008(33)	0.218±0.013(66)
MgO	1.57±0.07(68)	7.60±0.27(25)	3.72±0.09(21)	7.71±0.16(64)	7.83±0.12(31)	4.62±0.16(64)
CaO	5.70±0.16(70)	6.29±0.19(27)	6.24±0.16(23)	9.25±0.12(57)	9.31±0.40(33)	9.82±0.24(67)
Na ₂ O	3.84±0.16(67)	3.11±0.12(30)	3.19±0.10(21)	2.77±0.12(59)	2.73±0.13(35)	2.04±0.11(64)
K ₂ O	0.77±0.11(74)	1.81±0.06(34)	1.41±0.06(28)	1.43±0.07(63)	1.40±0.12(37)	0.42±0.03(70)
P ₂ O ₅	0.165±0.021(59)	0.146±0.014(19)	0.116±0.019(15)	0.255±0.022(52)	0.260±0.015(27)	0.101±0.017(54)
H ₂ O+	0.72±0.13(15)	1.12±0.20(9)	0.20±0.09(6)	1.02±0.21(21)	0.92±0.15(11)	0.25±0.04(11)
H ₂ O-	0.30±0.06(18)	1.25±0.17(9)	0.11±0.04(6)	0.95±0.11(21)	0.92±0.11(12)	0.13±0.03(17)
T-Fe ₂ O ₃	7.07±0.23(70)	6.21±0.18(31)	6.60±0.18(25)	8.99±0.16(60)	9.05±0.14(37)	14.25±0.37(65)

	JB-3	JF-1	JF-2	JG-1	JG-1a	JG-2
SiO ₂	50.96±0.30(39)	66.69±0.77(27)	65.30±0.49(19)	72.30±0.38(60)	72.30±0.51(35)	76.83±0.57(29)
TiO ₂	1.44±0.06(44)	0.005±0.002(8)	0.005±0.002(6)	0.26±0.02(60)	0.25±0.03(35)	0.044±0.009(28)
Al ₂ O ₃	17.20±0.36(44)	18.08±0.32(27)	18.52±0.26(19)	14.24±0.24(62)	14.30±0.41(36)	12.47±0.32(32)
Fe ₂ O ₃	3.20±0.40(18)	0.06±0.03(13)	0.06±0.01(7)	0.38±0.09(32)	0.51±0.14(16)	0.33±0.08(13)
FeO	7.85±0.24(21)	0.04±0.02(3)	0.03±0.02(3)	1.61±0.15(39)	1.36±0.19(20)	0.57±0.07(13)
MnO	0.177±0.011(42)	0.001±0.0001(7)	0.001±0.0003(9)	0.063±0.009(65)	0.057±0.007(35)	0.016±0.003(31)
MgO	5.19±0.10(42)	0.006±0.001(9)	0.004±0.002(4)	0.74±0.08(65)	0.69±0.07(34)	0.037±0.012(21)
CaO	9.79±0.12(43)	0.93±0.06(28)	0.09±0.03(16)	2.20±0.08(63)	2.13±0.08(36)	0.70±0.05(31)
Na ₂ O	2.73±0.11(46)	3.37±0.18(27)	2.39±0.11(23)	3.38±0.10(62)	3.39±0.13(35)	3.54±0.11(33)
K ₂ O	0.78±0.04(50)	0.99±0.22(31)	12.94±0.29(26)	3.98±0.09(69)	3.96±0.16(40)	4.71±0.09(35)
P ₂ O ₅	0.294±0.028(35)	0.010±0.005(10)	0.003±0.001(3)	0.099±0.019(52)	0.083±0.009(28)	0.002±0.000(5)
H ₂ O+	0.18±0.04(10)	0.23±0.06(8)	0.24±0.08(7)	0.54±0.13(28)	0.59±0.13(11)	0.33±0.08(8)
H ₂ O-	0.07±0.02(14)	0.13±0.06(9)	0.18±0.04(6)	0.07±0.02(24)	0.12±0.04(12)	0.12±0.05(11)
T-Fe ₂ O ₃	11.82±0.28(43)	0.08±0.01(19)	0.06±0.01(15)	2.18±0.13(64)	2.00±0.10(34)	0.97±0.06(33)

	JG-3	JGb-1	JP-1	JR-1	JR-2
SiO ₂	67.29±0.55(20)	43.66±0.32(37)	42.38±0.49(24)	75.45±0.57(39)	75.69±0.37(29)
TiO ₂	0.48±0.03(22)	1.60±0.08(42)	0.006±0.004(3)	0.11±0.02(38)	0.07±0.01(28)
Al ₂ O ₃	15.48±0.20(21)	17.49±0.42(44)	0.66±0.13(28)	12.83±0.40(43)	12.72±0.28(34)
Fe ₂ O ₃	1.62±0.18(8)	4.79±0.46(21)	1.98±0.56(11)	0.35±0.09(15)	0.27±0.12(14)
FeO	1.83±0.20(11)	9.43±0.47(23)	5.99±0.40(13)	0.49±0.10(21)	0.44±0.09(17)
MnO	0.071±0.004(22)	0.189±0.015(40)	0.121±0.010(28)	0.099±0.007(42)	0.112±0.007(31)
MgO	1.79±0.06(22)	7.85±0.18(41)	44.60±0.64(24)	0.12±0.03(32)	0.04±0.01(25)
CaO	3.69±0.09(22)	11.90±0.20(44)	0.55±0.05(27)	0.67±0.06(40)	0.50±0.06(33)
Na ₂ O	3.96±0.15(24)	1.20±0.08(41)	0.021±0.003(11)	4.02±0.21(43)	3.99±0.18(36)
K ₂ O	2.64±0.04(28)	0.24±0.03(42)	0.003±0.0004(5)	4.41±0.12(46)	4.45±0.12(39)
P ₂ O ₅	0.122±0.011(14)	0.056±0.014(32)	0.002±0.001(3)	0.021±0.008(29)	0.012±0.005(17)
H ₂ O+	0.67±0.12(8)	1.28±0.17(12)	2.39±0.14(6)	1.16±0.15(12)	1.19±0.14(11)
H ₂ O-	0.17±0.07(8)	0.13±0.06(17)	0.44±0.07(7)	0.20±0.08(13)	0.22±0.06(11)
T-Fe ₂ O ₃	3.69±0.12(23)	15.06±0.37(39)	8.37±0.22(25)	0.89±0.07(36)	0.77±0.06(31)

1986 values for fifteen GSJ rock reference samples, "Igneous rock series". *Geost. Newsletter*, vol.11, p. 159-166.

—, Kamioka, H., Terashima, S. and

Itoh, S. (1989a) 1988 values for GSJ rock reference samples, "Igneous rock series". *Geochem. Jour.*, vol.23, p.143-148.

—, Mita, N. and Matsumoto, A.

Table 6 Comparison of average values of different analytical methods and recommended values from this study(in %).

Element	Method	JG-1	JB-1	JB-2	Element	Method	JG-1	JB-1	JB-2
SiO ₂	Chem.	72.30±0.34(27)	52.06±0.23(15)	53.33±0.16(11)	MgO	AAS	0.72±0.04(12)	7.68±0.15(15)	4.56±0.13(4)
	XRF	72.27±0.49(12)	52.69±0.45(18)	53.29±0.30(22)		ICP	0.71±0.06(5)	7.75±0.20(6)	4.63±0.07(12)
	ICP	72.33±0.30(4)	52.19±0.08(3)	53.17(1)		Recom.	0.74	7.71	4.62
	Recom.	72.30	52.37	53.25	CaO	Chem.	2.19±0.09(24)	9.26±0.12(15)	9.73±0.25(13)
TiO ₂	Chem.	0.25±0.03(28)	1.35±0.08(14)	1.23±0.05(10)		XRF	2.18±0.05(11)	9.26±0.14(15)	9.84±0.13(24)
	XRF	0.27±0.02(13)	1.31±0.03(19)	1.17±0.04(24)		AAS	2.16±0.02(7)	9.24±0.10(8)	9.75±0.16(9)
	ICP	0.25±0.02(5)	1.30±0.04(6)	1.13±0.04(5)		ICP	2.20±0.04(5)	9.23±0.09(5)	9.92±0.41(5)
	Recom.	0.26	1.32	1.19	Recom.	2.20	9.25	9.82	
Al ₂ O ₃	Chem.	14.26±0.20(27)	14.51±0.19(15)	14.63±0.19(13)	Na ₂ O	Chem.	3.39±0.08(15)	2.79±0.08(8)	2.06±0.06(11)
	XRF	14.17±0.16(10)	14.53±0.24(17)	14.64±0.29(24)		XRF	3.40±0.16(6)	2.75±0.10(8)	2.02±0.15(17)
	ICP	14.16±0.30(5)	14.57±0.21(6)	14.62±0.35(4)		AAS	3.38±0.06(14)	2.77±0.16(16)	2.04±0.09(13)
	AAS	14.24±0.18(5)	14.49±0.17(8)	14.60±0.13(7)		ICP	3.41±0.14(4)	2.66±0.11(5)	1.98±0.13(3)
	Recom.	14.24	14.53	14.64		Fl.Phot.	3.36±0.09(13)	2.79±0.08(10)	1.99±0.06(5)
T-Fe ₂ O ₃	Chem.	2.19±0.12(24)	9.05±0.13(13)	14.45±0.21(8)	Recom.	3.38	2.77	2.04	
	XRF	2.21±0.18(13)	8.99±0.15(16)	14.21±0.36(23)	K ₂ O	Chem.	3.96±0.11(16)	1.37±0.12(8)	0.43±0.04(11)
	ICP	2.10±0.07(5)	8.98±0.09(6)	14.66±0.34(3)		XRF	3.96±0.05(11)	1.45±0.07(15)	0.41±0.03(22)
	AAS	2.18±0.08(8)	8.95±0.12(6)	14.21±0.12(6)		AAS	3.98±0.07(12)	1.45±0.05(13)	0.42±0.02(12)
	Recom.	2.18	8.99	14.25		ICP	4.04±0.03(4)	1.40±0.09(5)	0.37±0.03(4)
MnO	Chem.	0.061±0.008(27)	0.157±0.009(15)	0.216±0.018(13)		Fl.Phot.	3.96±0.09(14)	1.40±0.04(10)	0.43±0.01(4)
	XRF	0.062±0.011(11)	0.148±0.011(13)	0.220±0.011(19)	Recom.	3.98	1.43	0.42	
	ICP	0.063±0.007(5)	0.153±0.011(6)	0.210±0.014(5)	P ₂ O ₅	Chem.	0.097±0.017(27)	0.258±0.019(15)	0.099±0.010(10)
	AAS	0.063±0.005(13)	0.154±0.012(15)	0.216±0.008(13)		XRF	0.104±0.029(10)	0.264±0.027(15)	0.100±0.015(19)
	Recom.	0.063	0.153	0.218		Photom.	0.103±0.014(7)	0.248±0.019(11)	0.103±0.026(10)
MgO	Chem.	0.75±0.09(23)	7.67±0.14(15)	4.57±0.18(13)		ICP	0.104±0.016(2)	0.241±0.011(4)	0.113±0.026(3)
	XRF	0.74±0.05(10)	7.75±0.14(13)	4.64±0.15(20)		Recom.	0.099	0.255	0.101

Major elements in 17 GSI rock reference samples (Terashima et al.)

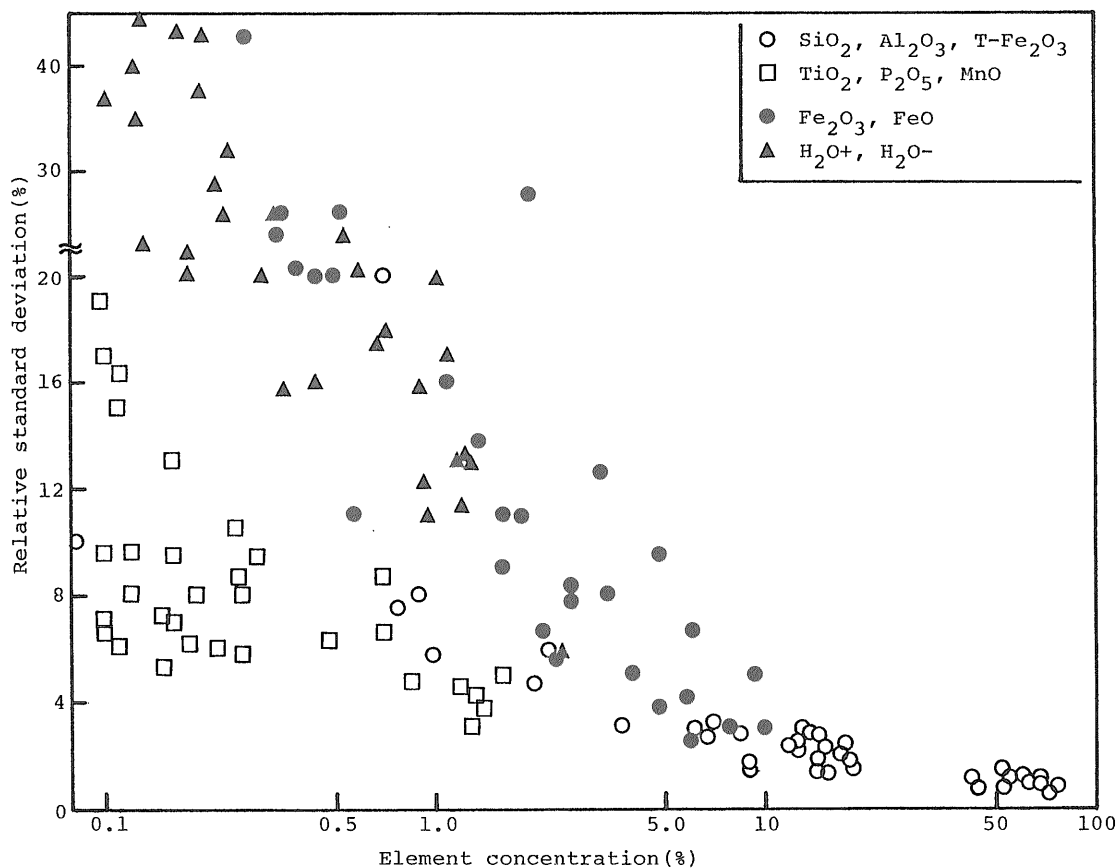


Fig.1 Analytical errors vs major element concentration for GSJ reference samples

(1989b) 1987 compilation of K₂O concentration in seventeen GSJ rock reference samples, "Igneous rock series". *Bull. Geol. Surv. Japan*, vol.40, p.19-45.

Gladney, E. S., Jones, E. A., Nickell, E. J. and Roelandts, I. (1991) 1988 compilation of elemental concentration data for USGS DTS-1, G-1, PCC-1 and W-1. *Geost. Newsletter*, vol.15, p.199-396.

Govindaraju, K. (1989) 1989 compilation of working values and sample description for 272 geostandards.

Geost. Newsletter, vol.13, p.1-133.

Itoh, S., Terashima, S., Imai, N., Kamioka, H., Mita, N. and Ando, A. (1992) 1992 compilation of analytical data for rare-earth elements, scandium, yttrium, zirconium and hafnium in twenty-six GSJ reference samples. *Bull. Geol. Surv. Japan*, vol.43, p.659-733.

Terashima, S. and Ando, A. (1987) Elemental concentration in nine new Japanese rock reference samples. *Geost. Newsletter*, vol.11, p.75-77.

地質調査所岩石標準試料“火成岩シリーズ”中の主成分分析値の編集

寺島 滋・今井 登・伊藤司郎・安藤 厚・三田直樹

要 旨

地質調査所から発行された岩石標準試料“火成岩シリーズ”17試料の主成分について、1993年9月までに入手した全報告277件（公表論文110，未公表文書167）について検討し，全分析データを一覧表にして提示した．異常値を除外した後に元素別，分析方法別の平均値，標準偏差を算出した．分析データ数の多いJG-1，JB-1，JB-2中の11成分について分析方法別の値を比較した結果，有意差は認められなかった．

各成分について信頼できる分析値が5個以上ある場合を推せん値とし，“火成岩シリーズ”17試料中のほとんどの成分について推せん値を設定することができた．しかし，JF-1中のFeO，JF-2中のFeO，MgO，P₂O₅，JP-1中のTiO₂，P₂O₅は主成分としては低含有量であるため信頼できる分析値が5個未満で，これらについては参考値を提示した．

（受付：1993年10月22日；受理：1994年3月3日）

Table A-1 Individual data for JA-1

%			Method			Code No.		
SiO ₂			64.25	XRF(Dry basis)	B-129	0.86	XRF	B-16
			64.3	XRF(fusion)	B-70	0.87	XRF	B-19
			Si			0.87	XRF	B-247
63.7	AAS	B-216				0.88	XRF	B-125
63.7	AAS	B-109				0.88	XRF	B-84
64.06	AAS	B-134				0.89	XRF	S-26'
65.39	AAS	B-312	28.4	AAS(microwave)	B-433	0.89	XRF	B-44, B-73
63.78	AAS	T-23'	29.956	SIMS	B-337	0.90	XRF	0-3'
64.15	AAS & others	T-41'	TiO ₂			0.90	XRF	T-13'
62.79	AAS & Photom.	C-4				0.94	XRF	B-43
63.16	AAS & Photom.	C-5'				0.83	XRF	S-24'
65.12	Chem.	B-482	0.75	AAS	B-312	0.80	XRF & Chem.	B-6'
63.31	Chem.	A-10'	0.81	AAS	B-134	0.85	XRF(Dry basis)	B-129
63.47	Chem.	K-11'	0.83	AAS	B-216	0.85	XRF(fusion)	B-70
63.61	Chem.	A-2'	0.86	AAS	B-109	Ti		
63.61	Chem.	K-11'	0.86	AAS	T-23'	0.4430 ICP B-77		
63.63	Chem.	B-39	0.86	AAS	T-41'	0.5175 SIMS B-337		
63.64	Chem.	K-11'	0.89	AAS & Photom.	C-4	0.6259 XRF B-111		
63.79	Chem.	B-56, B-221	0.95	AAS & Photom.	C-5'	A1203		
63.87	Chem.	0-3'	0.79	Chem.	B-39	15.0	AAS	B-109
63.98	Chem.	S-23	0.82	Chem.	A-2'	15.13	AAS	B-134
64.06	Chem.	0-11' A-10	0.82	Chem.	A-10'	15.29	AAS	B-312
64.28	Chem.	B-45	0.83	Chem.	B-45	15.35	AAS	B-216
64.31	Chem.	G-7	0.84	Chem.	0-3'	15.36	AAS	B-93
64.32	Chem.	P-5'	0.87	Chem.	0-11' A-10	15.5	AAS	B-279
64.06	FI-Photom.	B-253	0.89	Chem.	B-56, B-221	15.10	AAS	T-41'
63.34	Grav.	B-80, B-94	0.90	Chem.	G-7	15.42	AAS	T-23'
63.71	Grav.	B-93	0.91	Chem.	K-11'	15.46	AAS & Photom.	C-5'
63.72	Grav.	B-14, B-91	0.92	Chem.	K-11'	15.53	AAS & Photom.	C-4
63.79	Grav.	B-153	0.95	Chem.	K-11'	14.71	Chem.	P-5'
63.91	Grav.	B-224	0.79	ICP	B-192	14.84	Chem.	B-45
64.31	Grav. & Photom.	B-130	0.79	ICP	B-482	14.97	Chem.	B-56, B-221
64.77	ICP	B-122	0.85	ICP	B-196	14.98	Chem.	0-11' A-10
63.24	ICP	K-18'	0.86	ICP	B-18	15.09	Chem.	G-7
63.98	ICP & AAS	B-5'	0.87	ICP	B-122	15.39	Chem.	B-39
63.70	IDMS	B-48	0.90	ICP	K-18'	15.41	Chem.	K-11'
62.4	INAA	B-447	0.84	ICP & AAS	B-5'	15.50	Chem.	0-3'
64.7	INAA(γ -ray)	B-18	0.87	ICP-MS	B-320	15.63	Chem.	A-2'
63.48	Micro wave plasG-6'		0.73	INAA	B-447	15.63	Chem.	A-10'
62.4	NAA	B-277	0.77	INAA	B-270	15.80	Chem.	K-11'
64.37	Photom.	B-279	0.82	INAA(γ -ray)	B-18	14.64	Grav.	B-153
62.30	XRF	B-109	0.90	Micro wave plasG-6'		15.18	Grav.	B-80, B-94
63.23	XRF	B-75	0.83	PAA	B-55	15.89	Grav.	B-14, B-91
63.62	XRF	B-134	0.85	Photm(FI)	B-462	14.92	ICP	B-482
63.77	XRF	B-31	0.84	Photom.	B-224	15.24	ICP	B-192
63.90	XRF	0-3'	0.85	Photom.	B-153	15.27	ICP	B-196
63.91	XRF	S-26'	0.85	Photom.	B-93	15.67	ICP	B-122
63.95	XRF	B-16	0.86	Photom.	B-80, B-94	16.07	ICP	K-18'
63.97	XRF	B-18	0.86	Photom.	B-14, B-91	15.11	ICP & AAS	B-5'
64.04	XRF	B-125	0.88	Photom.	B-279	14.85	ICP-MS	B-320
64.06	XRF	B-247	0.89	Photom.	B-130	14.4	INAA	B-447
64.06	XRF	B-25	0.82	Various	P-5'	14.84	INAA	B-18
64.11	XRF	B-67	0.87	Various	S-23	15.3	INAA	B-270
64.14	XRF	Y-8'	0.81	XRF	Y-8'	15.10	Micro wave plasG-6'	
64.18	XRF	B-15	0.83	XRF	B-90	14.5	NAA	B-277
64.20	XRF	B-84	0.83	XRF	B-40	15.6	NAA	B-55
64.22	XRF	B-44, B-73	0.835	XRF	B-134	15.09	Photom.	B-130
64.25	XRF	B-87	0.84	XRF	B-15	15.4	Photom.	B-95
64.42	XRF	T-13'	0.84	XRF	B-87	15.4	Photom.	B-51
64.57	XRF	B-19	0.84	XRF	B-36	14.87	Various	S-23
64.59	XRF	B-36	0.85	XRF	B-18	15.00	Vol.	B-130
64.74	XRF	B-40	0.85	XRF	B-31			
64.79	XRF	B-270	0.85	XRF	B-109			
65.00	XRF	B-43	0.85	XRF	B-270			
65.11	XRF	B-90	0.86	XRF	B-67			
64.56	XRF & Chem.	B-6'	0.86	XRF	B-75			
64.37	XRF & others	S-24'	0.86	XRF	B-25			

Table A-1 Individual data for JA-1

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
0.15	AAS	B-279	Mn			1.51	XRF	B-67
0.15	AAS	B-80, B-94				1.52	XRF	B-18
0.154	AAS	B-134	0.1180	AAS	B-25	1.52	XRF	B-87
0.157	AAS	B-93	0.1250	AAS	B-325	1.54	XRF	B-31
0.158	AAS	B-84	0.1311	AAS	B-128	1.54	XRF	B-43
0.16	AAS	B-216	0.112	AAS(microwave)	B-433	1.57	XRF	B-16
0.16	AAS	T-41'	0.1137	ICP	B-77	1.58	XRF	B-40
0.16	AAS	B-328	0.118	INAA	B-58	1.59	XRF	0-3'
0.17	AAS	B-109	0.12	NAA	B-11	1.60	XRF	B-25
0.17	AAS	B-15	0.121	NAA	B-287	1.61	XRF	B-247
0.17	AAS	T-23'	0.1078	SIMS	B-337	1.61	XRF	B-270
0.15	AAS & Photom.	C-4	0.1159	XRF	B-130	1.62	XRF	S-26'
0.15	Chem.	K-11'	0.12	XRF	B-11	1.62	XRF	S-24'
0.15	Chem.	A-10'	0.1375	XRF	B-111	1.63	XRF	B-90
0.15	Chem.	A-2'	0.1183	XRF(fusion)	B-36	1.67	XRF	B-125
0.15	Chem.	0-11' A-10	0.1189	XRF(powder)	B-36	1.68	XRF	Y-8'
0.16	Chem.	B-39	MgO			1.71	XRF	B-75
0.16	Chem.	B-45				1.75	XRF	B-19
0.16	Chem.	0-3'	1.50	AAS	B-15	1.66	XRF & Chem.	B-6'
0.16	Chem.	B-56, B-221	1.52	AAS	B-312	1.58	XRF(Dry basis)	B-129
0.16	Chem.	K-11'	1.52	AAS	B-130	1.56	XRF(fusion)	B-70
0.17	Chem.	K-11'	1.54	AAS	B-129	Mg		
0.18	Chem.	G-7	1.55	AAS	B-328	0.940	AAS(microwave)	B-433
0.160	FI-Photom.	B-261	1.56	AAS	B-93	0.8800	ICP	B-77
0.14	ICP	B-122	1.59	AAS	B-134	0.52	INAA	B-58
0.14	ICP	K-18'	1.6	AAS	B-216	1.0687	SIMS	B-337
0.14	ICP	B-482	1.6	AAS	B-279	CaO		
0.15	ICP	B-192	1.64	AAS	B-84	5.3	AAS	B-279
0.16	ICP	B-196	1.68	AAS	B-109	5.61	AAS	B-93
0.16	ICP	B-18	1.55	AAS	T-41'	5.65	AAS	B-328
0.14	ICP & AAS	B-5'	1.64	AAS	T-23'	5.69	AAS	B-134
0.16	ICP-MS	B-320	1.51	AAS & Photom.	C-4	5.72	AAS	B-312
0.152	INAA	B-270	1.62	AAS & Photom.	C-5'	5.8	AAS	B-216
0.171	INAA	B-447	1.46	Chem.	A-10'	5.80	AAS	B-109
0.152	INAA(epi)	B-18	1.46	Chem.	A-2'	5.87	AAS	T-23'
0.15	Micro wave plasG-6'		1.54	Chem.	G-7	5.65	AAS	T-41'
0.164	NAA	B-234, B-277	1.58	Chem.	B-39	6.22	AAS & Photom.	C-4
0.14	PAA	B-55	1.59	Chem.	K-11'	5.36	Chem.	G-7'
0.15	Photom.	B-153	1.59	Chem.	B-56, B-221	5.64	Chem.	K-11'
0.16	Photom.	B-14, B-91	1.60	Chem.	K-11'	5.68	Chem.	0-11' A-10
0.18	Photom.	B-130	1.61	Chem.	0-11' A-10	5.69	Chem.	K-11'
0.14	Various	P-5'	1.62	Chem.	K-11'	5.69	Chem.	B-56, B-221
0.156	Various	S-23	1.65	Chem.	B-45	5.72	Chem.	K-11'
0.15	XRF	B-247	1.67	Chem.	0-3'	5.85	Chem.	A-2'
0.15	XRF	B-44, B-73	1.54	Grav.	B-14, B-91	5.85	Chem.	A-10'
0.15	XRF	B-125	1.58	Grav.	B-153	5.89	Chem.	0-3'
0.15	XRF	B-18	1.63	Grav.	B-80, B-94	5.91	Chem.	B-45
0.15	XRF	B-75	1.41	ICP	B-482	6.07	Chem.	B-39
0.156	XRF	B-270	1.51	ICP	B-192	5.66	Grav.	B-153
0.16	XRF	0-3'	1.53	ICP	B-122	5.75	Grav.	B-80, B-94
0.16	XRF	B-19	1.55	ICP	B-196	5.50	ICP	B-482
0.16	XRF	B-90	1.65	ICP	K-18'	5.70	ICP	B-196
0.16	XRF	B-67	1.61	ICP & AAS	B-5'	5.73	ICP	B-18
0.16	XRF	B-31	1.61	ICP-MS	B-320	5.97	ICP	B-122
0.16	XRF	B-16	1.48	INAA	B-18	5.59	ICP	B-192
0.16	XRF	B-43	1.74	INAA	B-270	5.88	ICP	K-18'
0.16	XRF	Y-8'	1.37	Micro wave plasG-6'		5.58	ICP & AAS	B-5'
0.162	XRF	B-40	1.52	PAA	B-55	5.70	ICP-MS	B-320
0.17	XRF	S-26	1.47	Various	P-5'	5.40	INAA	B-447
0.17	XRF	B-87	1.55	Various	S-23	5.69	INAA	B-270
0.18	XRF	B-109	1.54	Vol.	B-130	5.9	INAA(γ -ray)	B-18
0.15	XRF	S-24'	1.54	Vol.	B-224	5.48	Micro wave plasG-6'	
0.15	XRF & Chem.	B-6'	1.46	XRF	T-13'			
0.18	XRF(Dry basis)	B-129	1.46	XRF	B-36			
0.16	XRF(fusion)	B-70	1.46	XRF	B-44, B-73			

Table A-1 Individual data for JA-1

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
0.78	XRF(Dry basis)	B-129	0.16	XRF	B-87	0.67	Grav. ?	B-18
0.76	XRF(fusion)	B-70	0.16	XRF	B-16	0.60	KF	B-14, B-91
0.70	γ cntg.	B-41	0.16	XRF	S-26'	0.65	Tit	B-482
0.76	γ cntg.	B-237	0.160	XRF	B-270	H2O-		
0.76	γ cntg.	B-273	0.17	XRF	B-19	0.24	Chem.	T-41'
0.84	γ cntg.	B-109	0.170	XRF	B-40	0.25	Chem.	B-6'
K			0.18	XRF	B-109	0.26	Chem.	0-11' A-10
0.6300	AAS	B-77	0.18	XRF	B-125	0.31	Chem.	G-7
0.649	AAS	B-84	0.19	XRF	B-36	0.32	Chem.	P-5'
0.650	AAS(microwave)	B-433	0.20	XRF	B-75	0.38	Coul.	B-270
0.6700	IDMS	B-100, B-296,	0.16	XRF & Chem.	B-6'	0.37	Grav.	B-482
0.6890	IDMS	B-48	0.16	XRF(Dry basis)	B-129	0.19	Grav.	B-93
0.66	NAA	B-287	0.17	XRF(fusion)	B-70	0.20	Grav.	B-45
0.6486	SIMS	B-337	P (ppm)			0.21	Grav.	B-312
0.5967	XRF	B-111	562	ICP	B-77	0.27	Grav.	B-56, B-221
0.60	XRF	B-11	630	OES	B-208	0.28	Grav.	B-153
P205			741	SIMS	B-337	0.31	Grav.	B-130
0.16	AAS	T-41'	771	XRF	B-25	0.32	Grav.	B-80, B-94
0.17	AAS	T-23'	S03			0.32	Grav.	B-16
0.22	AAS & Photom.	C-4	<0.02	XRF	B-36	0.34	Grav.	B-25
0.22	AAS & Photom.	C-5'	L. O. I.			0.38	Grav.	B-134
0.13	Chem.	A-2'	1.22	Chem.	B-39	0.39	KF	B-14, B-91
0.15	Chem.	B-56, B-221	0.15	Grav.	B-70	CO2		
0.15	Chem.	0-3'	0.35	Grav.	B-129	0.036	Chem.	B-45
0.16	Chem.	A-10'	0.36	Grav.	B-87	0.11	Chem.	B-36
0.16	Chem.	0-11' A-10	0.51	Grav.	T-13'	0.14	Chem.	B-25
0.16	Chem.	K-11'	0.51	Grav.	B-36	<0.07	Chem.	G-7
0.16	Chem.	K-11'	0.54	Grav.	B-16	<0.07	Conduct.	B-130
0.16	Chem.	K-11'	0.56	Grav.	S-24'			
0.18	Chem.	B-45	0.58	Grav.	B-19			
0.19	Chem.	G-7	0.67	Grav.	B-224			
0.19	Chem.	B-39	0.67	Grav.	S-23			
0.17	FI-Photom.	B-254	0.80	Grav.	B-25			
0.14	ICP	B-196	1.09	Grav.	G-6'			
0.16	ICP	B-192	1.12	Grav.	B-134			
0.17	ICP	K-18'	1.13	Grav.	B-15			
0.15	ICP & AAS	B-5'	1.30	Grav.	B-31			
0.18	ICP-MS	B-320	T-H20					
0.14	Micro wave plas	G-6'	1.03	Coul.	B-270			
0.15	Photm	B-482	0.27	Grav.	B-224			
0.14	Photom.	B-279	1.1	Grav.	B-216			
0.15	Photom.	B-224	1.04	INAA(PG)	B-436			
0.157	Photom.	B-134	H20+					
0.16	Photom.	B-15	0.41	Chem.	P-5'			
0.164	Photom.	B-84	0.69	Chem.	B-6'			
0.165	Photom.	B-216	0.80	Chem.	0-11' A-10			
0.170	Photom.	B-93	0.80	Chem.	T-41'			
0.19	Photom.	B-80, B-94	0.65	Coul.	B-270			
0.19	Photom.	B-130	0.62	Grav.	B-312			
0.22	Photom.	B-153	0.64	Grav.	B-93			
0.16	Various	P-5'	0.80	Grav.	B-25			
0.167	Various	S-23	0.83	Grav.	B-36			
0.13	Vol.	B-14, B-91	0.88	Grav.	B-80, B-94			
0.11	XRF	B-90	0.91	Grav.	B-45			
0.13	XRF	B-67	0.91	Grav.	B-153			
0.15	XRF	B-31						
0.15	XRF	B-44, B-73						
0.15	XRF	0-3'						
0.16	XRF	Y-8'						
0.16	XRF	B-247						
0.16	XRF	B-18						
0.16	XRF	B-43						

Major elements in 17 GSJ rock reference samples (Terashima et al.)

Table A-2 Individual data for JA-2

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
<u>SiO₂</u>			<u>Al₂O₃</u>			6.48	XRF	B-270
56.19	AAS	B-134	15.27	AAS	Y-14'	6.50	XRF	B-63
56.33	AAS	B-202	15.37	AAS	B-202	<u>Fe₂O₃</u>		
56.35	AAS	B-216	15.4	AAS	B-279	2.03	Calc.	B-134
56.50	AAS	B-434	15.40	AAS	B-167	2.04	Calc.	B-134
57.06	AAS	Y-14'	15.50	AAS	B-216	2.04	Calc.	B-136
54.53	Chem.	B-181	15.87	AAS	B-134	2.05	Calc.	B-216
56.18	Chem.	B-258-7	14.90	Chem.	B-181	2.05	Calc.	B-142
55.93	Grav.	B-224	15.32	Chem.	B-258-7	2.06	Calc.	B-167
56.18	Grav.	F-3'	16.20	Grav. & AAS	B-139	2.08	Calc.	B-139
56.20	Grav. & AAS	B-167	15.38	ICP	B-434	2.13	Calc.	B-258-7
56.28	Grav. & AAS	B-139	14.8	INAA	B-447	2.16	Calc.	B-59
55.8	INAA	B-447	15.9	INAA	B-270	2.24	Calc.	B-202
55.8	NAA	B-277	14.8	NAA	B-277	2.33	Calc.	B-63
57.22	Photom.	B-279	15.32	Vol.	F-3'	2.51	Calc.	B-270
56.09	XRF	B-134	15.45	Vol.	B-224	2.31	Chem.	F-3'
56.16	XRF	B-201	14.68	XRF	B-270	<u>FeO</u>		
56.18	XRF	B-247	15.14	XRF	B-134	3.60	Chem.	B-258-7
56.31	XRF	B-62	15.24	XRF	B-62	3.57	Photom.	B-270
56.35	XRF	B-142	15.30	XRF	T-51'	3.9	Photom.	B-216
56.42	XRF	B-136	15.32	XRF	B-247	3.49	Vol.	B-279
56.53	XRF	B-63	15.38	XRF	B-434	3.51	Vol.	B-224
57.02	XRF	B-270	15.41	XRF	B-142	3.60	Vol.	F-3'
57.04	XRF	B-59	15.61	XRF	B-63	3.70	Vol.	B-136
57.08	XRF	B-61	15.62	XRF	B-136	3.71	Vol.	B-134
57.16	XRF	B-434	15.68	XRF	B-201	3.72	Vol.	B-202
57.98	XRF	T-51'	15.77	XRF	B-59	3.75	Vol.	B-63
<u>Si</u>			15.98	XRF	B-61	3.80	Vol.	B-59
26.2711	SIMS	B-337	<u>Al</u>			3.82	Vol.	B-167
<u>TiO₂</u>			7.9459	SIMS	B-337	3.85	Vol.	B-142
0.64	AAS	B-134	<u>T-Fe₂O₃</u>			3.61	Vol.?	B-139
0.65	AAS	B-216	6.1	AAS	B-279	<u>Fe</u>		
0.67	AAS	B-167	6.14	AAS	F-3'	4.2	INAA	B-244
0.673	AAS	Y-14'	6.16	AAS	B-134	4.2	INAA	B-230
0.63	Chem.	B-181	6.17	AAS	Y-14'	4.30	INAA	B-163
0.67	Chem.	B-258-7	6.31	AAS	B-167	4.30	INAA	B-310
0.67	Chem.	F-3'	6.31	AAS	B-328	4.44	INAA	B-324
0.67	ICP	B-434	6.37	AAS	B-202	4.53	INAA	B-24
0.45	INAA	B-270	6.10	Chem.	B-181	4.35	NAA	B-287
0.66	Photm(FI)	B-462	6.14	Chem.	B-258-7	4.5392	SIMS	B-337
0.64	Photom.	B-279	6.26	ICP	B-434	<u>MnO</u>		
0.66	Photom.	B-202	6.24	INAA	B-270	0.09	AAS	B-139
0.67	Photom.	B-224	6.30	INAA	B-447	0.10	AAS	B-224
0.68	Photom.	B-139	6.28	NAA	B-234, B-277	0.107	AAS	Y-14'
0.65	XRF	B-134	6.07	Photm(FI)	B-462	0.108	AAS	B-328
0.66	XRF	B-136	6.13	Photom.	B-224	0.108	AAS	B-167
0.66	XRF	B-64	6.18	Photom.	B-119	0.11	AAS	B-216
0.66	XRF	B-62	6.5	Photom.	B-216	0.11	AAS	B-279
0.67	XRF	B-247	6.14	Vol.	B-119	0.11	AAS	F-3'
0.67	XRF	B-63	5.53	XRF	T-51'	0.11	AAS	B-134
0.67	XRF	B-142	6.06	XRF	B-62	0.115	AAS	B-202
0.67	XRF	B-270	6.10	XRF	B-434	0.09	Chem.	B-181
0.68	XRF	B-201	6.13	XRF	B-64	0.11	Chem.	B-258-7
0.68	XRF	B-59	6.14	XRF	B-247	0.111	FI-Photom.	B-261
0.70	XRF	T-51'	6.15	XRF	B-134	0.11	ICP	B-434
0.70	XRF	B-434	6.15	XRF	B-136	0.112	INAA	B-270
0.70	XRF	B-61	6.33	XRF	B-142	0.114	INAA	B-447
<u>Ti</u>			6.35	XRF	B-201	0.114	NAA	B-234, B-277
0.4172	SIMS	B-337	6.37	XRF	B-61			
			6.38	XRF	B-59			

Major elements in 17 GSJ rock reference samples (Terashima et al.)

Table A-2 Individual data for JA-2

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
0.15	XRF	B-59						
0.15	XRF	B-247						
0.152	XRF	B-270						
<u>P (ppm)</u>								
600	OES	B-208						
545	SIMS	B-337						
777	XRF	B-136						
<u>L. O. I.</u>								
0.67	Grav.	B-59						
1.03	Grav.	B-224						
1.04	Grav.	T-51'						
1.22	Grav.	B-142						
1.27	Grav.	B-61						
2.03	Grav.	B-62						
2.27	Grav.	Y-14'						
2.30	Grav.	B-136						
2.48	Grav.	B-63						
2.59	Grav.	B-134						
3.95	Grav.	B-64						
<u>T-H2O</u>								
1.80	Coul.	B-270						
1.46	Grav.	B-224						
1.85	Grav.	B-216						
<u>H2O+</u>								
1.06	Chem.	F-3'						
1.06	Chem.	B-258-7						
0.87	Coul.	B-270						
0.96	Grav.	B-202						
0.97	Grav.	B-136						
1.02	Grav.	B-59						
1.26	Grav.	B-167						
1.40	Grav.	B-139						
1.46	Grav.	B-181						
<u>H2O-</u>								
1.41	Chem.	F-3'						
1.41	Chem.	B-258-7						
0.93	Coul.	B-270						
1.12	Grav.	B-134						
1.13	Grav.	B-139						
1.19	Grav.	B-142						
1.23	Grav.	B-167						
1.30	Grav.	B-136						
1.49	Grav.	B-202						
<u>CO2</u>								
0.07	Vol.	B-59						
0.11	XRF	B-136						
<u>S03</u>								
<0.02	XRF	B-59						

Table A-3 Individual data for JA-3

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
<u>SiO₂</u>			15.30	XRF	B-198	4.84	Vol.	B-162
			15.38	XRF	B-270	4.84	Vol.	B-159, B-167
62.15	AAS	B-216	15.51	XRF	B-207	4.87	Vol.	B-170
62.26	AAS	B-418	15.54	XRF	B-138	4.90	Vol.	B-168
62.19	Grav.	B-224	15.57	XRF	B-247	5.03	Vol.	B-207
62.42	Grav.	B-162	15.62	XRF	B-189	4.91	Vol.?	B-139
62.17	Grav. & AAS	B-139	15.74	XRF	B-201	<u>Fe</u>		
62.26	Grav. & AAS	B-159, B-167	15.79	XRF	B-169	4.60	INAA	B-230, B-244
61.58	ICP	B-476	15.81	XRF	B-170	4.78	INAA	B-324
63.03	Photom.	B-279	15.81	XRF	B-168	4.5392	SIMS	B-337
61.66	XRF	B-201	15.89	XRF	B-219	<u>MnO</u>		
62.03	XRF	B-189	<u>Al</u>			0.09	AAS	B-139
62.05	XRF	B-138	8.0250	SIMS	B-337	0.095	AAS	B-216
62.10	XRF	B-170	<u>T-Fe₂O₃</u>			0.10	AAS	B-224
62.18	XRF	B-168	6.5	AAS	B-279	0.106	AAS	B-418
62.26	XRF	B-247	6.55	AAS	B-139	0.106	AAS	B-159, B-167
62.40	XRF	B-169	6.59	AAS	B-418	0.106	AAS	B-328
62.44	XRF	B-207	6.59	AAS	B-328	0.11	AAS	B-279
62.46	XRF	B-270	6.59	AAS	B-159, B-167	0.08	Chem.	B-205
62.59	XRF	B-198	6.06	Chem.	B-205	0.107	FI-Photom.	B-261
62.89	XRF	B-219	6.79	ICP	B-476	0.12	ICP	B-476
<u>Si</u>			6.54	INAA	B-447	0.100	INAA	B-270
29.1143	SIMS	B-337	6.75	INAA	B-270	0.117	INAA	B-447
<u>TiO₂</u>			6.53	NAA	B-277	0.123	NAA	B-234, B-277
0.67	AAS	B-216	6.55	NAA	B-234	0.11	Photom.	B-162
0.68	AAS	B-159, B-167	6.66	Photm	B-467	0.09	Vol.	B-198
0.78	Chem.	B-205	6.51	Photm(FI)	B-462	0.10	XRF	B-219
0.69	ICP	B-476	6.48	Photom.	B-224	0.10	XRF	B-168
0.62	INAA	B-270	6.75	Photom.	B-216	0.10	XRF	B-189
0.88	NAA	B-234, B-277	6.27	XRF	B-270	0.106	XRF	B-247
0.69	Photm(FI)	B-462	6.57	XRF	B-168	0.106	XRF	B-270
0.62	Photom.	B-279	6.58	XRF	B-219	0.11	XRF	B-201
0.68	Photom.	B-162	6.59	XRF	B-247	0.11	XRF	B-170
0.69	Photom.	B-224	6.65	XRF	B-207	<u>Mn</u>		
0.74	Photom.	B-139	6.66	XRF	B-169	0.0847	AAS	B-207
0.58	XRF	B-138	6.68	XRF	B-189	0.083	INAA	B-230, B-244
0.670	XRF	B-219	6.69	XRF	B-201	0.0871	SIMS	B-337
0.68	XRF	B-270	6.86	XRF	B-170	0.0790	XRF	B-169
0.68	XRF	B-247	7.00	XRF	B-138	<u>MgO</u>		
0.68	XRF	B-169	<u>Fe₂O₃</u>			3.55	AAS	B-216
0.68	XRF	B-170	0.78	Calc.	B-270	3.58	AAS	B-207
0.69	XRF	B-207	1.06	Calc.	B-207	3.65	AAS	B-159, B-167
0.69	XRF	B-201	1.09	Calc.	B-139	3.65	AAS	B-328
0.71	XRF	B-168	1.10	Calc.	B-216	3.8	AAS	B-279
0.71	XRF	B-189	1.13	Calc.	B-168	3.8	Chem.	B-205
0.80	XRF	B-198	1.21	Calc.	B-159, B-167	3.82	Grav.	B-162
<u>Ti</u>			1.43	Calc.	B-170	3.74	Grav. & AAS	B-139
0.3866	SIMS	B-337	1.44	Calc.	B-169	3.85	ICP	B-476
<u>Al₂O₃</u>			1.13	Photm	B-467	3.65	INAA	B-270
15.3	AAS	B-279	1.10	Photom.	B-162	3.68	Vol.	B-224
15.57	AAS	B-418	<u>FeO</u>			3.65	XRF	B-247
15.57	AAS	B-159, B-167	4.98	Photm	B-467	3.69	XRF	B-138
15.60	AAS	B-216	4.95	Photom.	B-270	3.69	XRF	B-201
15.05	Grav. & AAS	B-139	5.05	Photom.	B-216	3.70	XRF	B-219
15.43	ICP	B-476	4.37	Vol.	B-198	3.72	XRF	B-169
15.4	INAA	B-270	4.56	Vol.	B-279	3.74	XRF	B-270
15.56	Vol.	B-224	4.70	Vol.	B-169	3.75	XRF	B-170
15.68	Vol.	B-162	4.84	Vol.	B-224	3.75	XRF	B-168

Major elements in 17 GSJ rock reference samples (Terashima et al.)

Table A-3 Individual data for JA-3

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
3.77	XRF	B-189				0.19	Grav.	B-189
3.91	XRF	B-198				0.52	Grav.	B-170
			K20			0.59	Grav.	B-207
						-0.01	Grav.	B-168
<u>Mg</u>			1.42	AAS	B-207			
			1.43	AAS	B-159, B-167			
2.4203	SIMS	B-337	1.43	AAS	B-224	T-H20		
			1.43	AAS	B-328			
<u>CaO</u>			1.50	AAS	B-216	0.34	Coul.	B-270
			1.47	Chem.	B-205	0.07	Grav.	B-224
5.9	AAS	B-279	1.41	FES	B-236	0.3	Grav.	B-216
6.28	AAS	B-328	1.45	FES	B-162	H2O+		
6.28	AAS	B-159, B-167	1.52	FES	B-279			
6.35	AAS	B-216	1.39	FI-AAS	B-262			
5.99	Chem.	B-205	1.44	Fl. Photom.	B-139	0.26	Coul.	B-270
6.53	Grav. & AAS	B-139	1.45	ICP	B-476	0.05	Grav.	B-205
6.25	ICP	B-476	1.38	INAA	B-447	0.12	Grav.	B-159, B-167
5.95	INAA	B-447	1.43	INAA	B-270	0.20	Grav.	B-198
6.34	INAA	B-270	1.18	NAA	B-234, B-277	0.27	Grav.	B-169
5.95	NAA	B-277	1.36	XRF	B-138	0.29	Grav.	B-162
6.17	Vol.	B-162	1.39	XRF	B-170	H2O-		
6.17	Vol.	B-224	1.39	XRF	B-168			
6.18	XRF	B-207	1.40	XRF	B-201	0.08	Coul.	B-270
6.21	XRF	B-201	1.40	XRF	B-270	0.06	Grav.	B-162
6.26	XRF	B-168	1.41	XRF	B-219	0.10	Grav.	B-168
6.28	XRF	B-247	1.41	XRF	B-207	0.11	Grav.	B-205
6.32	XRF	B-169	1.41	XRF	B-169	0.12	Grav.	B-139
6.34	XRF	B-219	1.42	XRF	B-189	0.19	Grav.	B-159, B-167
6.36	XRF	B-138	1.43	XRF	B-247	CO2		
6.37	XRF	B-198	1.44	XRF	B-198			
6.37	XRF	B-170	1.37	r cntg.	B-273	0.03	Vol.	B-169
6.37	XRF	B-189	1.39	r cntg.	B-237	<0.1	Vol.	B-168
6.38	XRF	B-270	K			SO3		
			1.1440	IDMS	B-438			
4.3663	SIMS	B-337	1.17	INAA	B-230, B-244	0.04	XRF	B-169
			1.0967	SIMS	B-337	0.05	XRF	B-168
<u>Na2O</u>			P205					
3.17	AAS	B-159, B-167	0.11	ICP	B-476			
3.17	AAS	B-328	0.09	Photom.	B-279			
3.18	AAS	B-207	0.108	Photom.	B-224			
3.20	AAS	B-216	0.11	Photom.	B-162			
3.31	AAS	B-224	0.11	Photom.	B-159, B-167			
3.15	Chem.	B-205	0.13	Photom.	B-216			
3.13	FES	B-279	0.18	Photom.	B-139			
3.14	FES	B-162	0.10	XRF	B-170			
3.17	FI-AAS	B-262	0.11	XRF	B-201			
3.20	Fl. Photom.	B-139	0.11	XRF	B-219			
3.27	ICP	B-476	0.11	XRF	B-198			
3.14	INAA	B-270	0.11	XRF	B-247			
3.21	INAA	B-437	0.12	XRF	B-169			
3.04	XRF	B-170	0.12	XRF	B-189			
3.07	XRF	B-198	0.120	XRF	B-270			
3.08	XRF	B-169	P (ppm)					
3.15	XRF	B-270	520	OES	B-208			
3.17	XRF	B-247	448	Photom.	B-207			
3.25	XRF	B-138	532	SIMS	B-337			
3.28	XRF	B-168	499	XRF	B-168			
3.53	XRF	B-201	L. O. I.					
<u>Na</u>			0.17	Grav.	B-224			
2.32	INAA	B-230, B-244						
2.47	INAA	B-324						
2.3367	SIMS	B-337						

Table A-4 Individual data for JB-1

% Method Code No.			% Method Code No.			% Method Code No.		
<u>SiO2</u>			22.8	PIXE	B-452	1.35	XRF	B-155
			24.3959	SIMS	B-337	1.36	XRF	B-44, B-73
51.9	AAS	R-1	22	XRF	B-81	<u>Ti</u>		
51.95	AAS	A-9'	24.07	XRF	B-106	0.807	ED-XRF	B-399
52.28	AAS	B-92	<u>TiO2</u>			0.8350	ED-XRF	B-400
51.73	Chem.	O-5	1.34		M-2	0.8043	ICP	B-350
51.75	Chem.	K-9	1.40		T-36'	0.8200	ICP	B-77
51.88	Chem.	A-13	1.33		B-146	0.80	PIXE	B-452
51.88	Chem.	B-56, B-221	1.33	AAS	B-49	0.7403	SIMS	B-337
51.95	Chem.	O-6	1.37	AAS	A-9'	0.6530	XRF	B-81
51.96	Chem.	I-7	1.16	Chem.	A-11	0.8979	XRF	B-111
51.97	Chem.	V-1	1.23	Chem.	I-7	<u>Al2O3</u>		
52.06	Chem.	O-7	1.26	Chem.	O-5	14.43		B-146
52.07	Chem.	T-29	1.31	Chem.	B'-2	14.10	AAS	S-24
52.09	Chem.	A-11	1.34	Chem.	B-56, B-221	14.4	AAS	H-10
52.10	Chem.	U-4	1.34	Chem.	A-13	14.43	AAS	B-49
52.17	Chem.	O-2	1.36	Chem.	O-6	14.52	AAS	W-1
52.27	Chem.	N-7	1.36	Chem.	O-2	14.58	AAS	A-9'
52.35	Chem.	S-14	1.38	Chem.	S-14	14.59	AAS	B-92
52.66	Chem.	B'-2	1.38	Chem.	V-1	14.60	AAS	M-8'
52.2	EPMA	B-351	1.40	Chem.	O-7	14.7	AAS	R-1
52.48	EPMA	M-6	1.40	Chem.	K-9	14.05	Chem.	T-29
53.06	EPMA	B-380	1.47	Chem.	T-29	14.37	Chem.	A-13
51.80	ES	G-6	1.47	Chem.	N-7	14.37	Chem.	B-56, B-221
52.3	FI-Photom.	B-348	1.32	Chem. Photom.	H-5	14.38	Chem.	O-6
52.86	FI-Photom.	B-253	1.32	Chem. Photom.	H-5	14.44	Chem.	S-14
51.92	Grav.	B-224	1.32	Chem. Photom.	H-5	14.47	Chem.	V-1
52.03	Grav.	B-153	1.32	Color.	S-23	14.53	Chem.	O-7
52.19	Grav.	H-5	1.25	EPMA	B-380	14.53	Chem.	U-4
52.22	Grav.	T-36'	1.36	EPMA	M-6	14.54	Chem.	O-2
52.23	Grav.	B-49	1.33	ES	G-6	14.56	Chem.	B'-2
52.26	Grav.	S-23	1.22	ICP	B-192	14.57	Chem.	K-9
52.20	Grav. +AAS	G-1	1.29	ICP	B-131	14.60	Chem.	A-11
52.65	Grav. +Color.	M-2	1.30	ICP	B-415, B-441	14.60	Chem.	I-7
52.10	ICP	B-122	1.31	ICP	B-196	14.75	Chem.	N-7
52.18	ICP	B-131	1.32	ICP	B-120	14.93	Chem.	O-5
52.3	ICP	B-120	1.33	ICP	B-122	14.57	EDTA Vol.	S-23
52.50	IDMS	B-48	1.31	PAA	B-6-1, B-6-2	14.57	EDTA Vol.	M-2
52.96	INAA (CA)	B-453	1.34	PAA	B-143-1	14.34	EPMA	M-6
52.18	PAA	B-143-1	1.29	Photom.	B-153	14.51	EPMA	B-380
52.00	Photom.	T-27	1.33	Photom.	B-161	14.80	ES	G-6
52.3	Photom.	H-10	1.34	Photom.	M-8'	14.71	Grav.	B-153
53.41	Photom.	B-161	1.34	Photom.	G-1	14.50	Grav. & AAS	G-1
51.64	XRF	B'-1	1.34	Photom.	B-92	14.17	ICP	B-192
51.88	XRF	B-1'	1.35	Photom.	T-27	14.50	ICP	B-415, B-441
52.33	XRF	B-85	1.35	Photom.	B-224	14.56	ICP	B-122
52.36	XRF	B-15	1.4	Photom.	H-10	14.63	ICP	B-196
52.42	XRF	B-13	1.33	TPD-prove	M-7'	14.75	ICP	B-131
52.55	XRF	B-270	1.26	XRF	B-388	14.8	ICP	B-120
52.61	XRF	O-1'	1.27	XRF	B-1'	14.40	INAA (CA)	B-453
52.64	XRF	B-155	1.29	XRF	B-382	14.53	PAA	B-143-1
52.69	XRF	B-96	1.29	XRF	B-270	14.27	Photom.	T-27
52.76	XRF	B-248	1.29	XRF	B-341-2	14.5	Photom.	B-95
52.76	XRF	B-28	1.3	XRF	B-28	14.6	Photom.	B-51
52.88	XRF	B-352	1.30	XRF	B'-1	14.49	Vol.	B-224
52.98	XRF	B-44, B-73	1.30	XRF	B-96	14.54	Vol.	H-5
52.99	XRF	C-3'	1.30	XRF	B-248	14.80	Vol.	T-36'
53.00	XRF	B-388	1.31	XRF	S-24	14.94	Vol.	B-161
53.02	XRF	W-1	1.31	XRF	B-382	14.03	XRF	B-270
53.32	XRF	B-382	1.31	XRF	B-85	14.16	XRF	B-382
53.56	XRF	S-24	1.31	XRF	O-1'	14.25	XRF	C-3'
			1.31	XRF	0-1'	14.25	XRF	B-13
			1.315	XRF	B-15			
			1.32	XRF	C-3'			
			1.35	XRF	B-352			
			1.35	XRF	B-13			
<u>Si</u>								
24.4	AAS	B-105						
22.2	ED-XRF	B-399						

Major elements in 17 GSF rock reference samples (Terashima et al.)

Table A-4 Individual data for JB-1

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
14.38	XRF	B'-1	8.81	Photom.	T-27	6.04	Chem.	T-29
14.49	XRF	B-85	8.96	Photom.	B-78-1	6.10	Chem.	K-9
14.5	XRF	B-1'	8.97	Photom.	B-224	6.16	Chem.	A-11
14.54	XRF	B-15	9.01	Photom.	B-123	6.18	Chem.	O-7
14.60	XRF	B-28	8.83	Vol.	T-36'	6.21	Chem.	I-7
14.60	XRF	B-248	8.99	Vol.	B-153	6.21	Chem.	B-56, B-221
14.60	XRF	B-44, B-73	8.70	XRF	B-270	6.21	Chem.	A-13
14.61	XRF	B-96	8.83	XRF	B-382	5.42	Chem. Photom.	R-1
14.7	XRF	B-341-2	8.84	XRF	B-388	5.98	Chem. Vol.	B'-1
14.77	XRF	O-1'	8.87	XRF	B-1'	5.98	Chem. Vol.	H-5
14.81	XRF	B-352	8.94	XRF	B-28	6.00	Chem. Vol.	G-1
14.87	XRF	B-155	8.94	XRF	B-248	6.02	PAA	B-143-1
14.88	XRF	B-388	8.95	XRF	O-1'	6.02	Photm.	S-23
			8.98	XRF	B-13	5.80	Photom.	B-270
Al			9.01	XRF	B-15	6.0	Photom.	A-9'
			9.02	XRF	B-44, B-73	6.0	Photom.	H-10
7.8718	AAS	B-127	9.03	XRF	B-155	6.04	Photom.	B-123
9.61	ED-XRF	B-399	9.05	XRF	B-85	6.05	Photom.	T-27
7.5400	ICP	B-77	9.09	XRF	C-3'	5.61	Vol.	T-36'
7.69	INAA	B-450	9.11	XRF	B-352	5.95	Vol.	B-153
8.3	NAA	B-98	9.12	XRF	B-96	5.96	Vol.	B-49
7.8	PIXE	B-452	9.38	XRF	W-1	5.97	Vol.	B-342
7.8346	SIMS	B-337				5.99	Vol.	B-224
5.66	XRF	B-106	Fe2O3			6.01	Vol.	B-15
7.5	XRF	B-81				6.19	Vol.	B-88
			2.28		O-1'			
			2.26	AAS	A-9'	Fe		
			2.25	Calc.	B-270	6.14	AAS	B-204
			2.33	Calc.	B-15	6.6224	AAS	B-127
8.78	AAS	B-65	2.40	Calc.	B-49	5.82	ED-XRF	B-399
8.83	AAS	K-6'	2.5	Calc.	H-10	6.0600	ED-XRF	B-400
8.92	AAS	B-161	2.50	Calc.	T-36'	6.2300	ICP	B-77
8.98	AAS	B-49	2.20	Chem.	O-7	6.08	INAA	B-58
9.09	AAS	G-1	2.20	Chem.	A-11	6.15	INAA	B-252, B-283
9.10	AAS	B-92	2.20	Chem.	U-4	6.16	INAA	B-8
8.88	Chem.	O-2	2.20	Chem.	O-2	6.44	INAA	B-24
8.91	Chem.	N-7	2.21	Chem.	K-9	6.54	INAA	B-223
8.93	Chem.	V-1	2.21	Chem.	O-2	6.08	NAA	B-4
8.93	Chem.	B'-2	2.24	Chem.	H-5	6.2700	NAA	B-126
8.97	Chem.	S-14	2.25	Chem.	I-7	6.3	NAA	B-98
8.99	Chem.	K-9	2.26	Chem.	V-1	6.59	NAA	B-10
9.01	Chem.	O-6	2.26	Chem.	A-13	6.34	Photom.	B-51
9.04	Chem.	A-11	2.26	Chem.	B-56, B-221	6.7	PIXE	B-452
9.07	Chem.	O-7	2.31	Chem.	B-143-1	5.5263	SIMS	B-337
9.13	Chem.	I-7	2.32	Chem.	B-143-1	5.66	XRF	B-106
9.16	Chem.	A-13	2.34	Chem.	N-7	6.3	XRF	B-81
9.18	Chem.	O-5	2.36	Chem.	B'-2	6.405	XRF	B-111
9.38	Chem.	T-29	2.40	Chem.	O-6			
8.91	Chem. Chem.	U-4	2.40	Chem.	S-14			
9.08	Chem. Photom.	R-1	2.61	Chem.	O-5			
8.89	Chem. Vol.	M-2	2.67	Chem.	T-29			
8.89	Chem. Vol.	B'-1	2.24	Chem. Vol.	B'-1			
8.90	EDTA Vol.	S-23	2.42	Chem. Vol.	G-1	MnO		
9.12	EDTA Vol.	H-5	2.47	Chem. Vol.	H-5	0.14		T-36'
8.60	EPMA	B-380	2.09	Photom.	T-27	0.16		B-146
9.08	EPMA	M-6	2.21	Photom.	S-23	0.16		W-1
8.90	ES	G-6	2.38	Vol.	B-153	0.12	AAS	G-1
8.87	ICP	B-192	FeO			0.15	AAS	K-6'
8.91	ICP	B-120	6.06		M-8'	0.15	AAS	B-65
8.93	ICP	B-196	5.91	Chem.	O-5	0.15	AAS	B-224
8.95	ICP	B-122	5.91	Chem.	S-14	0.15	AAS	B-78-1
9.09	ICP	B-415, B-441	5.93	Chem.	B'-2	0.15	AAS	B-161
9.12	ICP	B-131	5.93	Chem.	N-7	0.15	AAS	M-2
8.98	INAA	B-360	5.98	Chem.	O-6	0.15	AAS	S-23
9.16	INAA	B-393	6.00	Chem.	O-2	0.154	AAS	B-92
9.47	INAA(CA)	B-453	6.01	Chem.	V-1	0.155	AAS	B-49
8.62	PAA	B-6-1, B-6-2	6.04	Chem.	U-4	0.16	AAS	R-1
						0.16	AAS	M-8'

Bulletin of the Geological Survey of Japan, Vol.45, No.6

Table A-4 Individual data for JB-1

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
0.166	AAS	B-15	0.1030	XRF	B-81	7.91	XRF	B-352
0.17	AAS	B-388	0.1167	XRF	B-111	7.91	XRF	B-270
0.17	AAS	A-9'				7.95	XRF	0-1'
0.14	Chem.	B'-2	<u>MgO</u>			<u>Mg</u>		
0.14	Chem.	V-1						
0.15	Chem.	U-4	7.68		B-146			
0.15	Chem.	A-11	7.32	AAS	B-388	4.62	AAS	B-105
0.15	Chem.	I-7	7.48	AAS	W-1	4.7238	AAS	B-127
0.15	Chem.	S-14	7.51	AAS	B-161	4.67	ED-XRF	B-399
0.16	Chem.	T-29	7.61	AAS	K-6'	4.8600	ICP	B-77
0.16	Chem.	K-9	7.62	AAS	B-15	4.67	INAA	B-450
0.16	Chem.	0-6	7.68	AAS	A-9'	3.10	PIXE	B-452
0.16	Chem.	0-5	7.68	AAS	B-151	4.2313	SIMS	B-337
0.16	Chem.	0-2	7.69	AAS	B-92	5.01	XRF	B-106
0.16	Chem.	N-7	7.72	AAS	B-78-1			
0.17	Chem.	0-7	7.73	AAS	B-49	<u>CaO</u>		
0.17	Chem.	B-56, B-221	7.76	AAS	M-8'			
0.17	Chem.	A-13	7.76	AAS	B-65	9.17		H-5
0.16	Color.	H-5	7.82	AAS	R-1	9.23		B-146
0.13	EPMA	B-380	7.84	AAS	S-24	9.07	AAS	B-65
0.15	ES	G-6	7.9	AAS	H-10	9.14	AAS	K-6'
0.155	FI-Photom.	B-261	7.23	Chem.	A-11	9.16	AAS	B-78-1
0.13	ICP	B-122	7.52	Chem.	T-29	9.27	AAS	B-49
0.15	ICP	B-192	7.63	Chem.	0-5	9.29	AAS	B-161
0.157	ICP	B-415, B-441	7.63	Chem.	I-7	9.3	AAS	A-9'
0.16	ICP	B-131	7.64	Chem.	S-14	9.31	AAS	M-8'
0.16	ICP	B-120	7.69	Chem.	0-2	9.4	AAS	H-10
0.16	ICP	B-196	7.69	Chem.	V-1	9.05	Chem.	K-9
0.15	INAA	B-393	7.70	Chem.	B-56, B-221	9.07	Chem.	I-7
0.15	PAA	B-6-1, B-6-2	7.70	Chem.	A-13	9.11	Chem.	A-13
0.15	PAA	B-143-1	7.72	Chem.	B'-2	9.11	Chem.	B-56, B-221
0.15	Photom.	B-153	7.73	Chem.	0-7	9.21	Chem.	U-4
0.167	Photom.	B-263	7.74	Chem.	K-9	9.23	Chem.	A-11
0.17	Photom.	T-27	7.77	Chem.	0-6	9.24	Chem.	0-7
0.12	XRF	B-1'	7.83	Chem.	U-44	9.30	Chem.	N-7
0.13	XRF	B-382	7.87	Chem.	N-7	9.31	Chem.	S-14
0.14	XRF	B-155	7.64	EDTA Vol.	H-5	9.32	Chem.	T-29
0.149	XRF	B-270	7.72	EDTA Vol.	S-23	9.34	Chem.	B'-2
0.15	XRF	B-85	7.87	EDTA Vol.	G-1	9.35	Chem.	0-2
0.15	XRF	C-3'	7.99	EDTA Vol.	M-2	9.38	Chem.	0-5
0.15	XRF	B-44, B-73	7.67	EPMA	B-380	9.41	Chem.	0-6
0.15	XRF	B-28	7.79	EPMA	M-6	9.46	Chem.	V-1
0.15	XRF	B'-1	7.60	ES	G-6	9.27	EDTA Vol.	S-23
0.15	XRF	0-1'	7.80	Grav.	B-153	9.33	EDTA Vol.	M-2
0.16	XRF	B-13	7.35	ICP	B-192	9.34	EDTA Vol.	G-1
0.16	XRF	B-96	7.70	ICP	B-196	9.27	EPMA	M-6
0.16	XRF	S-24	7.78	ICP	B-415, B-441	9.35	EPMA	B-380
			7.80	ICP	B-120	9.10	ES	G-6
			7.91	ICP	B-122	9.36	Grav.	B-153
			7.97	ICP	B-131	9.10	ICP	B-196
			7.40	INAA(CA)	B-453	9.19	ICP	B-192
0.1150	AAS	B-204	7.74	PAA	B-143-1	9.20	ICP	B-120
0.1225	AAS	B-127	8.07	PAA	B-6-1, B-6-2	9.32	ICP	B-131
0.1284	AAS	B-128	7.71	Photom.	T-27	9.36	ICP	B-415, B-441
0.1291	AAS	B-325	7.68	Vol.	T-36'	9.24	PAA	B-143-1
0.112	ED-XRF	B-399	7.77	Vol.	B-224	9.37	PAA	B-6-1, B-6-2
0.1140	ED-XRF	B-400	7.40	XRF	B-96	9.20	Photom.	T-27
0.1161	ICP	B-77	7.61	XRF	B-85	9.04	Vol.	T-36'
0.1226	ICP	B-350	7.66	XRF	B-1'	9.25	Vol.	B-224
0.115	INAA	B-58	7.72	XRF	B'-1	8.93	XRF	S-24
0.128	INAA	B-450	7.74	XRF	C-3'	8.96	XRF	W-1
0.1000	NAA	B-7	7.74	XRF	B-155	9.12	XRF	B-382
0.1160	NAA	B-4	7.75	XRF	B-382	9.24	XRF	B-1'
0.1190	NAA	B-1	7.75	XRF	B-13	9.24	XRF	B'-1
0.13	NAA	B-98	7.75	XRF	B-28	9.28	XRF	B-15
0.1200	PIXE	B-452	7.85	XRF	B-44, B-73	9.28	XRF	B-13
0.1004	SIMS	B-337						

Major elements in 17 GSJ rock reference samples (Terashima et al.)

Table A-5 Individual data for JB-1A

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
<u>SiO₂</u>			1.29	XRF	B-16	9.07	ICP	B-434
52.00	AAS	B-434	1.29	XRF	B-36	9.0	INAA	B-118
52.15	AAS	B-216	1.30	XRF	B-25	9.00	INAA	B-447
52.41	AAS	B-202	1.30	XRF	B-247	9.10	INAA	B-478
52.52	AAS	B-134	1.31	XRF	B-19	9.17	INAA	B-270
53.78	AAS	B-312	1.33	XRF	B-43	9.37	INAA	B-142
51.64	Chem.	B-52	1.37	XRF	B-434	8.87	NAA	B-277
51.945	Chem.	B-148	1.29	XRF(Dry basis)	B-129	8.94	Photm(FI)	B-462
51.95	Chem.	B-89	1.28	XRF(fusion)	B-70	8.83	Photom.	B-123
53.43	Chem.	B-39	Ti			9.01	Photom.	B-224
53.03	FI-Photom.	B-253	0.7990 SIMS			9.05	Photom.	B-119
51.87	Grav.	B-224	A1203			9.15	Photom.	B-216
52.16	Grav.	B-49	13.79	AAS	B-202	9.02	Vol.	B-119
52.22	Grav.	B-162	14.25	AAS	B-312	8.66	XRF	B-134
52.16	Grav. & AAS	B-167	14.35	AAS	B-216	8.95	XRF	B-31
52.24	Grav. & AAS	B-139	14.51	AAS	B-167	9.07	XRF	B-201
52.820	ICP	B-148	14.51	AAS	B-49	9.07	XRF	B-15
55.8	INAA	B-447	14.58	AAS	B-134	9.09	XRF	B-270
53.14	Photom.	B-279	14.7	AAS	B-279	9.10	XRF	B-247
52.05	XRF	B-434	14.01	Chem.	B-39	9.10	XRF	B-36
52.13	XRF	B-15	14.72	Chem.	B-52	9.13	XRF	B-16
52.15	XRF	B-201	15.095	Chem.	B-148	9.15	XRF	B-25
52.16	XRF	B-134	15.10	Chem.	B-89	9.18	XRF	B-19
52.16	XRF	B-247	14.57	Grav. & AAS	B-139	9.22	XRF	B-40
52.18	XRF	B-25	14.730	ICP	B-148	9.23	XRF	B-43
52.20	XRF	B-31	15.37	ICP	B-434	9.24	XRF	B-434
52.28	XRF	B-40	13.2	INAA	B-447	9.05	XRF(Dry basis)	B-129
52.43	XRF	B-16	14.1	INAA	B-270	9.20	XRF(fusion)	B-70
52.55	XRF	B-270	14.6	Photom.	B-51	<u>Fe203</u>		
52.71	XRF	B-36	14.34	Vol.	B-162	2.12	Calc.	B-134
52.98	XRF	B-43	14.48	Vol.	B-224	2.12	Calc.	B-31
53.36	XRF	B-19	13.89	XRF	B-434	2.35	Calc.	B-139
52.56	XRF(Dry basis)	B-129	14.04	XRF	B-270	2.45	Calc.	B-216
51.9	XRF(fusion)	B-70	14.27	XRF	B-31	2.52	Calc.	B-167
<u>Si</u>			14.35	XRF	B-25	2.52	Calc.	B-49
24.3913	SIMS	B-337	14.36	XRF	B-134	2.54	Calc.	B-15
<u>TiO₂</u>			14.41	XRF	B-15	2.61	Calc.	B-134
1.185	AAS	B-216	14.41	XRF	B-201	2.615	Calc.	B-202
1.24	AAS	B-312	14.46	XRF	B-16	2.67	Calc.	B-25
1.27	AAS	B-134	14.51	XRF	B-247	2.71	Calc.	B-36
1.30	AAS	B-167	14.55	XRF	B-40	2.80	Calc.	B-270
1.31	AAS	B-49	14.55	XRF	B-36	2.82	Calc.	B-312
1.260	Chem.	B-148	14.58	XRF	B-19	2.47	Chem.	B-89
1.28	Chem.	B-89	14.87	XRF	B-43	2.490	Chem.	B-148
1.29	Chem.	B-52	14.61	XRF(Dry basis)	B-129	2.94	Chem.	B-39
1.31	ICP	B-434	14.51	XRF(fusion)	B-70	2.62	Photom.	B-162
1.314	ICP	B-148	<u>Al</u>			<u>FeO</u>		
1.14	INAA	B-270	7.6558 SIMS			5.44	AAS	B-312
1.27	INAA	B-447	T-Fe203			5.17	Chem.	B-39
1.32	Photm(FI)	B-462	8.865	AAS	B-202	5.278	Chem.	B-148
1.23	Photom.	B-202	8.95	AAS	B-134	5.78	Chem.	B-89
1.26	Photom.	B-279	9.0	AAS	B-279	5.820	Chem.	B-148
1.27	Photom.	B-139	9.01	AAS	B-49	5.97	Chem.	B-52
1.28	Photom.	B-162	9.10	AAS	B-328	5.66	Photom.	B-270
1.29	Photom.	B-224	9.10	AAS	B-167	6.05	Photom.	B-216
1.24	XRF	B-40	8.80	Chem.	B-52	6.11	Photom.	B-123
1.27	XRF	B-134	8.96	Chem.	B-148	5.62	Vol.	B-202
1.27	XRF	B-201	8.897	ICP	B-148	5.72	Vol.	B-279
1.27	XRF	B-31				5.72	Vol.	B-162
1.27	XRF	B-15				5.75	Vol.	B-36
1.28	XRF	B-270				5.84	Vol.	B-25
1.28	XRF	B-270				5.86	Vol.	B-224

Table A-5 Individual data for JB-1A

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
5.88	Vol.	B-15	7.75	AAS	B-328	9.51	XRF	B-43
5.89	Vol.	B-134	7.76	AAS	B-49	9.37	XRF(Dry basis)	B-129
5.92	Vol.	B-49	7.78	AAS	B-134	9.32	XRF(fusion)	B-70
5.92	Vol.	B-167	7.85	AAS	B-216			
6.14	Vol.	B-31	7.9	AAS	B-279		Ca	
5.82	Vol. ?	B-139	7.905	AAS	B-202			
			7.67	Chem.	B-52	6.7608	SIMS	B-337
			7.75	Chem.	B-39			
			7.81	Chem.	B-89		Na2O	
			7.925	Chem.	B-148	2.49	AAS	B-312
			8.03	Grav.	B-162	2.73	AAS	B-134
			7.80	Grav. & AAS	B-139	2.74	AAS	B-328
			7.728	ICP	B-148	2.74	AAS	B-167
			7.90	ICP	B-434	2.75	AAS	B-49
			8.07	INAA	B-270	2.77	AAS	B-224
			7.73	Vol.	B-224	2.82	AAS	B-202
			7.69	XRF	B-201	2.85	AAS	B-216
			7.75	XRF	B-247	2.87	AAS	B-15
			7.81	XRF	B-16	2.49	Chem.	B-52
			7.82	XRF	B-36	2.710	Chem.	B-148
			7.82	XRF	B-31	2.72	Chem.	B-89
			7.84	XRF	B-43	2.70	FES	B-279
			7.88	XRF	B-25	2.76	FES	B-162
			7.92	XRF	B-270	2.73	Fl. Photom.	B-139
			7.97	XRF	B-19	2.76	Fl. Photom.	B-434
			8.00	XRF	B-40	2.700	ICP	B-148
			7.96	XRF(Dry basis)	B-129	2.67	INAA	B-478
			7.84	XRF(fusion)	B-70	2.80	INAA	B-270
						2.81	INAA	B-142
						2.93	INAA	B-447
						2.93	NAA	B-277
						2.38	XRF	B-25
						2.46	XRF	B-43
						2.47	XRF	B-434
						2.65	XRF	B-36
						2.68	XRF	B-270
						2.70	XRF	B-40
						2.74	XRF	B-247
						2.78	XRF	B-16
						2.82	XRF	B-201
						2.83	XRF	B-31
						2.87	XRF	B-19
						2.85	XRF(Dry basis)	B-129
						2.76	XRF(fusion)	B-70
							Na	
						2.03	INAA	B-324
						2.04	INAA	B-310
						2.04	INAA	B-37-2
						2.08	INAA	B-24
						2.16	NAA	B-287
						1.9554	SIMS	B-337
							K2O	
						1.18	AAS	B-312
						1.36	AAS	B-202
						1.38	AAS	B-134
						1.41	AAS	B-224
						1.45	AAS	B-49
						1.45	AAS	B-216
						1.46	AAS	B-167
						1.46	AAS	B-328
						1.23	Chem.	B-39

Table A-6 Individual data for JB-2

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
0.25	XRF	B-11				0.23	Chem.	B-36
0.3525	XRF	B-111				<0.07	Conduct.	B-130
<u>P205</u>			S03					
			<0.02	XRF	B-36			
0.10	AAS	T-41'	<u>L. O. I.</u>					
0.11	AAS	T-23'						
0.09	Chem.	K-11'	0.55	Chem.	B-39			
0.09	Chem.	B-56, B-221	0.37	Grav.	B-134			
0.09	Chem.	A-2'	0.45	Grav.	B-16			
0.09	Chem.	K-117	0.50	Grav.	T-13'			
0.09	Chem.	A-2'	0.70	Grav.	B-15			
0.10	Chem.	0-11' A-10'	0.83	Grav.	B-70			
0.10	Chem.	K-11'	0.90	Grav.	B-31			
0.11	Chem.	0-3'	-0.33	Grav.	B-25			
0.11	Chem.	B-45	-0.38	Grav.	B-224			
0.12	Chem.	G-7'	-0.48	Grav.	B-19			
0.10	FI-Photom.	B-254	-0.56	Grav.	B-36			
0.092	ICP	B-192	-0.66	Grav.	B-87			
0.096	ICP	B-455	-0.68	Grav.	B-129			
0.15	ICP	K-18'						
0.10	ICP & AAS	B-5'	<u>T-H20</u>					
0.08	Micro wave plas	G-6'						
0.09	Photm	B-482	0.36	Coul.	B-270			
0.07	Photom.	B-216	0.07	Grav.	B-224			
0.08	Photom.	B-279	0.40	Grav.	B-216			
0.09	Photom.	B-15	0.67	Grav.	B-153			
0.094	Photom.	B-134						
0.097	Photom.	B-84	<u>H20+</u>					
0.10	Photom.	B-224						
0.10	Photom.	B-71	0.26	Chem.	B-6'			
0.111	Photom.	B-93	0.31	Chem.	0-11' A-10'			
0.12	Photom.	B-130	0.25	Coul.	B-270			
0.17	Photom.	B-80, B-94	0.18	Grav.	B-93			
0.096	Various	S-23'	0.22	Grav.	B-71			
0.11	Various	P-5'	0.25	Grav.	B-25			
0.09	Vol.	B-14, B-91	0.26	Grav.	T-41'			
0.07	XRF	B-90	0.29	Grav.	B-36			
0.08	XRF	B-109	0.26	Grav. ?	B-18			
0.08	XRF	B-44, B-73	0.20	KF	B-14, B-91			
0.09	XRF	B-67	0.31	Tit	B-482			
0.09	XRF	S-24'						
0.09	XRF	B-31	<u>H20-</u>					
0.10	XRF	B-247						
0.10	XRF	B-16	0.07	Chem.	0-11' A-10'			
0.10	XRF	B-18	0.11	Chem.	T-41'			
0.10	XRF	S-26'	0.16	Chem.	G-7'			
0.10	XRF	B-87	0.18	Chem.	S-23'			
0.10	XRF	Y-8'	0.11	Coul.	B-270			
0.106	XRF	B-270	0.19	Grav.	B-482			
0.11	XRF	B-36	0.10	Grav.	B-16			
0.11	XRF	0-3'	0.12	Grav.	B-80, B-94			
0.11	XRF	B-125	0.12	Grav.	B-25			
0.110	XRF	B-40	0.12	Grav.	B-71			
0.12	XRF	B-19	0.12	Grav.	B-153			
0.14	XRF	B-43	0.12	Grav.	B-93			
0.10	XRF & Chem.	B-6'	0.15	Grav.	B-45			
0.10	XRF(Dry basis)	B-129	0.16	Grav.	B-130			
0.10	XRF(fusion)	B-70	0.17	Grav.	B-455			
			0.12	KF	B-14, B-91			
			0.13	XRF & Chem.	B-6'			
<u>P (ppm)</u>								
366	ICP	B-77	<u>CO2</u>					
480	OES	B-208						
410	SIMS	B-337	0.03	Chem.	B-45			
399	XRF	B-25	0.09	Chem.	B-25			

Major elements in 17 GSJ rock reference samples (Terashima et al.)

Table A-7 Individual data for JB-3

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
<u>SiO₂</u>			1.41	Photom.	B-162	17.12	XRF	B-97
			1.46	Photom.	B-224	17.15	XRF	B-16
50.65	AAS	B-216	1.47	Photom.	B-130	17.18	XRF	B-44, B-73
51.14	AAS	B-134	1.47	Photom.	B-153	17.20	XRF	B-25
51.15	AAS	T-41'	1.51	Photom.	B-14, B-91	17.29	XRF	B-40
51.00	Chem.	B-56, B-221	1.32	XRF	B-74	17.30	XRF	B-90
51.04	Chem.	0-11' A-10'	1.36	XRF	B-90	17.33	XRF	B-36
51.14	Chem.	B-45	1.37	XRF	Y-8'	17.35	XRF	B-134
51.18	Chem.	G-7'	1.38	XRF	B-40	17.41	XRF	S-26'
50.51	Grav.	B-14, B-91	1.39	XRF	B-43	17.41	XRF	B-15
50.59	Grav.	B-94	1.39	XRF	S-26'	17.90	XRF	B-43
50.66	Grav.	B-153	1.40	XRF	B-31	17.43	XRF(Dry basis)	B-129
50.89	Grav.	B-224	1.40	XRF	B-270	17.34	XRF(fusion)	B-70
51.09	Grav.	B-162	1.41	XRF	B-134			
51.12	Grav.	B-74	1.42	XRF	B-15	<u>Al</u>		
51.18	Grav. & Photom.	B-130	1.43	XRF	B-19			
50.59	ICP	B-309	1.43	XRF	B-16	8.9900	ICP	B-77
51.16	ICP	B-476	1.43	XRF	B-36	9.85	NAA	B-11
51.00	IDMS	B-48	1.45	XRF	B-44, B-73	8.7942	SIMS	B-337
50.5	INAA	B-447	1.45	XRF	B-247	<u>T-Fe2O₃</u>		
50.5	NAA	B-277	1.47	XRF	T-37'			
50.87	Photom.	B-86	1.50	XRF	B-25			
50.38	XRF	B-44, B-73	1.50	XRF	B-22	11.7	AAS	B-279
50.52	XRF	B-31	1.52	XRF	B-97	11.72	AAS	B-86
50.82	XRF	B-16	1.57	XRF	B-422	11.80	AAS	B-134
50.85	XRF	B-97	1.44	XRF(Dry basis)	B-129	11.99	AAS	B-328
50.87	XRF	B-19	1.42	XRF(fusion)	B-70	11.99	AAS	T-41'
50.97	XRF	B-270				11.75	Chem.	G-7'
50.99	XRF	B-40	<u>Ti</u>			11.88	Chem.	0-11' A-10'
51.00	XRF	B-15				11.81	ICP	B-309
51.04	XRF	B-247	0.7418	ICP	B-77	12.10	ICP	B-476
51.06	XRF	B-134	0.7729	SIMS	B-337	12.16	ICP	B-192
51.07	XRF	B-25				12.00	ICP-MS	B-320
51.19	XRF	B-22	<u>Al₂O₃</u>			11.0	INAA	B-447
51.23	XRF	Y-8'				11.12	INAA	B-270
51.25	XRF	B-36	16.6	AAS	B-279	11.9	INAA	B-118
51.44	XRF	T-37'	16.90	AAS	B-216	12.15	INAA	B-142
51.63	XRF	B-90	16.99	AAS	B-134	11.8	PAA	B-55
51.70	XRF	S-26'	17.03	AAS	T-41'	11.45	Photm(FI)	B-462
50.86	XRF(Dry basis)	B-129	17.65	AAS	B-74	11.75	Photom.	B-130
50.7	XRF(fusion)	B-70	16.89	Chem.	0-11' A-10'	11.83	Photom.	B-119
			16.91	Chem.	B-56, B-221	11.87	Photom.	B-123
			16.97	Chem.	B-45	11.88	Photom.	B-224
			17.34	Chem.	G-7'	11.95	Photom.	B-216
<u>Si</u>			16.95	Grav.	B-153	11.81	Vol.	B-119
23.8675	SIMS	B-337	17.34	Grav.	B-94	12.35	Vol.	B-153
<u>TiO₂</u>			17.62	Grav.	B-14, B-91	11.16	XRF	S-26'
			17.02	ICP	B-476	11.32	XRF	B-270
1.42		B-146	17.23	ICP	B-192	11.52	XRF	B-90
1.40	AAS	B-134	17.39	ICP	B-309	11.67	XRF	B-134
1.46	AAS	T-41'	16.98	ICP-MS	B-320	11.69	XRF	B-31
1.52	AAS	B-216	16.6	INAA	B-270	11.84	XRF	B-19
1.45	Chem.	0-11' A-10'	17.1	NAA	B-55	11.86	XRF	B-43
1.46	Chem.	G-7'	18.4	NAA	B-277	11.88	XRF	B-247
1.50	Chem.	B-56, B-221	17.34	Photom.	B-130	11.88	XRF	B-15
1.52	Chem.	B-45	17.8	Photom.	B-51	11.97	XRF	Y-8'
1.33	ICP	B-192	17.87	Photom.	B-86	11.98	XRF	B-16
1.37	ICP	B-309	16.91	Vol.	B-224	11.99	XRF	B-36
1.49	ICP	B-476	17.16	Vol.	B-162	12.00	XRF	B-40
1.47	ICP-MS	B-320	16.54	XRF	T-37'	12.01	XRF	T-37'
1.39	INAA	B-270	16.82	XRF	B-22	12.09	XRF	B-422
1.45	PAA	B-55	16.89	XRF	B-247	12.10	XRF	B-44, B-73
1.43	Photm(FI)	B-462	16.96	XRF	B-19	12.12	XRF	B-25
1.36	Photom.	B-94	17.01	XRF	B-270	11.83	XRF(Dry basis)	B-129
1.38	Photom.	B-86	17.04	XRF	B-31	11.76	XRF(fusion)	B-70
1.39	Photom.	B-279	17.10	XRF	Y-8'			

Table A-7 Individual data for JB-3

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
<u>S03</u>								
<0.02	XRF	B-36						
<u>L. O. I.</u>								
0.30	Grav.	B-134						
0.42	Grav.	B-16						
0.43	Grav.	T-37'						
0.51	Grav.	B-15						
0.54	Grav.	B-70						
0.70	Grav.	B-31						
-0.36	Grav.	B-25						
-0.39	Grav.	B-19						
-0.40	Grav.	B-309						
-0.48	Grav.	B-224						
-0.54	Grav.	B-129						
-0.67	Grav.	B-36						
<u>T-H20</u>								
0.24	Coul.	B-270						
0.11	Grav.	B-224						
0.45	Grav.	B-216						
0.48	Grav.	B-153						
<u>H20+</u>								
0.14	Grav.	T-41'						
0.20	Chem.	0-11' A-10'						
0.18	Coul.	B-270						
0.13	Grav.	B-22						
0.16	Grav.	B-25						
0.17	Grav.	B-56, B-221						
0.17	Grav.	B-36						
0.27	Grav.	B-162						
0.16	KF	B-14, B-91						
0.214	KF	B-97						
<u>H20-</u>								
0.03	Chem.	0-11' A-10'						
0.11	Chem.	G-7'						
0.06	Coul.	B-270						
0.04	Grav.	B-45						
0.04	Grav.	B-16						
0.06	Grav.	T-41'						
0.06	Grav.	B-74						
0.06	Grav.	B-162						
0.07	Grav.	B-86						
0.07	Grav.	B-153						
0.09	Grav.	B-56, B-221						
0.09	Grav.	B-25						
0.11	Grav.	B-130						
0.06	KF	B-14, B-91						
<u>CO2</u>								
0.016	Chem.	B-45						
0.03	Chem.	B-36						
0.04	Chem.	B-25						
<0.07	Conduct.	B-130						

Major elements in 17 GSJ rock reference samples (Terashima et al.)

Table A-8 Individual data for JF-1

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
<u>SiO₂</u>			17.4	NAA	B-277	0.06	INAA	B-163
			17.99	Vol.	F-3'	0.06	INAA	B-310
66.20	AAS	B-434	18.29	Vol.	B-224	0.055	NAA	B-287
66.76	AAS	B-134	17.38	XRF	B-270	<u>MnO</u>		
66.82	AAS	Y-14'	17.83	XRF	T-51'			
66.85	AAS	B-216	17.96	XRF	B-62			
67.11	AAS	B-202	17.99	XRF	B-247	0.001	AAS	B-167
64.35	Chem.	B-181	18.00	XRF	B-142	0.001	AAS	B-328
66.64	Chem.	B-258-7	18.00	XRF	B-434	0.001	AAS	B-224
66.40	Grav.	B-224	18.02	XRF	B-59	0.00116	AAS	Y-14'
66.64	Grav.	F-3'	18.20	XRF	B-136	0.00085	INAA	B-447
66.87	Grav. & AAS	B-139	18.41	XRF	B-63	0.0012	INAA	B-270
66.70	Grav. & AAS	B-167	18.44	XRF	B-201	0.00085	NAA	B-234, B-277
67.8	INAA	B-447	18.45	XRF	B-61	0.003	XRF	B-270
67.8	NAA	B-277	18.51	XRF	B-134	<u>Mn (ppm)</u>		
66.94	Photom.	B-279	18.62	XRF	B-64	13	AAS	B-142
64.69	XRF	B-62	<u>T-Fe₂O₃</u>			60	AAS	B-136
65.58	XRF	B-434	0.07	AAS	B-134	22	XRF (fusion)	B-59
66.24	XRF	B-201	0.07	AAS	B-202	<5	XRF (powder)	B-59
66.64	XRF	B-247	0.0776	AAS	Y-14'	<u>Mgo</u>		
66.72	XRF	B-134	0.08	AAS	B-167	0.004	AAS	B-224
66.90	XRF	B-136	0.08	AAS	B-328	0.0052	AAS	Y-14'
66.91	XRF	B-142	0.09	AAS	B-279	0.006	AAS	F-3'
67.03	XRF	B-59	0.08	Chem	B-258-7	0.006	AAS	B-328
67.11	XRF	B-61	0.085	INAA	B-447	0.006	AAS	B-167
67.11	XRF	B-64	0.09	INAA	B-270	0.0075	AAS	B-216
67.12	XRF	B-63	0.088	NAA	B-234	0.008	AAS	B-279
67.47	XRF	T-51'	0.075	Photom.	B-216	0.006	Chem.	B-258-7
67.48	XRF	B-270	0.08	Photom.	B-224	0.006	XRF	B-247
<u>TiO₂</u>			0.06	XRF	B-63	<u>CaO</u>		
0.001	AAS	B-216	0.07	XRF	B-136	0.86	AAS	B-202
0.016	AAS	B-134	0.07	XRF	T-51'	0.887	AAS	Y-14'
<0.01	AAS	Y-14'	0.08	XRF	B-247	0.93	AAS	B-167
<0.01	AAS	B-167	0.08	XRF	B-134	0.93	AAS	B-328
0.005	Chem.	F-3'	0.085	XRF	B-434	0.94	AAS	B-134
0.005	Chem.	B-258-7	0.09	XRF	B-59	0.95	AAS	B-216
0.04	Chem.	B-181	<u>Fe₂O₃</u>			0.98	AAS	B-224
<0.8	INAA	B-270	0.01	AAS	B-134	1.03	AAS	B-279
0.005	Photom.	B-224	0.06	Calc.	B-63	0.93	Chem.	B-181
0.01	Photom.	B-202	0.07	Calc.	B-136	1.05	Chem.	F-3'
0.02	Photom.	B-279	0.07	Calc.	B-202	1.05	Chem.	B-258-7
0.005	XRF	B-247	0.075	Calc.	B-216	1.03	Grav. & AAS	B-139
0.005	XRF	B-63	0.08	Calc.	B-167	0.89	INAA	B-270
0.007	XRF	B-270	0.08	Calc.	B-258-7	0.9	INAA	B-447
0.008	XRF	B-136	0.09	Calc.	B-59	0.887	NAA	B-277
0.01	XRF	B-64	0.08	Chem.	F-3'	0.84	XRF	B-61
0.01	XRF	B-62	0.089	NAA	B-277	0.86	XRF	B-270
0.01	XRF	B-59	0.01	XRF	B-134	0.87	XRF	T-51'
0.02	XRF	B-201	0.01	XRF	B-201	0.87	XRF	B-201
<0.02	XRF	B-142	<u>FeO</u>			0.89	XRF	B-134
<u>Al₂O₃</u>			0.01	Photom.	B-216	0.89	XRF	B-62
17.96	AAS	Y-14'	<0.03	Photom.	B-270	0.90	XRF	B-63
18.04	AAS	B-167	0.05	Vol.	B-224	0.92	XRF	B-434
18.15	AAS	B-216	0.06	Vol.	B-134	0.92	XRF	B-64
18.18	AAS	B-202	<u>Fe</u>			0.92	XRF	B-136
18.2	AAS	B-279	0.05	INAA	B-24	0.93	XRF	B-142
18.42	AAS	B-134	0.052	INAA	B-324	0.94	XRF	B-59
17.99	Chem.	B-258-7	<u>Na₂O</u>			1.05	XRF	B-247
18.08	Grav. & AAS	B-139						
18.28	ICP	B-434						
17.4	INAA	B-447						
17.9	INAA	B-270						

Table A-8 Individual data for JF-1

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
3.25	AAS	B-216	10.05	XRF	B-247	0.03	Grav.	B-134
3.27	AAS	Y-14'	10.12	XRF	T-51'	0.13	Grav.	B-167
3.29	AAS	B-142	9.96	γ cntg.	B-237	0.14	Grav.	B-136
3.32	AAS	B-202	10.18	γ cntg.	B-273	0.20	Grav.	B-202
3.32	AAS	B-134				0.21	Grav.	B-139
3.35	AAS	B-167	K			CO2		
3.35	AAS	B-328	8.05	INAA	B-310			
3.54	AAS	F-3'	8.4	INAA	B-163	0.01	Vol.	B-59
3.63	AAS	B-224	8.3	NAA	B-287	0.01	XRF	B-136
3.54	Chem.	B-258-7	P205			SO3		
3.60	Chem.	B-181						
3.28	FES	B-279						
3.37	FI-AAS	B-262	0.009	Chem.	B-258-7	<0.02	XRF	B-59
3.30	Fl. Photom.	B-139	0.004	Photom.	B-202			
3.38	INAA	B-437	0.008	Photom.	B-224			
3.42	INAA	B-270	0.009	Photom.	F-3'			
3.72	INAA	B-447	0.01	Photom.	B-167			
3.72	NAA	B-234, B-277	0.01	Photom.	B-216			
3.07	XRF	B-61	0.02	Photom.	B-279			
3.07	XRF	B-136	0.006	XRF	B-63			
3.08	XRF	B-63	0.009	XRF	B-247			
3.18	XRF	B-59	0.017	XRF	B-270			
3.19	XRF	B-270	P (ppm)					
3.28	XRF	B-64						
3.32	XRF	T-51'						
3.52	XRF	B-201	<100	OES	B-208			
3.54	XRF	B-247	97	XRF	B-136			
Na			L. O. I.					
2.41	INAA	B-324	0.15	Grav.	T-51'			
2.49	INAA	B-310	0.24	Grav.	B-59			
2.49	INAA	B-163	0.24	Grav.	B-224			
2.52	INAA	B-24	0.27	Grav.	B-134			
2.19	NAA	B-287	0.27	Grav.	B-142			
			0.27	Grav.	B-61			
K2O			0.31	Grav.	B-62			
			0.325	Grav.	Y-14'			
9.86	AAS	B-202	0.37	Grav.	B-136			
9.87	AAS	B-142	0.44	Grav.	B-63			
10.05	AAS	F-3'	1.63	Grav.	B-64			
10.06	AAS	B-167	T-H2O					
10.06	AAS	B-328						
10.07	AAS	Y-14'						
10.07	AAS	B-224	0.33	Coul.	B-270			
10.10	AAS	B-216	0.18	Grav.	B-224			
10.11	AAS	B-134	0.25	Grav.	B-216			
10.05	Chem.	B-258-7	H2O+					
9.99	FES	B-236						
10.12	FES	B-279	0.17	Chem.	B-258-7			
10.06	FI-AAS	B-262	0.17	Chem.	F-3'			
9.89	Fl. Photom.	B-139	0.18	Coul.	B-270			
10.8	INAA	B-270	0.19	Grav.	B-167			
9.80	NAA	B-234, B-277	0.23	Grav.	B-59			
9.68	XRF	B-63	0.24	Grav.	B-139			
9.71	XRF	B-270	0.31	Grav.	B-181			
9.72	XRF	B-201	0.33	Grav.	B-136			
9.79	XRF	B-59	H2O-					
9.79	XRF	B-64						
9.80	XRF	B-62						
9.81	XRF	B-142	0.14	Chem.	B-258-7			
9.85	XRF	B-61	0.14	Chem.	F-3'			
9.91	XRF	B-136	0.15	Coul.	B-270			
10.03	XRF	B-134	0.03	Grav.	B-181			

Major elements in 17 GSJ rock reference samples (Terashima et al.)

Table A-9 Individual data for JF-2

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
<u>SiO₂</u>			0.05	AAS	B-139	0.007	AAS	B-162
			0.06	AAS	B-159, B-167	0.03	AAS	B-328
65.35	AAS	B-216	0.06	AAS	B-328	<0.005	AAS	B-279
65.51	Chem.	B-205	0.06	ICP	B-443	<0.02	Chem.	B-205
65.12	Grav.	B-162	0.052	INAA	B-270	0.007	ICP	B-443
65.22	Grav.	B-224	0.060	INAA	B-447	<0.3	INAA	B-270
64.91	Grav. & AAS	B-139	0.059	NAA	B-234, B-277	0.003	XRF	B-247
65.20	Grav. & AAS	B-159, B-167	0.05	Photom.	B-224	0.01	XRF	B-198
65	INAA	B-447	0.079	Photom.	B-216	0.02	XRF	B-138
64.95	Photom.	B-279	0.04	XRF	B-169	0.05	XRF	B-201
64.06	XRF	B-219	0.05	XRF	B-138	0.06	XRF	B-168
64.77	XRF	B-201	0.06	XRF	B-247	0.08	XRF	B-219
65.14	XRF	B-169	0.07	XRF	B-219	<0.05	XRF	B-270
65.20	XRF	B-247	0.08	XRF	B-189	<0.05	XRF	B-169
65.24	XRF	B-168	0.08	XRF	B-168	<0.10	XRF	B-189
65.33	XRF	B-138	<u>Fe₂O₃</u>			<u>CaO</u>		
65.52	XRF	B-189	0.05	AAS	B-139	0.06	AAS	B-162
65.86	XRF	B-207	0.04	Calc.	B-169	0.085	AAS	B-216
65.91	XRF	B-198	0.06	Calc.	B-159, B-167	0.09	AAS	B-159, B-167
66.18	XRF	B-170	0.065	Calc.	B-216	0.09	AAS	B-328
66.20	XRF	B-270	0.08	Calc.	B-168	0.10	AAS	B-279
<u>TiO₂</u>			0.11	Calc.	B-270	0.11	AAS	B-224
0.001	AAS	B-216	0.14	Calc.	B-207	0.12	Chem.	B-205
<0.01	AAS	B-159, B-167	0.05	Photom.	B-162	0.12	ICP	B-443
<0.05	Chem.	B-205	0.04	XRF	B-198	0.004	XRF	B-170
0.006	ICP	B-443	<u>FeO</u>			0.034	XRF	B-270
<0.7	INAA	B-270	0.01	Photom.	B-216	0.07	XRF	B-169
0.004	Photom.	B-162	<0.03	Photom.	B-270	0.08	XRF	B-138
0.02	Photom.	B-279	0.04	Vol.	B-198	0.09	XRF	B-247
0.007	Photom.	B-224	0.05	Vol.	B-224	0.10	XRF	B-219
0.004	XRF	B-270	<0.01	Vol.	B-162	0.12	XRF	B-201
0.007	XRF	B-170	<0.01	Vol.	B-168	0.12	XRF	B-198
0.01	XRF	B-247	<u>Fe</u>			<u>Na₂O</u>		
0.01	XRF	B-189	0.037	INAA	B-324	2.41	AAS	B-207
0.02	XRF	B-201	0.042	INAA	B-230	2.41	AAS	B-224
0.05	XRF	B-168	0.052	INAA	B-244	2.45	AAS	B-216
0.10	XRF	B-198	<u>MnO</u>			2.46	AAS	B-328
<0.01	XRF	B-169	0.001	AAS	B-224	2.46	AAS	B-159, B-167
<0.02	XRF	B-207	0.001	AAS	B-328	2.43	Chem.	B-205
<u>Al₂O₃</u>			0.001	AAS	B-159, B-167	2.45	FES	B-279
18.30	AAS	B-216	0.001	ICP	B-443	2.50	FES	B-162
18.43	AAS	B-159, B-167	0.00098	INAA	B-447	2.43	FI-AAS	B-262
18.5	AAS	B-279	0.0014	INAA	B-270	2.43	FI. Photom.	B-139
18.57	Grav. & AAS	B-139	0.00098	NAA	B-234, B-277	2.367	ICP	B-443
18.84	ICP	B-443	0.002	Photom.	B-162	2.35	INAA	B-270
18.6	INAA	B-270	(0.001)	XRF	B-168	2.58	INAA	B-437
18.41	Vol.	B-224	<u>Mn (ppm)</u>			2.46	NAA	B-247
18.50	Vol.	B-162	18	AAS	B-207	2.01	XRF	B-189
17.73	XRF	B-270	5	XRF	B-169	2.22	XRF	B-170
18.27	XRF	B-198	<u>MgO</u>			2.24	XRF	B-169
18.33	XRF	B-207	0.003	AAS	B-159, B-167	2.33	XRF	B-198
18.37	XRF	B-138	0.0055	AAS	B-216	2.33	XRF	B-168
18.43	XRF	B-247	0.006	AAS	B-224	2.34	XRF	B-219
18.63	XRF	B-169	<u>Na</u>			2.36	XRF	B-270
18.63	XRF	B-219	1.78	INAA	B-230	2.37	XRF	B-138
18.73	XRF	B-168	1.78	INAA	B-244	2.50	XRF	B-201
18.79	XRF	B-201	<u>T-Fe₂O₃</u>			1.86	INAA	B-324
18.81	XRF	B-170						
18.91	XRF	B-189						

Table A-9 Individual data for JF-2

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
<u>K2O</u>			0.47	Grav.	B-168			
			0.48	Grav.	B-189			
13.03	AAS	B-207	<u>T-H2O</u>					
13.10	AAS	B-159, B-167						
13.10	AAS	B-328	0.37	Coul.	B-270			
13.13	AAS	B-224	0.18	Grav.	B-224			
13.25	AAS	B-216	0.3	Grav.	B-216			
13.16	Chem.	B-205	<u>H2O+</u>					
13.01	FES	B-279						
13.07	FES	B-236						
13.20	FES	B-162	0.20	Coul.	B-270			
13.05	FI-AAS	B-262	0.1	Grav.	B-168			
12.99	FI. Photom.	B-139	0.21	Grav.	B-198			
12.55	ICP	B-443	0.22	Grav.	B-159, B-167			
12.8	INAA	B-447	0.29	Grav.	B-169			
12.7	NAA	B-234, B-277	0.33	Grav.	B-205			
12.05	XRF	B-198	0.34	Grav.	B-162			
12.49	XRF	B-170	<u>H2O-</u>					
12.57	XRF	B-201						
12.63	XRF	B-189						
12.89	XRF	B-219	0.17	Coul.	B-270			
12.90	XRF	B-169	0.11	Grav.	B-205			
13.00	XRF	B-168	0.16	Grav.	B-168			
13.10	XRF	B-247	0.18	Grav.	B-162			
13.25	XRF	B-138	0.20	Grav.	B-139			
13.40	XRF	B-207	0.24	Grav.	B-159, B-167			
12.94	γ cntg.	B-237	<u>CO2</u>					
13.15	γ cntg.	B-273						
<u>K</u>			0.03	Vol.	B-169			
			<0.1	Vol.	B-168			
10.4	INAA	B-230	<u>S03</u>					
10.4	INAA	B-244						
<u>P205</u>			0.01	XRF	B-168			
			<0.02	XRF	B-169			
0.25	Chem.	B-205						
0.023	ICP	B-443						
0.002	Photom.	B-162						
0.0025	Photom.	B-224						
0.01	Photom.	B-216						
0.02	Photom.	B-279						
0.03	Photom.	B-139						
<0.01	Photom.	B-159, B-167						
0.004	XRF	B-170						
0.015	XRF	B-270						
0.02	XRF	B-189						
0.02	XRF	B-219						
0.05	XRF	B-198						
<0.01	XRF	B-247						
<0.01	XRF	B-201						
<0.01	XRF	B-169						
<u>P (ppm)</u>								
<100	OES	B-208						
8	Photom.	B-207						
14	XRF	B-168						
<u>L. O. I.</u>								
0.32	Grav.	B-138						
0.37	Grav.	B-207						
0.43	Grav.	B-224						
0.44	Grav.	B-170						

Major elements in 17 GSJ rock reference samples (Terashima et al.)

Table A-10 Individual data for JG-1

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
<u>SiO₂</u>			31.66	XRF	B-106			
			32	XRF	B-81	<u>Ti</u>		
71.5	AAS	R-1	<u>TiO₂</u>			0.1578	ICP	B-77
72.17	AAS	B-92	0.29		B-146	0.1400	XRF	B-106
71.62	Chem.	T-29	0.26	AAS	B-49	0.1470	XRF	B-81
71.9	Chem.	H-10	0.2	Chem.	H-10	0.1555	XRF	B-111
71.98	Chem.	K-9	0.21	Chem.	N-7	0.16	XRF	B-398
71.99	Chem.	O-5	0.23	Chem.	I-7	<u>Al₂O₃</u>		
72.01	Chem.	H-8	0.23	Chem.	H-9	14.33		B-146
72.06	Chem.	K-25	0.23	Chem.	R-7	14.10	AAS	S-15
72.08	Chem.	V-1	0.24	Chem.	C-3	14.14	AAS	B-92
72.11	Chem.	A-13	0.24	Chem.	C-3'	14.15	AAS	B-49
72.11	Chem.	B-56, B-221	0.24	Chem.	M-10	14.20	AAS	S-24
72.15	Chem.	M-10	0.25	Chem.	A-11	14.6	AAS	R-1
72.19	Chem.	O-2	0.25	Chem.	M-12	13.94	Chem.	H-8
72.20	Chem.	H-9	0.25	Chem.	O-6	13.97	Chem.	B'-4
72.21	Chem.	O-6	0.25	Chem.	K-9	14.0	Chem.	H-10
72.21	Chem.	A-11	0.25	Chem.	V-1	14.06	Chem.	V-1
72.3	Chem.	A-9'	0.25	Chem.	M-7	14.06	Chem.	K-9
72.30	Chem.	I-7	0.25	Chem.	B-56, B-221	14.07	Chem.	F-2
72.33	Chem.	S-14	0.25	Chem.	O-7	14.07	Chem.	A-13
72.35	Chem.	M-7	0.25	Chem.	A-13	14.07	Chem.	B-56, B-221
72.40	Chem.	R-7	0.26	Chem.	K-25	14.16	Chem.	C-3
72.41	Chem.	O-7	0.26	Chem.	O-2	14.21	Chem.	K-25
72.41	Chem.	N-7	0.26	Chem.	N-8	14.21	Chem.	O-7
72.42	Chem.	M-12	0.26	Chem.	F-2	14.21	Chem.	O-2
72.43	Chem.	F-2	0.26	Chem.	A-9'	14.23	Chem.	A-11
72.71	Chem.	C-3	0.26	Chem.	S-14	14.23	Chem.	S-14
72.87	Chem.	N-8	0.27	Chem.	B'-4	14.25	Chem.	A-9'
72.87	Chem.	B'-4	0.28	Chem.	M-8'	14.29	Chem.	H-9
73.36	Chem.	C-3'	0.28	Chem.	T-29	14.30	Chem.	R-7
72.17	EPMA	B-380	0.29	Chem.	O-5	14.35	Chem.	N-8
72.40	EPMA	M-6	0.31	Chem.	H-8	14.35	Chem.	M-8'
72.40	ES	G-6	0.31	Chem.	M-13	14.36	Chem.	M-7
72.2	FI-Photom.	B-348	0.28	Color	S-23	14.42	Chem.	T-29
72.33	FI-Photom.	B-253	0.28	Color	M-13	14.44	Chem.	C-3'
72.03	Grav.	B-153	0.28	Color	S-23	14.46	Chem.	O-6
72.08	Grav.	B-224	0.25	EPMA	B-380	14.48	Chem.	N-7
72.25	Grav.	B-49	0.28	EPMA	M-6	14.57	Chem.	M-10
72.52	Grav.	S-23	0.23	ICP	B-122	14.64	Chem.	I-7
72.01	ICP	B-122	0.24	ICP	B-192	14.73	Chem.	O-5
72.04	ICP	G-8'	0.26	ICP	G-8'	14.49	EPMA	M-6
72.6	ICP	B-120	0.26	ICP	B-131	14.65	EPMA	B-380
72.66	ICP	B-131	0.28	ICP	B-120	13.90	ES	G-6
72.30	IDMS	B-48	0.26	ICP-MS	B-320	14.60	Grav.	B-153
73.20	INAA(CA)	B-453	0.27	PAA	B-6-1, B-6-2	13.70	ICP	B-122
72.15	Photom.	M-13	0.29	Photm.	M-2	14.02	ICP	B-192
72.20	Photom.	G-1	0.27	Photm(FI)	B-462	14.23	ICP	G-8'
72.70	Photom.	M-2	0.26	Photom	B-224	14.6	ICP	B-131
72.74	Photom.	B-161	0.26	Photom	B-153	14.80	ICP-MS	B-320
70.90	XRF	S-15	0.27	Photom.	B-92	15.00	INAA(CA)	B-453
71.78	XRF	B'-1	0.27	Photom.	B-161	13.93	Oxine Grav.	M-12
72.24	XRF	B-1'	0.27	Photom.	G-1	14.09	Photom.	M-13
72.27	XRF	B-15	0.25	XRF	O-1'	14.2	Photom.	B-51
72.29	XRF	O-1'	0.26	XRF	B-96	14.2	Photom.	B-95
72.34	XRF	B-96	0.26	XRF	B-1'	14.30	Photom.	G-1
72.35	XRF	B-125	0.26	XRF	B-270	13.84	Vol.	S-23
72.42	XRF	B-270	0.26	XRF	B'-1	14.08	Vol.	M-2
72.45	XRF	B-28	0.266	XRF	B-15	14.26	Vol.	B-224
72.55	XRF	S-24	0.27	XRF	B-44, B-73	14.44	Vol.	B-161
72.76	XRF	B-85	0.27	XRF	B-85	13.84	XRF	B-270
72.91	XRF	B-44, B-73	0.28	XRF	S-24	14.08	XRF	B-44, B-73
			0.28	XRF	B-28			
			0.28	XRF	B-28			
<u>Si</u>			0.28	XRF	S-15			
33.6	AAS	B-105	0.30	XRF	B-125			
			0.30	XRF	B-456			

Table A-11 Individual data for JG-1A

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
<u>SiO₂</u>			0.25	XRF	B-15	2.00	Photom.	B-119
71.53	AAS	B-134	0.25	XRF	B-25	2.00	Photom.	B-224
71.70	AAS	B-434	0.26	XRF	B-19	2.24	Photom.	B-216
72.05	AAS	B-216	0.26	XRF	B-201	2.00	Vol.	B-119
72.75	AAS	B-202	0.26	XRF	B-16	1.94	XRF	B-201
72.78	AAS	B-312	0.27	XRF	B-43	1.94	XRF	B-134
71.52	Chem.	B-52	0.24	XRF(Dry basis)	B-129	1.98	XRF	B-25
72.59	Chem.	B-89	0.24	XRF(fusion)	B-70	1.99	XRF	B-36
72.605	Chem.	B-148				2.00	XRF	B-270
72.90	Chem.	B-39	<u>Al₂O₃</u>			2.00	XRF	B-15
71.30	FI-Photom.	B-253	13.44	AAS	B-312	2.01	XRF	B-31
72.03	Grav.	B-190	13.87	AAS	B-202	2.01	XRF	B-19
72.19	Grav.	B-49	14.16	AAS	B-49	2.05	XRF	B-247
72.23	Grav.	B-224	14.2	AAS	B-279	2.09	XRF	B-40
71.87	Grav. & AAS	B-139	14.22	AAS	B-167	2.10	XRF	B-43
72.19	Grav. & AAS	B-167	14.25	AAS	B-216	2.11	XRF	B-434
73.150	ICP	B-148	14.47	AAS	B-134	1.94	XRF(Dry basis)	B-129
71.7	INAA	B-447	14.19	Chem.	B-52	1.93	XRF(fusion)	B-70
71.7	NAA	B-277	14.26	Chem.	B-39	<u>Fe₂O₃</u>		
72.82	Photom.	B-279	15.050	Chem.	B-148	0.30	Calc	B-482
71.35	XRF	B-434	15.07	Chem.	B-89	0.35	Calc.	B-216
72.12	XRF	B-134	14.56	Grav. & AAS	B-139	0.41	Calc.	B-270
72.16	XRF	B-16	14.11	ICP	B-482	0.42	Calc.	B-31
72.16	XRF	B-40	14.15	ICP	B-434	0.43	Calc.	B-134
72.17	XRF	B-31	14.202	ICP	B-148	0.43	Calc.	B-167
72.19	XRF	B-247	14.3	INAA	B-270	0.43	Calc.	B-49
72.40	XRF	B-201	15.5	INAA	B-447	0.45	Calc.	B-25
72.40	XRF	B-25	15.5	NAA	B-277	0.47	Calc.	B-15
72.47	XRF	B-270	14.5	Photom.	B-51	0.47	Calc.	B-134
72.48	XRF	B-36	14.12	Vol.	B-190	0.47	Calc.	B-36
72.71	XRF	B-15	14.22	Vol.	B-224	0.58	Calc.	B-139
73.11	XRF	B-19	13.80	XRF	B-270	0.66	Calc.	B-202
73.19	XRF	B-43	14.00	XRF	B-31	0.79	Calc.	B-148
72.22	XRF(Dry basis)	B-129	14.05	XRF	B-43	0.595	Chem.	B-89
72.8	XRF(fusion)	B-70	14.10	XRF	B-25	0.73	Chem.	B-39
<u>TiO₂</u>			14.11	XRF	B-434	<u>FeO</u>		
0.24	AAS	B-134	14.11	XRF	B-15	1.40		B-312
0.25	AAS	B-167	14.13	XRF	B-16	1.01	Chem.	B-89
0.25	AAS	B-49	14.19	XRF	B-40	1.010	Chem.	B-148
0.257	AAS	B-216	14.22	XRF	B-247	1.20	Chem.	B-39
0.32	AAS	B-312	14.26	XRF	B-134	1.47	Chem.	B-52
0.195	Chem.	B-148	14.27	XRF	B-36	1.129	ICP	B-148
0.20	Chem.	B-89	14.46	XRF	B-201	1.76	INAA	B-330
0.24	Chem.	B-52	14.46	XRF	B-19	1.39	Photom.	B-123
0.29	Chem.	B-39	14.12	XRF(Dry basis)	B-129	1.43	Photom.	B-270
0.193	ICP	B-148	14.28	XRF(fusion)	B-70	1.70	Photom.	B-216
0.23	ICP	B-482	<u>T-Fe₂O₃</u>			1.48	Vol.	B-482
0.25	ICP	B-434	1.98	AAS	B-134	1.19	Vol.	B-202
0.27	ICP	B-472	2.00	AAS	B-279	1.27	Vol.	B-36
0.21	INAA	B-270	2.03	AAS	B-49	1.36	Vol.	B-134
0.24	Photm(FI)	B-462	2.05	AAS	B-328	1.38	Vol.	B-15
0.18	Photom.	B-279	2.05	AAS	B-167	1.38	Vol.	B-25
0.25	Photom.	B-190	2.11	AAS	B-202	1.38	Vol.	B-224
0.25	Photom.	B-224	1.72	Chem.	B-148	1.43	Vol.	B-31
0.27	Photom.	B-139	1.89	Chem.	B-52	1.46	Vol.	B-167
0.27	Photom.	B-202	2.21	ICP	B-434	1.46	Vol.	B-49
0.24	XRF	B-36	1.87	INAA	B-447	1.24	Vol. ?	B-139
0.24	XRF	B-134	1.97	INAA	B-270	<u>Fe</u>		
0.24	XRF	B-40	1.98	INAA	B-118	1.369	INAA	B-330
0.24	XRF	B-31	1.86	NAA	B-234, B-277	1.37	INAA	B-24
0.25	XRF	B-270	1.92	Photm(FI)	B-462			
0.25	XRF	B-434	1.95	Photom.	B-190			
0.25	XRF	B-247	1.97	Photom.	B-123			

Major elements in 17 GSJ rock reference samples (Terashima et al.)

Table A-11 Individual data for JG-1A

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
1.38	INAA	B-324	0.50	Chem.	B-89	3.40	AAS	B-216
1.44	INAA	B-37-2	0.515	Chem.	B-148	3.41	AAS	B-49
1.44	INAA	B-310	0.63	Chem.	B-39	3.41	AAS	B-202
1.45	NAA	B-287	0.67	Chem.	B-52	3.41	AAS	B-167
1.40	Photom.	B-51	0.77	Grav. & AAS	B-139	3.41	AAS	B-328
			0.551	ICP	B-148	3.44	AAS	B-224
<u>MnO</u>			0.64	ICP	B-482	3.45	AAS	B-15
0.05	AAS	B-139	0.72	ICP	B-434	3.70	AAS	B-312
0.05	AAS	B-312	0.69	Vol.	B-190	3.15	Chem.	B-52
0.055	AAS	B-224	0.58	XRF	B-270	3.47	Chem.	B-39
0.057	AAS	B-134	0.62	XRF	B-36	3.49	Chem.	B-89
0.060	AAS	B-167	0.69	XRF	B-31	3.490	Chem.	B-148
0.060	AAS	B-279	0.69	XRF	B-247	3.30	FES	B-279
0.060	AAS	B-190	0.70	XRF	B-434	3.40	Fl. Photom.	B-434
0.060	AAS	B-49	0.73	XRF	B-201	3.40	Fl. Photom.	B-139
0.060	AAS	B-328	0.76	XRF	B-43	3.29	ICP	B-482
0.063	AAS	B-216	0.77	XRF	B-16	3.29	ICP	B-148
0.068	AAS	B-202	0.78	XRF	B-19	3.32	INAA	B-447
0.07	AAS	B-15	0.79	XRF	B-25	3.46	INAA	B-270
0.04	Chem.	B-89	0.82	XRF	B-40	3.31	NAA	B-234, B-277
0.040	Chem.	B-148	0.74	XRF(Dry basis)	B-129	2.94	XRF	B-43
0.06	Chem.	B-52	0.69	XRF(fusion)	B-70	3.14	XRF	B-434
0.06	Chem.	B-39				3.25	XRF	B-36
0.049	ICP	B-148	<u>CaO</u>			3.32	XRF	B-270
0.05	ICP	B-482	2.08	AAS	B-190	3.33	XRF	B-25
0.06	ICP	B-434	2.12	AAS	B-49	3.40	XRF	B-16
0.04	INAA	B-330	2.13	AAS	B-167	3.41	XRF	B-247
0.059	INAA	B-270	2.13	AAS	B-328	3.42	XRF	B-31
0.061	INAA	B-447	2.14	AAS	B-312	3.49	XRF	B-40
0.060	NAA	B-234, B-277	2.17	AAS	B-134	3.53	XRF	B-19
0.050	XRF	B-40	2.175	AAS	B-202	3.65	XRF	B-201
0.054	XRF	B-16	2.20	AAS	B-216	3.46	XRF(Dry basis)	B-129
0.054	XRF	B-134	2.08	Chem.	B-52	3.46	XRF(fusion)	B-70
0.06	XRF	B-43	2.175	Chem.	B-148	<u>Na</u>		
0.06	XRF	B-434	2.18	Chem.	B-89	2.54	INAA	B-24
0.06	XRF	B-19	2.19	Grav. & AAS	B-139	2.55	INAA	B-37-2
0.06	XRF	B-201	1.94	ICP	B-482	2.55	INAA	B-310
0.06	XRF	B-31	2.193	ICP	B-148	2.67	INAA	B-324
0.06	XRF	B-247	2.22	ICP	B-434	2.53	NAA	B-287
0.060	XRF	B-270	2.01	INAA	B-270	<u>K2O</u>		
0.06	XRF(Dry basis)	B-129	2.34	INAA	B-447	3.785	AAS	B-202
0.06	XRF(fusion)	B-70	1.9	NAA	B-279	3.96	AAS	B-190
			2.13	Vol.	B-190	3.98	AAS	B-134
<u>Mn</u>			2.14	Vol.	B-224	4.02	AAS	B-49
0.0460	AAS	B-25	2.01	XRF	B-43	4.03	AAS	B-224
0.0281	INAA	B-330	2.08	XRF	B-36	4.04	AAS	B-167
0.044	NAA	B-287	2.09	XRF	B-201	4.04	AAS	B-328
0.0440	XRF(fusion)	B-36	2.12	XRF	B-15	4.05	AAS	B-312
0.0462	XRF(powder)	B-36	2.13	XRF	B-134	4.05	AAS	B-216
			2.13	XRF	B-19	4.05	AAS	B-148
			2.13	XRF	B-31	3.86	Chem.	B-89
			2.13	XRF	B-247	3.875	Chem.	B-148
			2.14	XRF	B-40	4.04	Chem.	B-39
0.66	AAS	B-190	2.14	XRF	B-270	3.93	FES	B-435
0.67	AAS	B-224	2.15	XRF	B-25	4.03	FES	B-236
0.67	AAS	B-312	2.18	XRF	B-18	4.07	FES	B-279
0.67	AAS	B-15	2.18	XRF	B-16	4.07	FES	B-139
0.69	AAS	B-49	2.20	XRF	B-434	3.98	Fl. Photom.	B-434
0.69	AAS	B-328	2.13	XRF(Dry basis)	B-129	3.71	ICP	B-482
0.69	AAS	B-167	2.14	XRF(fusion)	B-70	3.952	ICP	B-148
0.70	AAS	B-216				3.60	INAA	B-447
0.70	AAS	B-279	<u>Na2O</u>			3.93	INAA	B-270
0.72	AAS	B-129	3.35	AAS	B-190	3.27	NAA	B-234, B-277
0.73	AAS	B-134	3.36	AAS	B-134			
0.76	AAS	B-202						

Major elements in 17 GSJ rock reference samples (Terashima et al.)

Table A-12 Individual data for JG-2

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
<u>SiO₂</u>			12.36	AAS	B-202	1.04	XRF	B-270
76.50	AAS	B-434	12.41	AAS	B-418	<u>Fe₂O₃</u>		
76.95	AAS	B-418	12.44	AAS	B-134	0.20	Calc.	B-134
76.96	AAS	B-134	12.45	AAS	B-216	0.22	Calc.	B-134
77.00	AAS	Y-14'	12.52	AAS	Y-14'	0.23	Calc.	B-63
77.1	AAS	B-216	12.9	AAS	B-279	0.24	Calc.	B-136
77.35	AAS	B-202	11.45	Chem.	B-181	0.30	Calc.	B-270
74.73	Chem.	B-181	12.41	Chem.	B-258-7	0.35	Calc.	B-216
76.95	Chem.	B-258-7	12.39	Grav. & AAS	B-141	0.36	Calc.	B-258-7
76.84	Grav.	B-224	12.29	ICP	B-476	0.38	Calc.	B-167
76.88	Grav.	B-190	12.58	ICP	B-443	0.40	Calc.	B-59
76.95	Grav.	F-3'	12.95	ICP	B-434	0.42	Calc.	B-142
76.78	Grav. & AAS	B-141	12.42	INAA	B-270	0.42	Calc.	B-202
76.92	Grav. & AAS	B-167	13.1	INAA	B-447	0.44	Calc.	B-141
76.34	ICP	B-476	13.3	NAA	B-277	0.36	Chem.	F-3'
77.1	INAA	B-447	12.41	Vol.	F-3'	<u>FeO</u>		
77.1	NAA	B-277	12.45	Vol.	B-224	0.52	Chem.	B-258-7
77.51	Photom.	B-279	12.53	Vol.	B-190	0.55	Photom.	B-216
75.56	XRF	B-64	11.91	XRF	B-62	0.67	Photom.	B-270
75.92	XRF	B-62	12.27	XRF	T-51'	0.52	Vol.	B-167
76.72	XRF	B-201	12.29	XRF	B-434	0.52	Vol.	F-3'
76.77	XRF	B-434	12.32	XRF	B-270	0.54	Vol.	B-224
76.92	XRF	B-270	12.38	XRF	B-63	0.55	Vol.	B-142
76.95	XRF	B-247	12.40	XRF	B-136	0.56	Vol.	B-202
77.00	XRF	B-136	12.41	XRF	B-247	0.56	Vol.	B-59
77.05	XRF	B-142	12.44	XRF	B-134	0.61	Vol.	B-136
77.10	XRF	B-134	12.46	XRF	B-142	0.64	Vol.	B-63
77.13	XRF	B-59	12.49	XRF	B-64	0.72	Vol.	B-134
77.17	XRF	T-51'	12.59	XRF	B-59	0.49	Vol.?	B-141
77.77	XRF	B-63	12.73	XRF	B-201	<u>Fe</u>		
			12.73	XRF	B-61	0.65575	INAA	B-330
<u>TiO₂</u>			<u>T-Fe₂O₃</u>			0.67	INAA	B-324
0.03	AAS	B-134	0.92	AAS	F-3'	0.70	INAA	B-230
0.04	AAS	B-167	0.92	AAS	B-418	0.71	INAA	B-244
0.0416	AAS	Y-14'	0.96	AAS	B-328	0.73	INAA	B-24
0.06	AAS	B-216	0.96	AAS	B-167	0.74	NAA	B-287
0.02	Chem.	B-181	0.977	AAS	Y-14'	<u>MnO</u>		
0.04	Chem.	B-258-7	1.00	AAS	B-134	0.0085	AAS	B-216
0.04	Chem.	F-3'	1.01	AAS	B-279	0.01	AAS	B-134
0.04	ICP	B-434	1.01	AAS	B-202	0.014	AAS	B-224
0.04	ICP	B-476	1.04	AAS	B-181	0.015	AAS	B-190
0.043	ICP	B-443	0.80	Chem.	B-181	0.017	AAS	B-418
0.04	Photom.	B-279	0.92	Chem.	B-258-7	0.017	AAS	B-328
0.04	Photom.	B-190	0.90	ICP	B-434	0.017	AAS	B-167
0.045	Photom.	B-224	0.92	ICP	B-443	0.0179	AAS	Y-14'
0.05	Photom.	B-202	1.01	INAA	B-447	0.018	AAS	B-279
0.06	Photom.	B-141	1.07	INAA	B-270	0.018	AAS	B-202
0.03	XRF	B-134	1.01	NAA	B-234, B-277	0.02	AAS	B-141
0.04	XRF	B-270	0.91	Photom.	B-224	0.01	Chem.	B-181
0.04	XRF	B-136	0.95	Photom.	B-190	0.015	Chem.	B-258-7
0.04	XRF	B-63	0.96	Photom.	B-119	0.018	Chem.	F-3'
0.04	XRF	B-434	0.97	Photom.	B-216	0.018	FI-Photom.	B-261
0.04	XRF	B-247	0.95	Vol.	B-119	0.016	ICP	B-434
0.05	XRF	B-142	0.88	XRF	B-62	0.016	ICP	B-443
0.05	XRF	B-201	0.92	XRF	B-136	0.02	ICP	B-476
0.05	XRF	B-51'	0.92	XRF	B-247	0.016	INAA	B-270
0.05	XRF	B-59	0.94	XRF	B-201	0.018	INAA	B-447
0.05	XRF	B-64	0.94	XRF	B-63	0.02	INAA	B-447
0.05	XRF	B-62	0.95	XRF	T-51'	0.02	INAA	B-330
0.06	XRF	B-61	0.99	XRF	B-64			
<u>Al₂O₃</u>			1.01	XRF	B-134			
12.35	AAS	B-167	1.02	XRF	B-61			
			1.02	XRF	B-434			
			1.02	XRF	B-59			
			1.03	XRF	B-142			

Table A-12 Individual data for JG-2

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
0.017	NAA	B-234, B-277	0.66	XRF	B-270	4.79	AAS	B-328
0.01	XRF	B-61	0.67	XRF	T-51'	4.79	AAS	B-167
0.01	XRF	B-63	0.68	XRF	B-136	4.76	Chem.	B-258-7
0.01	XRF	B-62	0.68	XRF	B-201	4.98	Chem.	B-181
0.013	XRF	B-136	0.69	XRF	B-59	4.70	FES	B-279
0.013	XRF	B-434	0.70	XRF	B-63	4.73	FES	B-236
0.015	XRF	B-247	0.70	XRF	B-142	4.71	FI-AAS	B-262
0.02	XRF	B-201	0.71	XRF	B-62	4.62	FI. Photom.	B-434
0.02	XRF	B-64	0.71	XRF	B-64	4.74	FI. Photom.	B-141
0.020	XRF	B-270	0.78	XRF	B-434	4.64	ICP	B-476
			0.80	XRF	B-247	4.644	ICP	B-443
Mn			Na2O			4.43	INAA	B-270
0.0102	AAS	B-136	3.50	AAS	Y-14'	4.63	XRF	B-63
0.0137	AAS	B-142	3.52	AAS	B-134	4.65	XRF	B-201
0.01255	INAA	B-330	3.53	AAS	B-190	4.66	XRF	B-64
0.020	NAA	B-287	3.53	AAS	B-328	4.67	XRF	B-434
0.0147	XRF(fusion)	B-59	3.54	AAS	B-167	4.67	XRF	B-142
0.0135	XRF(powder)	B-59	3.55	AAS	B-202	4.68	XRF	B-62
			3.55	AAS	F-3'	4.70	XRF	B-61
MgO			3.55	AAS	B-216	4.72	XRF	B-59
0.03	AAS	B-142	3.57	AAS	B-142	4.72	XRF	B-136
0.03	AAS	B-190	3.59	AAS	B-224	4.74	XRF	B-134
0.0329	AAS	Y-14'	3.55	Chem.	B-258-7	4.76	XRF	B-247
0.033	AAS	B-224	3.80	Chem.	B-181	4.78	XRF	B-270
0.035	AAS	B-167	3.49	FES	B-279	4.79	XRF	T-51'
0.035	AAS	B-328	3.57	FI-AAS	B-262	4.74	γ cntg.	B-237
0.035	AAS	B-202	3.52	FI. Photom.	B-434	4.76	γ cntg.	B-273
0.04	AAS	B-279	3.56	FI. Photom.	B-141	K		
0.045	AAS	B-216	3.42	ICP	B-476	3.72	INAA	B-230
0.06	AAS	B-134	3.448	ICP	B-443	3.72	INAA	B-244
0.04	Chem.	B-258-7	3.50	INAA	B-270	3.78	NAA	B-287
0.05	Chem.	B-181	3.58	INAA	B-437	P205		
0.03	Grav. & AAS	B-141	3.77	INAA	B-447	0.002	Chem.	B-258-7
0.04	ICP	B-434	3.53	NAA	B-234, B-277	0.002	Photom.	B-224
0.042	ICP	B-443	3.34	XRF	B-59	0.002	Photom.	F-3'
0.04	Photom.	F-3'	3.36	XRF	B-62	0.003	Photom.	B-190
0.04	Vol.	B-190	3.37	XRF	B-136	0.002	XRF	B-247
0.01	XRF	T-51'	3.43	XRF	B-63	P (ppm)		
0.01	XRF	B-136	3.43	XRF	B-64	<100	OES	B-208
0.04	XRF	B-247	3.48	XRF	B-61	79	XRF	B-136
0.06	XRF	B-64	3.55	XRF	B-247	L. O. I.		
			3.58	XRF	T-51'	0.32	Grav.	B-190
CaO			3.60	XRF	B-270	0.32	Grav.	T-51'
0.62	AAS	B-224	3.70	XRF	B-201	0.34	Grav.	B-59
0.65	AAS	B-190	3.82	XRF	B-434	0.35	Grav.	B-61
0.655	AAS	Y-14'	Na			0.35	Grav.	B-142
0.68	AAS	B-167	2.54	INAA	B-244	0.40	Grav.	B-136
0.68	AAS	B-328	2.54	INAA	B-230	0.40	Grav.	B-224
0.68	AAS	B-134	2.76	INAA	B-24	0.484	Grav.	Y-14'
0.685	AAS	B-202	2.78	INAA	B-324	0.54	Grav.	B-134
0.70	AAS	B-216	2.78	INAA	B-287	0.57	Grav.	B-63
0.76	AAS	B-279	2.59	NAA		0.97	Grav.	B-62
0.80	AAS	F-3'	K2O			3.06	Grav.	B-64
0.84	Chem.	B-181	4.47	AAS	B-202	T-H2O		
0.80	Chem.	B-258-7	4.64	AAS	B-190	0.40	Coul.	B-270
0.65	Grav. & AAS	B-141	4.67	AAS	Y-14'	0.20	Grav.	B-224
0.67	ICP	B-476	4.71	AAS	B-142			
0.73	ICP	B-443	4.75	AAS	B-216			
0.76	ICP	B-434	4.75	AAS	B-134			
0.61	INAA	B-270	4.76	AAS	F-3'			
0.73	Vol.	B-190	4.77	AAS	B-224			
0.62	XRF	B-61						
0.66	XRF	B-134						

Major elements in 17 GSJ rock reference samples (Terashima et al.)

Table A-12 Individual data for JG-2

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
0.25	Grav.	B-216						
<u>H2O+</u>								
0.25	Chem.	B-258-7						
0.25	Chem.	F-3'						
0.27	Coul.	B-270						
0.22	Grav.	B-167						
0.37	Grav.	B-59						
0.39	Grav.	B-181						
0.40	Grav.	B-136						
0.465	Grav.	B-202						
<u>H2O-</u>								
0.13	Chem.	B-258-7						
0.13	Chem.	F-3'						
0.13	Coul.	B-270						
0.03	Grav.	B-181						
0.07	Grav.	B-134						
0.08	Grav.	B-190						
0.11	Grav.	B-142						
0.13	Grav.	B-136						
0.14	Grav.	B-167						
0.18	Grav.	B-202						
0.22	Grav.	B-141						
<u>CO2</u>								
0.03	Vol.	B-59						
0.01	XRF	B-136						
<u>S03</u>								
<0.02	XRF	B-59						

Major elements in 17 GSJ rock reference samples (Terashima et al.)

Table A-13 Individual data for JG-3

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
3.67	Vol.	B-190	2.61	XRF	B-207	<u>H2O-</u>		
3.77	Vol.	B-224	2.61	XRF	B-169			
3.58	XRF	B-207	2.61	XRF	B-189	0.18	Coul.	B-270
3.63	XRF	B-201	2.62	XRF	B-270	0.09	Grav.	B-190
3.64	XRF	B-138	2.62	XRF	B-219	0.11	Grav.	B-205
3.65	XRF	B-198	2.62	XRF	B-168	0.12	Grav.	B-162
3.69	XRF	B-219	2.63	XRF	B-247	0.13	Grav.	B-168
3.70	XRF	B-169	2.69	XRF	B-198	0.16	Grav.	B-139
3.71	XRF	B-170	2.70	γ cntg.	B-273	0.21	Grav.	B-159, B-167
3.74	XRF	B-189	2.71	γ cntg.	B-237	0.33	Grav.	B-198
3.74	XRF	B-168				<u>CO2</u>		
3.76	XRF	B-247	K					
3.81	XRF	B-270						
<u>Na2O</u>			2.2000	IDMS	B-438	0.04	Vol.	B-169
			2.31	INAA	B-230, B-244	<0.1	Vol.	B-168
			<u>P2O5</u>			<u>SO3</u>		
3.90	AAS	B-190	0.11	Photom.	B-279	0.02	XRF	B-168
4.00	AAS	B-207	0.12	Photom.	B-159, B-167	0.04	XRF	B-169
4.03	AAS	B-159, B-167	0.12	Photom.	B-162			
4.03	AAS	B-328	0.125	Photom.	B-216			
4.05	AAS	B-216	0.13	Photom.	B-190			
4.11	AAS	B-224	0.148	Photom.	B-224			
3.61	Chem.	B-205	0.10	XRF	B-170			
3.97	FES	B-162	0.11	XRF	B-198			
4.04	FES	B-279	0.12	XRF	B-201			
4.03	FI-AAS	B-262	0.12	XRF	B-247			
4.05	FI. Photom.	B-139	0.12	XRF	B-219			
4.06	INAA	B-270	0.13	XRF	B-189			
4.11	INAA	B-437	0.13	XRF	B-169			
4.20	NAA	B-234, B-277	0.130	XRF	B-270			
3.64	XRF	B-219						
3.66	XRF	B-189	<u>P (ppm)</u>					
3.75	XRF	B-198	540	OES	B-208			
3.88	XRF	B-169	509	Photom.	B-207			
3.92	XRF	B-170	562	XRF	B-168			
3.92	XRF	B-168	<u>L. O. I.</u>					
3.99	XRF	B-270	0.67	Grav.	B-224			
4.02	XRF	B-201	0.58	Grav.	B-138			
4.03	XRF	B-247	0.66	Grav.	B-190			
4.04	XRF	B-138	0.70	Grav.	B-168			
<u>Na</u>			0.77	Grav.	B-189			
3.09	INAA	B-230, B-244	0.91	Grav.	B-207			
3.21	INAA	B-324	0.96	Grav.	B-170			
<u>K2O</u>			<u>T-H2O</u>					
2.61	AAS	B-224	0.87	Coul.	B-270			
2.63	AAS	B-159, B-167	0.10	Grav.	B-224			
2.63	AAS	B-328	0.90	Grav.	B-216			
2.64	AAS	B-190	<u>H2O+</u>					
2.65	AAS	B-216	0.69	Coul.	B-270			
2.66	AAS	B-207	0.5	Grav.	B-168			
2.71	Chem.	B-205	0.53	Grav.	B-198			
2.62	FES	B-236	0.61	Grav.	B-169			
2.64	FES	B-162	0.67	Grav.	B-205			
2.75	FES	B-279	0.67	Grav.	B-159, B-167			
2.62	FI-AAS	B-262	0.80	Grav.	B-139			
2.67	FI. Photom.	B-139	0.87	Grav.	B-162			
2.66	INAA	B-447						
2.68	INAA	B-270						
2.65	NAA	B-234, B-277						
2.57	XRF	B-138						
2.58	XRF	B-170						
2.59	XRF	B-201						

Bulletin of the Geological Survey of Japan, Vol.45, No.6

Table A-14 Individual data for JGB-1

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
11.86	XRF	B-134	1.32	XRF	B-40	0.21	NAA	B-287
11.90	XRF	B-15	1.20	XRF(Dry basis)	B-129	0.37	NAA	B-11
11.90	XRF	B-25	1.27	XRF(fusion)	B-70	0.2173	SIMS	B-337
11.93	XRF	B-16				0.14	XRF	B-11
11.94	XRF	B-36	Na			P205		
11.95	XRF	B-44, B-73	0.88	AAS	B-97			
11.98	XRF	B-97	0.9800	AAS	B-77	0.05	AAS	T-41'
11.98	XRF	B-247	0.89	INAA	B-24	0.04	Chem.	B-56, B-221
12.03	XRF	T-37'	0.95	INAA	B-324	0.05	Chem.	0-11' A-13'
12.09	XRF	B-19	0.97	INAA	B-310	0.05	Chem.	B-45
12.09	XRF	B-43	0.974	INAA	B-163	0.075	Chem.	G-7'
12.09	XRF	B-31	0.92	NAA	B-11	0.06	FI-Photom.	B-254
12.13	XRF	B-22	0.95	NAA	B-287	0.047	ICP	B-192
12.33	XRF	B-40	0.9296	SIMS	B-337	0.04	Photm	B-482
12.40	XRF	B-90	K20			0.03	Photom.	B-279
11.86	XRF(Dry basis)	B-129	0.21	AAS	B-134	0.05	Photom.	B-15
11.96	XRF(fusion)	B-70	0.22	AAS	B-71	0.05	Photom.	B-224
Ca			0.228	AAS	B-74	0.06	Photom.	B-71
6.7800	AAS	B-77	0.23	AAS	B-224	0.07	Photom.	B-86
8.1	NAA	B-11	0.24	AAS	B-328	0.066	Photom.	B-134
9.0504	SIMS	B-337	0.24	AAS	T-41'	0.07	Photom.	B-216
9.46	XRF	B-11	0.25	AAS	B-216	0.075	Photom.	B-130
Na20			0.24	AAS	T-41'	0.04	Vol.	B-14, B-91
1.17		B-146	0.25	AAS	B-216	0.03	XRF	B-90
1.02	AAS	B-312	0.26	AAS	0-11' A-13'	0.05	XRF	Y-8'
1.20	AAS	T-41'	0.29	AAS	B-312	0.05	XRF	B-31
1.20	AAS	B-216	0.33	AAS	B-14, B-91	0.05	XRF	B-44, B-73
1.20	AAS	B-328	0.25	Chem.	G-7'	0.05	XRF	B-247
1.22	AAS	B-134	0.25	Chem.	B-45	0.053	XRF	B-74
1.22	AAS	B-74	0.230	FES	B-236	0.06	XRF	B-16
1.23	AAS	0-11' A-13'	0.24	FES	B-279	0.06	XRF	S-26'
1.23	AAS	B-71	0.23	FI-AAS	B-262	0.061	XRF	B-40
1.23	AAS	B-15	0.20	FI. Photom.	B-86	0.062	XRF	B-270
1.29	AAS	B-224	0.24	FI. Photom.	B-153	0.07	XRF	B-36
1.31	AAS	B-14, B-91	0.25	FI. Photom.	B-130	0.09	XRF	B-22
1.31	AAS	B-224	0.25	FI. Photom.	B-56, B-221	0.09	XRF	B-19
1.31	AAS	B-14, B-91	0.29	FI. Photom.	B-80, B-94	0.06	XRF(Dry basis)	B-129
1.22	Chem.	G-7'	0.21	ICP	B-482	0.05	XRF(fusion)	B-70
1.27	Chem.	B-45	0.19	XRF	B-134	P (ppm)		
1.21	FES	B-279	0.20	XRF	B-43	120	ICP	B-77
1.24	FI-AAS	B-262	0.20	XRF	B-22	200	OES	B-208
1.16	FI. Photom.	B-86	0.21	XRF	B-36	230	Photom.	B-97
1.19	FI. Photom.	B-80, B-94	0.22	XRF	B-31	223	SIMS	B-337
1.22	FI. Photom.	B-130	0.22	XRF	B-270	275	XRF	B-25
1.23	FI. Photom.	B-56, B-221	0.22	XRF	B-25	S03		
1.24	FI. Photom.	B-153	0.24	XRF	B-90			
1.09	ICP	B-192	0.24	XRF	B-16			
1.10	ICP	B-482	0.24	XRF	B-44, B-73			
0.982	INAA	B-447	0.24	XRF	T-37'			
1.27	INAA	B-270	0.25	XRF	B-40	0.46	XRF	B-36
1.30	NAA	B-277	0.26	XRF	B-247	L. O. I.		
1.29	PAA	B-55	0.26	XRF	B-19			
1.00	XRF	B-22	0.26	XRF	B-15	0.43	Grav.	T-37'
1.08	XRF	B-25	0.28	XRF	Y-8'	0.50	Grav.	B-129
1.09	XRF	S-26'	0.24	XRF(Dry basis)	B-129	0.56	Grav.	B-16
1.10	XRF	B-16	0.25	XRF(fusion)	B-70	0.61	Grav.	B-224
1.11	XRF	B-110, Y-8'	0.24	γ cntg.	B-237	0.62	Grav.	B-25
1.14	XRF	B-19	0.24	γ cntg.	B-273	0.64	Grav.	B-19
1.18	XRF	B-270	0.26	γ cntg.	B-41	1.54	Grav.	B-134
1.19	XRF	B-44, B-73	K			1.66	Grav.	B-15
1.19	XRF	B-36				1.70	Grav.	B-31
1.19	XRF	T-37'	0.1280	AAS	B-77	-0.21	Grav.	B-36
1.23	XRF	B-247	0.192	AAS	B-97	-0.25	Grav.	B-70
1.31	XRF	B-31	0.2160	IDMS	B-48			

Major elements in 17 GSI rock reference samples (Terashima et al.)

Table A-14 Individual data for JGB-1

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
<u>T-H2O</u>								
1.27	Coul.	B-270						
1.35	Grav.	B-216						
1.45	Grav.	B-153						
<u>H2O+</u>								
1.30	AAS	T-41'						
1.23	Chem.	0-11' A-13'						
1.08	Coul.	B-270						
1.09	Grav.	B-71						
1.16	Grav.	B-56, B-221						
1.21	Grav.	B-25						
1.39	Grav.	B-153						
1.47	Grav.	B-80, B-94						
1.67	Grav.	B-45						
1.11	KF	B-14, B-91						
1.26	KF	B-97						
1.36	Tit	B-482						
<u>H2O-</u>								
0.09	AAS	T-41'						
0.04	Chem.	0-11' A-13'						
0.20	Chem.	G-7'						
0.19	Coul.	B-270						
0.14	Grav.	B-482						
0.06	Grav.	B-153						
0.07	Grav.	B-45						
0.09	Grav.	B-22						
0.10	Grav.	B-74						
0.10	Grav.	B-71						
0.10	Grav.	B-86						
0.12	Grav.	B-16						
0.14	Grav.	B-25						
0.20	Grav.	B-56, B-221						
0.20	Grav.	B-130						
0.26	Grav.	B-80, B-94						
0.18	KF	B-14, B-91						
<u>CO2</u>								
0.06	Chem.	B-45						
0.066	Chem.	G-7'						
0.12	Chem.	B-36						
0.12	Chem.	B-25						
0.066	Conduct.	B-130						

Table A-15 Individual data for JP-1

% Method Code No.			% Method Code No.			% Method Code No.		
SiO2			0.58	ICP	B-434	3.09	Chem.	B-39
			0.60	ICP	B-476	FeO		
42.55	AAS	B-216	0.63	INAA	B-270	6.01	Chem.	B-312
42.80	AAS	B-434	0.88	INAA	B-447	6.06	Chem.	B-52
43.15	AAS	B-134	0.28	XRF	B-15	5.85	Photom.	B-216
41.73	Chem.	B-52	0.57	XRF	B-25	5.90	Photom.	B-270
42.11	Grav.	B-224	0.58	XRF	B-434	6.75	Photom.	B-123
42.39	Grav. & AAS	B-167	0.60	XRF	B-43	5.28	Vol.	B-279
42.27	ICP	B-476	0.62	XRF	B-270	5.40	Vol.	B-36
42.07	Photom.	B-279	0.62	XRF	B-247	5.73	Vol.	B-167
41.83	XRF	B-64	0.63	XRF	B-31	5.76	Vol.	B-224
41.93	XRF	B-134	0.65	XRF	B-36	6.02	Vol.	B-25
41.94	XRF	B-201	0.66	XRF	B-44, B-73	6.09	Vol.	B-134
42.00	XRF	B-25	0.69	XRF	B-40	6.36	Vol.	B-31
42.00	XRF	B-15	0.77	XRF	B-16	6.61	Vol.	B-15
42.03	XRF	B-31	0.81	XRF	B-134	Fe		
42.05	XRF	B-44, B-73	0.83	XRF	B-201	5.8	INAA	B-230
42.39	XRF	B-247	0.90	XRF	B-64	5.96	INAA	B-324
42.53	XRF	B-16	0.99	XRF	B-19	6.0	INAA	B-244
42.53	XRF	B-40	0.68	XRF(Dry basis)	B-129	6.4	INAA	B-308
42.66	XRF	B-36	0.71	XRF(fusion)	B-70	5.69	NAA	B-287
42.80	XRF	B-270	Al			5.73	Photom.	B-51
43.22	XRF	B-434	0.3	INAA	B-308	MnO		
43.79	XRF	B-43	T-Fe203			0.108	AAS	B-216
42.13	XRF(Dry basis)	B-129	8.22	AAS	B-134	0.11	AAS	B-224
42.2	XRF(fusion)	B-70	8.3	AAS	B-279	0.116	AAS	B-167
TiO2			8.34	AAS	B-167	0.116	AAS	B-134
0.01	AAS	B-216	8.34	AAS	B-328	0.116	AAS	B-328
0.02	AAS	B-134	8.17	Chem.	B-52	0.12	AAS	B-15
<0.01	AAS	B-167	7.78	INAA	B-270	0.13	AAS	B-312
0.02	Chem.	B-39	8.35	INAA	B-447	0.13	Chem.	B-52
<0.05	Chem.	B-52	8.41	INAA	B-118	0.13	Chem.	B-39
<0.01	ICP	B-476	8.32	NAA	B-277	0.096	FI-Photom.	B-261
<1.2	INAA	B-270	8.14	Photm(FI)	B-462	0.12	ICP	B-476
0.009	Photom.	B-224	8.17	Photom.	B-123	0.120	INAA	B-270
0.02	Photom.	B-279	8.29	Photom.	B-224	0.125	INAA	B-447
0.003	XRF	B-270	8.35	Photom.	B-216	0.122	NAA	B-277
0.01	XRF	B-15	8.20	XRF	B-434	0.09	XRF	B-43
0.01	XRF	B-43	8.29	XRF	B-134	0.11	XRF	B-201
0.01	XRF	B-134	8.34	XRF	B-247	0.12	XRF	B-247
0.013	XRF	B-40	8.40	XRF	B-15	0.122	XRF	B-40
0.02	XRF	B-201	8.41	XRF	B-201	0.126	XRF	B-270
0.02	XRF	B-25	8.50	XRF	B-36	0.13	XRF	B-44, B-73
0.02	XRF	B-19	8.58	XRF	B-16	0.13	XRF	B-31
0.03	XRF	B-64	8.67	XRF	B-270	0.13	XRF	B-434
0.03	XRF	B-16	8.83	XRF	B-19	0.13	XRF	B-19
<0.01	XRF	B-36	8.89	XRF	B-64	0.13	XRF	B-64
<0.01	XRF	B-247	8.30	XRF(Dry basis)	B-129	0.13	XRF	B-16
<0.01	XRF	B-44, B-73	8.60	XRF(fusion)	B-70	0.12	XRF(Dry basis)	B-129
0.01	XRF(fusion)	B-70	Fe203			0.13	XRF(fusion)	B-70
Ti			1.05	Calc.	B-15	Mn		
<0.0171	INAA	B-308	1.46	Calc.	B-134	0.0810	AAS	B-25
Al2O3			1.53	Calc.	B-134	0.085	INAA	B-308
0.60	AAS	B-216	1.54	Calc.	B-312	0.097	INAA	B-230
0.61	AAS	B-279	1.85	Calc.	B-216	0.097	INAA	B-244
0.62	AAS	B-167	1.97	Calc.	B-167	0.095	NAA	B-287
0.67	AAS	B-312	2.09	Calc.	B-31	0.0921	XRF(fusion)	B-36
0.73	AAS	B-134	2.11	Calc.	B-270			
0.53	Chem.	B-52	2.50	Calc.	B-36			
0.56	Chem.	B-39	2.57	Calc.	B-25			

Major elements in 17 GSJ rock reference samples (Terashima et al.)

Table A-15 Individual data for JP-1

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
0.0944	XRF(powder)	B-36				34.4	NAA	B-275
			Na2O			40	NAA	B-287
MgO						P205		
43.53	AAS	B-312	0.018	AAS	B-216			
44.06	AAS	B-15	0.02	AAS	B-15	0.07	Chem.	B-39
44.50	AAS	B-216	0.021	AAS	B-167	<0.05	Chem.	B-52
44.6	AAS	B-279	0.026	AAS	B-328	<0.01	ICP	B-476
44.72	AAS	B-167	0.06	AAS	B-224	0.0015	Photom.	B-224
44.72	AAS	B-328	0.07	AAS	B-312	0.01	Photom.	B-15
44.86	AAS	B-134	0.01	Chem.	B-134	0.01	Photom.	B-134
43.9	Chem.	B-52	<0.1	Chem.	B-39	0.015	Photom.	B-216
45.15	ICP	B-476	0.027	FES	B-52	0.02	Photom.	B-279
44.76	Vol.	B-224	0.02	ICP	B-279	<0.01	Photom.	B-167
42.96	XRF	B-434	0.022	INAA	B-476	0.002	XRF	B-40
43.50	XRF	B-64	0.051	INAA	B-270	0.01	XRF	B-19
44.35	XRF	B-270	0.035	NAA	B-447	0.01	XRF	B-16
44.38	XRF	B-25	0.015	XRF	B-277	0.015	XRF	B-270
44.72	XRF	B-247	0.021	XRF	B-40	0.02	XRF	B-36
44.74	XRF	B-201	0.03	XRF	B-247	<0.01	XRF	B-43
44.80	XRF	B-134	0.03	XRF	B-64	<0.01	XRF	B-44, B-73
44.81	XRF	B-31	0.04	XRF	B-44, B-73	<0.01	XRF	B-201
44.94	XRF	B-16	0.05	XRF	B-31	<0.01	XRF	B-19
45.04	XRF	B-40	0.07	XRF	B-201	0.02	XRF(fusion)	B-70
45.34	XRF	B-36	0.30	XRF	B-270			
46.05	XRF	B-44, B-73	<0.01	XRF	B-25	P	(ppm)	
45.12	XRF(Dry basis)	B-129	<0.08	XRF	B-43	<100	OES	B-208
44.90	XRF(fusion)	B-70	<0.10	XRF	B-16	12	XRF	B-25
Mg			0.12	XRF(Dry basis)	B-129			
			0.10	XRF(fusion)	B-70			
27.0	INAA	B-308	Na			S03		
CaO			<0.038	INAA	B-308	<0.02	XRF	B-36
0.53	AAS	B-224	K2O			L. O. I.		
0.535	AAS	B-134	0.003	AAS	B-167	2.01	Grav.	B-36
0.55	AAS	B-216	0.003	AAS	B-328	2.19	Grav.	B-129
0.56	AAS	B-167	0.003	AAS	B-224	2.29	Grav.	B-16
0.56	AAS	B-328	0.0075	AAS	B-216	2.38	Grav.	B-19
0.58	AAS	B-312	0.015	AAS	B-216	2.52	Grav.	B-224
0.61	AAS	B-279	0.015	AAS	B-134	2.60	Grav.	B-70
0.56	Chem.	B-52	0.02	AAS	B-312	2.83	Grav.	B-25
0.51	ICP	B-476	0.01	Chem.	B-39	3.38	Grav.	B-134
0.56	INAA	B-270	<0.1	Chem.	B-52	3.41	Grav.	B-15
0.40	XRF	B-40	0.004	FES	B-279	3.60	Grav.	B-39
0.42	XRF	B-43	<0.01	ICP	B-476	3.60	Grav.	B-31
0.46	XRF	B-36	<0.48	INAA	B-270	4.44	Grav.	B-64
0.53	XRF	B-270	0.003	XRF	B-247			
0.54	XRF	B-134	0.006	XRF	B-43	T-H20		
0.54	XRF	B-44, B-73	0.006	XRF	B-270	2.77	Coul.	B-270
0.54	XRF	B-434	0.009	XRF	B-40	0.46	Grav.	B-224
0.55	XRF	B-25	0.01	XRF	B-16	2.90	Grav.	B-216
0.55	XRF	B-15	0.02	XRF	B-25			
0.56	XRF	B-247	0.02	XRF	B-19			
0.57	XRF	B-19	0.03	XRF	B-15	H20+		
0.57	XRF	B-201	0.03	XRF	B-64	2.33	Coul.	B-270
0.57	XRF	B-16	<0.01	XRF	B-44, B-73	2.23	Grav.	B-36
0.62	XRF	B-64	<0.01	XRF	B-201	2.34	Grav.	B-312
0.63	XRF	B-31	<0.01	XRF	B-36	2.37	Grav.	B-52
0.55	XRF(Dry basis)	B-129	0.01	XRF(fusion)	B-70	2.40	Grav.	B-25
0.58	XRF(fusion)	B-70	0.044	r cntg.	B-41	2.68	Grav.	B-167
Ca			K	(ppm)				
0.38	INAA	B-308	<30	INAA	B-308	H20-		

Table A-15 Individual data for JP-1

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
0.44	Coul.	B-270						
0.34	Grav.	B-52						
0.37	Grav.	B-134						
0.40	Grav.	B-167						
0.48	Grav.	B-16						
0.53	Grav.	B-25						
0.54	Grav.	B-312						
<u>CO2</u>								
0.28	Chem.	B-25						
0.38	Chem.	B-36						
0.24	com-IR-abs.	B-312						

Table A-16 Individual data for JR-1

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
0.23	Chem.	B-56, B-221	0.08	ICP-MS	B-320	0.12	XRF	B-18
0.28	Chem.	B-45	0.094	INAA	B-270	0.13	XRF	B-87
0.31	Vol.	B-14, B-91	0.115	INAA	B-447	0.19	XRF	B-16
0.42	Vol.	B-71	0.097	INAA(epi)	B-18	0.08	XRF(Dry basis)	B-129
0.47	Vol.	B-153	0.0920	NAA	B-277	0.05	XRF(fusion)	B-70
			0.088	PAA	B-55			
Fe0			0.10	Photom.	B-153	Mg		
			0.10	Photom.	B-14, B-91	0.0697	ICP	B-77
0.26	Chem.	B-39	0.11	Photom.	B-130	0.0558	SIMS	B-337
0.55	Chem.	B-45	0.094	XRF	B-16			
0.61	Chem.	B-56, B-221	0.10	XRF	B-90	CaO		
0.45	Photom.	B-216	0.10	XRF	B-44, B-73	0.63	AAS	B-224
0.47	Photom.	B-270	0.10	XRF	B-247	0.66	AAS	B-130
0.50	Photom.	B-123	0.10	XRF	B-43	0.66	AAS	B-93
0.46	Vol.	B-482	0.10	XRF	B-19	0.66	AAS	B-312
0.39	Vol.	B-36	0.10	XRF	B-18	0.67	AAS	B-71
0.40	Vol.	B-18	0.10	XRF	B-87	0.69	AAS	B-328
0.41	Vol.	B-71	0.10	XRF	B-31	0.7	AAS	B-216
0.41	Vol.	B-15	0.100	XRF	B-270	0.71	AAS	B-134
0.43	Vol.	B-153	0.101	XRF	B-40	0.72	AAS	B-279
0.44	Vol.	B-93	0.11	XRF	B-67	0.61	Chem.	B-56, B-221
0.47	Vol.	B-224	0.11	XRF(Dry basis)	B-129	0.65	Chem.	B-39
0.49	Vol.	B-25	0.10	XRF(fusion)	B-70	0.72	Chem.	B-45
0.52	Vol.	B-80, B-94	Mn			0.60	Grav.	B-153
0.56	Vol.	B-312	0.0750	AAS	B-25	0.85	Grav.	B-80, B-94
0.59	Vol.	B-130	0.0844	AAS	B-128	0.62	ICP	B-482
0.61	Vol.	B-134	0.0711	ICP	B-77	0.69	ICP	B-192
0.66	Vol.	B-31	0.083	NAA	B-287	0.73	ICP	B-311
0.69	Vol.	B-14, B-91	0.10	NAA	B-11	0.61	ICP-MS	B-320
Fe			0.0755	SIMS	B-337	0.59	INAA	B-18
0.584	ICP	B-77	0.0801	XRF	B-130	0.69	PAA	B-55
0.61	INAA	B-24	0.10	XRF	B-11	0.75	Vol.	B-14, B-91
0.62	INAA	B-324	0.0741	XRF(fusion)	B-36	0.52	XRF	B-43
0.64	INAA	B-37-1	0.0823	XRF(powder)	B-36	0.62	XRF	B-36
0.64	INAA	B-310	MgO			0.62	XRF	B-67
0.63	NAA	B-11	0.07	AAS	B-216	0.63	XRF	B-247
0.68	NAA	B-287	0.11	AAS	B-93	0.63	XRF	B-90
0.63	Photom.	B-51	0.11	AAS	B-328	0.67	XRF	B-16
0.7772	SIMS	B-337	0.12	AAS	B-134	0.68	XRF	B-19
0.46	XRF	B-11	0.12	AAS	B-312	0.68	XRF	B-270
0.50	XRF	B-84	0.12	AAS	B-129	0.68	XRF	B-44, B-73
MnO			0.12	AAS	B-15	0.69	XRF	B-87
0.11		B-146	0.12	AAS	B-224	0.69	XRF	B-40
0.07	AAS	B-312	0.12	AAS	B-71	0.69	XRF	B-15
0.095	AAS	B-279	0.120	AAS	B-84	0.71	XRF	B-25
0.096	AAS	B-84	0.14	AAS	B-130	0.71	XRF	B-18
0.097	AAS	B-134	0.14	AAS	B-279	0.73	XRF	B-31
0.097	AAS	B-93	0.14	AAS	B-56, B-221	0.80	XRF	B-84
0.10	AAS	B-71	0.12	Chem.	B-56, B-221	0.69	XRF(Dry basis)	B-129
0.10	AAS	B-80, B-94	0.13	Chem.	B-45	0.51	XRF(fusion)	B-70
0.10	AAS	B-328	0.11	Grav.	B-14, B-91	Ca		
0.10	AAS	B-15	0.12	Grav.	B-153	0.2700	AAS	B-77
0.103	AAS	B-216	0.19	Grav.	B-80, B-94	0.4177	SIMS	B-337
0.11	AAS	B-224	0.11	ICP	B-482	0.73	XRF	B-11
0.10	Chem.	B-56, B-221	0.127	ICP	B-311	Na2O		
0.10	Chem.	B-39	0.13	ICP	B-192	3.67		B-146
0.10	Chem.	B-45	0.11	ICP-MS	B-320	3.90	AAS	B-71
0.095	FI-Photom.	B-261	0.16	PAA	B-55	3.92	AAS	B-93
0.09	ICP	B-482	0.05	XRF	B-40	3.95	AAS	B-134
0.099	ICP	B-192	0.08	XRF	B-31			
0.100	ICP	B-18	0.09	XRF	B-67			
0.100	ICP	B-311	0.09	XRF	B-247			
			0.11	XRF	B-44, B-73			

Table A-16 Individual data for JR-1

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
0.36	Grav	B-482						
0.14	Grav.	B-56, B-221						
0.14	Grav.	B-16						
0.17	Grav.	B-45						
0.18	Grav.	B-71						
0.19	Grav.	B-153						
0.23	Grav.	B-130						
0.24	Grav.	B-80, B-94						
0.24	Grav.	B-312						
0.25	Grav.	B-93						
0.27	Grav.	B-134						
0.10	KF	B-14, B-91						
<hr style="width: 50px; margin-left: 0;"/>								
CO2								
0.001	Chem.	B-45						
0.04	Chem.	B-25						
0.06	Chem.	B-36						
<0.07	Conduct.	B-130						

Major elements in 17 GSF rock reference samples (Terashima et al.)

Table A-17 Individual data for JR-2

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
<u>SiO₂</u>						0.84	Photom.	B-216
75.39	AAS	B-134	<u>Ti</u>			0.85	Vol.	B-153
75.45	AAS	B-216	0.0307	ICP	B-77	0.60	XRF	B-270
75.40	Chem.	B-56, B-221	0.0431	SIMS	B-337	0.70	XRF	B-25
76.26	Chem.	B-45	0.0425	XRF	B-130	0.70	XRF	B-40
75.22	Grav.	B-153	<u>Al₂O₃</u>			0.74	XRF	B-19
75.40	Grav.	B-80, B-94	13.39		B-146	0.74	XRF	B-36
75.40	Grav.	B-14, B-91	12.10	AAS	B-74	0.75	XRF	B-31
75.54	Grav.	B-224	12.75	AAS	B-216	0.75	XRF	B-90
76.37	Grav.	B-74	13.0	AAS	B-279	0.75	XRF	B-134
75.86	Grav. & Photom.	B-130	13.02	AAS	B-134	0.78	XRF	B-44, B-73
75.25	ICP	B-476	12.72	Chem.	B-45	0.79	XRF	B-15
75.65	IDMS	B-48	13.13	Chem.	B-56, B-221	0.80	XRF	B-43
75.40	Photom.	B-86	12.96	Grav.	B-80, B-94	0.86	XRF	B-247
75.49	Photom.	B-279	13.07	Grav.	B-153	0.87	XRF	B-16
74.94	XRF	B-40	13.12	Grav.	B-14, B-91	0.73	XRF(Dry basis)	B-129
75.29	XRF	B-134	12.62	ICP	B-192	0.84	XRF(fusion)	B-70
75.46	XRF	B-16	12.77	ICP	B-476	<u>Fe₂O₃</u>		
75.60	XRF	B-22	12.87	INAA	B-270	0.12	Calc.	B-270
75.65	XRF	B-247	12.1	NAA	B-55	0.13	Calc.	B-134
75.71	XRF	B-90	12.29	Photom.	B-86	0.14	Calc.	B-134
75.80	XRF	B-36	13.3	Photom.	B-51	0.19	Calc.	B-31
75.88	XRF	B-25	12.74	Vol.	B-130	0.22	Calc.	B-25
76.05	XRF	B-15	12.81	Vol.	B-224	0.23	Calc.	B-22
76.06	XRF	B-270	12.38	XRF	B-31	0.34	Calc.	B-36
76.07	XRF	B-97	12.41	XRF	B-90	0.39	Calc.	B-80, B-94
76.20	XRF	B-31	12.42	XRF	B-270	0.41	Calc.	B-15
76.40	XRF	B-19	12.49	XRF	B-22	0.45	Calc.	B-216
75.85	XRF(Dry basis)	B-129	12.50	XRF	B-97	0.18	Chem.	B-56, B-221
75.9	XRF(fusion)	B-70	12.59	XRF	B-15	0.22	Chem.	B-45
<u>Si</u>			12.60	XRF	B-25	0.35	Vol.	B-14, B-91
35.3758	SIMS	B-337	12.63	XRF	B-44, B-73	0.46	Vol.	B-153
			12.63	XRF	B-43	<u>Fe₀</u>		
<u>TiO₂</u>			12.63	XRF	B-16	0.42	Chem.	B-45
0.06	AAS	B-134	12.71	XRF	B-36	0.59	Chem.	B-56, B-221
0.07	Chem.	B-56, B-221	12.82	XRF	B-134	0.35	Photom.	B-216
0.08	Chem.	B-45	12.82	XRF	B-247	0.43	Photom.	B-123
0.058	ICP	B-192	12.99	XRF	B-40	0.43	Photom.	B-270
0.07	ICP	B-476	13.00	XRF	B-19	0.43	Photom.	B-270
0.060	PAA	B-55	12.72	XRF(Dry basis)	B-129	0.32	Vol.	B-80, B-94
0.05	Photom.	B-279	12.78	XRF(fusion)	B-70	0.34	Vol.	B-15
0.05	Photom.	B-14, B-91	<u>Al</u>			0.35	Vol.	B-153
0.06	Photom.	B-224	6.1900	ICP	B-77	0.36	Vol.	B-36
0.07	Photom.	B-86	6.7213	SIMS	B-337	0.41	Vol.	B-86
0.07	Photom.	B-130	<u>T-Fe₂O₃</u>			0.43	Vol.	B-25
0.08	Photom.	B-153	0.74	AAS	B-134	0.43	Vol.	B-224
0.05	XRF	B-31	0.75	AAS	B-328	0.47	Vol.	B-130
0.05	XRF	B-22	0.75	AAS	B-86	0.50	Vol.	B-31
0.058	XRF	B-270	0.81	AAS	B-279	0.52	Vol.	B-22
0.06	XRF	B-74	0.73	ICP	B-192	0.55	Vol.	B-134
0.06	XRF	B-36	0.80	ICP	B-476	0.64	Vol.	B-14, B-91
0.06	XRF	B-90	0.734	INAA	B-447	<u>Fe</u>		
0.06	XRF	B-15	0.79	INAA	B-118	0.50	AAS	B-74
0.06	XRF	B-44, B-73	0.81	INAA	B-270	0.4910	ICP	B-77
0.06	XRF	B-134	0.73	NAA	B-277	0.52	INAA	B-324
0.07	XRF	B-25	0.88	PAA	B-55	0.54	INAA	B-24
0.07	XRF	B-43	0.75	Photom.	B-123	0.54	INAA	B-310
0.08	XRF	B-19	0.81	Photom.	B-130	0.54	INAA	B-37-1
0.08	XRF	B-16	0.79	Photom.	B-224	0.60	INAA	B-244
0.08	XRF	B-16	0.79	Photom.	B-224	0.61	INAA	B-230
0.09	XRF	B-247				0.55	NAA	B-11
0.06	XRF(Dry basis)	B-129						
0.08	XRF(fusion)	B-70						

Table A-17 Individual data for JR-2

%	Method	Códe No.	%	Method	Code No.	%	Method	Code No.
0.53	Photom.	B-51	0.03	Chem.	B-45	3.97	AAS	B-15
0.5927	SIMS	B-337	0.04	Chem.	B-56, B-221	3.98	AAS	B-134
0.39	XRF	B-11	0.04	Grav.	B-153	4.02	AAS	B-328
0.51	XRF	B-97	0.05	Grav.	B-14, B-91	4.07	AAS	B-224
MnO			0.041	ICP	B-192	4.10	AAS	B-216
0.10	AAS	B-74	0.072	PAA	B-55	4.15	AAS	B-14, B-91
0.10	AAS	B-224	0.01	XRF	B-31	3.93	Chem.	B-45
0.108	AAS	B-216	0.02	XRF	B-90	3.95	FES	B-279
0.108	AAS	B-134	0.04	XRF	B-44, B-73	4.05	FI-AAS	B-262
0.11	AAS	B-279	0.04	XRF	B-40	3.83	Fl. Photom.	B-80, B-94
0.11	AAS	B-328	0.05	XRF	B-247	3.83	Fl. Photom.	B-86
0.12	AAS	B-15	0.08	XRF	B-25	3.96	Fl. Photom.	B-153
0.12	AAS	B-86	0.05	XRF(Dry basis)	B-129	4.02	Fl. Photom.	B-56, B-221
0.12	AAS	B-80, B-94	0.05	XRF(fusion)	B-70	4.10	Fl. Photom.	B-130
0.11	Chem.	B-56, B-221	Mg			3.88	ICP	B-192
0.11	Chem.	B-45	2.1300	ICP	B-77	3.97	ICP	B-476
0.110	FI-Photom.	B-261	0.0282	SIMS	B-337	3.88	INAA	B-447
0.11	ICP	B-476	CaO			4.10	INAA	B-270
0.11	ICP	B-192	0.45	AAS	B-216	4.29	NAA	B-277
0.109	INAA	B-270	0.49	AAS	B-74	3.90	PAA	B-55
0.110	INAA	B-447	0.51	AAS	B-86	3.39	XRF	B-43
0.117	NAA	B-277	0.51	AAS	B-224	3.64	XRF	B-22
0.097	PAA	B-55	0.51	AAS	B-328	3.65	XRF	B-90
0.11	Photom.	B-14, B-91	0.51	AAS	B-134	3.91	XRF	B-16
0.11	Photom.	B-153	0.56	AAS	B-279	3.92	XRF	B-36
0.12	Photom.	B-130	0.45	Chem.	B-56, B-221	3.98	XRF	B-25
0.11	XRF	B-16	0.60	Chem.	B-45	3.98	XRF	B-270
0.11	XRF	B-90	0.48	Grav.	B-153	4.01	XRF	B-40
0.11	XRF	B-19	0.43	ICP	B-476	4.03	XRF	B-247
0.11	XRF	B-247	0.53	ICP	B-192	4.10	XRF	B-31
0.111	XRF	B-40	0.41	INAA	B-270	4.18	XRF	B-110
0.112	XRF	B-270	0.54	PAA	B-55	4.27	XRF	B-44, B-73
0.12	XRF	B-43	0.49	Vol.	B-130	4.21	XRF	B-19
0.12	XRF	B-44, B-73	0.51	Vol.	B-14, B-91	4.05	XRF(Dry basis)	B-129
0.13	XRF(Dry basis)	B-129	0.32	XRF	B-43	4.14	XRF(fusion)	B-70
0.11	XRF(fusion)	B-70	0.43	XRF	B-36	Na		
Mn			0.45	XRF	B-247	2.91	AAS	B-97
0.0830	AAS	B-25	0.46	XRF	B-90	3.6300	ICP	B-77
0.0788	ICP	B-77	0.48	XRF	B-270	3.02	INAA	B-37-1
0.096	INAA	B-244	0.49	XRF	B-134	3.02	INAA	B-310
0.096	INAA	B-230	0.49	XRF	B-16	3.05	INAA	B-24
0.15	NAA	B-11	0.49	XRF	B-44, B-73	3.08	INAA	B-230
0.0851	SIMS	B-337	0.50	XRF	B-15	3.08	INAA	B-244
0.0930	XRF	B-130	0.50	XRF	B-19	3.08	INAA	B-324
0.115	XRF	B-97	0.51	XRF	B-25	3.08	NAA	B-11
0.12	XRF	B-11	0.52	XRF	B-40	3.7861	SIMS	B-337
0.0824	XRF(fusion)	B-36	0.55	XRF	B-31	K2O		
0.0921	XRF(powder)	B-36	0.60	XRF	B-22	4.42	AAS	B-134
MgO			0.606	XRF	B-97	4.44	AAS	B-14, B-91
0.03	AAS	B-129	0.50	XRF(Dry basis)	B-129	4.45	AAS	B-216
0.04	AAS	B-224	0.54	XRF(fusion)	B-70	4.51	AAS	B-74
0.04	AAS	B-15	Ca			4.54	AAS	B-328
0.04	AAS	B-328	0.0180	AAS	B-77	4.59	AAS	B-224
0.04	AAS	B-279	0.3538	SIMS	B-337	4.56	Chem.	B-45
0.04	AAS	B-74	0.77	XRF	B-11	4.48	FES	B-279
0.04	AAS	B-86	Na2O			4.51	FES	B-236
0.044	AAS	B-97	3.84		B-146	4.36	FI-AAS	B-262
0.045	AAS	B-134	3.95	AAS	B-74	4.21	Fl. Photom.	B-80, B-94
0.055	AAS	B-216				4.42	Fl. Photom.	B-86
0.06	AAS	B-130				4.44	Fl. Photom.	B-130
						4.47	Fl. Photom.	B-153
						4.52	Fl. Photom.	B-56, B-221

Major elements in 17 GSJ rock reference samples (Terashima et al.)

Table A-17 Individual data for JR-2

%	Method	Code No.	%	Method	Code No.	%	Method	Code No.
4.22	ICP	B-192	S03					
4.38	ICP	B-476						
4.30	INAA	B-447	<0.02	XRF	B-36			
4.48	INAA	B-270						
4.74	NAA	B-277	L. O. I.					
4.35	XRF	B-90						
4.38	XRF	B-40	1.10	Grav.	B-36			
4.38	XRF	B-270	1.17	Grav.	B-70			
4.38	XRF	B-44, B-73	1.32	Grav.	B-129			
4.41	XRF	B-22	1.46	Grav.	B-16			
4.44	XRF	B-31	1.58	Grav.	B-15			
4.45	XRF	B-25	1.60	Grav.	B-31			
4.45	XRF	B-15	1.60	Grav.	B-224			
4.46	XRF	B-134	1.61	Grav.	B-25			
4.48	XRF	B-247	1.75	Grav.	B-134			
4.48	XRF	B-36	1.42	XRF	B-19			
4.54	XRF	B-16						
4.54	XRF	B-19	T-H20					
4.56	XRF	B-43						
4.55	XRF(Dry basis)	B-129	1.50	Coul.	B-270			
4.73	XRF(fusion)	B-70	1.35	Grav.	B-216			
4.08	r cntg.	B-41	1.58	Grav.	B-153			
4.41	r cntg.	B-237						
4.54	r cntg.	B-273	H20+					
K			1.38	Coul.	B-270			
			0.98	Grav.	B-56, B-221			
3.67	AAS	B-97	1.02	Grav.	B-45			
4.4300	ICP	B-77	1.07	Grav.	B-22			
3.7000	IDMS	B-438	1.09	Grav.	B-36			
3.7200	IDMS	B-48	1.20	Grav.	B-80, B-94			
3.77	INAA	B-230	1.30	Grav.	B-25			
3.77	INAA	B-244	1.32	Grav.	B-153			
3.84	INAA	B-310	1.38	Grav.	B-86			
3.84	INAA	B-37-1	1.15	KF	B-14, B-91			
3.50	NAA	B-11	1.21	KF	B-97			
4.0741	SIMS	B-337						
3.98	XRF	B-11	H20-					
P205			0.12	Coul.	B-270			
			0.14	Grav.	B-16			
0.01	Chem.	B-45	0.16	Grav.	B-45			
0.01	Chem.	B-56, B-221	0.18	Grav.	B-86			
0.02	FI-Photom.	B-254	0.22	Grav.	B-134			
0.005	ICP	B-192	0.23	Grav.	B-74			
0.02	ICP	B-476	0.24	Grav.	B-130			
0.006	Photom.	B-224	0.26	Grav.	B-153			
0.01	Photom.	B-15	0.31	Grav.	B-22			
0.015	Photom.	B-216	0.32	Grav.	B-25			
0.02	Photom.	B-80, B-94	0.19	KF	B-14, B-91			
0.01	Vol.	B-14, B-91						
0.003	XRF	B-74	CO2					
0.01	XRF	B-247						
0.01	XRF	B-16	0.03	Chem.	B-25			
0.014	XRF	B-270	0.05	Chem.	B-36			
0.016	XRF	B-40	<0.01	Chem.	B-45			
0.01	XRF(Dry basis)	B-129	<0.07	Conduct.	B-130			
0.01	XRF(fusion)	B-70						
P (ppm)								
52	ICP	B-77						
<100	OES	B-208						
63	SIMS	B-337						
2.2	XRF	B-25						

Bulletin of the Geological Survey of Japan, Vol.45, No.6

Code	Analyst	Year	Title	Journal	Vol	Page
A-2'	T. Abe	1978	Personal communication, Geological Survey of Japan.			
A-9'	B. Ayranci	1977	The major-, minor-, and trace-element analysis of silicate rocks and minerals from a single sample solution.	Schweiz. Mineral. Petrogr. Mitt.	57	299-312
A-10'	A. Ando, T. Ohmori and S. Terashima	1983	New GSJ silicate rock reference samples and their chemical compositions.	1983 Annual Meet. Japan Geoch. Soc.		168-169
A-11	T. Abe	1970	Personal communication, Geological Survey of Japan.			
A-13	Y. Ueda, K. Aoki, H. Onuki, and Y. Kato	1969	Analytical data on the geochemical standards JB-1 basalt and JG-1 granodiorite	J. Japan Assoc. Min. Pet. Econ. Geol.	61	35-39
B'-1	P. H. Beasley	1972	Personal communication, The Australian National University, Canberra, Australia			
B'-2	Y. I. Belyaev and O. P. Sobornov	1981	Uranium, thorium and potassium in reference samples	Geost. Newsletter	5	109-111
B'-4	J. L. Bouvier	1968	Personal communication, Geological Survey of Canada			
B-1	Y. Tanizaki	1976	Personal communication, Tokyo Metro. Isot. Res. Center			
B-1'	G. M. Best, G. R. Neilsen and W. H. Brimhall	1976	Personal communication, Brigham Young Univ., Provo, Utah, U.S.A.			
B-2	S. Gohda and H. Yamazaki	1982	Heavy metal pollution in Osaka bay sediment (in Japanese with English abstract)	Rep. Atom. Ener. Res. Inst., Kinki Univ.	19	29-36
B-3	H. Wakita	1982	Personal communication, Tokyo University			
B-4	T. Kawashima	1981	Personal communication, Government Industrial Research Institute Nagoya			
B-5'	I. Gal	1983	Personal communication, Geological Survey of Israel.			
B-6-1	T. Yoshida, H. Fujimaki and K. Aoki	1981	Analysis of igneous rocks by instrumental photon-activation	Sci. Rep. Tohoku Univ. Ser. III	15	101-119
B-6-2	T. Yoshida, H. Fujimaki and K. Aoki	1982	Nondestructive multielement photon-activation analysis of rocks	Res. Rep. Lab. Nuc. Sci. Tohoku Univ.	15	224-238
B-6'	G. Bologne	1983	Personal communication, University of Liege, Belgium.			
B-7	Y. Saito	1979	Personal communication, Nihon Inspection Ltd., Tokyo Res. Center			
B-8	H. Hamaguchi, N. Nonaka, H. Fukushima and H. Higuchi	1979	Application of instrumental neutron activation analysis for environmental samples	Rep. Ministry of Educ.	1	122-124
B-10	Y. Sakakibara	1977	Personal communication, Tokyo Gakugei University			
B-11	N. Aota, T. Nikko, K. Okada, K. Sakamoto and H. Nohke	1983	Activation analysis of standard rock samples (Abst., in Japanese)	1983 Annual Meet. Japan Geoch. Soc.		170-171
B-13	H. Kobayashi, T. Watanabe and S. Iizumi	1981	A full-automatic analysis of silicate rocks by X-ray fluorescence method (in Japanese)	Mem. Fac. Sci., Shimane Univ.	15	115-124
B-14	T. Tiba	1984	Major constituents in the six new geochemical standards	Bull. Natn. Sci. Mus., Tokyo, Ser. C	10	47-48
B-15	Z. Solyom	1985	Personal communication, University of Lund, Sweden			
B-16	S. Naidoo	1985	Personal communication, The Transvaal Coal Owners Association, Richmond, South Africa			
B-18	N. W. Bower, E. S. Gladney, R. C. Hagan, P. E. Trujillo and R. G. Warren	1985	Elemental concentrations in Japanese silicate rock standards JA-1, JR-1 and JB-2	Geost. Newsletter	9	199-203
B-19	J. Etoubleau	1985	Personal communication, IFREMER, Centre de Brest, France			
B-22	I. Roelandts	1983	Personal communication, Universite de Liege, Liege, Belgium			
B-24	S. Ninomiya	1985	Personal communication, Tokyo Gakugei University			
B-25	H. A. Olszowy	1985	Personal communication, Govern. Chem. Lab., Brisbane, Australia			
B-28	J. Gill	1985	Personal communication, Earth Sciences Board, University of California			
B-31	S. A. Mertzman	1985	Personal communication, Franklin & Marshall College, Pennsylvania			
B-36	R. Kanaris-Sotiriou	1984	Personal communication, Sheffield Univ., England			

Major elements in 17 GSJ rock reference samples (Terashima et al.)

Code	Analyst	Year	Title	Journal	Vol	Page
B-37-1	T. Chunhan	1985	Personal communication, Chengdu College of Geology, China			
B-37-2	T. Chunhan	1985	Personal communication, Chengdu College of Geology, China			
B-39	V. Balaram	1985	Personal communication, National Geophysical Research Institute, India			
B-40	J. C. H. Huang	1985	Personal communication, University of Windsor, Canada			
B-41	K. L. Tan and K. Komura	1985	Personal communication, Kanazawa University			
B-43	G. Thompson	1985	Personal communication, Woods Hole Oceanographic Institution, U.S.A.			
B-44	S. Nakada, T. Yanagi, S. Maeda, D. Fang and M. Yamaguchi	1985	X-ray fluorescence analysis of major elements in silicate rocks (in Japanese with English abstract)	Sci. Repts., Dept. Geol., Kyushu Univ.	14	103-115
B-45	B. Moldan	1984	Personal communication, Geological Survey Prague, Czechoslovakia			
B-48	H. Kurasawa	1984	Strontium isotopic consequence of the volcanic rocks from Fuji, Hakone and Izu areas (in Japanese with English abstract)	Bull. Geol. Surv. Japan	35	637-659
B-49	T. Yamashige, M. Yamamoto, S. Terashima, Y. Shigetomi, A. Ando and Y. Yamamoto	1985	Determination of major and minor elements in GSJ reference rock samples (JB-1a and JG-1a) (in Japanese with English abstract)	Bunseki Kagaku	34	104-107
B-51	T. Ohmori	1982	Personal communication, Toho University			
B-52	C. Riandey	1984	Personal communication, ORSTOM, services Sci. Cent., Bondy, France			
B-55	T. Kato	1984	Personal communication, Tohoku University			
B-56	T. Yoshida and K. Aoki	1985	Photon-activation analysis of GSJ standard rocks	Res. Rep. Lab. Nuc. Sci. Tohoku Univ.	18	336-350
B-58	H. Nakahara, K. Masago, Y. Nakamura, K. Horiuchi and Y. Murakami	1980	Neutron activation analysis of Japanese standard rocks	J. Radioanal. Chem.	59	245-248
B-59	R. Kanaris-Sotiriou	1985	Personal communication, Sheffield Univ., England			
B-61	J. Etoubleau	1985	Personal communication, IFREMER, Centre de Brest, France			
B-62	D. Nielsen and C. J. Van Niekerk	1985	Personal communication, Gold Fields Laboratories, Johannesburg, South Africa			
B-63	S. A. Mertzman	1985	Personal communication, Franklin & Marshall College, Pennsylvania			
B-64	J. Kalf	1985	Personal communication, Netherlands Inst. Sea Research, Netherlands			
B-65	K. Inoue, Y. Ikeda and A. Minami	1985	Determination of Sodium, Potassium, Magnesium, Calcium, Manganese and Iron in the silicate rocks by Atomic Absorption Spectrophotometry (in Japanese)	Comm. Pub. Prof. Yoshida, H.		355-363
B-67	T. Takenaka	1985	Personal communication, Cent. Res. Lab. Idemitsukosan Ltd.			
B-70	I. W. Croudace	1984	Personal communication, University of Southampton, England			
B-71	T. Nakajima	1983	Personal communication, Geological Survey of Japan			
B-72	S. Uchiumi and K. Shibata	1980	Errors in K-Ar age determination (in Japanese with English abstract)	Bull. Geol. Surv. Japan	31	267-273
B-73	S. Nakada	1984	Personal communication, Kyushu University			
B-74	V. Sjoberg	1984	Personal communication, Rautaruukki oy, Research Centre, Raahel, Finlande			
B-75	R. Matsumoto and T. Urabe	1980	An automatic analysis of major elements in silicate rocks with X-ray fluorescence spectrometer using fused disc samples	J. Japan Assoc. Min. Pet. Econ. Geol.	75	272-278
B-77	S. Hirata	1984	Personal communication, Government Industrial Research Institute, Chugoku			
B-78-1	A. Inazumi	1982	Personal communication, Kagawa University			
B-79	R. Kuroda and I. Ida	1983	Spectrophotometric determination of Phosphorus in silicates following fusion with a mixture of Lithium carbonate/Boric acid	Fresenius Z. Anal. Chem.	31	53-54
B-80	Y. Ohba	1983	Personal communication, Yamagata University			
B-81	Y. Shirayanagi	1983	Determination of multi elements in sediments by X-ray fluorescence	Annual Rep. Yokohama Res. Inst. for Env.	8	103-110

Bulletin of the Geological Survey of Japan, Vol.45, No.6

Code	Analyst	Year	Title	Journal	Vol	Page
B-84	G. Jecko	1983	Personal communication, IRSID, Maizieres-les-Metz, France	Sci.		
B-85	O. Ujike	1982	Personal communication, Univ. Tronto, Canada			
B-86	M. Pinta	1983	Personal communication, ORSTOM, services Sci. Cent., Bondy, France			
B-87	M. Ogasawara and J. Stanley	1982	Personal communication, The University of Adelaide, Australia			
B-88	O. Ujike	1975	Personal communication, Geological Survey of Japan			
B-89	K. Ohta	1984	Personal communication, Tokyo Coal and Mineral Institute			
B-90	R. Matsumoto	1984	Personal communication, Tokyo University			
B-91	T. Tiba	1984	Personal communication, National Science Museum, Tokyo			
B-92	S. Yamazaki	1978				
B-93	B. Sulasmoro	1983	Personal communication, Mineral Technology Development Center, Bandung, Indonesia			
B-94	Y. Ohba	1983	Personal communication, Yamagata University			
B-95	T. Ohmori	1983	Spectrophotometric determination of a small amount of aluminum with stilbazo and zephiramine in alkaline solution; Determination of aluminum in standard rocks and cement(in Japanese with English abstract)	Bunseki Kagaku	32	483-487
B-96	R. J. Parker	1982	Single pass major element X-ray fluorescence analysis of silicate rock samples using a Philips 1212 spectrometer	X-ray Spectrometry	11	100-108
B-97	G. Jecko	1983	Personal communication, IRSID, Maizieres-les-Metz, France			
B-98	S. Tanaka, S. Shibata, P. Y. Chen, C. H. Ke and S. J. Yeh	1977	Depth profiles of chemical elements in pelagic clay sediments	Geoch. J.	11	171-176
B-100	S. Nohda	1982	Personal communication, Kyoto Sangyo University			
B-102	K. Nagao and T. Itatani	1983	Personal communication, Okayama University of Science			
B-104	A. Ueda	1982	Personal communication, Okayama University			
B-105	M. Tuchiya	1975	Personal communication, Res. Center Jujo Paper Co. Ltd.			
B-106	J. Yamamoto	1975	Personal communication, Kochi Pref. Res. Center Env. Prot.			
B-109	S. Terashima, H. Gotoh, T. Tanaka and H. Kanaya	1975	Personal communication, Geological Survey of Japan			
B-110	A. Yoshioka	1983	Personal communication, Cent. Res. Institute, Mitsubishi Metal Co.			
B-111	T. Takamatsu	1978	Multi-element analyses of rock and sediment samples by non-dispersive X-ray fluorescence (in Japanese with English abstract)	Bunseki Kagaku	27	193-198
B-114	H. Takagi and H. Sugiyama	1978	Personal communication, Kanagawa Prefectural Public Health Laboratory			
B-118	P. J. Potts and N. W. Rogers	1986	Instrumental neutron activation analysis of nine new reference materials from the Geological Survey of Japan	Geost. Newsletter	10	121-125
B-119	T. Okai and T. Fujinuki	1986	Determination of total iron in silicate and aluminous silicate by EDTA-H2O2 spectrophotometric method (in Japanese with English abstract)	Bull. Geol. Surv. Japan	37	67-75
B-120	H. Uchida, T. Uchida and C. Iida	1979	Determination of major and minor elements in silicates by inductively coupled plasma emission spectrometry	Anal. Chim. Acta	10	87-92
B-122	T. Uchida, C. Iida, K. Yamasaki, S. Kanaoka, Y. Ohmori and T. Masuda	1984	Simple and rapid determination of major elements in miligram amounts of silicate by multi-channel inductively coupled plasma emission spectrometry (in Japanese with English abstract)	Bunseki Kagaku	33	242-247
B-123	T. Uchida, M. Mitsumatsu, I. Kojima and C. Iida	1986	Rapid spectrophotometric determination of iron (II, III) in silicates with 1,10-phenanthroline	Bunseki Kagaku	35	42-46

Major elements in 17 GSJ rock reference samples (Terashima et al.)

Code	Analyst	Year	Title	Journal	Vol	Page
			(in Japanese with English abstract)			
B-125	R. Sugisaki, T. Shimomura and K. Ando	1977	An automatic X-ray fluorescence method for the analysis of silicate rocks	J. Geol. Soc. Japan	83	725-733
B-126	H. Takagi	1979	Personal communication, Kanagawa Prefectural Public Health Laboratory			
B-127	Y. Honma	1981	Personal communication, Yamagata University			
B-128	S. Yokota	1983	Personal communication, Geological Survey of Japan			
B-129	J. Stanley	1984	Personal communication, University of Adelaide			
B-130	Gotte	1984	Private communication, DDR Zentrales Geologisches Institut, Berlin			
B-131	A. H. Debnam	1984	Personal communication, Technical Service Laboratories, Canada			
B-134	B. Zanettin	1986	Personal communication, Univ. Padova, Italia			
B-136	H. A. Olszowy	1986	Personal communication, Govern. Chem. Lab., Brisbane, Australia			
B-138	S. Tanemura	1986	Personal communication, Kyoritsu Bunseki Center, Japan			
B-139	Y. Ohba	1986	Personal communication, Yamagata University			
B-141	Y. Ohba	1986	Personal communication, Yamagata University			
B-142	Z. Solyom	1986	Personal communication, University of Lund, Sweden			
B-143-1	T. Yoshida, K. Aoki, M. W. Lee, K. Ishikawa and N. Kaneko	1982	Elemental abundances in some basaltic rocks from the Japan arc and adjacent area	Res. Rep. Lab. Nuc. Sci. Tohoku Univ.	15	239-248
B-146	Y. Minai, M. Ebihara, K. Sakamoto, N. Aota, R. Matsumoto, J. Ishibashi, K. Togashi, A. Ando and K. Tominaga	1985	Analysis of standard rock samples by neutron activation, x-ray fluorescence and Mossbauer Methods (Abst., in Japanese)	29 Symp. Radioch.		
B-148	S. Terashima	1984	Personal communication, Geological Survey of Japan			
B-151	R. Kuroda, T. Nara and K. Oguma	1986	Determination of magnesium in silicates by flow-injection-atomic absorption spectrometry (Abst., in Japanese)	47th Symp. Japan Soc. for Anal. Chem.		29-30
B-153	H. Nishido, Y. Ye, T. Sakamoto and A. Doi	1985	Analytical data on the GSJ geochemical reference samples of JA-1, JB-1, JB-2, JB-3, JG-1, JGb-1, JR-1 and JR-2	Bull. Hiruzen Res. Institute, Okayama Univ. Sci.	11	15-21
B-155	M. Nakagawa and M. Komatsu	1983	Analysis of rocks by automated X-ray fluorescence spectrometer	Rep. 1982 Kakenhi(A) No. 542023 Niigata Univ.		4-10
B-159	A. Ando and S. Terashima	1986	GSJ rock RMs "igneous rock series" and their chemical compositions (Abst.)	1986 Annual Meet. Japan Geoch. Soc.		243
B-161	R. Kuroda, N. Suzuki and K. Oguma	1986	New scheme for complete silicate analysis based on ion-exchange chromatography	Fresenius Z. Anal. Chem.	32	43-46
B-162	S. Suzuki	1986	Personal communication, Japan Chem. Anal. Center			
B-163	T. Chunhan	1986	Personal communication, Chengdu College of Geology, China			
B-167	S. Terashima and A. Ando	1987	Elemental concentrations in nine new Japanese rock reference samples	Geost. Newsletter	11	75-77
B-168	H. A. Olszowy, R. Sumner, R. Francis, J. Hegarty and S. McKeown	1986	Personal communication, Govern. Chem. Lab., Brisbane, Australia			
B-169	R. Kanaris-Sotiriou	1986	Personal communication, Sheffield Univ., England			
B-170	S. A. Mertzman	1986	Personal communication, Franklin & Marshall College, Pennsylvania			
B-181	C. Riandey	1986	Personal communication, ORSTOM, services Sci. Cent., Bondy, France			
B-184	A. Alian and B. Sansoni	1980	Comparison of different methods for activation analysis of geological and pedological samples: Reactor and epithermal neutron activation, relative and monostandard method	KFA Julich GmbH	19	1-46
B-185	A. Alian, R. G. Djingova, B. Kroner and B. Sansoni	1983	The monostandard method in thermal neutron activation analysis	KFA Julich GmbH	19	1-24

Bulletin of the Geological Survey of Japan, Vol.45, No.6

Code	Analyst	Year	Title	Journal	Vol	Page
B-189	J. Etoubleau	1987	Personal communication, IPREMER, Centre de Brest, France			
B-190	N. Hirate and Y. Yokote	1987	Personal communication, Toshiba Compo Res. Inst.			
B-192	N. Imai	1986	Multielement determination of rocks by inductively coupled plasma emission spectrometry (in Japanese with English abstract)	Bull. Geol. Surv. Japan	37	515-523
B-196	K. Kikkawa	1986	Personal communication, Geological Survey of Japan			
B-198	I. Roelands and G. Bologne	1987	Personal communication, Universite de Liege, Liege, Belgium			
B-201	A. Yoshioka	1987	Personal communication, Cent. Res. Institute, Mitsubishi Metal Co.			
B-202	H. U. Kasper	1987	Personal communication, Universitat zu Koln, Germany			
B-204	K. Suga and K. Kurosawa	1987	Geochemical map of heavy metal elements in soils from the northern Hokkaido (in Japanese with English abstract)	J. Geol. Surv. Hokkaido	17	1-30
B-205	C. Riandey	1987	Personal communication, ORSTOM, services Sci. Cent., Bondy, France			
B-207	Z. Solyom	1987	Personal communication, University of Lund, Sweden			
B-208	B. F. Myasoedov	1987	Personal communication, Vernadsky Inst. Geoch. Anal. Chem., USSR			
B-216	B. Ayranci	1987	Personal communication, ETH Inst. Krist. Krist. Petr., Zurich, Switzerland			
B-219	D. Nielsen, C. J. Van Niekerk, M. B. Forsyth, P. R. Janisch, A. H. Munro and C. J. Ross	1987	Personal communication, Gold Fields Laboratories, Johannesburg, South Africa			
B-221	T. Yoshida, K. Masumoto and K. Aoki	1986	Photon-activation analysis of standard rocks using an automatic γ -ray counting system with a micro-robot	J. Japan. Assoc. Min. Petr. Econ. Geol.	81	406-422
B-223	S. Ito, K. Shibata, T. Tanaka, K. Uto, S. Tamanyu, H. Kamioka, A. Ando, S. Terashima, N. Imai, Y. Kanai, T. Okai, T. Sakamoto and K. Sato	1987	Geochemical map project for evaluating the distribution of heavy metals in natural background level (in Japanese with English abstract)	1986 Annual Rep. on Environ. Res. National Inst. Japan		1-19
B-224	E. M. Macalalad	1987	Personal communication, BMG, Philippines			
B-230	F. Wakabayashi and M. Shima	1987	Personal communication, National Sci. Museum, Tokyo			
B-234	Y. Miyamoto, N. Aota, S. Kosanda, T. Fukasawa, Y. Ozaki, A. Kunugise, Y. Hamajima and K. Sakamoto	1987	Neutron activation analysis of geochemical reference rocks (Abst.)	31 Symp. Radioch.		70-71
B-236	A. Matsumoto	1987	Personal communication, Geological Survey of Japan			
B-237	K. Komura	1987	Personal communication, Kanazawa Univ. LLRL			
B-240	K. Komura	1987	Personal communication, Kanazawa Univ. LLRL			
B-244	F. Wakabayashi	1987	Determination of major and trace elements in nine Japanese geochemical standard rock samples by instrumental neutron activation analysis	Bull. Natn. Sci. Mus., Tokyo, Ser. E	10	14-19
B-247	D. Hogari	1987	XRF analysis of rock samples (in Japanese)	JEOL Application Note		3-18
B-248	A. L. Stork, D. K. Smith and J. B. Gill	1987	Evaluation of geochemical reference standards by X-ray fluorescence analysis	Geost. Newsletter	11	107-113
B-252	T. Tanaka, H. Kamioka and K. Yamanaka	1987	A fully automated γ -ray counting and data processing system for INAA and analysis of rock reference samples (in Japanese with English abstract)	Bull. Geol. Surv. Japan	39	537-557
B-253	T. Uchida, K. Yamamoto, I. Kojima and C. Iida	1987	Determination of silica in standard rocks by FIA method (Abst., in Japanese)	36th Annual Meeting Japan Soc. Anal. Chem.		950
B-254	N. Mita and Y. Kato	1987	Determination of phosphorous in geologic materials by flow injection method (Abst., in Japanese)	36th Annual Meeting Japan Soc. Anal. Chem.		953

Major elements in 17 GSJ rock reference samples (Terashima et al.)

Code	Analyst	Year	Title	Journal	Vol	Page
B-258-7	T. Fujinuki, S. Harayama, O. Ujike, T. Sudo and A. Ando	1985	New standard rock samples, JF-1, JA-2 and JG-2, and their prototype chemical composition (Abst., in Japanese)	1985 Annual Meet. Japan Geoch. Soc.		159
B-261	K. Oguma, K. Nishiyama and R. Kuroda	1987	Spectrophotometric flow injection analysis of silicates for manganese	Analytical Sciences	3	251-255
B-262	T. Nara, K. Oguma and R. Kuroda	1987	Determination of sodium and potassium in silicates by FIA/AAS (in Japanese with English abstract)	Bunseki Kagaku	36	851-855
B-263	R. Kuroda, Y. Matsuzawa and K. Oguma	1987	Spectrophotometric microanalysis of silicate rocks for manganese after fusion with a lithium carbonate-boric acid mixture	Fresenius Z. Anal. Chem.	32	156-157
B-270	K. W. Sims, E. S. Gladney, C. Lundstrom and N. W. Bower	1988	Elemental concentrations in Japanese silicate rock standards: A comparison with the literature	Geost. Newsletter	12	379-389
B-273	K. Komura, K. L. Tan and K. Ueno	1988	Uranium, thorium and potassium contents in eighteen geochemical reference samples issued from the Geological Survey of Japan	Geost. Newsletter	12	371-374
B-275	M. Ebihara	1985	Determination of ppm level contents of potassium in silicate materials by means of neutron activation analysis (in Japanese with English abstract)	Bunseki Kagaku	34	761-765
B-277	Y. Miyamoto	1988	Personal communication, Kanazawa University			
B-279	V. P. Afonin	1988	Personal communication, USSR Academy of Sciences Siberian Branch			
B-283	S. Itoh, K. Shibata, T. Tanaka, K. Uto, S. Tamanyu, H. Kamioka, A. Ando, S. Terashima, N. Imai, Y. Kanai, T. Okai, T. Sakamoto and K. Sato	1988	Geochemical map project for evaluating the distribution of heavy metals in natural background level (in Japanese with English abstract)	1987 Annual Rep. on Environ. Res. National Inst. Japan		1-29
B-287	F. Wakabayashi	1988	Neutron activation analysis of Japanese standard rock samples II	Bull. Natn. Sci. Mus., Tokyo Ser. E	11	9-16
B-289	T. Fujitani	1988	Activation analysis of trace elements in some standard rocks	Rev. Marine Tech. College	3	45-58
B-295	A. Ueda and H. Sakai	1983	Simultaneous determinations of the concentration and isotope ratio of sulfate- and sulfide-sulfur and carbonate-carbon in geological samples	Geoch. J.	17	185-196
B-296	S. Nohda and G. J. Wasserburg	1981	Nd and Sr isotopic study of volcanic rocks from Japan	Earth Planet. Sci. Lett.	52	264-276
B-300	T. Fujitani	1988	Activation analysis of trace elements in some standard rocks	Rev. Marine Tech. College	31	45-58
B-308	S. Hirai and S. Suzuki	1989	Personal communication, Musashi Institute of Technology			
B-309	K. Govindaraju	1988	Personal communication, Centre Nat. Res. Sci., France			
B-310	T. Chunhan	1988	Personal communication, Chengdu College of Geology, China			
B-311	K. Kikkawa	1989	Personal communication, Geological Survey of Japan			
B-312	H. Takeda	1989	Personal communication, Ministry Ener. Mines., Caracas, Venezuela			
B-320	N. Imai	1990	Multielement analysis of rocks with the use of geological certified reference material by inductively coupled plasma mass spectrometry	Analytical sciences	6	389-395
B-324	H. Kamioka and T. Tanaka	1989	The problems in the analyses of geological materials by INAA -An examination of the analytical results of GSJ rock reference samples-	J. Geol. Soc. Japan	95	835-850
B-325	J. S. Kane	1989	Analysis of geochemical reference materials using simultaneous multi-element atomic absorption spectrometry	Geost. Newsletter	13	205-215
B-328	S. Terashima, T. Okai, A. Ando and S. Itoh	1990	Homogeneity tests for twenty-four GSJ rock reference samples (in Japanese with English abstract)	Bull. Geol. Surv. Japan	41	129-138
B-330	A. Ishiwatari	1989	Personal communication, Kanazawa University			
B-337	H. Yurimoto, A. Yamashita, N. Nishida and S. Sueno	1989	Quantitative SIMS of rock reference samples	Geoch. J.	23	215-236

Bulletin of the Geological Survey of Japan, Vol.45, No.6

Code	Analyst	Year	Title	Journal	Vol	Page
B-341-2	J. N. Ludden, R. Daigneault, F. Robert and R. P. Taylor	1984	Trace element mobility in alteration zones associated with Archean Au lode deposits	Econ. Geol.	79	1131-1141
B-342	S. S. Goldich	1984	Determination of ferrous iron in silicate rocks	Chem. Geol.	42	343-347
B-348	R. Kuroda, I. Ida and H. Kimura	1985	Spectrophotometric determination of silicon in silicates by flow-injection analysis	Talanta	32	353-357
B-350	V. K. Din	1984	The preparation of iron-free solutions from geological materials for the determination of boron (and other elements) by inductively-coupled plasma emission spectrometry	Anal. Chim. Acta	15	387-391
B-351	A. Ueda and H. Sakai	1984	Sulfur isotope study of Quaternary volcanic rocks from the Japanese islands arc	Geoch. Cosmo. Acta	48	1837-1848
B-352	R. A. Coish, R. Hickey and F. A. Frey	1982	Rare earth elements geochemistry of the Betts Cove ophiolite, Newfoundland: complexities in ophiolite formation	Geoch. Cosmo. Acta	46	2117-2134
B-357	S. Nohda and G. J. Wasserburg	1981	Nd and Sr isotopic study of volcanic rocks from Japan	Earth Planet. Sci. Let.	52	264-276
B-360	S. J. Barnes and M. P. Gorton	1984	Trace element analysis by neutron activation with a low flux reactor (slowpoke-II): Results for international reference rocks	Geost. Newsletter	8	17-23
B-380	T. Mori and K. Kanehira	1984	X-ray energy spectrometry for electron-probe analysis	J. Geol. Soc. Japan	90	271-285
B-382	B. Robins and M. A. Takla	1979	Geology and geochemistry of a metamorphosed picrite-ankaramite dyke suite from the Seiland province, northern Norway	Norsk Geologisk Tidsskrift	59	67-95
B-388	M. A. Olade and A. A. Elueze	1979	Petrochemistry of the Ilesha amphibolites and Precambrian crustal evolution in the Pan-African domain of SW Nigeria	Precambrian Research	8	303-318
B-393	H. Nagasawa, K. Yamakoshi and T. Shimamura	1979	Trace element concentrations in silicate spherules from oceanic sediments	Geoch. Cosmo. Acta	43	267-272
B-398	P. V. Espen, L. Van Dack, F. Adams and R. V. Grieken	1979	Effective sample weight from scatter peaks in energy-dispersive X-ray fluorescence	Anal. Chem.	51	961-967
B-399	P. Verbeke and F. Adams	1979	Multi-element analysis of geological samples by energy-dispersive X-ray fluorescence	Anal. Chim. Acta	10	85-95
B-400	R. V. Grieken, L. Van Dack, C. C. Dantas and H. Da Silveira Dantas	1979	Soil analysis by thin-film energy-dispersive X-ray fluorescence	Anal. Chim. Acta	10	93-101
B-415	K. Kikkawa, N. Imai, K. Okumura and K. Mizuno	1989	Identification of tephra layers by chemical analyses of volcanic glass using inductively coupled plasma emission spectrometry (ICP) (in Japanese with English abstract)	Bull. Geol. Surv. Japan	40	1-18
B-418	R. E. Santelli, M. Gallego and M. Valcarcel	1989	Atomic absorption determination of copper in silicate rocks by continuous precipitation preconcentration	Anal. Chem.	61	1427-1430
B-422	C. T. Yap and K. V. R. Gunawardena	1989	TXRF spectrometric analysis of major elements in mineral sands	Applied Spectroscopy	43	702-704
B-433	T. Suzuki and M. Sensui	1991	Application of the microwave acid digestion method to the decomposition of rock samples	Anal. Chim. Acta	24	43-48
B-434	N. K. Saini	1991	Personal communication, Wadia Institute of Himalayan Geology, Dehra, India			
B-435	N. Ueno	1991	Potassium concentrations in GSJ rock reference samples -JB-2, JB-3 and JG-1a	J. Toyo Univ., General Education	(3)	1-10
B-436	D. M. Shaw and P. L. C. Smith	1991	Concentrations of B, Sm, Gd, and H in 24 reference materials	Geost. Newsletter	15	59-66
B-437	P. J. Potts and N. W. Rogers	1991	Determination of trace elements in selected geological reference materials by instrumental neutron activation analysis	Geost. Newsletter	15	111-116
B-438	S. P. Verma	1991	Determination of thirteen rare-earth elements by high-performance liquid chromatography in thirty and of K, Rb, Cs, Sr and Ba by isotope dilution mass spectrometry in eighteen international geochemical reference samples	Geost. Newsletter	15	129-134
B-441	K. Kikkawa	1991	Major and minor elements composition of volcanic glasses -Comparison of tephra using ICP analysis-(in Japanese)	Chikyu	13	161-168
B-443	V. Sixta	1991	Evaluation of ICP spectrometric measurements	Atomic Spectroscopy	12	11-15
B-447	Y. Oura, N. Aota, S. Kosanda, Y. Miyamoto,	1991	Activation analysis of GSJ rock standard samples -Sedimentary rock series-	1991 Annual Meet. Japan Geoch. Soc.		201

Major elements in 17 GSF rock reference samples (Terashima et al.)

Code	Analyst	Year	Title	Journal	Vol	Page
	T. Okui, Y. Kameda and K. Sakamoto		(Abst., in Japanese)			
B-450	H. Nakahara, M. Tsukada, A. Moriizumi, K. Horiuchi and Y. Murakami	1982	Matrix effects of epithermal neutron activation analysis of various kinds of reference materials		72	377-391
B-452	I. Brissaud, A. de Chateau-Thierry, J. P. Frontier and G. Lagarde	1986	PIXE and PIGE techniques applications to volcanic rocks	Chem., Articles	10	131-141
B-453	P. Ila and D. S. Murty	1989	Elemental analysis of geological samples by cyclic activation using a 14 MeV neutron generator and applying flux corrections	J. Radio. Nuc. Chem., Articles	13	27-37
B-455	M. Tanaka	1991	Personal communication, Toray research center			
B-456	L. M. Muia and R. Van Grieken	1990	Use of theoretical accurate binary influence coefficients with tertian's equation in X-ray fluorescence analysis of silicate rocks on borax glass beads	X-ray Spectrometry	19	141-144
B-462	S. Kozuka, K. Saito, K. Ogawa and R. Kuroda	1990	Simultaneous Determination of Trace Amounts of Iron(III) and Titanium(IV) by Flow Injection With Spectrophotometric Detection	Analyst	11	431-434
B-467	S. Endo and S. Abe	1991	Kinetic spectrophotometry of iron(II) and iron(III), (abstract)	40th Annual Meeting Japan, Soc. Anal. Chem		532
B-472	H. Hirano, M. Kamitani, Y. Kanazawa and S. Sudo	1992	Personal Communication, Geol. Survey of Japan (Anal. Chemex)			
B-476	G. R. Boaventura	1992	Personal Communicatoin, Universidade de Brasilla			
B-478	M. Musashino and Y. Miyake	1992	Personal Communication, Kyoto Kyoiku University			
B-482	Y. Kinryu	1992	Personal Communication, Dowa Engineering Co., Ltd. (Anal. Iijima Bunseki Center)			
C-3	Onoda Cement Co.	1967	Personal communication, Central Research Lab., Tokyo.			
C-3'	D. H. Cornell	1976	Personal communication, The University of Stellenbosch, South Africa.			
C-4'	S. Chagrapan	1983	Personal Communication, ESCAP/RMRDC, Bandung, Indonesia.			
C-5'	S. C. Chareonkul	1983	Taken from C-4'			
F-2	D. C. G. Friese	1972	Personal communication, Zentrales Geologisches Institut, Berlin, DDR.			
F-3'	T. Fujinuki	1985	Personal communication, Geological Survey of Japan.			
G-1	J. Gagnon	1975	Personal communication, Service Analyse et Contro, Complexe Scientifique, Canada.			
G-6	K. Govindaraju	1969	Personal communication, C. R. P. G., Nancy, France.			
G-6'	K. Govindaraju	1983	Personal communication, C. R. P. G., Nancy, France.			
G-8'	N. I. Gulko	1985	Personal communication, Institute of Lithosphere, Moscow, USSR.			
H-5	T. Hayata	1974	Chemical analysis of geochemical standard sample JB-1	Nagasaki-ken Chigaku21 kaishi	19-21	
H-6	K. Huysmans	1973	Personal communication, Ruks Univ. Belgie.			
H-7	K. Huysmans	1974	Personal communication, Ruks Univ. Belgie.			
H-8	H. Haramura	1968	Personal communication, Geological Institute, Univ. of Tokyo			
H-9	Y. Hikichi	1968	Personal communication, Nagoya Institute of Technology, Japan.			
H-10	T. Hugi	1975	Personal communication, Univ. Bern, Switzerland.			
I-7	K. Ishibashi	1970	Personal communication, Faculty of Science, Kyushu Univ., Japan.			
K-6'	S. Kanisawa	1974	Personal communication, Tohoku Univ. Japan.			
K-9	Y. Kato	1969	Taken from A-13.			
K-11'	Y. Kato, H. Onuki and K. Aoki	1978	Major element analyses on the geochemical standards JA-1 and JB-2	J. Japan Assoc. Min. Pet. Econ. Geol.	73	281-282
K-18'	S. Koga	1980	The determination of major and minor elements on the two geochemical standard samples, JA-1 and JB-2, by inductively	J. Japan Assoc. Min. Pet. Econ. Geol.	75	266-271

Bulletin of the Geological Survey of Japan, Vol.45, No.6

Code	Analyst	Year	Title	Journal	Vol	Page
K-25	P. R. Kyle	1976	coupled plasma emission spectroscopy Personal communication, Ohio State Univ. U. S. A.			
M-2	G. Maruyama and M. Suda	1974	Personal communication, Mitsubishi Mining Cement Research Lab., Saitama, Japan.			
M-6	T. Mori	1972	Personal communication, Kanazawa Univ. Japan.			
M-7	E. L. Munson	1967	Personal communication, U. S. Geological Survey, Denver, Colorado, U. S. A.			
M-7'	T. Mori and D. H. Green	1976	Subsolidus equilibria between pyroxenes in the CaO-MgO-SiO ₂ system at high pressures and temperatures.	Am. Mineralogist	61	616-625
M-8'	G. K. Muecke	1979	Personal communication, Dalhousie Univ., Nova Scotia, Canada.			
M-10	K. Maeda	1970	Personal communication, Geological Survey of Japan.			
M-12	Nittetsu Mining Co.	1967	Personal communication, Mitaka Laboratory, Japan.			
M-13	M. Murakami	1970	Personal communication, Faculty of Liberal Arts, Yamaguchi Univ., Japan.			
N-7	K. Nakao	1970	Personal communication, Tokyo Kyoiku Univ. Japan.			
N-8	Nihon Cement	1968	Personal communication, Research Laboratory, Tokyo, Japan.			
O-1'	M. Ogasawara	1979	Personal communication, university of Adelaide, Australia			
O-2	K. Ohta	1972	Personal communication, Tokyo Coal and Mineral Laboratory, Japan.			
O-3'	T. Ohomori	1976	X-ray fluorescence analysis of major elements in rocks and minerals. Part 2. Quantitative analysis by linear calibration method.	Bull. Geol. Surv. Japan	27	425-442
O-5	Y. Ohba	1970	Personal communication, Faculty of Science, Hokkaido Univ., Japan.			
O-6	T. Ohmori	1970	Personal communication, Geological Survey of Japan.			
O-7	H. Ohnuki	1969	Taken from A-13.			
O-11'	T. Ohmori	1983	Personal communication, Geological Survey of Japan.			
P-5'	M. Pinta	1983	Personal communication, Office de la Recherche Scientifique et Technique Outre-Mer, France.			
R-1	B. A. O. Randall	1972	Personal communication, The Univ. of Newcastle upon Tyne, England.			
R-7	Asahi Glass Co.	1967	Personal communication, Research Laboratory.			
S-14	H. Shirahata	1972	Personal communication, Muroran Institute of Technology, Muroran, Japan.			
S-15	K. F. Steele	1971	Personal communication, University of Arkansas, U. S. A.			
S-23	R. Sugisaki and T. Tanaka	1971	Collective analysis of silicate rocks in the mass and analyses of standard rocks. -With special reference to carbonate bearing silicate rocks-	J. Geol. Soc. Japan	77	453-463
S-23'	V. Sjoberg	1983	Personal communication, Research Center, Raahe, Finland.			
S-24	J. G. Sullivan	1970	Personal communication, ESCAP/RMRDC, Bandung, Indonesia.			
S-24'	F. Kalsbeek	1983	Personal communication, The Geological Survey of Greenland, Denmark.			
S-26'	J. Sato	1984	Personal communication, Meiji Univ. Tokyo.			
T-13'	S. Tanemura	1982	Personal communication, Kyoritsu Analytical Center, Nagoya, Japan.			
T-27	H. Takamura	1969	Analytical data on the geochemical standard JB-1 basalt.	J. Japan Assoc. Min. Pet. Econ. Geol.	62	219-221
T-29	T. Tiba	1970	JB-1 and JG-1-Geological Survey of Japan silicate rock standards-	J. Geol. Soc. Japan	76	441-447
T-36'	K. Takai and K. Kanehira	1975	Chemical analysis of geochemical standard sample JB-1.	J. College of Arts and Sciences, Chiba University	B-8	163-168
T-37'	S. Tanemura	1983	Personal communication, Kyoritsu Analytical			

Major elements in 17 GSJ rock reference samples (Terashima et al.)

Code	Analyst	Year	Title	Journal	Vol	Page
T-41'	S. Terashima, T. Yamashige and A. Ando	1984	Determination of major and minor elements on the six GSJ rock reference samples.	Bull. Geol. Surv. Japan	35	171-177
T-51'	S. Tanemura	1985	Personal communication, Kyoritsu Analytical Center, Nagoya, Japan.			
U-4	T. Uchida	1970	Personal communication, Tokyo Kyoiku Univ. Japan.			
V-1	M. Vernet	1969	Personal communication, C. R. P. G., Nancy, France.			
W-1	P. W. Weigand	1970	Major and trace element geochemistry of the Mesozoic dolerite dikes from eastern North America, Ph. D. Thesis, University of North Carolina, U. S. A.			
Y-8'	T. Yamashige	1984	Personal communication, Hiroshima Prefectural Research Center for Environmental Science, Japan.			
Y-14'	T. Yamashige	1985	Personal communication, Hiroshima Prefectural Research Center for Environmental Science, Japan.			