were actually drilled, i.e. MJAS-18 and MJAS-19, for the purpose of underground exploration of disseminated chromitite and its dunite envelope with a plunge of N60°W48°N detected by trenches and shafts as indicated in Fig. 2-3-16.

The main reason by drilling of MJAS-17 was cancelled is that the geological situation of the two holes, MJAS-18 and MJAS-19 drilled before it, reveals that the dunite accompanied by chromitite of the Murriq indication does not continue to the point scheduled for MJAS-17. Another contributing factor in that decision was also fears of considerable decline in work efficiency due to serious deterioration of the access road on account of rain and snow.

The coordinates, azimuth, inclination, depth and core recovery of MJAS-18 and MJAS-19 have already been given in Table 2-3-1. The results of geological core log of each drill hole are given in Apx. 2-3-1 (15)-(16), and the drilling profiles are given in Fig. 2-3-17.

The geology of both drill holes consists mainly of harzburgite, accompanied by dunite and rarely by thin pyroxenite dikes. These are frequently cut by fault fractured zones and brecciated zones, some of which are filled with fault clay.

Harzburgite is generally serpentinized and is greenish dark gray in color, the quantity of orthopyroxene included in it being about 30%.

Dunite occurs rarely in both holes, but comparatively thick one thereof were recognized in the depth sections 16.65-17.25 m, 20.35-28.10 m, 35.60-37.80 m and 81.00-82.00 m in MJAS-18 and 16.00- 18.00 m in MJAS-19. Dunite of about 10 cm thick is also observed sporadically. All of it is dark gray in color as a result of serpentinization. Chromian spinel is sparsely disseminated in it, however, no substantial concentrations as chromitite were found.

The main fault fractured zones accompanied by fault clay were in depth sections 82.00-91.80 m in MJAS-18 and 67.20-68.82 m in MJAS-19.

Judging from the geological situation of both holes, it is considered that the dunite accompanied by disseminated chromitite in the Murriq indication is of only a small scale without much continuity and, besides that, has considerably displaced by faulting.

(5) Qarri i Zi Area

In this area four drill holes, i.e., MJAS-8, MJAS-9, MJAS-10 and MJAS-11 were scheduled to be drilled on profiles 2-2, 1-1 and 0-0 as indicated in Fig. 2-2-18 for the purpose of underground exploration of the southern extension of the Qarri i Zi deposit, but only three of them were implemented, i.e., MJAS-8 and MJAS-9 on profile 2-2 and MJAS-10 on profile 1-1.

The reason why drilling of MJAS-11 was cancelled is that it turned out, from the results of MJAS-10, which was drilled before MJAS-11, that the dunite accompanied by the Qarri i Zi deposit distributed to the north of profile 2-2 has only very small-scale distribution in profile 1-1, which corresponds to its topographical lower part, and it was therefore concluded that only harzburgite is distributed in profile 0-0, which is located still lower level. Also contributing to that decision was the fact that the overall progress of the drilling survey was far behind schedule and that there was great difficulties in maintaining the access roads because of rain and snow.

The coordinates, azimuth, inclination, depth and core recovery of the three holes of MJAS-8, MJAS-9 and MJAS-10 have already been given in Table 2-3-1. The results of geological core log of each drill hole are given in Apx. 2-3-1 (7)-(9), the drilling profiles in Fig. 2-3-19, and the projection profile in the N30°W direction in Fig. 2-3-20.

As indicated in Apx. 2-3-1 (7)-(8), the geology of drill holes MJAS-8 and MJAS-9 drilled in profile 2-2 consists of dunite and harzburgite, and in some cases dunite has dense concentrations of

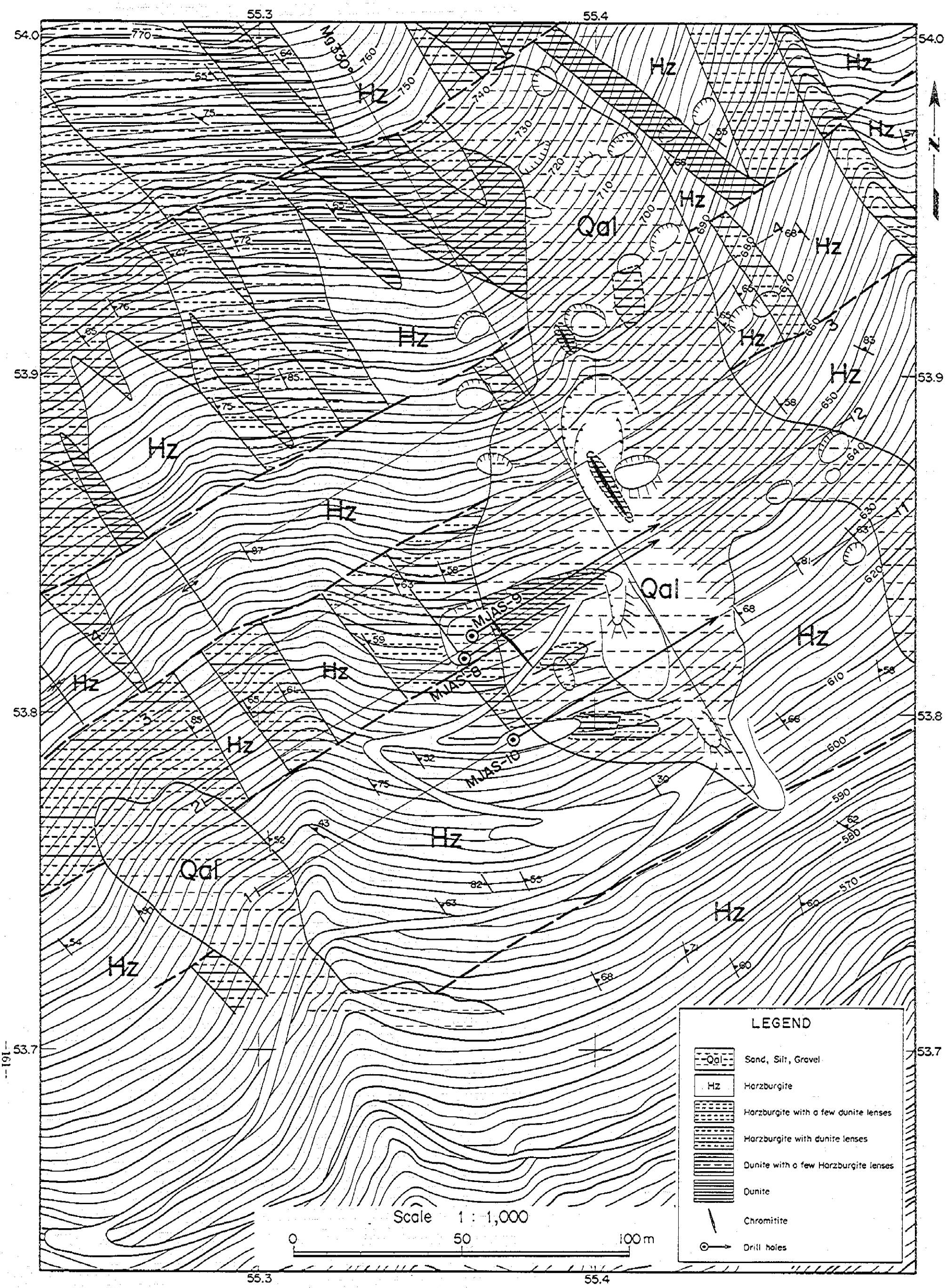
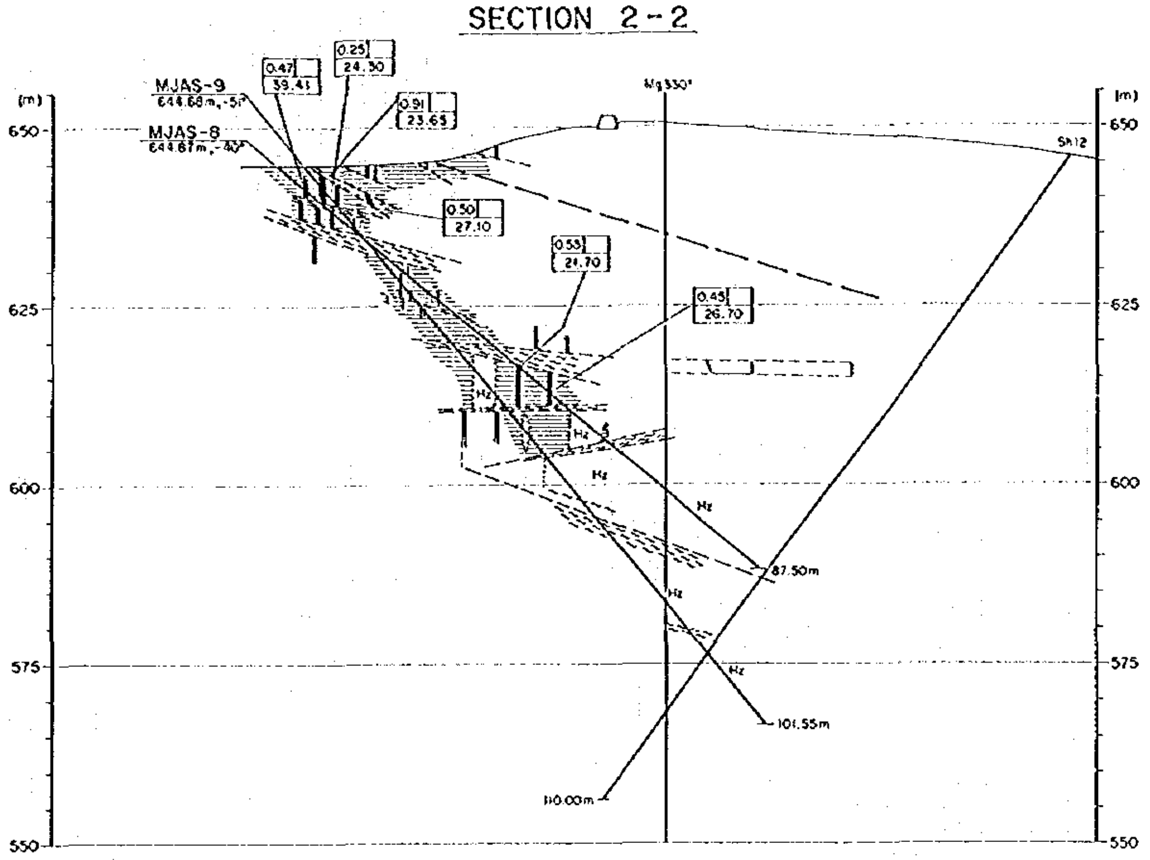


Fig. 2-3-18 Geological map with drilling sites, Qarri i Zi area



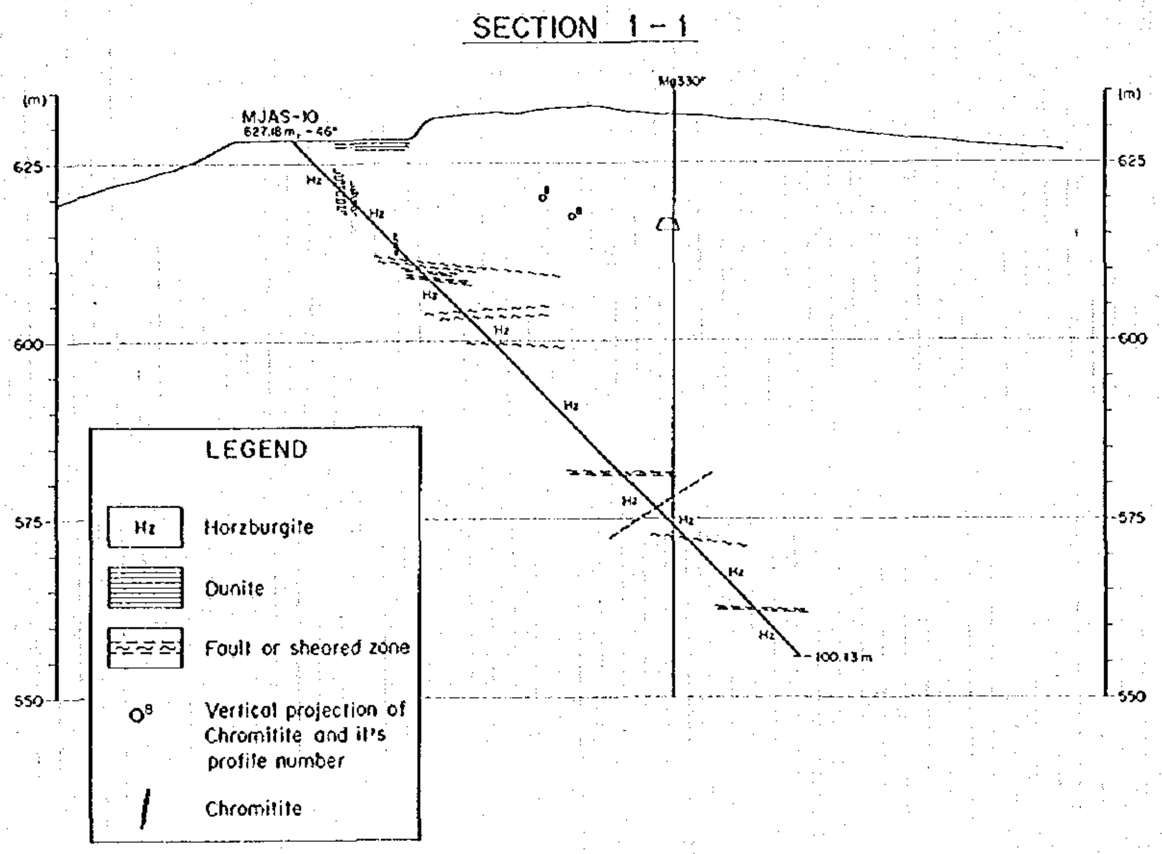


Fig. 2-3-19 Cross section of 1-1 and 2-2, Qarri i Zi area

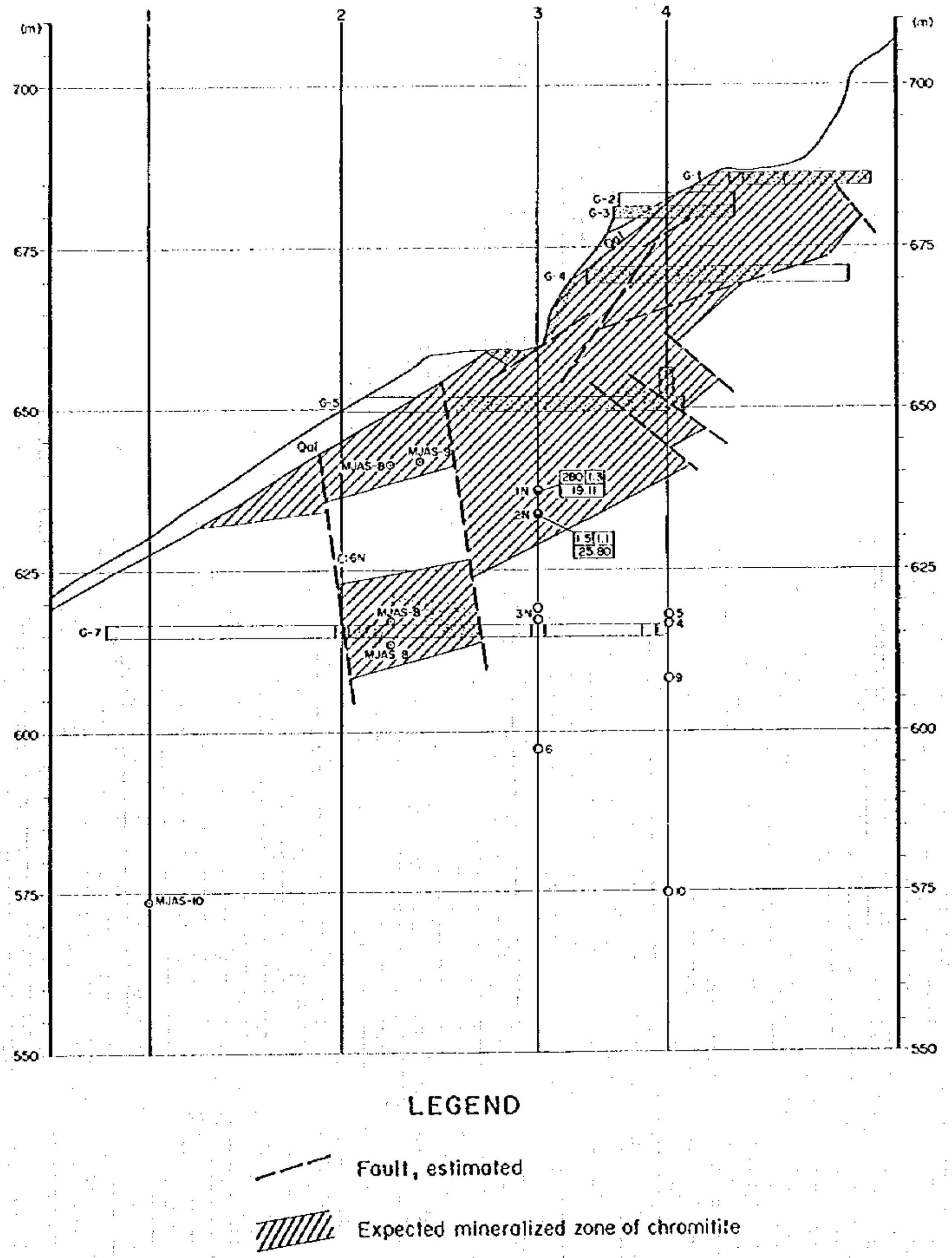


Fig. 2-3-20 Longitudinal section of Mg-330', Qarri i Zi area

chromitite. Those are cut frequently by many faults, brecciated zones and fractured zones and suffered strongly by serpentinization.

Harzburgite is greenish dark gray in color, and the amount of orthopyroxene varies in the range 30-35%.

Dunite is generally dark brown to brown in color as a result of serpentinization and oxidation. Dunite was recognized on a large-scale in the depth sections 0.00-12.90 m and 20.70-53.30 m in MJAS-8, in both of the sections being accompanied by chromitite. In MJAS-9 large-scale dunite accompanied by chromitite is encountered in depth sections 0.30-12.00 m and 18.70-31.90 m, and complex zones of dunite and harzburgite are recognized in depth sections 12.00-18.70 m and 31.90-53.19 m, which are contiguous to those two depth sections. In some of dunite chromian spinel is concentrated in schlieren form with a thickness of several centimeters. The depth sections and modes of occurrence of chromitite encountered in both holes are indicated in Table 2-3-7 along with analytical results.

Table 2-3-7 Chromitite discovered by MJAS-8 and MJAS-9, Qarri i Zi area

No.of Hole	Depth(m)	Thickness	Dunite Envelope	Type of Ore	Cr_2O_3(%)
	4.85- 5.11	0.26m	0.00m ~	Disseminated	40.50
	5.19- 5.21	0.03m		Disseminated	33.40
	5.29- 5.32	0.03m		Disseminated	36.00
MJAS-8	9.75-10.00	0.25m	~ 12.90m	Disseminated	24.30
	28.76-28.81	0.05m	20.70m ~	Disseminated	N.D.
	43.30-43.85	0.55m		Disseminated	21.70
	48.80-49.25	0.45m	~ 53.30m	Disseminated	26.70
	3.60- 3.87	0.27m	0.30m ~	Disseminated	25.60
	3.87- 4.13	0.26m		Disseminated	23.00
	4.13- 4.51	0.38m		Disseminated	22.70
	4.93- 5.00	0.07m		Disseminated	N.D.
	6.97- 7.47	0.50m		Disseminated	27.10
MJAS-9	9.30- 9.32	0.02m		Disseminated	N.D.
	11.17-11.19	0.02m	~ 12.00m	Disseminated	N.D.
	21.75-21.80	0.05m	18.70m ~	Disseminated	N.D.
	25.60-25.65	0.05m		Disseminated	N.D
	26.20-26.23	0.05m	~ 31.90m	Disseminated	N.D
	36.30-36.32	0.02m	34.30-36.40m	Disseminated	N.D

The geology of MJAS-10 drilled on a profile 30 m to the south and 17.5 m lower in elevation from the MJAS-8 and MJAS-9 consists of harzburgite accompanied by dunite, just as in the case of MJAS-8 and MJAS-9. However, large-scale dunite is recognized only in the depth section 8.85-12.70 m. At the only other two places where dunite was found on any appreciable scale, the thickness was only 10 to 20 cm. In none of those dunite was concentrated in chromian spinel as chromitite.

It is considered that the reason why chromitite was not encountered in MJAS-10 is that the dunite accompanied by chromitite in MJAS-8 and MJAS-9 migrated by faulting as shown in Fig. 2-3-20, and therefore only a part of the lower bottom thereof was found by MJAS-10 in profile 1-1.

(6) Fusha e Madhe Area

In this area two drill holes, MJAS-4 and MJAS-5, were scheduled to be drilled for the purpose

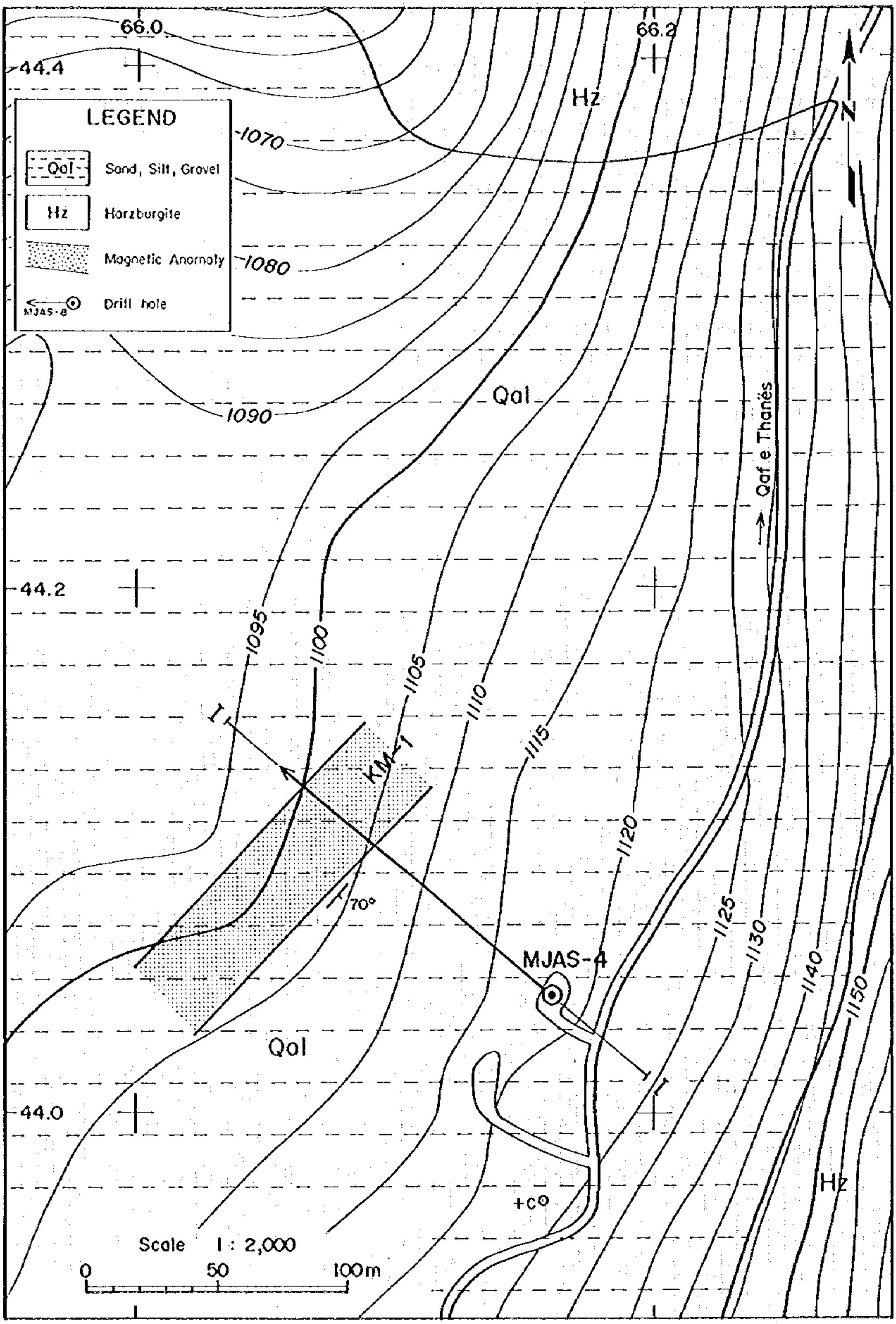


Fig. 2-3-21 Geological map with drilling sites, Fusha e Madhe area

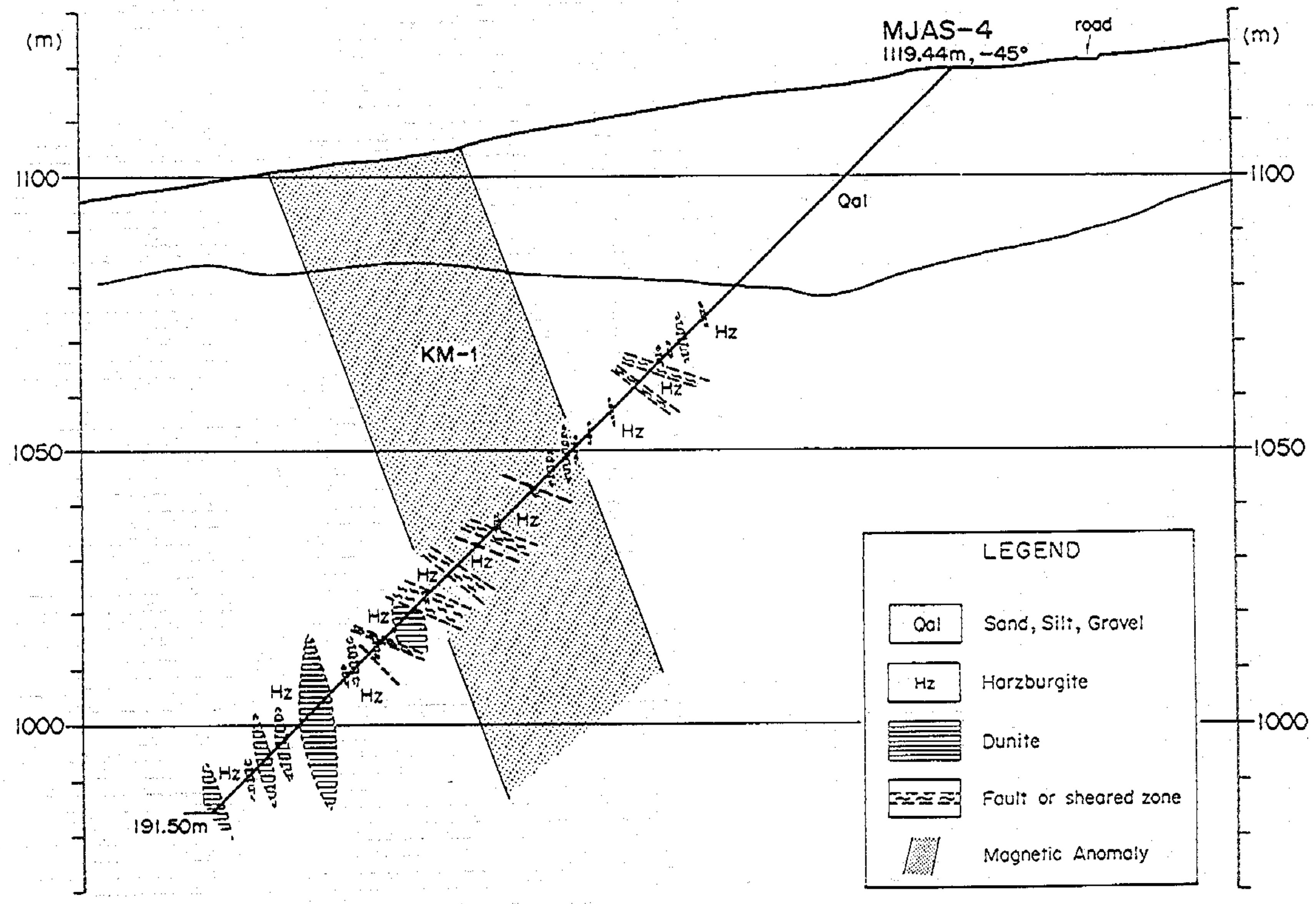


Fig. 2-3-22 Cross section along with MJAS-4, Fusha e Madhe area

of underground investigation of the KM-1 magnetic anomaly (see Fig. 2-3-21) detected by the magnetic survey of the phase I, but only the MJAS-4 was actually implemented.

The reasons why drilling of MJAS-5 was cancelled are as follows:

1) The KM-1 magnetic anomaly was mostly elucidated geologically by MJAS-4 drilled at first.

2) Besides delay in mobilization to the MJAS-4 drill site caused by rain in late September, at it they fell behind the drilling schedule as a result of frequent occurrence of argillized fractured zones, and, still worse, an incident of rod breakage in a argillized fracture zone caused considerable delay in the drilling survey as whole.

The coordinates, azimuth, inclination, depth and core recovery of MJAS-4 have already been given in Table 2-3-1. The results of geological core log of MJAS-4 are given in Apx. 2-3-1 (4), and the drilling profile in Fig. 2-3-22.

The geology of MJAS-4 consists of weathered lateritic soil with blocks of ultrabasic rocks of various sizes in the depth section 0.00-55.00 m, harzburgite sporadically accompanied by thin dunite in the section 63.00-140.00 m, dunite in sections 140.00-145.65 m and 161.05-169.50 m, complex zone of dunite and harzburgite in sections 145.65-161.05 m, 172.80-182.80 and 188.20-191.50 m and harzburgite in sections 169.50-172.80 m and 182.80-188.20. Those are cut by many fractures, faults and brecciated zones including that in depth section 117.80-121.60 m, and oxidation effect extends all the way to the bottom of the drill hole along fault and brecciated zones, with consequent frequent accompaniment of brown clay contaminated by iron oxides.

Harzburgite is generally dark gray as a result of rather intense serpentinization, and the quantity of orthopyroxene in it varies in the range 30-40%.

Almost all of the dunite is oxidized and therefore dark brown in color and is frequently cut by faults accompanied by brown clay contaminated by iron oxides. Dunite occurs frequently at depths greater than 140.00 m, sometimes forming complex zones with harzburgite. No conspicuous concentrations of chromian spinel as chromitite were encountered.

As indicated in Fig. 2-3-22, MJAS-4 intersects the KM-1 magnetic anomaly in depth section 95-135 m, in which not only the above-mentioned fault and brecciated zone occur but also a fault zone in section 128.30-130.46 m and fractured zones and brecciated zones. Iron oxide contamination and other oxidation is conspicuous. The KM-1 magnetic anomaly is, therefore, considered to be a reflection of the fact that at some places magnetite was produced by oxidation of iron in rocks due to circulation of groundwater that penetrated along the faults and the brecciated zones.

(7) Pishkash South Area

In this area two drill holes, MJAS-15 and MJAS-16, were drilled for the purpose of underground investigation of the PM-5 magnetic anomaly detected by the phase I survey.

Fig. 2-3-23 indicates the drilling sites and locations of the two drill holes, Apx. 2-3-1 (13)-(14) give the results of geological core log of the two drill holes, and Fig. 2-3-24 indicates the drilling profiles. The coordinates, azimuth, inclination, depth and core recovery of the two holes have already been given in Table 2-3-1.

The geology of the two holes consists of harzburgite and dunite frequently accompanied by pyroxenite dikes with a thickness of several centimeters (maximum of 10 cm) and is cut by many brecciated zones and fault zones.

Harzburgite is greenish dark gray in color as a result of serpentinization, the orthopyroxene content varying in the range 20-35%.

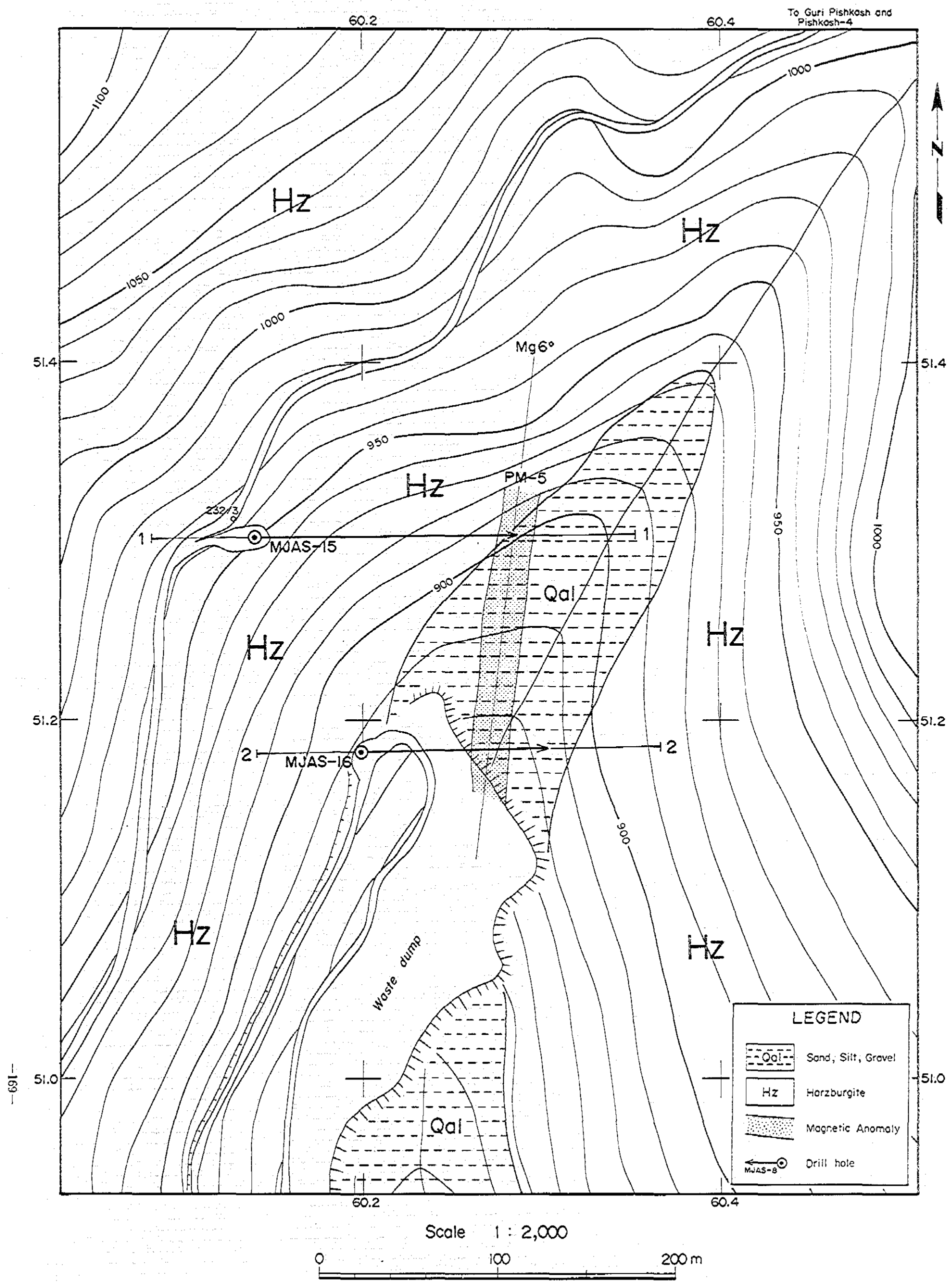


Fig. 2-3-23 Geological map with drilling sites, Pishkash South area

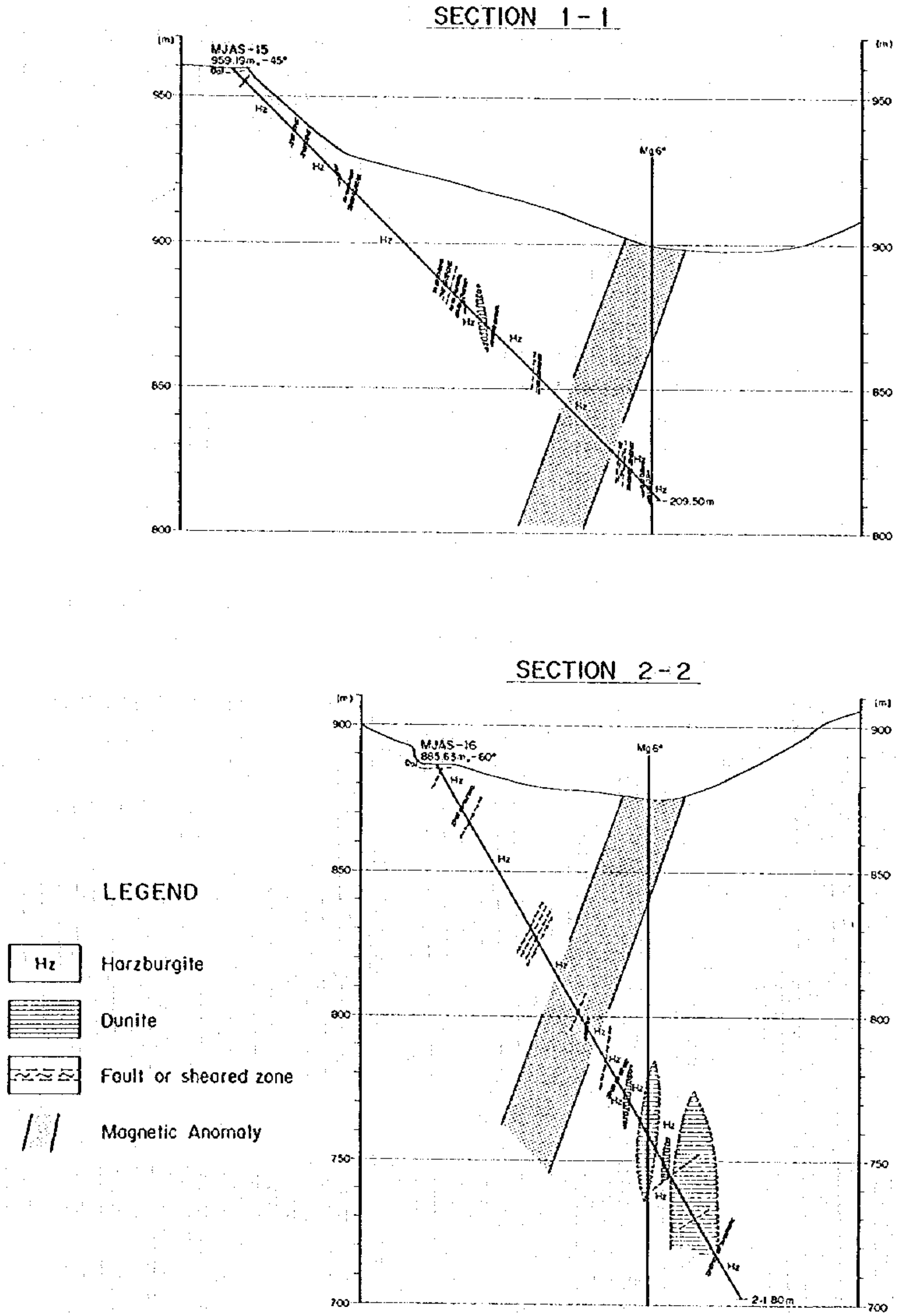


Fig. 2-3-24 Cross section of 1-1 and 2-2, Pishkash South area

Dunite is dark greenish gray to dark brown, also as a result of serpentinization. In MJAS-15 comparatively large-scale dunite is recognized in the depth sections 51.20-52.10 m, 112.70-113.80 m, 119.75-127.70 m, 199.10-203.50 m, etc., and in MJAS-16 there is considerable distribution of dunite below 131.30 m. Of those depth sections, the 199.10-203.50 m section in MJAS-15 is a complex zone of dunite and harzburgite. Although chromian spinel is sporadically observed in the dunite as a rock forming mineral, no concentrations as chromitite were encountered.

According to the simulation results, the depths at which the two drill holes were supposed to intersect the PM-5 magnetic anomaly are 162-186 m in the case of MJAS-15 and 83-111 m in the case of MJAS-16. Both those sections consist of harzburgite accompanied by thin brecciated zones and fault zones. Since its lithological character, alteration and state of weathering are about the same as in the surrounding rocks at the expected depth of the magnetic anomaly, without any recognizable difference, it was not possible to explain the PM-5 magnetic anomaly geologically, but one of the possibilities is that the difference in direction of natural remanent magnetization between geological blocks divided by faulting has resulted in the magnetic anomaly.

(8) Mbi Skroske Area

In this area three drill holes, MJAS-20, MJAS-21 and MJAS-22, were drilled. The purpose of MJAS-20 was underground investigation of the PM-2 magnetic anomaly detected by the phase I survey, and that of MJAS-22 was underground exploration of the No. 49 chromitite indication (Mbi Skroske). The purpose of MJAS-21 was to investigate the relationship between the two.

Fig. 2-3-25 gives the drilling sites and locations of the drill holes, Apx. 2-3-1 (17)-(19) give the results of geological core log, Fig. 2-3-26 gives the drilling profiles. The coordinates, azimuth, inclination, depth and core recovery of each drill hole have already been given in Table 2-3-1.

The geology of the three drill holes consists mainly of harzburgite very rarely accompanied by dunite and frequently by pyroxenite dikes. Many brecciated zones and fault fractured zones are also recognized.

Harzburgite is greenish dark gray as a result of serpentinization. Its lithofacies is quite similar in all three drill holes, the orthopyroxene content varying mostly in the range 20-35%, but also very rarely as low as about 10%.

The frequency of dunite occurrence is lower than in the other drilling target areas so far discussed. Dunite is observed only at depth 5.90-6.30 m in MJAS-20 and depths 53.90-54.60 m, 63.30-63.40 m and 69.00-69.10 m in MJAS-21, and there is no concentrations of chromian spinel as chromitite. Dunite was not found at all in MJAS-22.

Pyroxenite occurs in harzburgite as dikes, the frequency of occurrence being higher than the other drilling survey areas. Most of the dikes are small, with a thickness of only a few centimeters to about 10 cm, but in some depth sections, such as 29.90-32.50 m and 88.10-90.10 m in MJAS-20, 30.52-32.20 m in MJAS-21 and 8.90-10.90 m in MJAS-22, there is pyroxenite dikes with a thickness of more than 1 meters.

In this area there are located the No. 48 indication to the south of the Mbi Skroske indication, and the Pishkash-4 deposit some 800 m to the east, which is presently in operation. Furthermore, as will be discussed later on, although the chromian spinel in the harzburgite in this area has suitable Cr# values of about 0.6, no chromitite was encountered in the drill cores, as mentioned above. In view of the fact that the frequency of dunite occurrence in this area is lower than the other areas, it is surmised that there was not enough dunite activity in this area to produce chromitite deposits.

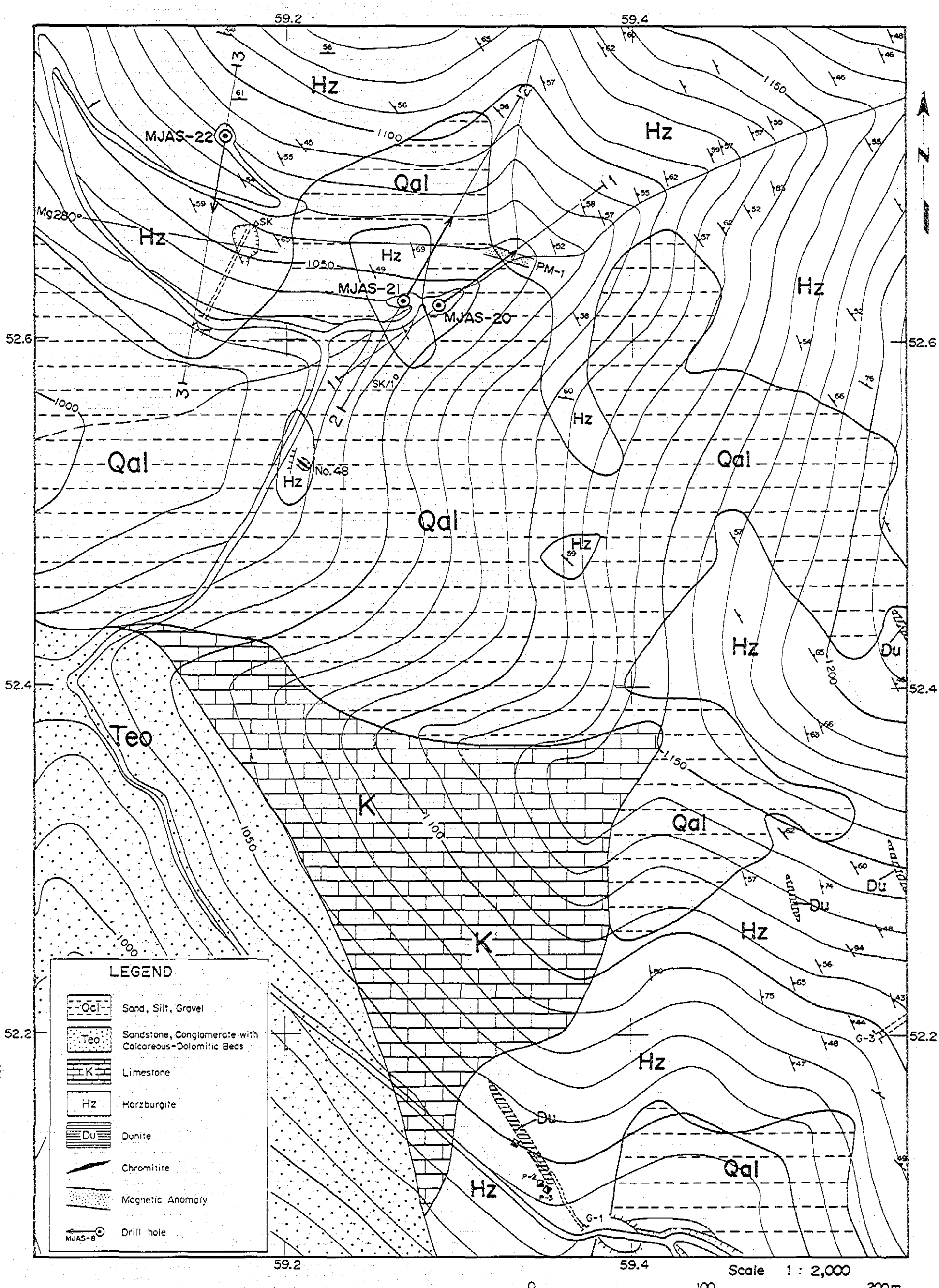


Fig. 2-3-25 Geological map with drilling sites, Mbi Skroske area

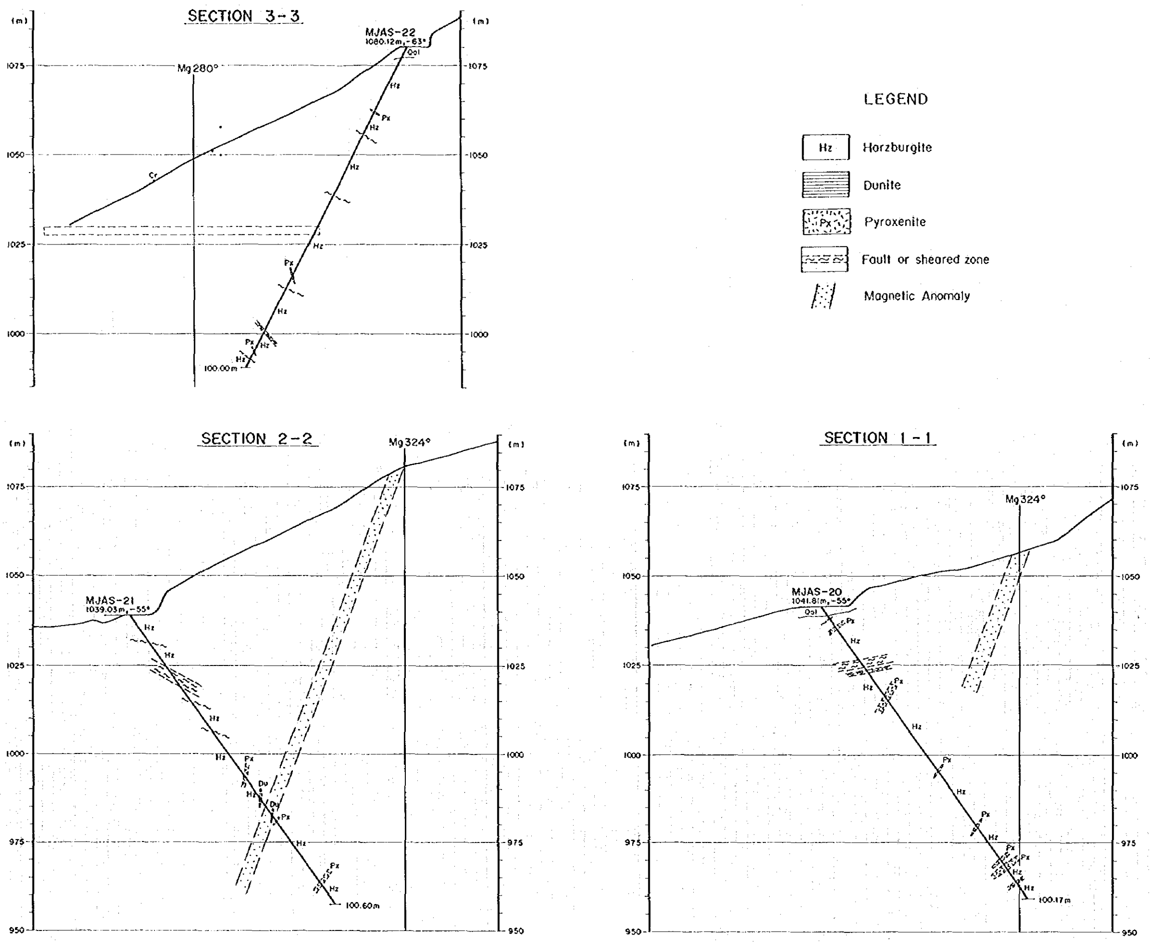


Fig. 2-3-26 Cross section of 1-1, 2-2 and 3-3, Mbi Skroske area

2-3-4 Results of Laboratory Tests

As a part of the drilling survey microscopic observation of ores and rocks, chemical analysis of 24 elements, chemical analysis of platinum group elements (PGE) and EPMA analysis were carried out. The location of the test samples are indicated in the geological logs of Appendix 2-3-1(1) to (19).

(1) Microscopic Observation

Table 2-3-8 gives the results of microscopic observation of the thin sections and Table 2-3-9 those of the polished-thin sections. Their microphotographs are shown in Apx. 2-3-3.

Thin sections were prepared for 20 rock samples, 7 of them dunite and 13 harzburgite. Polished-thin sections were prepared for a total of 31 samples, 2 of them chromitite, 12 dunite including spinel-rich one and 17 harzburgite. Of which polished-thin sections were used for EPMA analysis. The results of the microscopic observation are as follows:

-Harzburgite

Harzburgite consists mainly of olivine and orthopyroxene and is accompanied by small amounts of chromian spinel and clinopyroxene. In general harzburgite has protogranular texture, but some of it shows porphyroclastic texture with foliation. Harzburgite is usually altered to serpentine, however, some of the samples from Bregu i Pishes and Gjorduke are little altered. Noteworthy is the fact that surface outcrops of such fresh rock, including samples from drilling core, are extremely rare in ophiolite ultrabasic massifs.

In many cases some or all of the olivine (1.0-0.1 mm in size) and pyroxene (orthopyroxene, 5.0-0.1 mm; clinopyroxene, under 1.0-0.1 mm in size) are replaced by serpentine (chrysotile or lizardite). The serpentine sometimes has a mesh texture. Kink bands are often recognized in the olivine and orthopyroxene.

Chromian spinel (1.0-0.1 mm in size) is reddish brown to opaque. Sometimes it is altered to magnetite or ferrit-chromite along the crystal edges or cracks, but usually the core of the crystal is fresh. In chromian spinel crystal olivine and pyroxene along with pargasite and other hydrous minerals are often recognized as inclusion minerals under 0.2mm in size.

As secondary minerals in harzburgite, besides serpentine and magnetite, talc, tremolite and carbonate minerals occur, of which the talc and tremolite replace olivine and pyroxene. Chlorite is also sometimes observed as a decomposition product of talc, and in many cases chlorite occurs around the chromian spinel as an alteration halo. Carbonate minerals mainly of dolomite sometimes fill cracks in veinlets form.

-Dunite

Dunite almost entirely consists of olivine, and is accompanied by a small amount of chromian spinel. In some of the samples, however, it is accompanied by a very small amount of orthopyroxene or clinopyroxene. As in the case of the harzburgite, some of the dunite are little serpentinized. Generally dunite shows protogranular texture.

Olivine (1.0-0.1 mm in size) and pyroxene (orthopyroxene, 5.0-0.1 mm; clinopyroxene, 1.0 to less than 0.1 mm in size) is often partly or entirely replaced by serpentine (chrysotile or lizardite), and the serpentine sometimes has mesh texture.

Chromian spinel (1.0-0.1 mm in size) is reddish brown to opaque. Sometimes it is altered to magnetite or ferrit-chromite along the crystal edges or cracks, but usually the core of the crystal is fresh. Olivine and pyroxene together with pargasite are sometimes observed in chromian spinel as inclusion minerals (under 0.2 mm in size).

Table 2-3-8 Results of microscopic observation of thin sections

No.	Sample No.	Depth (m)	Rock type	primary minerals							secondary minerals										Note
				ol	opx	cpx	sp	par	pl	mi	ser	tc	chl	bru	mt	f.c.	tre	ca	di	cl	
1	1-R-4	53.40	Dunite	◎	·		·				◎										Completely serpentinized
2	2-R-1	22.30	OPX-bearing Dunite	◎	·		△				◎							·			Relatively OPX rich
3	3-R-3	59.20	Harzburgite	◎	△		△				◎				·						Completely serpentinized
4	4-R-7	189.00	Harzburgite	◎	○	·	·				○	·			·		·				
5	6-R-2	35.65	Harzburgite	◎	○	·	·				△	·									Porphyroclastic texture
6	6-R-3	72.80	Dunite	◎			△				△							·			
7	7-R-3	79.60	Harzburgite	◎	○		·				△										Porphyroclastic texture
8	7-R-4	80.00	OPX-bearing Dunite	◎	·		·				△				·						Porphyroclastic texture
9	7-R-9	162.50	Harzburgite	◎	○	·	△				·	·									Relatively fresh
10	8-R-1	22.70	Harzburgite	◎	○		·				◎	·			·			·			Strongly serpentinized
11	14-R-3	28.20	Harzburgite	◎	○		·				◎				·						
12	14-R-4	29.00	Dunite	◎			△				◎										Relatively spinel-rich
13	15-R-2	28.80	Harzburgite	◎	○		·				◎				·			·			Strongly serpentinized
14	15-R-4	51.60	Dunite	◎			△				◎				·						Completely serpentinized
15	15-R-12	198.40	Harzburgite	◎	○	·	·				◎							·			
16	16-R-2	65.70	Harzburgite	◎	○		·				◎							·			Completely serpentinized
17	16-R-9	183.30	Dunite	◎			△				◎				·			·			
18	20-R-2	38.70	Harzburgite	◎	○		·				◎							·			Strongly serpentinized
19	21-R-3	99.20	Harzburgite	◎	○	·	·				○				·			·			Weakly porphyroclastic texture
20	22-R-1	56.80	Harzburgite	◎	○		·				◎										Strongly serpentinized

Legend; ◎,abundant; ○, common; △, minor; · rare

ol:olivine, opx:ortho pyroxene, cpx:clino pyroxene, sp:chromian spinel, par: pargasite, pl: plagioclase, mi:mica,

ser: serpentine (chrysotile/lizardite), tc: talc, chl: chlorite, bru: brucite, mt: magnetite,

f.t.: ferrit chromite, tre: tremolite, di: diopside, ca: carbonate, cl: clay minerals

Table 2-3-9 Results of microscopic observation of polished-thin sections

No	Sample No.	Depth (m)	Rock type	primary minerals ol	opx	cpx	sp	par	pl	mi	secondary minerals ser	tc	chl	bru	mt	f.c	tre	ca	di	cl	Note
1	1-R-1	42.00	Olivine chromitite	○			◎				○		△		·						Spinel has olivine-inclusion
2	1-R-2	43.00	Dunite	◎			·				◎										Strongly serpentinized
3	1-R-5	25.30	Harzburgite	◎	○	·	·				◎				·						Porphyroclastic texture
4	2-R-2	40.50	Harzburgite	◎	○		·				◎										Strongly serpentinized
5	2-R-3	59.80	Dunite	◎			△				◎										Spinel is relatively fine and rich
6	2-R-4	60.30	Chromitite		○		◎				○		△								weakly crushed
7	2-R-5	66.40	OPX-bearing Dunite	◎	△		△				◎										Strongly serpentinized
8	3-R-4	74.00	Dunite	◎			·				◎										
9	3-R-5	115.50	Harzburgite	◎	○	·	△				·										Porphyroclastic texture (fresh)
10	4-R-2	124.10	Harzburgite	◎	○	·	△				◎										Porphyroclastic texture
11	4-R-5	166.30	Dunite	◎			△				○										
12	4-R-6	170.30	Harzburgite	◎	○	·	△				◎	·									Porphyroclastic texture
13	6-R-6	121.40	Harzburgite	◎	○	·	△				△										Weakly Porphyroclastic (fresh)
14	6-R-7	156.00	OPX-bearing Dunite	◎	△		△				·										Porphyroclastic texture (fresh)
15	6-R-8	153.00	Harzburgite	◎	○	·	△				·										Porphyroclastic texture (fresh)
16	7-R-6	126.40	Harzburgite	◎	○	·	△				·										Strongly Porphyroclastic (fresh)
17	7-R-7	150.85	Dunite	◎			○				△										Strongly foliated; Porphyroclastic texture
18	8-R-3	44.45	Dunite	◎			○				◎				·			△			
19	8-R-4	49.20	Spinel-rich dunite	◎			○				◎										
20	8-R-6	70.00	Harzburgite	◎	○	·	·				◎						·	·			Protogranular texture
21	14-R-6	46.30	Dunite	◎			△				◎										
22	14-R-7	46.70	Harzburgite	◎	○	·	△				◎										Weakly Porphyroclastic
23	15-R-5	99.10	Harzburgite	◎	○	·	△				◎	△					·				Protogranular texture; relatively spinel rich
24	15-R-9	129.00	Harzburgite	◎	○	△	·				◎										
25	16-R-4	128.05	Harzburgite	◎	○	△	△				◎							△			Protogranular texture
26	16-R-6	148.50	Dunite	◎			△				◎				·						Veinlet serpentine is relatively rich
27	16-R-7	155.60	Harzburgite	◎	○	△	△				◎							△			Weakly Porphyroclastic
28	20-R-3	74.50	Harzburgite	◎	○		·				◎	○									
29	21-R-1	54.50	Dunite	◎			△				◎										It has foliation
30	21-R-2	62.35	Harzburgite	◎	○	△	△				◎	○					△				Protogranular texture; lherzolitic
31	22-R-2	96.70	Harzburgite	◎	○	△	△				◎										

Legend; ◎,abundant; ○, common; △, minor; · rare

ol:olivine, opx:ortho pyroxene, cpx:clino pyroxene, sp:chromian spinel, par: pargasite, pl: plagioclase, mi:mica,
ser: serpentine (chrysotile/lizardite), tc: talc, chl: chlorite, bru: brucite, mt: magnetite,
f.t.: ferrit chromite, tre: tremolite, di: diopside, ca: carbonate, cl: clay minerals

-Chromitite

Of the two samples of chromitite, one is olivine-chromitite (1-R-1; 42.00 m) consisting mainly of olivine and chromian spinel, and the other is massive chromitite (2-R-4; 60.30 m) consisting mostly of chromian spinel accompanied rarely by orthopyroxene (partly olivine?) replaced by bustite.

In both the samples olivine (5.0-0.1 mm in size) is entirely serpentinized (chrysotile or lizardite). However, olivine as an inclusion in chromian spinel remains fresh. The chromian spinel is reddish brown, but it is replaced by magnetite or ferrit-chromite along crystal edges and cracks.

Serpentine (chrysotile or lizardite or antigorite), chlorite and magnetite (or ferrit-chromite) occur as secondary minerals.

(2) Chemical Analyses of Rocks and Ores

(2)-1 24 - Elements Analysis

A total of 52 samples was analyzed chemically for 24-elements, and 21 ores for Cr_2O_3. The breakdown of the samples was 19 harzburgite samples, 13 dunite samples and 25 chromitite samples. All of the results of those analyses are given in Table 2-3-10. In Table 2-3-11 they are given according to rock types along with their statistics.

The elements analyzed in 24-elements analysis are Ag, Ba, Be, Bi, Cd, Co, Cu, Mn, Mo, Ni, Sr, V, Zn, Al, Ca, Fe, K, Mg, Na, Ti, Pb and Cr. Of them, the elements of Ba, Be, Bi, Cd, Cu, Mo, Sr, K, Mg, Ti and Pb were below the detection limit, and it was not possible to read the chemical characteristics regarding them among the harzburgite, dunite and chromitite.

On the other hand, concerning Al, Ca, Co, Fe, Mn, Na, Ni, V, Zn and Cr it is possible to read the characteristics of the different rock types on a variation chart with Cr on the horizontal axis and the other elements on the vertical axis, as shown in Fig. 2.3.27, and those characteristics are consistent with the results concerning surface rocks. For all of the elements, however, the compositional dispersion is smaller than that of the surface samples as an indication of less effect of serpentinization and other alteration in case of the core samples.

Since the Cr content is highest in chromian spinel, it is natural that the Cr content of chromitite should be much higher than that of dunite and harzburgite. Cr content of chromitite varies approximately 5% to 49.7% (average: 30.3%). The average Cr content of harzburgite (about 854 ppm) is slightly lower than that of dunite (about 934 ppm), which relationship is the reverse of that in the case of the surface specimens. The values are lower for both harzburgite and dunite than in the case of the surface rocks. That can be considered to be a reflection of the fact that chromian spinel or orthopyroxene content of the core samples was lower than that of the surface samples.

As indicated in Fig. 2-3-27, the Al, Ca, Mn and V contents of harzburgite are higher than those of dunite. Those results are consistent with the data concerning the surface rocks, and the reason is considered to be the fact that more of those elements is fixed in orthopyroxene than in olivine.

As for nickel content, dunite is higher than harzburgite, which is considered to reflect the fact that more Ni is fixed in olivine than in orthopyroxene.

As for Co, Fe and Zn contents, there was either no or very little difference between dunite and harzburgite regarding them, which can be interpreted as an indication that there is not much difference between olivine and orthopyroxene in terms of degree of fixation of those elements.

(2)-2 Ore Analysis

The results of the ore analysis are as given in Table 2-3-10, and the ore grades and modes of occurrence of chromitite are already indicated in Tables 2-3-6 and 2-3-7 of Section 2-3-3.

Table 2-3-10 Results of chemical analysis of rocks and chromitites

No.	SAMPLE DESCRIPTION	Ag ppm	Al %	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	K %	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P ppm	Pb ppm	Sr ppm	Ti %	V ppm	W ppm	Zn ppm	Cr2O3 %
1	1-C-1	<.2	1.15	<10	<.5	Intf*	0.21	<.5	66	>10000	<1	3.36	<.01	11.7	450	5	0.02	1335	70	<2	1	0.01	173	Intf*	54	36.70
2	1-C-2	<.2	1.02	<10	<.5	Intf*	0.16	<.5	59	>10000	<1	3.1	<.01	10.85	405	3	<.01	1220	40	<2	<1	0.01	154	Intf*	46	34.40
3	1-C-3	<.2	0.47	<10	<.5	Intf*	0.07	<.5	33	>10000	<1	2.11	<.01	9.83	330	1	<.01	1155	10	<2	<1	<.01	68	Intf*	24	32.40
4	1-C-3-2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	36.40
5	1-R-1	<.2	0.96	<10	<.5	Intf*	0.11	<.5	62	>10000	47	3.07	<.01	10.75	385	5	0.05	1250	130	<2	1	0.01	146	Intf*	44	–
6	1-R-2	<.2	0.12	<10	<.5	Intf*	0.05	<.5	80	700	4	4.2	0.01	>15.00	590	<1	0.06	2100	Intf*	<2	4	<.01	17	20	30	–
7	1-R-5	<.2	0.23	<10	<.5	Intf*	0.15	<.5	78	894	2	4.59	<.01	>15.00	715	<1	0.01	1835	Intf*	<2	1	<.01	32	30	28	–
8	2-C-1	<.1	0.96	<10	<.5	Intf*	0.15	<.5	55	>10000	<1	3.1	<.01	9.75	415	4	0.01	1025	50	<2	<1	<.01	166	Intf*	54	38.60
9	2-C-2	0.2	0.82	<10	<.5	Intf*	0.12	<.5	39	>10000	<1	2.27	<.01	4.1	320	3	<.01	338	70	<2	<1	<.01	144	Intf*	44	49.70
10	2-C-2-2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	48.90
11	2-R-2	<.2	0.13	<10	<.5	Intf*	0.03	<.5	83	518	4	4.71	<.01	>15.00	715	<1	0.01	1930	Intf*	<2	1	<.01	23	10	28	–
12	2-R-3	<.2	0.06	<10	<.5	Intf*	0.03	<.5	84	233	2	4.57	<.01	>15.00	645	<1	0.02	2170	Intf*	<2	1	<.01	16	10	30	–
13	2-R-4	<.2	2.2	<10	<.5	Intf*	0.24	<.5	99	>10000	20	4.97	<.01	7.05	580	13	0.03	506	160	<2	<1	0.02	404	Intf*	122	–
14	2-R-5	<.2	0.14	<10	<.5	Intf*	0.04	<.5	84	563	3	4.8	<.01	>15.00	740	<1	0.07	1895	Intf*	<2	<1	<.01	24	20	28	–
15	3-R-4	<.2	0.05	<10	<.5	Intf*	0.02	<.5	76	339	2	4.72	<.01	>15.00	660	<1	0.02	2240	Intf*	<2	1	<.01	18	20	26	–
16	3-R-5	<.2	0.33	<10	<.5	Intf*	0.36	<.5	91	1080	2	5.43	0.04	>15.00	870	<1	0.19	2020	Intf*	<2	<1	<.01	39	40	34	–
17	4-R-1	<.2	0.11	<10	<.5	Intf*	0.03	<.5	98	2370	21	4.93	<.01	>15.00	725	<1	0.05	2470	Intf*	<2	1	<.01	24	10	30	–
18	4-R-2	<.2	0.14	<10	<.5	Intf*	0.22	<.5	87	631	4	5.05	<.01	>15.00	770	<1	0.03	1950	Intf*	<2	<1	<.01	27	30	30	–
19	4-R-5	<.2	0.07	<10	<.5	Intf*	0.08	<.5	89	497	3	4.55	<.01	>15.00	665	<1	0.06	2280	Intf*	<2	<1	<.01	18	10	28	–
20	4-R-6	<.2	0.25	<10	<.5	Intf*	0.3	<.5	83	808	7	4.92	0.02	>15.00	785	<1	0.12	1880	Intf*	<2	<1	<.01	34	40	32	–
21	6-C-1	<.2	0.34	<10	<.5	<2	0.13	<.5	98	6770	2	5.36	0.03	>15.00	815	<1	0.26	2380	<10	<2	<1	<.01	36	40	34	4.97
22	6-R-5	<.2	0.14	<10	<.5	Intf*	0.08	<.5	107	2860	17	5.53	<.01	>15.00	820	<1	0.07	2260	Intf*	<2	<1	<.01	29	30	38	–
23	6-R-6	<.2	0.28	<10	<.5	Intf*	0.32	<.5	100	716	2	5.79	0.05	>15.00	900	<1	0.19	2200	Intf*	<2	<1	<.01	34	30	36	–
24	6-R-7	<.2	0.19	<10	<.5	Intf*	0.25	<.5	99	1140	4	5.34	0.04	>15.00	800	<1	0.15	2370	Intf*	<2	<1	<.01	26	40	28	–
25	6-R-8	<.2	0.27	<10	<.5	Intf*	0.34	<.5	93	1060	3	5.55	<.01	>15.00	870	<1	0.12	2120	Intf*	<2	<1	<.01	38	40	34	–
26	7-R-3	<.2	0.27	<10	<.5	Intf*	0.3	<.5	95	1360	9	5.26	<.01	>15.00	850	<1	0.17	2030	Intf*	<2	<1	<.01	38	10	34	–
27	7-R-6	<.2	0.29	<10	<.5	Intf*	0.35	<.5	88	983	3	5.21	<.01	>15.00	825	<1	0.12	1980	Intf*	<2	<1	<.01	37	40	32	–
28	7-R-7	<.2	0.14	<10	<.5	Intf*	0.07	<.5	107	680	5	5.69	0.01	>15.00	825	<1	0.12	2530	Intf*	<2	<1	<.01	22	30	34	–
29	8-C-1	<.2	0.42	<10	<.5	Intf*	0.22	<.5	39	>10000	<1	2.18	<.01	8.47	395	1	<.01	1015	30	<2	4	<.01	63	Intf*	34	40.50
30	8-C-2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	33.40
31	8-C-3	<.2	0.95	<10	<.5	Intf*	0.21	<.5	67	>10000	<1	3.37	<.01	10.45	540	4	<.01	1265	50	<2	1	<.01	143	Intf*	68	36.00
32	8-C-4	0.4	0.91	<10	<.5	Intf*	0.23	<.5	84	>10000	3	3.77	<.01	12.3	565	3	<.01	1300	40	<2	2	0.01	133	Intf*	96	24.30
33	8-C-5	<.2	0.22	<10	<.5	Intf*	0.51	<.5	34	>10000	4	1.94	<.01	12.85	355	<1	0.01	1620	<10	<2	3	<.01	33	Intf*	20	21.70
34	8-C-5-2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	21.60
35	8-C-6	<.2	0.24	<10	<.5	Intf*	2.15	<.5	69	>10000	5	3.36	<.01	>15.00	860	<1	0.03	2110	<10	<2	27	<.01	35	Intf*	26	7.78
36	8-C-6-2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	26.70
37	8-R-2	<.2	0.32	<10	<.5	Intf*	0.14	<.5	45	>10000	6	2.35	<.01	13.25	390	<1	<.01	1670	Intf*	<2	1	<.01	49	Intf*	30	–
38	8-R-3	<.2	0.07	<10	<.5	Intf*	0.65	<.5	85	917	<1	4.68	<.01	>15.00	530	<1	<.01	2840	Intf*	<2	9	<.01	19	30	18	–
39	8-R-4	<.2	0.11	<10	<.5	Intf*	1.16	<.5	66	2740	<1	3.35	<.01	>15.00	595	<1	<.01	2320	Intf*	<2	13	<.01	19	80	18	–
40	8-R-5	<.2	0.23	<10	<.5	Intf*	0.3	<.5	92	965	16	5.19	<.01	>15.00	740	<1	<.01	2030	Intf*	<2	5	<.01	35	30	32	–
41	9-C-1	<.2	0.28	<10	<.5	Intf*	0.39	<.5	40	9540	1	2.05	<.01	8.07	410	<1	0.01	1065	Intf*	<2	7	<.01	29	190	28	25.60
42	9-C-2	<.2	0.36	10	<.5	Intf*	0.22	<.5	39	8790	1	2.18	<.01	12.55	375	<1	0.01	1900	Intf*	<2	4	<.01	30	180	26	23.00
43	9-C-3	<.2	0.3	10	<.5	Intf*	0.27	<.5	40	7050	2	2.35	<.01	13.5	405	<1	0.01	2160	Intf*	<2	6	<.01	27	170	26	22.70
44	9-C-4	<.2	0.29	<10	<.5	Intf*	1	<.5	51	>10000	<1	2.66	<.01	12.6	410	1	<.01	1380	Intf*	<2	15	<.01	40	400	46	27.10
45	14-R-6	<.2	0.09	<10	<.5	Intf*	0.11	<.5	90	691	3	4.88	<.01	>15.00	715	<1	0.05	2080	Intf*	<2	<1	<.01	20	30	30	–
46	14-R-7	<.2	0.15	<10	<.5	Intf*	0.21	<.5	86	531	1	4.78	<.01	>15.00	735	<1	0.08	1880	Intf*	<2	<1	<.01	25	10	30	–
47	15-R-5	<.2	0.24	<10	<.5	Intf*	0.26	<.5	84	891	1	4.95	<.01	>15.00	750	<1	0.01	1865	Intf*	<2	4	<.01	34	30	30	–
48	15-R-9	<.2	0.28	<10	<.5	Intf*	0.29	<.5	84	910	18	5.05	<.01	>15.00	785	<1	0.05	1895	Intf*	<2	3	<.01	39	30	34	–
49	16-R-4	<.2	0.2	<10	<.5	Intf*	0.41	<.5	86	875	4	5.15	<.01	>15.00	810	<1	<.01	1875	Intf*	<2	2	<.01	38	30	30	–
50	16-R-6	<.2	0.11	<10	<.5	Intf*	0.07	<.5	89	451	87	4.52	<.01	>15.00	635	<1	0.07	2120	Intf*	<2	1	<.01	18	10	24	–
51	16-R-7	<.2	0.17	<10	<.5	Intf*	1.03	<.5	81	677	4	4.93	<.01	>15.00	815	<1	<.01	1780	Intf*	<2	7	<.01	32	30	30	–
52	16-R-10	<.2	0.13	<10	<.5	Intf*	0.04	<.5	88	715	9	4.41	<.01	>15.00	700	<1	0.07	1975	Intf*	<2	2	<.01	26	<10	26	–
53	20-R-3	<.2	0.21	<10	<.5	Intf*	0.19	<.5	92	859	<1	5.42	<.01	>15.00	805	<1	0.02	2050	Intf*	<2	4	<.01	34	30	30	–
54	21-R-1	<.2	0.1	<10	<.5	Intf*	0.07	<.5	90	537	3	5.09	<.01	>15.00	740	<1	0.05	2010	Intf*	<2	1	<.01	20	20	30	–
55	21-R-2	<.2	0.22	<10	<.5	Intf*	0.28	<.5	88	993	<1	5.21	<.01	>15.00	800	<1	0.01	1895	Intf*	<2	5	<.01	35	30	30	–
56	22-R-2	<.2	0.2	<10	<.5	Intf*	0.19	<.5	82	920	2	4.94	<.01	>15.00	745	<1	0.01	1800	Intf*	<2	1	<.01	32	40	30	–
57	HUA E ZEZE	<.2	0.11	<10	<.5	Intf*	0.04	<.5	17	4100	1	1.64	<.01	7.88	225	<1	<.01	1320	Intf*	<2	1	<.01	18	80	12	43.70
	maximum	0.4	2.2	10.0	-	-	2.2	-	107.0	>10000	87.0	5.8	0.1	>15.00	900.0	13.0	0.3	2840.0	-	<2	27.0	0.0	404.0	-	122.0	49.7
	Average	–	0.3	-	-	-	0.3	-	75.8	-	-	4.2	-	-	640.4	-	-	1820.9	-	-	-	-	54.1	-	34.9	30.3
	minimum	<.2	0.1	<10	-	-	0.0	-	17.0	233.0	<1	1.6	<.01	4.1	225.0	<1	<.01	338.0	-	<2	<1	<.01	16.0	-	12.0	5.0
	Standard. Dev.	–	0.4	–	–	–	0.4	–	22.0	–	–	1.2	–	–	184.4	–	–	500.2	–	–	–	–	65.5	–	17.8	11.6

Table 2-3-11 Chemical characteristics of chromitite, dunite and harzburgite

chromitite

SAMPLE DESCRIPTION	Ag ppm	Al %	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	K %	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P ppm	Pb ppm	Sr ppm	Ti %	V ppm	W ppm	Zn ppm	Cr2O3 %
1-C-1	<.2	1.15	<10	<.5	Intf*	0.21	<.5	66	>10000	<1	3.36	<.01	11.7	450	5	0.02	1335	70	<2	1	0.01	173	Intf*	54	36.70
1-C-2	<.2	1.02	<10	<.5	Intf*	0.16	<.5	59	>10000	<1	3.1	<.01	10.85	405	3	<.01	1220	40	<2	<1	0.01	154	Intf*	46	34.40
1-C-3	<.2	0.47	<10	<.5	Intf*	0.07	<.5	33	>10000	<1	2.11	<.01	9.83	330	1	<.01	1155	10	<2	<1	<.01	68	Intf*	24	32.40
1-C-3-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36.40
1-R-1	<.2	0.96	<10	<.5	Intf*	0.11	<.5	62	>10000	47	3.07	<.01	10.75	385	5	0.05	1250	130	<2	1	0.01	146	Intf*	44	-
2-C-1	<.1	0.96	<10	<.5	Intf*	0.15	<.5	55	>10000	<1	3.1	<.01	9.75	415	4	0.01	1025	50	<2	<1	<.01	166	Intf*	54	38.60
2-C-2	0.2	0.82	<10	<.5	Intf*	0.12	<.5	39	>10000	<1	2.27	<.01	4.1	320	3	<.01	338	70	<2	<1	<.01	144	Intf*	44	49.70
2-C-2-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	48.90
2-R-4	<.2	2.2	<10	<.5	Intf*	0.24	<.5	99	>10000	20	4.97	<.01	7.05	580	13	0.03	506	160	<2	<1	0.02	404	Intf*	122	-
6-C-1	<.2	0.34	<10	<.5	<2	0.13	<.5	98	6770	2	5.36	0.03	>15.00	815	<1	0.26	2380	<10	<2	<1	<.01	36	40	34	4.97
8-C-1	<.2	0.42	<10	<.5	Intf*	0.22	<.5	39	>10000	<1	2.18	<.01	8.47	395	1	<.01	1015	30	<2	4	<.01	63	Intf*	34	40.50
8-C-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33.40
8-C-3	<.2	0.95	<10	<.5	Intf*	0.21	<.5	67	>10000	<1	3.37	<.01	10.45	540	4	<.01	1265	50	<2	1	<.01	143	Intf*	68	36.00
8-C-4	0.4	0.91	<10	<.5	Intf*	0.23	<.5	84	>10000	3	3.77	<.01	12.3	565	3	<.01	1300	40	<2	2	0.01	133	Intf*	96	24.30
8-C-5	<.2	0.22	<10	<.5	Intf*	0.51	<.5	34	>10000	4	1.94	<.01	12.85	355	<1	0.01	1620	<10	<2	3	<.01	33	Intf*	20	21.70
8-C-5-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21.60
8-C-6	<.2	0.24	<10	<.5	Intf*	2.15	<.5	69	>10000	5	3.36	<.01	>15.00	860	<1	0.03	2110	<10	<2	27	<.01	35	Intf*	26	7.78
8-C-6-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26.70
8-R-2	<.2	0.32	<10	<.5	Intf*	0.14	<.5	45	>10000	6	2.35	<.01	13.25	390	<1	<.01	1670	Intf*	<2	1	<.01	49	Intf*	30	-
8-R-4	<.2	0.11	<10	<.5	Intf*	1.16	<.5	66	2740	<1	3.35	<.01	>15.00	595	<1	<.01	2320	Intf*	<2	13	<.01	19	80	18	-
9-C-1	<.2	0.28	<10	<.5	Intf*	0.39	<.5	40	9540	1	2.05	<.01	8.07	410	<1	0.01	1065	Intf*	<2	7	<.01	29	190	28	25.60
9-C-2	<.2	0.36	10	<.5	Intf*	0.22	<.5	39	8790	1	2.18	<.01	12.55	375	<1	0.01	1900	Intf*	<2	4	<.01	30	180	26	23.00
9-C-3	<.2	0.3	10	<.5	Intf*	0.27	<.5	40	7050	2	2.35	<.01	13.5	405	<1	0.01	2160	Intf*	<2	6	<.01	27	170	26	22.70
9-C-4	<.2	0.29	<10	<.5	Intf*	1	<.5	51	>10000	<1	2.66	<.01	12.6	410	1	<.01	1380	Intf*	<2	15	<.01	40	400	46	27.10
KUA E ZEZE	<.2	0.11	<10	<.5	Intf*	0.04	<.5	17	4100	1	1.64	<.01	7.88	225	<1	<.01	1320	Intf*	<2	1	<.01	18	80	12	43.70
maximum	0.4	2.2	10.0	<.5	-	2.2	<.5	99.0	>10000	47.0	5.4	0.0	>15.00	860.0	13.0	0.3	2380.0	-	<2	27.0	0.0	404.0	-	122.0	49.7
Average	-	0.6	-	-	-	0.4	-	55.1	-	-	2.9	-	-	461.3	-	-	1416.7	-	-	-	-	95.5	-	42.6	30.3
minimum	<.2	0.1	<10	<.5	-	0.0	<.5	17.0	2740.0	<1	1.6	<.01	4.1	225.0	<1	<.01	338.0	-	<2	<1	<.01	18.0	-	12.0	5.0
Standard. Dev.	-	0.5	-	-	-	0.5	-	21.7	-	-	1.0	-	-	157.9	-	-	549.5	-	-	-	-	92.2	-	27.0	11.6

dunite

SAMPLE DESCRIPTION	Ag ppm	Al %	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	K %	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P ppm	Pb ppm	Sr ppm	Ti %	V ppm	W ppm	Zn ppm	Cr2O3 %
1-R-2	<.2	0.12	<10	<.5	Intf*	0.05	<.5	80	700	4	4.2	0.01	>15.00	590	<1	0.06	2100	Intf*	<2	4	<.01	17	20	30	-
2-R-3	<.2	0.06	<10	<.5	Intf*	0.03	<.5	84	233	2	4.57	<.01	>15.00	645	<1	0.02	2170	Intf*	<2	1	<.01	16	10	30	-
3-R-4	<.2	0.05	<10	<.5	Intf*	0.02	<.5	76	339	2	4.72	<.01	>15.00	660	<1	0.02	2240	Intf*	<2	1	<.01	18	20	26	-
4-R-1	<.2	0.11	<10	<.5	Intf*	0.03	<.5	98	2370	21	4.93	<.01	>15.00	725	<1	0.05	2470	Intf*	<2	1	<.01	24	10	30	-
4-R-5	<.2	0.07	<10	<.5	Intf*	0.08	<.5	89	497	3	4.55	<.01	>15.00	665	<1	0.06	2280	Intf*	<2	<1	<.01	18	10	28	-
6-R-5	<.2	0.14	<10	<.5	Intf*	0.08	<.5	107	2860	17	5.53	<.01	>15.00	820	<1	0.07	2260	Intf*	<2	<1	<.01	29	30	38	-
6-R-7	<.2	0.19	<10	<.5	Intf*	0.25	<.5	99	1140	4	5.34	0.04	>15.00	800	<1	0.15	2370	Intf*	<2	<1	<.01	26	40	28	-
7-R-7	<.2	0.14	<10	<.5	Intf*	0.07	<.5	107	680	5	5.69	0.01	>15.00	825	<1	0.12	2530	Intf*	<2	<1	<.01	22	30	34	-
14-R-6	<.2	0.09	<10	<.5	Intf*	0.11	<.5	90	691	3	4.88	<.01	>15.00	715	<1	0.05	2080	Intf*	<2	<1	<.01	20	30	30	-
16-R-6	<.2	0.11	<10	<.5	Intf*	0.07	<.5	89	451	87	4.52	<.01	>15.00	635	<1	0.07	2120	Intf*	<2	1	<.01	13	10	24	-
16-R-10	<.2	0.13	<10	<.5	Intf*	0.04	<.5	88	715	9	4.41	<.01	>15.00	700	<1	0.07	1975	Intf*	<2	2	<.01	26	<10	26	-
21-R-1	<.2	0.1	<10	<.5	Intf*	0.07	<.5	90	537	3	5.09	<.01	>15.00	740	<1	0.05	2010	Intf*	<2	1	<.01	20	20	30	-
maximum	<.2	0.2	<10	<.5	-	0.3	<.5	107.0	2860.0	87.0	5.7	0.0	-	825.0	<1	0.2	2530.0	-	<2	4.0	<.01	29.0	40.0	38.0	-
Average	-	0.1	-	-	-	0.1	-	91.4	934.4	13.3	4.9	-	-	710.0	-	0.1	2217.1	-	-	-	-	21.2	-	29.5	-
minimum	<.2	0.1	<10	<.5	-	0.0	<.5	76.0	233.0	2.0	4.2	<.01	-	590.0	<1	0.0	1975.0	-	<2	<1	<.01	16.0	<10	24.0	-
Standard. Dev.	-	0.0	-	-	-	0.1	-	9.7	823.9	24.0	0.5	-	-	75.9	-	0.0	175.1	-	-	-	-	4.2	-	3.7	-

harzburgite

SAMPLE DESCRIPTION	Ag ppm	Al %	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	K %	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P ppm	Pb ppm	Sr ppm	Ti %	V ppm	W ppm	Zn ppm	Cr2O3 %
1-R-5	<.2	0.23	<10	<.5	Intf*	0.15	<.5	76	854	2	4.59	<.01	>15.00	715	<1	0.01	1835	Intf*	<2	1	<.01	32	30	28	-
2-R-2	<.2	0.13	<10	<.5	Intf*	0.03	<.5	83	518	4	4.71	<.01	>15.00	715	<1	0.01	1930	Intf*	<2	1	<.01	23	10	28	-
2-R-5	<.2	0.14	<10	<.5	Intf*	0.04	<.5	84	563	3	4.8	<.01	>15.00	740	<1	0.07	1895	Intf*	<2	<1	<.01	24	20	28	-
3-R-5	<.2	0.33	<10	<.5	Intf*	0.36	<.5	91	1080	2	5.43	0.04	>15.00	870	<1	0.19	2020	Intf*	<2	<1	<.01	39	40	34	-
4-R-2	<.2	0.14	<10	<.5	Intf*	0.22	<.5	87	631	4	5.05	<.01	>15.00	770	<1	0.03	1950	Intf*	<2	<1	<.01	27	30	30	-
4-R-6	<.2	0.25	<10	<.5	Intf*	0.3	<.5	83	808	7	4.92	0.02	>15.00	785	<1	0.12	1880	Intf*	<2	<1	<.01	34	40	32	-
6-R-6	<.2	0.28	<10	<.5	Intf*	0.32	<.5	100	716	2	5.79	0.05	>15.00	900	<1	0.19	2200	Intf*	<2	<1	<.01	34	30	36	-
6-R-8	<.2	0.27	<10	<.5	Intf*	0.34	<.5	93	1060	3	5.55	<.01	>15.00	870	<1	0.12	2120	Intf*	<2	<1	<.01	38	40	34	-
7-R-3	<.2	0.27	<10	<.5	Intf*	0.3	<.5	95	1360	9	5.26	<.01	>15.00	850	<1	0.17	2030	Intf*	<2	<1	<.01	38	10	34	-
7-R-6	<.2	0.29	<10	<.5	Intf*	0.35	<.5	88	983	3	5.21	<.01	>15.00	825	<1	0.12	1980	Intf*	<2	<1	<.01	37	40	32	-
8-R-5	<.2	0.23	<10	<.5	Intf*	0.3	<.5	92	965	16	5.19	<.01	>15.00	740	<1	<.01	2030	Intf*	<2	5	<.01	35	30	32	-
14-R-7	<.2	0.15	<10	<.5	Intf*	0.21	<.5	86	531	1	4.78	<.01	>15.00	735	<1	0.08	1880	Intf*	<2	<1	<.01	25	10	30	-
15-R-5	<.2	0.24	<10	<.5	Intf*	0.26	<.5	84	891	1	4.95	<.01	>15.00	750	<1	0.01	1865	Intf*	<2	4	<.01	34	30	30	-
15-R-9	<.2	0.28	<10	<.5	Intf*	0.29	<.5	84	910	18	5.05	<.01	>15.00	785	<1	0.05	1895	Intf*	<2	3	<.01	39	30	34	-
16-R-4	<.2	0.2	<10	<.5	Intf*	0.41	<.5	86	875	4	5.15	<.01	>15.00	810	<1	<.01	1875	Intf*	<2	2	<.01	38	30	30	-
16-R-7	<.2	0.17	<10	<.5	Intf*	1.03	<.5	81	677	4	4.93	<.01	>15.00	815	<1	<.01	1780	Intf*	<2	7	<.01	32	30	30	-
20-R-3	<.2	0.21	<10	<.5	Intf*	0.19	<.5	92	859	<1	5.42	<.01	>15.00	805	<1	0.02	2050	Intf*	<2	4	<.01	34	30	30	-
21-R-2	<.2	0.22	<10	<.5	Intf*	0.28	<.5	88	993	<1	5.21	<.01	>15.00	800	<1	0.01	1895	Intf*	<2	5	<.01	35	30	30	-
22-R-2	<.2	0.2	<10	<.5	Intf*	0.19	<.5	82	920	2	4.94	<.01	>15.00	745	<1	0.01	1800	Intf*	<2	1	<.01	32	40	30	-
maximum	<.2	0.3	<10	<.5	-	1.0	<.5	100.0	1360.0	18.0	5.8	0.1	>15.00	900.0	<1	0.2	2200.0	-	<2	7.0	<.01	39.0	40.0	36.0	-
Average	-	0.2	-	-	-	0.3	-	87.2	854.4	-	5.1	-	-	790.8	-	-	1942.6	-	-	-	-	33.2	28.9	31.2	-
minimum	<.2	0.1	<10	<.5	-	0.0	<.5	78.0	518.0	<1	4.6	<.01	>15.00	715.0	<1	<.01	1780.0	-	<2	<1	<.01	23.0	10.0	28.0	-
Standard. Dev.	-	0.1	-	-	-	0.2	-	16.7	469.0	-	1.0	-	-	153.3	-	-	389.1	-	-	-	-	8.6	10.5	6.2	-

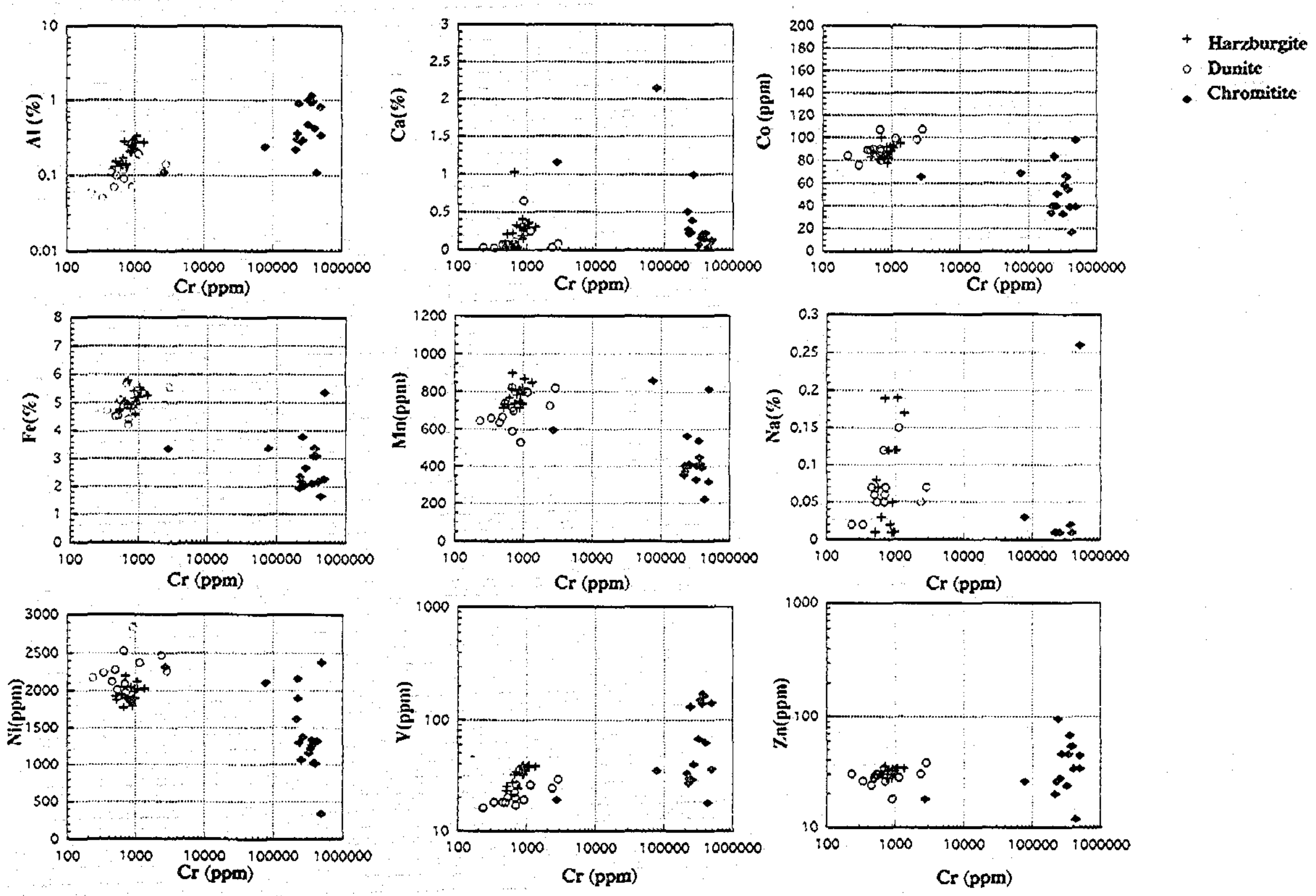


Fig. 2-3-27 Variation diagram of Al, Ca, Co, Fe, Mn, Na, Ni, V, Zn and Cr contents

(2)-3 Platinum Group Element (PGE) Analysis

Platinum Group Element (PGE) analysis was undertaken with respect to a total of 21 chromitite samples: 20 drilling core samples and 1 outcrop sample from the Hija e Zeze area.

The results of the analysis are given in Table 2-3-12, and the PGE pattern normalized by chondrite values is given in Fig. 2-3-28 along with the LG5 and LG6 chromitite horizons of the Merensky Reef and Bushveld and those of the ophiolite (chromitite and dunite).

Table 2-3-12 Results of chemical analysis of chromitite for platinum group elements

No.	Sample No.	Rock Type	Os (ppb)	Ir (ppb)	Ru (ppb)	Rh (ppb)	Pt (ppb)	Pd (ppb)	Au (ppb)	Re (ppb)
1	1-C-1	Chromitite	12	15.0	25	3.2	10	< 2	0.8	< 5
2	1-C-2	Chromitite	9	14	51	3.2	< 5	< 2	1.9	< 5
3	1-C-3	Chromitite	15	21	49	3.1	< 5	< 2	1.3	< 5
4	1-C-3-2	Chromitite	11	12	20	2.9	< 5	< 2	0.7	< 5
5	2-C-1	Chromitite	14	22	50	4.3	< 5	< 2	2.3	< 5
6	2-C-2	Chromitite	16	22	67	7.4	< 5	< 2	1.3	< 5
7	2-C-2-2	Chromitite	14	27	79	7.2	< 5	7	1.2	< 5
8	6-C-1	Chromitite	< 2	0.1	< 5	< 0.2	11	< 2	< 0.5	< 5
9	8-C-1	Chromitite	29	42	70	7.1	< 5	11	3.3	< 5
10	8-C-2	Chromitite	68	74	120	9.8	< 5	39	10.0	< 5
11	8-C-3	Chromitite	50	65	140	13	< 5	< 4	11.0	< 5
12	8-C-4	Chromitite	38	61	120	8.8	28	< 2	1.2	< 5
13	8-C-5	Chromitite	10	16	37	5.4	< 5	< 2	0.8	< 5
14	8-C-5-2	Chromitite	11	15	24	3.2	10	< 2	3.3	< 5
15	8-C-6	Chromitite	< 2	0.6	< 5	< 0.2	< 5	< 2	< 0.5	< 5
16	8-C-6-2	Chromitite	5	5.4	24	1.2	< 5	< 2	1.6	< 5
17	9-C-1	Chromitite	22	30	62	5.7	< 5	< 2	0.8	< 5
18	9-C-2	Chromitite	11	16	30	3.1	< 5	14	4.5	< 5
19	9-C-3	Chromitite	14	18	45	2.7	8	12	1.6	< 5
20	9-C-4	Chromitite	12	16	32	5.0	< 5	< 2	2.7	< 5
21	HIJA E ZEZE	Chromitite	20	23	40	4.8	< 5	< 2	2.9	< 5

As shown in Fig. 2-3-28, although in some of the samples the Ir-group PGE contents are low, in most of them there is a pattern of gentle decline to the right from the Ir group to the Pt group, which is similar to the ophiolite pattern.

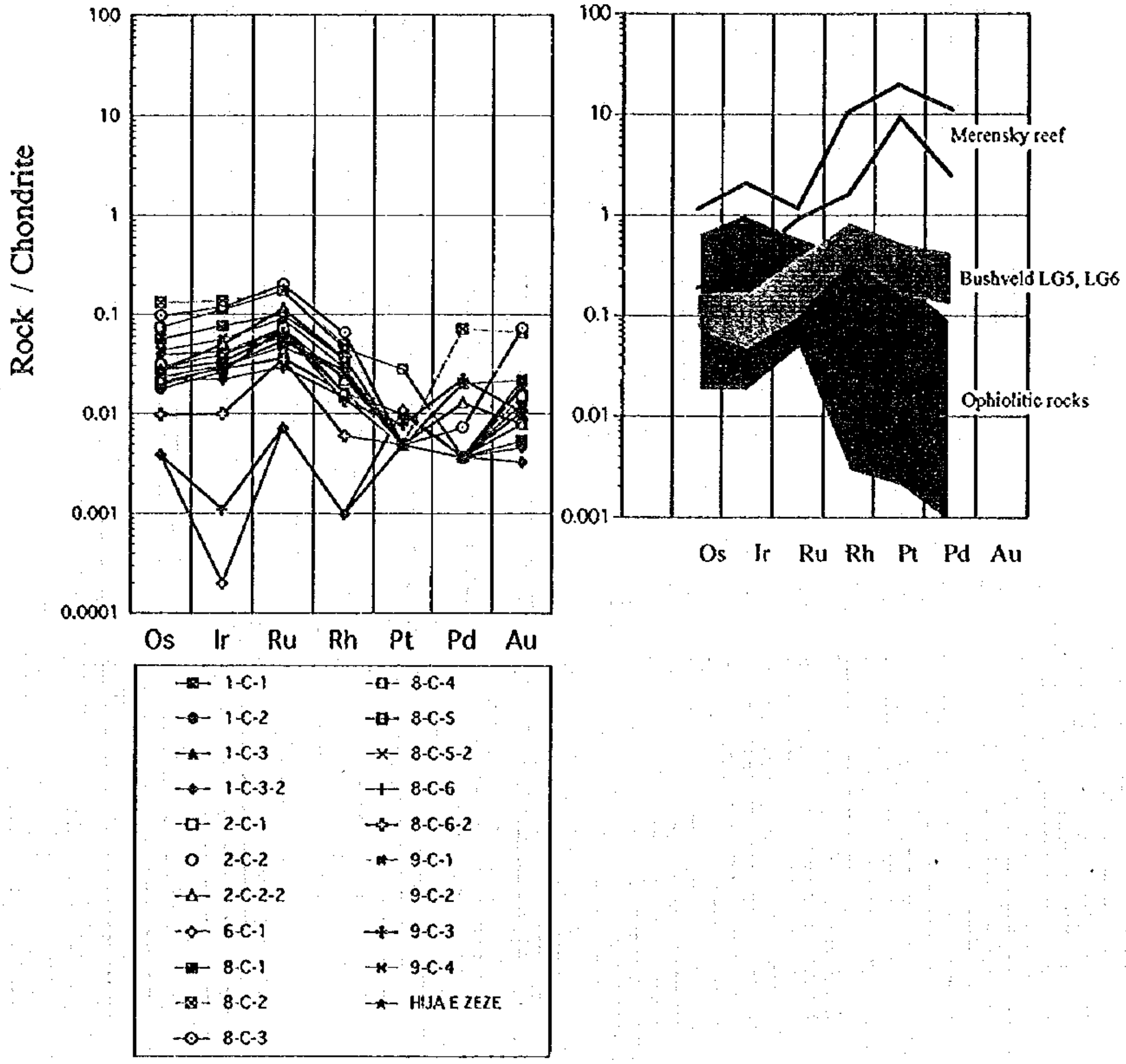
Moreover, regarding content values, in all of the samples, just as in the case of the surface samples, both the Ir and the Pt groups of PGE showed low values, no considerable concentrations having been found. Considering that, the results of the PGE analysis of the samples collected in the geological survey and other factors, one can conclude that there was not high expectation of concentrations of the PGE in the Eastern zone, including the samples from this drilling survey.

(3) EPMA Analysis

As already mentioned, as a result of this year's drilling survey comprising 19 drill holes chromitite was encountered in a total of 4 drill holes: 2 in the Bregu i Pishes area and 2 in the Qarri i Zi area. It was not detected, however, in any of the other 15 drill holes. EPMA analysis was carried out using core samples for the purpose of studying the chrome potential of those drill holes particularly those in which chromitite was not encountered.

In this EPMA analysis the measurement conditions, the standard samples and the study items were exactly the same as in the EPMA analysis in the geological survey described previously.

The core samples used for the test were 31 samples from a total of 13 drill holes (MJAS-1, 2, 3, 4, 6, 7, 8, 14, 15, 16, 20, 21 and 22) which were available as of the end of November 1996. It was not possible to carry out EPMA analysis with respect to cores from the six drill holes MJAS-9, 10, 12, 13, 18 and 19 because of time restrictions. Of the 31 core samples that underwent the EPMA analysis, 2



Data sources;
Merensky reef: Lee (1983)
Bushveld LG5, LG6: Lee and Parry (1988)
Ophiolitic rocks: Talkington and Watkinson (1986)

Fig. 2-3-28 Chondrite Normalized PGE patterns of chromitite of drill-core samples

Table 2-3-13 Results of EPMA analysis

No.	Sample No.	TiO2	Al2O3	Cr2O3	FeO*	V2O3	MnO	MgO	Total	Ti	Al	Cr	Fe	V	Mn	Mg	total	Fe2+	Fe3+	Cr#	Mg#	Fe3+#
	MJAS-1 (Bregu i Pishes)																					
1	1-R-1	0.12	11.06	59.75	14.72	0.14	0.24	14.20	100.24	0.003	0.415	1.505	0.392	0.004	0.006	0.674	3.000	0.322	0.070	0.784	0.679	0.035
2	1-R-2	0.06	10.69	58.03	18.20	0.21	0.31	11.10	98.60	0.002	0.417	1.517	0.503	0.005	0.009	0.547	3.000	0.446	0.058	0.785	0.551	0.029
3	1-R-5	0.03	20.49	48.83	17.31	0.23	0.28	12.50	99.65	0.001	0.753	1.203	0.451	0.006	0.007	0.580	3.000	0.413	0.038	0.615	0.583	0.019
	MJAS-2 (Bregu i Pishes)																					
4	2-R-2	0.03	14.58	55.10	18.86	0.27	0.31	10.79	99.93	0.001	0.554	1.404	0.508	0.007	0.008	0.518	3.000	0.474	0.034	0.717	0.521	0.017
5	2-R-3	0.05	13.16	56.17	18.26	0.20	0.31	11.18	99.33	0.001	0.504	1.443	0.496	0.005	0.008	0.542	3.000	0.451	0.045	0.741	0.545	0.023
6	2-R-4	0.07	10.33	60.58	14.68	0.14	0.24	13.64	99.68	0.002	0.393	1.544	0.396	0.004	0.007	0.656	3.000	0.340	0.056	0.797	0.659	0.028
7	2-R-5	0.01	9.66	59.69	19.76	0.26	0.37	9.65	99.39	0.000	0.379	1.573	0.551	0.007	0.010	0.479	3.000	0.511	0.040	0.806	0.482	0.020
	MJAS-3 (Bregu i Pishes)																					
8	3-R-4	0.07	9.89	58.61	20.25	0.21	0.36	9.97	99.36	0.002	0.387	1.539	0.563	0.006	0.010	0.494	3.000	0.498	0.064	0.799	0.497	0.032
9	3-R-5	0.03	17.14	52.30	18.07	0.29	0.31	11.36	99.50	0.001	0.644	1.318	0.482	0.007	0.008	0.540	3.000	0.453	0.029	0.672	0.543	0.015
	MJAS-4 (Fusha e Madhe)																					
10	4-R-2	0.03	14.60	55.23	17.90	0.23	0.32	11.06	99.37	0.001	0.556	1.412	0.484	0.006	0.009	0.533	3.000	0.459	0.025	0.717	0.536	0.012
11	4-R-5	0.04	6.72	62.19	19.90	0.21	0.36	9.62	99.04	0.001	0.268	1.665	0.564	0.006	0.010	0.486	3.000	0.505	0.059	0.861	0.489	0.029
12	4-R-6	0.05	16.33	52.97	18.07	0.29	0.33	11.41	99.46	0.001	0.616	1.339	0.483	0.007	0.009	0.544	3.000	0.448	0.035	0.685	0.548	0.018
	MJAS-6 (Gjorduke)																					
13	6-R-6	0.03	18.46	50.27	17.94	0.30	0.28	11.55	98.82	0.001	0.693	1.266	0.478	0.008	0.008	0.548	3.000	0.445	0.033	0.646	0.551	0.016
14	6-R-7	0.04	11.88	58.00	16.85	0.21	0.29	12.07	99.34	0.001	0.455	1.489	0.458	0.006	0.008	0.584	3.000	0.409	0.049	0.766	0.587	0.024
15	6-R-8	0.02	16.66	52.70	18.01	0.33	0.30	11.51	99.51	0.000	0.626	1.329	0.480	0.008	0.008	0.547	3.000	0.445	0.035	0.680	0.550	0.018
	MJAS-7 (Gjorduke)																					
16	7-R-6	0.03	20.51	49.98	17.41	0.26	0.28	11.72	100.18	0.001	0.754	1.233	0.454	0.007	0.007	0.545	3.000	0.448	0.006	0.620	0.548	0.003
17	7-R-7	0.04	8.55	61.06	18.80	0.25	0.35	10.02	99.05	0.001	0.338	1.618	0.527	0.007	0.010	0.500	3.000	0.491	0.036	0.827	0.504	0.018
	MJAS-8 (Qarri i Zi)																					
18	8-R-3	0.15	11.76	56.02	20.80	0.10	0.34	10.03	99.20	0.004	0.457	1.461	0.574	0.003	0.010	0.493	3.000	0.501	0.072	0.762	0.497	0.036
19	8-R-4	0.13	10.82	58.59	17.49	0.12	0.30	12.34	99.79	0.003	0.413	1.502	0.474	0.003	0.008	0.596	3.000	0.399	0.076	0.784	0.601	0.038
20	8-R-6	0.05	23.39	44.63	17.44	0.21	0.25	13.21	99.18	0.001	0.848	1.085	0.449	0.005	0.007	0.605	3.000	0.389	0.059	0.561	0.608	0.030
	MJAS-14 (Shesh Bush)																					
21	14-R-6	0.04	11.87	57.09	18.95	0.27	0.32	10.34	98.89	0.001	0.462	1.489	0.523	0.007	0.009	0.509	3.000	0.483	0.040	0.763	0.512	0.020
22	14-R-7	0.02	11.27	57.90	18.65	0.27	0.33	10.22	98.65	0.001	0.441	1.519	0.518	0.007	0.009	0.505	3.000	0.486	0.032	0.775	0.508	0.016
	MJAS-15 (Pishkash South)																					
23	15-R-5	0.04	24.54	44.31	17.06	0.25	0.27	12.91	99.36	0.001	0.886	1.073	0.437	0.006	0.007	0.590	3.000	0.404	0.033	0.548	0.593	0.016
24	15-R-9	0.04	23.38	45.49	16.73	0.25	0.25	13.19	99.33	0.001	0.847	1.105	0.430	0.006	0.007	0.604	3.000	0.390	0.040	0.566	0.607	0.020
	MJAS-16 (Pishkash South)																					
25	16-R-4	0.03	17.83	50.92	18.37	0.33	0.30	11.51	99.29	0.001	0.668	1.280	0.489	0.008	0.008	0.546	3.000	0.447	0.042	0.657	0.549	0.021
26	16-R-6	0.12	13.21	55.60	18.10	0.19	0.30	11.62	99.14	0.003	0.505	1.426	0.491	0.005	0.008	0.562	3.000	0.433	0.058	0.738	0.566	0.029
27	16-R-7	0.04	16.38	52.34	17.96	0.32	0.29	11.42	98.75	0.001	0.621	1.331	0.483	0.008	0.008	0.548	3.000	0.445	0.038	0.682	0.551	0.019
	MJAS-20 (Mbi Skroske)																					
28	20-R-3	0.03	21.85	47.22	17.92	0.28	0.27	12.18	99.75	0.001	0.799	1.158	0.465	0.007	0.007	0.563	3.000	0.431	0.034	0.592	0.566	0.017
	MJAS-21 (Mbi Skroske)																					
29	21-R-1	0.08	19.93	48.06	17.91	0.29	0.29	12.10	98.65	0.002	0.741	1.200	0.473	0.007	0.008	0.570	3.000	0.425	0.048	0.618	0.573	0.024
30	21-R-2	0.04	23.99	44.65	17.78	0.26	0.30	12.55	99.56	0.001	0.869	1.085	0.457	0.006	0.008	0.575	3.000	0.419	0.038	0.555	0.578	0.019
	MJAS-22 (Mbi Skroske)																					
31	22-R-2	0.06	18.94	50.16	18.06	0.29	0.29	11.70	99.50	0.001	0.705	1.252	0.477	0.007	0.008	0.551	3.000	0.443	0.034	0.640	0.554	0.017

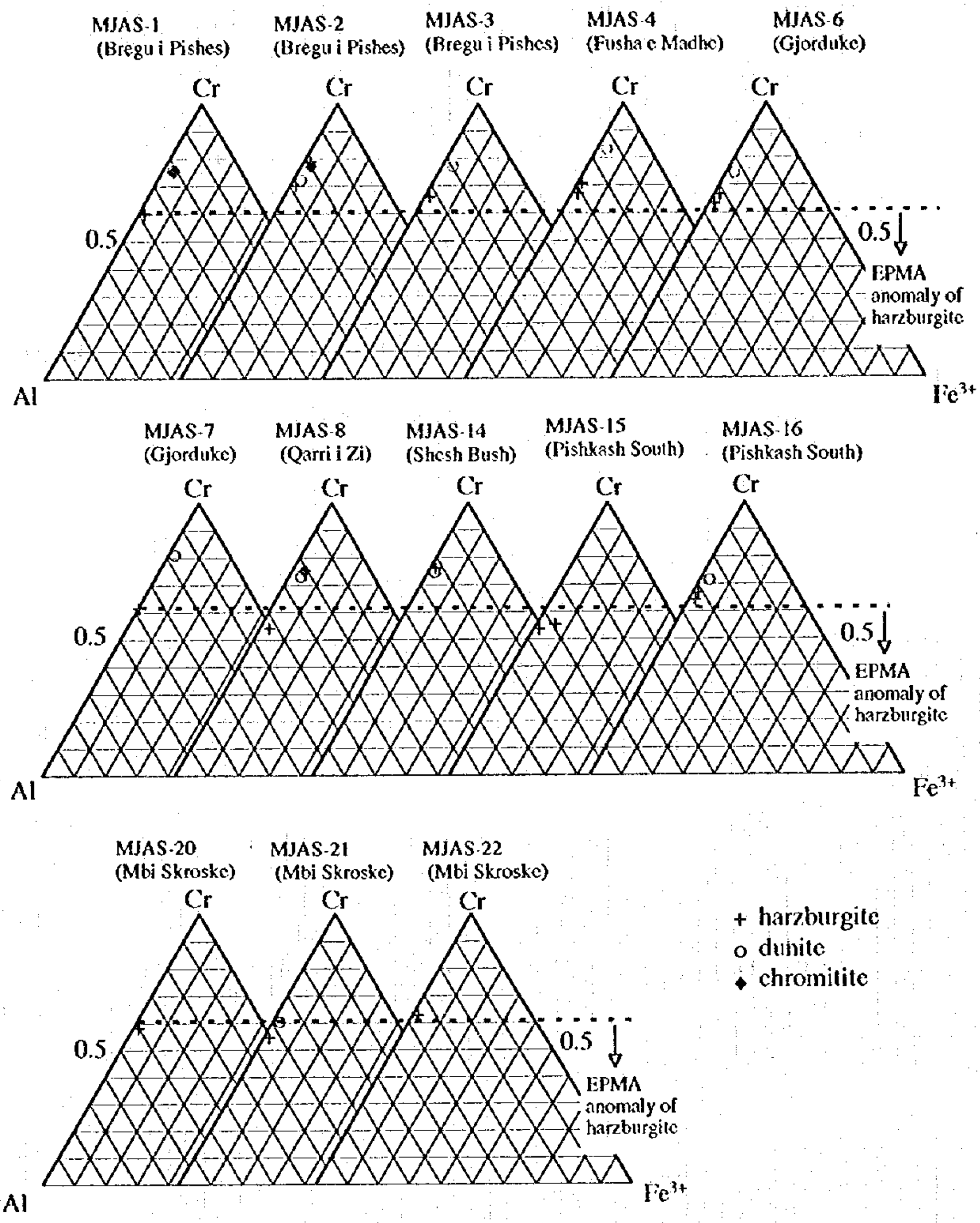


Fig. 2-3-29 Cr-Al-Fe^{3+} proportion of chromian spinel

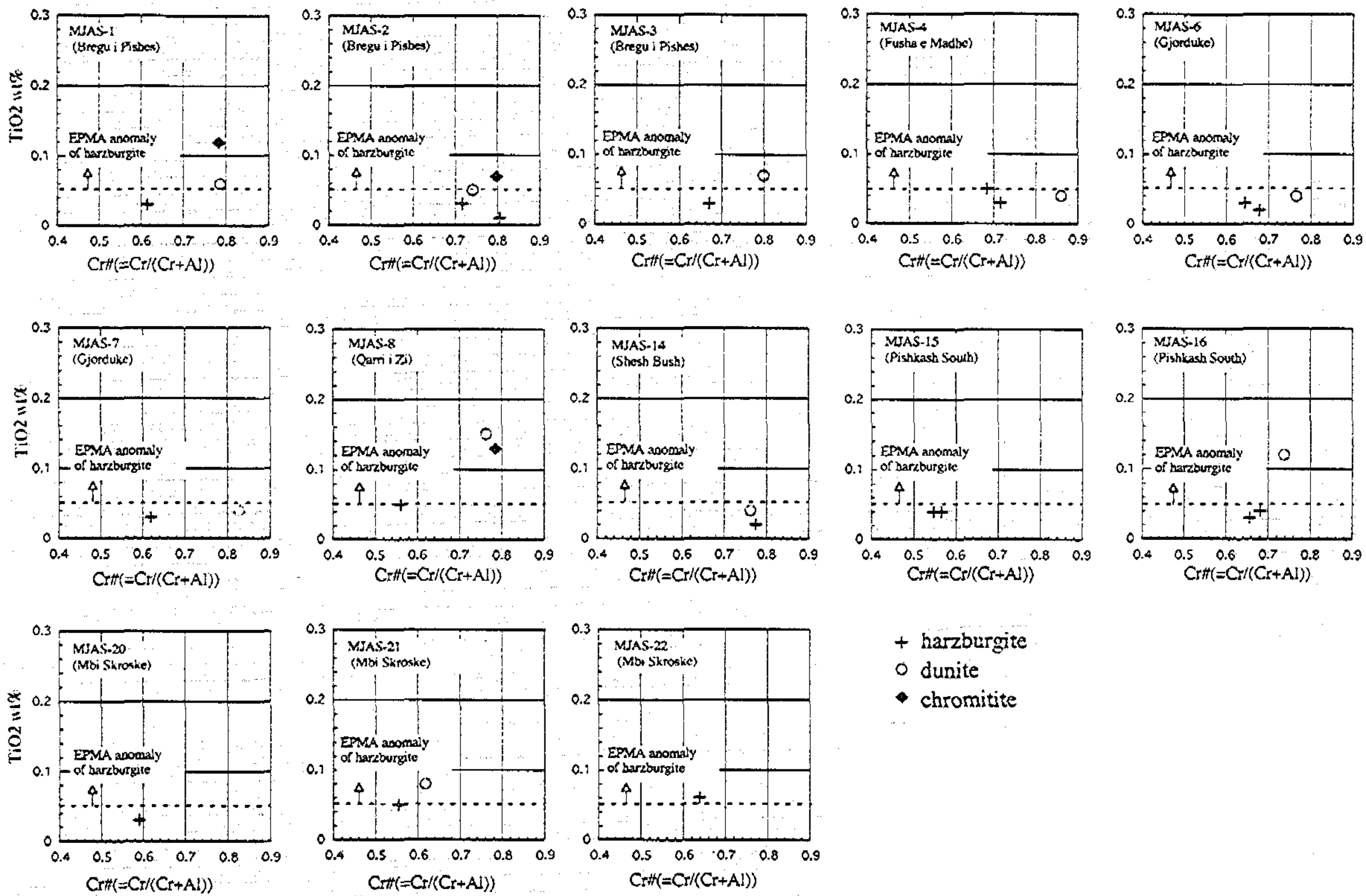


Fig. 2-3-30 Relationship between Cr# and TiO_2 wt % in chromian spinel

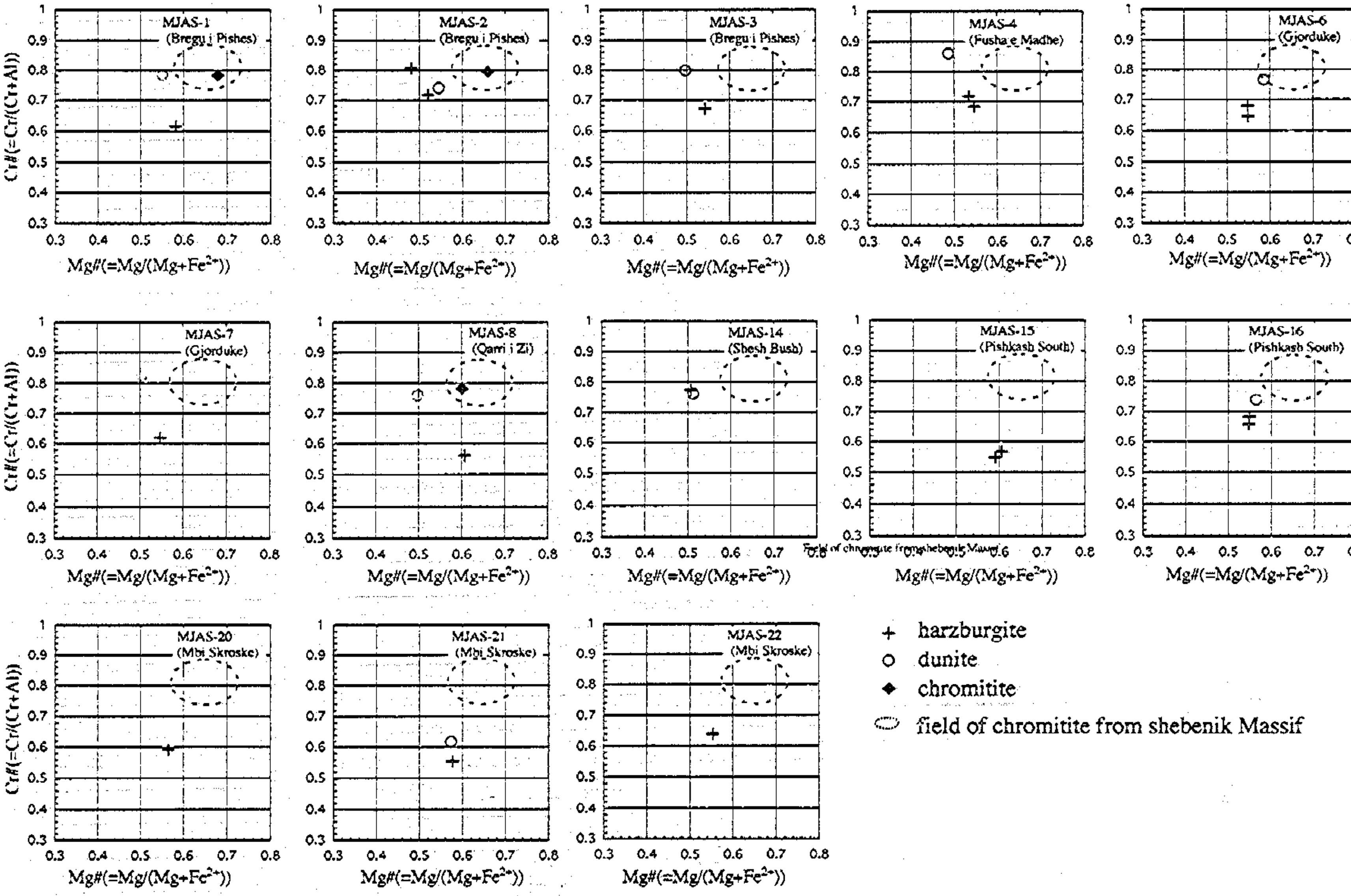


Fig. 2-3-31 Relationship between Cr# and Mg# in chromian spinel

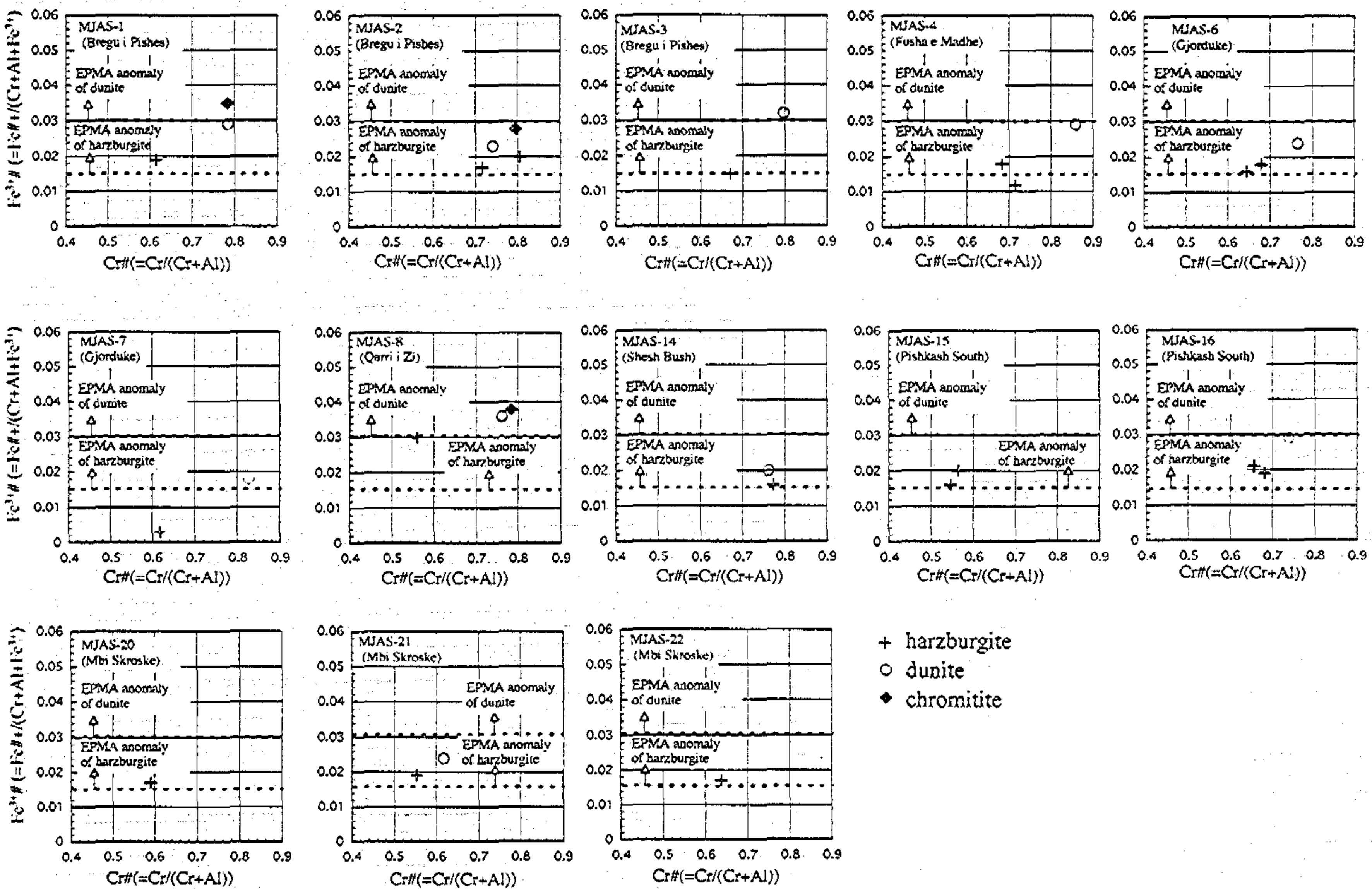


Fig. 2-3-32 Relationship between Cr# and Fe^{3+}# in chromian spinel

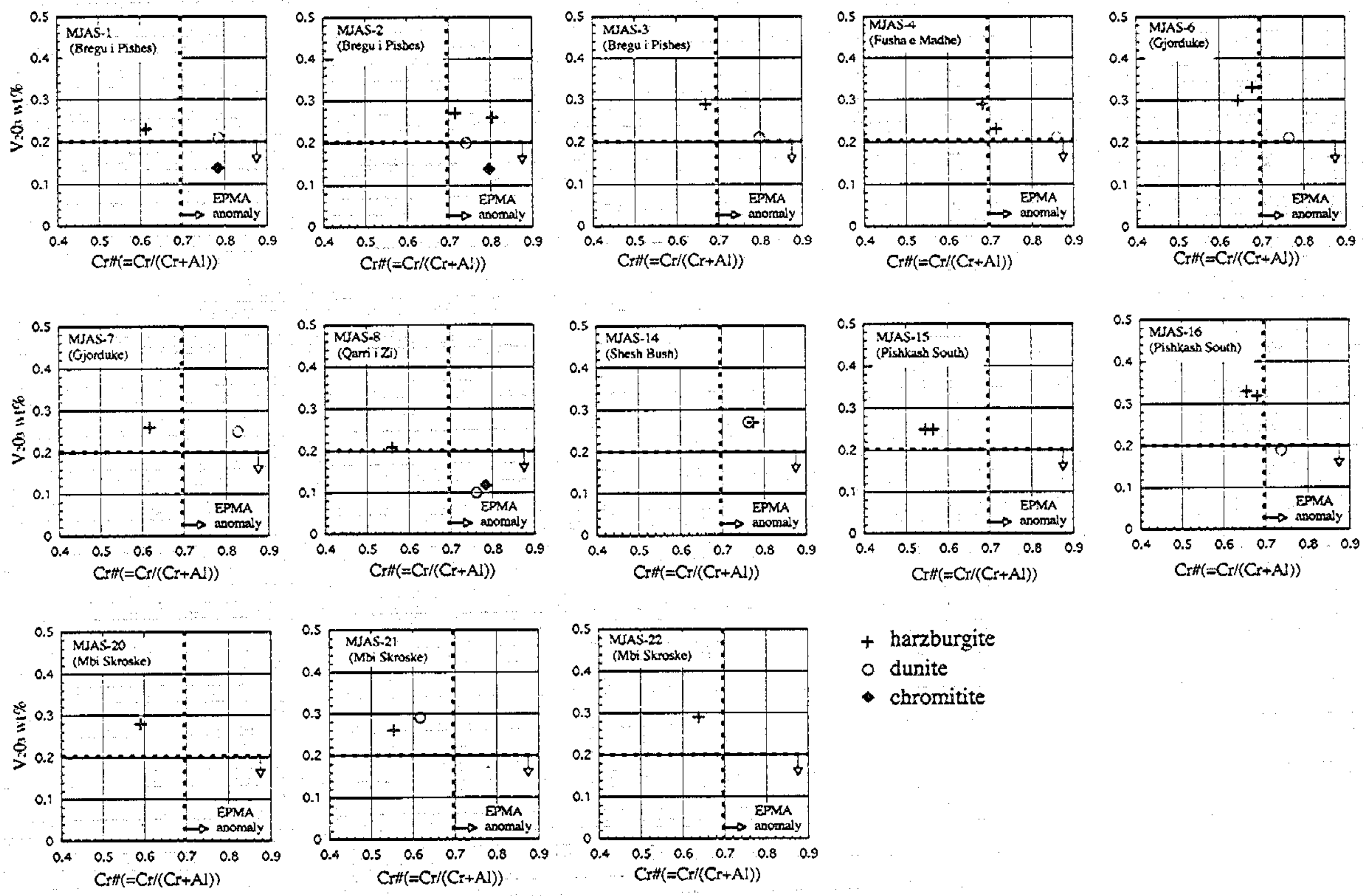


Fig. 2-3-33 Relationship between Cr# and V_2O_3 wt% in chromian spinel

were chromitite, 12 dunite and 17 harzburgite. The EPMA analysis was carried out with respect to the center, unaltered parts of the chromian spinel grains included in those core samples.

The results of the measurements are given in Table 2-3-13. Fig. 2-3-29 gives the results concerning Cr-Al-Fe^{3+}, Fig. 2-3-30 those concerning Cr#-TiO_2, Fig. 2-3-31 those concerning Mg#-Cr#, Fig. 2-3-32 those concerning Cr#-Fe^{3+}, and Fig. 2-3-33 those concerning V_2O_3-Cr#. Those diagrams were prepared concerning the core samples for the purposes of reading the characteristics for dunite, harzburgite and chromitite, checking consistency with the data from the surface samples and considering whether or not the drilling cores, too, can serve as indices for prospecting and mine development. The different variation diagrams were prepared for the different drill holes, and the chrome potential was studied with respect to the different drill holes.

a) Cr#: Cr/(Cr + Al) atomic ratio

The value of Cr# is generally 0.55-0.78, but there are differences in characteristics between harzburgite, dunite and chromitite as indicated in Figs. 2-3-30 to 2-3-33. Chromitite has comparatively higher Cr# values (average of 0.791, ranging 0.784 to 0.797), but the Cr# values of harzburgite ranges from relatively low to high (average of 0.643, ranging 0.548 to 0.775). As for dunite, its Cr# values are somewhat lower than those of the chromitite (average of 0.771, ranging 0.618 to 0.861). Such relationship on Cr# between the different lithofacies of cores is consistent with the data from the surface samples.

As mentioned before, since harzburgite with comparatively low Cr# values is suitable for comparatively large chrome deposits as the host rock, for this reason Cr# values of 0.6 or lower were extracted as EPMA anomalies for the cores samples as in the case of the surface samples.

The five samples extracted as Cr# anomalies were those from depth 70.00 m in MJAS-8 (Qarri i Zi; 8-R-6), depths 99.10 m and 129.00 m in MJAS-15 (Pishkash South; 15-R-5; 15-R-9), depth 74.50 m in MJAS-20 (Mbi Skroske; 20-R-3) and depth 62.35 m in MJAS-21 (Mbi Skroske; 21-R-2).

b) TiO_2 wt%

As indicated in Fig. 2-3-30, the TiO_2 content was less than 0.2 wt% for all the core samples. Comparison of the different lithofacies shows higher values for dunite and chromitite (average of 0.099 for chromitite and 0.069 for dunite) and lower values for harzburgite (average of 0.034), the boundaries between the three being quite clear. Such relationship between the different lithofacies regarding TiO_2 content is consistent with the surface samples. That being the case, harzburgite with a TiO_2 content of 0.05 wt% or higher was extracted as EPMA anomalies.

The three harzburgite samples that were extracted as TiO_2 anomalies were from depth 149.00 m in MJAS-4 (Fusha e Madhe; 4-R-4), depth 70.00 m in MJAS-8 (Qarri i Zi;8-R-6) and depth 96.70 m in MJAS-22 (Mbi Skroske; 22-R-2).

c) Fe^{3+}#: Fe^{3+}/(Cr+Al+Fe^{3+}) atomic ratio

Although the values of Fe^{3+}# were lower than 0.05 in all of the core samples, there were differences in characteristics between chromitite, dunite and harzburgite as indicated in Fig. 2-3-32.: whereas chromitite and dunite had comparatively high values (averages of 0.032 for chromitite and 0.027 for dunite), harzburgite had a comparatively low value (average of 0.017).

Such relationship between the different lithofacies regarding Fe^{3+}# is consistent with the surface samples, and as in the case of the surface data, values above 0.030 for dunite and 0.015 for harzburgite were extracted as EPMA anomalies.

The samples extracted as anomalies are core samples from all the drill holes except MJAS-7. That is considered to be because of the fact that mineralization effect was noted to some extent or other for all the drill holes except for MJAS-7 tested by EPMA.

d) V_2O_3 wt%

As indicated in Fig. 2-3-33, the V_2O_3 contents of all of the core samples were below 0.4 wt%. Comparison of the different lithofacies shows average values of 0.273 wt% for harzburgite, 0.208 wt% for dunite and 0.139 wt% for chromitite.

Such difference of V_2O_3 content between the different lithofacies is consistent with the surface samples. As in the case of the surface data, core samples with V_2O_3 content lower than 0.2 wt% and Cr# value higher than 0.7 (except for chromitite) were extracted as EPMA anomalies. As mentioned before, the V_2O_3-Cr# relationship is one of the most important factors in prospecting for chromitite deposits since it is considered to reflect rock-melt interaction and magma mixing.

The four core samples extracted as EPMA anomalies were from depth 59.80 in MJAS-2 (Bregu i Pishes; 2-R-3), depths 44.45 m and 49.20 m in MJAS-8 (Qarri i Zi; 8-R-3 and 8-R-4) and depth 148.56 m in MJAS-16 (Pishkash South; 16-R-6).

e) Mg#: Mg/(Mg+Fe^{2+}) atomic ratio

It is known that Mg# greatly depends on the modal ratio of chromian spinel and olivine (Arai, 1980) because Mg-exchange reaction occurs between spinel and adjoining olivine under subsolidus condition: Mg# rises with rise in spinel mode.

Thus, chromitite of core samples shows characteristically high values (average value of 0.669) as indicated in Fig. 2-3-31 (Cr#-Mg# diagram), in which Mg# is low for dunite and harzburgite (average values of 0.534 for dunite and 0.559 for harzburgite), such relations being consistent with the surface samples.

As mentioned before, Mg# of the spinel grains in stream sediments is considered to be very effective for predicting the lithofacies of ultrabasic rocks distributed in the river basin and existence or nonexistence of chromitite in it (Arai and Okada, 1991; Arai, 1992). However, its effectiveness as an index for chromitite exploration in the ultrabasic rocks of a limited area has not yet been studied.

f) MnO wt%

In all of the samples the MnO content was lower than 0.4 wt%. Comparison of the different lithofacies shows some difference between them, the average values being 0.237 wt% for chromitite, 0.324 wt% for dunite and 0.291 wt% for harzburgite, but it has not yet been determined whether or not MnO wt% can serve as an effective index in chromitite exploration.

g) Evaluation of Chrome Potential on the Basis of EPMA Anomalies

As in the case of the geological survey described previously, the chrome potential of the core samples was evaluated using EPMA anomalies. Chrome potential is expressed as the ratio of the EPMA anomalies to the items used for detection of EPMA anomalies. The results are given in Table 2-3-14 along with Cr#-V_2O_3 anomalies, the most important item for the formation of chromitite.

Table 2-3-14 indicates an evaluation at the different drill holes from the viewpoint of the host rock (dunite and harzburgite). As indicated in the table, the number of values extracted as anomalies is considerable greater for the drill hole MJAS-8 (Qarri i Zi) than for any of the others. Furthermore, the values for Cr# and V_2O_3 considered as a pair suggest that mineralization, melt-rock interaction and magma mixing, occurred most effectively at MJAS-2 (Bregu i Pishes), MJAS-8 (Qarri i

Zi) and MJAS-16 (Pishkash South). Such results of EPMA analysis are in harmony with existence of chromitite in the those drill holes, and therefore the areas around the drill holes with EPMA anomalies are considered to be places where unconfirmed chromitite endowment can be expected.

Table 2-3-14 Potentiality of EPMA anomaly

Number of drill hole	Value of Potentiality	Cr#-V_2O_3 anomaly
MJAS-1 (Bregu i Pishes)	1/6 =0.167	
MJAS-2 (Bregu i Pishes)	2/8 =0.250	○
MJAS-3 (Bregu i Pishes)	2/6 =0.333	
MJAS-4 (Fusha e Madhe)	2/10=0.200	
MJAS-6 (Gjorduke)	2/10=0.200	
MJAS-7 (Gjorduke)	0/6 =0.000	
MJAS-8 (Qarri i Zi)	7/8 =0.875	○○
MJAS-14 (Shesh Bush)	1/6 =0.167	
MJAS-15 (Pishkash South)	4/8 =0.500	
MJAS-16 (Pishkash South)	3/10=0.300	○
MJAS-20 (Mbi Skroske)	2/4 =0.500	
MJAS-21 (Mbi Skroske)	2/6 =0.333	
MJAS-22 (Mbi Skroske)	2/4 =0.500	

2-3-5 Discussion

As mentioned above, in the drilling survey 19 holes (total lengths: 2,333.41 m) were drilled in a total of 8 areas, 5 areas of them selected for exploration of underground extensions of known chrome indications (Bregu i Pishes, Gjorduke, Shesh Bush No.1, Murriq and Qarri i Zi areas) and 3 of them for investigation of the zones of magnetic anomalies (Fusha e Madhe, Pishkash South and Mbi Skroske areas).

As a result of the drilling survey chromitite ore was encountered in a total of 4 drill holes in two areas for which EPMA anomalies were obtained in the Phase I survey: the Bregu i Pishes area (MJAS-1 and MJAS-2) and the Qarri i Zi area (MJAS-8 and MJAS-9).

In the Bregu i Pishes area massive to disseminated chromitite with a thickness of about 1 meters was discovered at depth 41.70-72.73 m (Cr_2O_3: 32.40-36.70%) in MJAS-1 and at depth 59.00-60.90 (Cr_2O_3: 38.60-49.70%) in MJAS-2. From the geological situation so far, it is estimated that the dunite accompanied by chromitite strikes N36°W dipping 70 to 80 degrees to east and that the chromitite ore body plunges 14 degrees to north.

In the Qarri i Zi area disseminated chromitite was encountered in the dunite of MJAS-8 at depths of 0.00-12.90 m and 20.70-53.80 m with Cr_2O_3 values of 21.70-40.50% and in the dunite of MJAS-9 at depths of 0.30-12.00 m and 18.70-36.40 m with Cr_2O_3 values of 22.70-27.10%. To the south, however, the dunite accompanied by chromitite is displaced by faulting, therefore only a part of the bottom thereof was detected in MJAS-10.

On the other hand, in the other 3 areas where underground extensions of chrome indications were explored, i.e., Gjorduke, Shesh Bush No.1 and Murriq, dunite was found but no chromitite ores.

As a result of the drilling survey of the northern extension of the Gjorduke ore body in the Gjorduke area it is considered that the Gjorduke ore body is the lower part of the Fusha e Madhe ore body displaced to the east by faulting and that the ore body displaced by faulting plunges as a whole a comparatively gentle angle of about 10 degrees to the north. It is thought that chromitite was not encountered in the present drilling survey because of another displacement to the west by faults at deeper part of the ore body. Therefore it would probably be advisable to explore shallower parts in future drilling survey.

In the Shesh Bush No. 1 area, although high-grade massive ores had been encountered near the surface, most of the drill holes deeper than gallery of 1,201 mL, including the three holes of this drilling survey, have not encountered any ore. A possible reason for that is major displacement of the lower extension of the dunite with chromitite by a fault with a very gentle inclination passing through at about elevation 1,200 m, it being estimated that the amount of displacement is greater than 100 m to the east and west of the known ore body.

In the Murriq area not only is the dunite of the indication accompanied by disseminated chromitite small-scale and with little continuity, but also it has displaced by faulting, that being considered the reason by its extension was not discovered by either of MJAS-18 and MJAS-19.

Of the three areas in which underground investigation of zones of magnetic anomalies was undertaken, i.e. Fusha e Madhe, Pishkash South and Mbi Skroske areas, in the Fusha e Madhe area in the vicinity of the depth of intersection with the KM-1 magnetic anomaly are to be found fault zones, fractured zones, brecciated zones, etc., and it is surmised that the magnetic anomaly is an indication of magnetite produced by the oxidation effect of groundwater that penetrated by way of those structures. The reasons for the magnetic anomalies in the other two areas, however, have not been elucidated.

As a result of platinum group element (PGE) quantitative analysis of 21 chromitite core samples it was found that all of the chondrite-normalized patterns were similar to that typical for ophiolite, and no particularly noteworthy PGE concentrations were discovered.

The EPMA analysis for cores samples has identified Qarri i Zi area as the area with the highest frequency of EPMA anomalies as well as revealing Cr# anomalies in some of the cores from the Pishkash South and Mbi Skroske areas. Cr#-V_2O_3 anomalies, as the most important index, were noted in the 3 areas of Qarri i Zi, Bregu i Pishes and Pishkash South, and they indicate that rock-melt interaction and magma mixing occurred in at least those areas.

Chapter 3 Comprehensive Consideration of the Survey Results

Chapter 3 Comprehensive Consideration of the Survey Results

3-1 Summary of the Survey Results

3-1-1 Summary of the Geological Survey

(1) Geology

Most of the Central Shebenik area is occupied by ultrabasic rocks belonging to the Shebenik ultrabasic massif, but there is also distribution of Cretaceous limestone and Tertiary terrigenous sediments at the southwest corner of the area.

The ultrabasic rocks consist of harzburgite accompanied by dunite, some of dunite enveloping chromitite. In terms of ophiolite succession it is divided into a Massive dunite-harzburgite suite (MDHS) and a Dunite-harzburgite suite with remarkable layering (DHSRL) in ascending order.

In terms of geological structure, the ultrabasic rocks have a homoclinal structure with a NNW-SSE strike dipping to NE, and besides several major faults in the ENE-WSW direction in the northeastern part of the area, there are also many small faults.

The MDHS consists mainly of massive harzburgite accompanied by dunite lenses. The part rich in such dunite lenses has been termed the Dunite-rich zone to distinguish it from "Harzburgite 1", the part consisting mainly of massive harzburgite. On the other hand, the DHSRL consists of harzburgite with intercalation of thin layers of dunite. The part of it consisting mainly of harzburgite has been termed "Harzburgite 2" to distinguish it from the part with frequent intercalation of thin layers of dunite, which is referred to as the "Dunite and harzburgite layer".

Of those four facies of the ultrabasic rocks, the one that is closely related to chrome deposits is the Dunite-rich zone in the MDHS.

(2) Chrome Deposit and indication

Many chrome deposits and indications are distributed in the study area and its vicinity, almost all of them being concentrated in the Dunite-rich zone of the MDHS, particularly large-scale outcrops of chromitite concentrated in the vicinity of directly below the boundary with the DHSRL.

The scale of the chromitite outcrops varies considerably, the largest ones having a thickness of 1 to 2 meters. Many such comparatively large-scale chromitite are found near Lugu i Batres and Ahu i Vetem in the central part of the study area. Chromitite in those outcrops is always enclosed in dunite envelopes without exception. Types of chromitite are classified into massive, nodular, antinodular, disseminated and banded ores. Microscopically those types of chromitite are of olivine chromitite, consisting of chromian spinel and olivine. Of those different types of chromitite, most of high-grade massive chromitite are distributed in the vicinity of the central part of the area.

(3) Laboratory Tests

In the whole rock chemical analysis for chromitite, harzburgite and dunite, dunite with a Cr content close to that of harzburgite was obtained from Lugu i Batres and Ahu i Vetem and noted as a geochemical anomaly.

EPMA anomalies were extracted by paying attention to the following four criteria in the EPMA analysis by chromian spinel:

1. Low Cr# of the chromian spinel in harzburgite (about 0.4-0.6)
2. High TiO_2 wt% of the chromian spinel in harzburgite
3. High Fe^{3+}# of the chromian spinel in dunite and harzburgite
4. Existence of spinel in dunite and harzburgite with high Cr# and low V_2O_3 wt%

Many EPMA anomalies were detected at 5 localities, IM002(Gobille), IM003 (No. 115, Qafa e Dinarit), IM005 (Buzgare), IM011 and IM014 (Ahu i Vetem). It is noteworthy that the frequency of such anomalies is particularly high at the locality IM014 (Ahu i Vetem).

All of the samples in this area that underwent platinum group element (PGE) analysis showed the characteristic ophiolite pattern on the chondrite normalized diagram, which suggests that the ultrabasic rock in the area originates in ophiolite and indicates that it is not very likely that chromitite in this area is accompanied by conspicuous concentrations of PGE.

3-1-2 Summary of the Magnetic Survey

(1) Central Shebenik Area

A magnetic survey was carried out in the western half of the area, which was extracted in the geological survey, and measurement of magnetic susceptibility at outcrops and measurement of natural remanent magnetization of oriented samples were also undertaken.

The magnetic lineaments of the Central Shebenik area have a direction of N15°E throughout most of the area, except for those with a direction of N30°W in a part of the northeast corner where the DHSRL is found, that direction being in harmony with the regional geological structure of the ultrabasic rock.

Although no significant difference in magnetic susceptibility according to type of rock is to be seen in the rocks distributed in this area, each rock type has fairly high variability of values. It was also noted concerning natural remanent magnetization orientation that for the dunite there is a fairly high probability of reverse magnetization and that some of the harzburgite samples, too, have reverse magnetization or magnetization in a different direction from that of the earth's present magnetic field. Such a tendency regarding orientation of natural remanent magnetization is considered to be a reflection of the direction of the earth's magnetic field at the time of acquisition of remanent magnetization or shifted by faulting or some other factor. The magnetic anomalies obtained in this area are thought to be a reflection of such differences in magnetic susceptibility according to rock type, difference in orientation of natural remanent magnetization and the like.

Fourteen high and ten low magnetic anomalies were extracted as the main anomalies at intermediate depths. In view of the fact that the chrome ore body in the Katjel deposit is correlated with a low magnetic anomaly and with its margins, four places in the area where high and low anomalies are paired have been extracted as zones that require further survey in the future.

Furthermore, deep low magnetic anomalies are widely distributed in the northeast direction from the southern part of the area to the central part of its northern half. Although such low magnetic anomalies are thought to be a reflection of the influence of rock bodies with different remanent magnetization orientations, one cannot rule out the possibility that the terrain correction at measurement points along the valley at the time of terrain correction of values of total magnetic intensity was insufficient.

(2) The Katjel Area

In this area a magnetic survey was carried out directly above the Katjel chrome deposit, the largest in the Pogradec-Shebenik ultrabasic massif, and measurement of magnetic susceptibility at outcrops and verification of the effectiveness of magnetic surveying above chrome outcrops were also undertaken.

In the western half of the Katjel area the magnetic lineaments that have a direction of N30°W, in harmony with the regional geological structure are predominant, but at lower depths there are also many with a direction of N40°W. On the other hand, on the east side of the valley the direction is N60°E, which suggests the possibility of a discontinuity of geological structure between the two.

The Katjel chrome ore body lies in the low magnetic anomaly east of the M-2 control line, the western end of the vertical to sharply dipping ore body being situated at about the boundary between the high magnetic anomaly on the west side and the low magnetic anomaly to the east. The deep ore body with a gentle dip is situated approximately in the middle of a large low magnetic anomaly.

In the magnetic survey directly above the chromitite outcrop located southeast of the Katjel ore body chromitite and its dunite envelope were clearly recognized as a low magnetic anomaly although a weak one.

From those results it is considered that chromitite deposits and the dunite accompanying them have a correlation with low magnetic anomalies and that it is highly likely that the low magnetic anomalies are due to rocks with reverse magnetization.

3-1-3 Summary of the Drilling Survey

The drilling survey was carried out with respect to the 5 areas, Bregu i Pishes, Gjorduke, Shesh Bush No. 1, Murriq and Qarri i Zi, for the purpose of exploring the downward extensions of known chrome indications and with respect to the 3 areas, Fusha e Madhe, Pishkash South and Mbi Skroske, for the purpose of underground investigation of zones of magnetic anomalies, for a total of 8 areas and 19 drill holes (total drilling length: 2,333.41 m).

As a result of the drilling survey chromitite was encountered in a total of 4 drill holes, 2 in the Bregu i Pishes area (MJAS-1 and 2) and 2 in the Qarri i Zi area (MJAS-8 and 9).

However, in three areas of Gjorduke, Shesh Bush No. 1 and Murriq, where the downward extensions of chrome indications were explored, dunite was encountered in all cases, but no concentrations of chromitite. The reason why chromitite was not encountered is thought to be major displacement of the chrome ore body by faulting. In the case of the Murriq area it is considered to be due to the fact that the size of the dunite accompanied by chromitite is small.

As for three areas of Fusha e Madhe, Pishkash South and Mbi Skroske, where exploration for zones of magnetic anomalies was undertaken, in MJAS-4 of the Fusha e Madhe area there are faulted, fractured, brecciated and other such zones near the depth where there is intersection with the KM-1 magnetic anomaly, and it is surmised that the magnetic anomaly is an indication of the existence of magnetite produced by oxidation by groundwater that penetrated by way of such structures. The magnetic anomalies in the other two areas, however, were not elucidated.

The results of the platinum group element (PGE) quantitative analysis carried out with respect to the 21 chromitite samples in all cases showed a chondrite normalized pattern similar to the one typical of ophiolite, no particularly concentrations of PGE having been recognized.

In the EPMA analysis carried out on the cores samples EPMA anomalies were detected with the highest frequency in the Qarri i Zi area, and some of the cores from the Pishkash South and Mbi Skroske areas showed Cr# anomalies. Anomalies in the most important index, i.e. Cr#-V_2O_3, were detected in three areas of Qarri i Zi, Bregu i Pishes and Pishkash South, which suggests that rock-melt interaction and magma mixing occurred at least in those areas.

3-2 Comprehensive Consideration

(1) Stratigraphical Control of Chromitite Mineralization

All of the chromitite deposits discovered in the Central Shebenik area are enclosed in dunite envelope, and most of them occur in the Dunite-rich zone of the MDHS, particularly many of large-scale massive chromitite are distributed in the Dunite-rich zone directly below the boundary with the DHSRL. This fact suggests that the chromitite mineralization in the area is controlled by a stratigraphical horizon in term of ophiolite succession.

Such horizon control of chromitite mineralization has been noted in ophiolite in other regions of the world as well. Nicolas and Prinzfer (1988) has shown that many chrome deposits in ophiolite occur in tectonite peridotite directly below cumulates. Since the DHSRL in the Central Shebenik area is comparable to the cumulates of ophiolite, it is concluded that many of the chrome deposits in this area as well occur directly below cumulates.

Many EPMA anomalies have been recognized in the Dunite-rich zone directly below the cumulates. It is considered that a transition zone (Matsumoto, 1996) was formed in that vicinity by effective occurrence of both rock-melt interaction and magma mixing, which are important to concentration of chromian spinel as chromitite in dunite.

(2) Relationship Between Magnetic Anomalies and Chromitite Deposits

The Katjel chrome deposit is included in a low magnetic anomaly, and the chromitite ore body was detected as a low magnetic anomaly in the detailed measurements above the chromitite outcrop as well. Many chrome indications are located where high and low magnetic anomalies with medium-wavelength are paired and on the margins of low magnetic anomalies with long-wavelength , which indicates there is some relationship between magnetic anomalies and chrome deposits.

In general, when a ferromagnetic body is assumed to exist below the ground in the northern hemisphere, an induced magnetic anomaly of the ferromagnetic body due to the present geomagnetic field appears as a pair consisting of a negative anomaly on the north side and a positive anomaly on the south side, and after reduction to the pole it is expressed as a positive anomaly directly above the ferromagnetic body.

The results of the magnetic susceptibility measurements show that the ultrabasic rock distributed in the areas have comparatively high magnetic susceptibility, but no significant difference was recognized among the different rock types constituting it: dunite, harzburgite and chromitite. For each of the rock types there was considerable dispersion in the values of magnetic susceptibility measured at each outcrop. As for the results of measurement of natural remanent magnetization, while some of the samples showed positive magnetization in harmony with the present geomagnetic field, others showed magnetization different from that, and still others clearly showed reverse magnetization. Besides quite a high probability of reverse magnetization in the case of dunite, harzburgite with reverse magnetization or magnetization different from the present geomagnetic field was also frequently recognized.

From the results of those measurements it is thought that rather than the magnetic anomalies in the magnetic survey being an indication of difference in rock types, they are an indication of difference in magnetic susceptibility and in orientation of natural remanent magnetization from outcrop to outcrop or from geological block to geological block, in particular it being very likely that low magnetic anomalies are a reflection of geological bodies with reverse magnetization.

Therefore it is considered that the fact of frequent existence of chromitite indications and deposits at low magnetic anomalies with medium-wavelength or long-wavelength and the margins thereof very likely is a reflection of the fact that dunite, including dunite accompanied by chromitite, has a high probability of reverse remanent magnetization. As for the phenomenon itself of high probability of reverse magnetization of dunite, further study will have to be given in the future.

(3) Chrome Potential and Extraction of Promising Areas

To a certain extent it is possible to estimate the size of podiform type chrome deposits by studying the composition of the chromian spinel in the harzburgite, dunite and chromitite by EPMA, and it has been pointed out that generally there is a high possibility of harzburgite with chromian spinel with a Cr# value of about 0.4-0.6 being a host rock of a large-scale chrome deposit (Arai, 1994, 1995, 1996).

In the Central Shebenik area harzburgite with Cr# of about 0.6 has been noted, and there are massive chromitite deposits in it with a thickness of up to 2 meters. Judging from examples in other ophiolite regions of the world, it is considered that the study area might have a chrome deposit endowment of from several tens of thousands to several hundreds of thousands of tons.

Just as in the case of chrome deposits in ophiolite in other regions of the world, the chrome deposits in the study area are seen to be clearly controlled by a stratigraphical horizon in terms of ophiolite succession. In view of the high incidences of chrome deposits and EPMA anomalies in the Dunite-rich zone directly under the boundary of the DHSRL, five points indicated in Fig. 3-2-1, i.e. Gobille, No. 115 (near Qafa e Dinarit), Buzgare, Ahu i Vetem and Lugu i Batres, have been extracted as places in the Central Shebenik area with high chrome deposit potential, Ahu i Vetem being particularly noteworthy as the place with the highest incidence of EPMA anomalies. As indicated in Fig. 3-2-1 those points are all located in or around magnetic anomalies except for Gobille and No. 115, that are located out of the magnetic survey area.

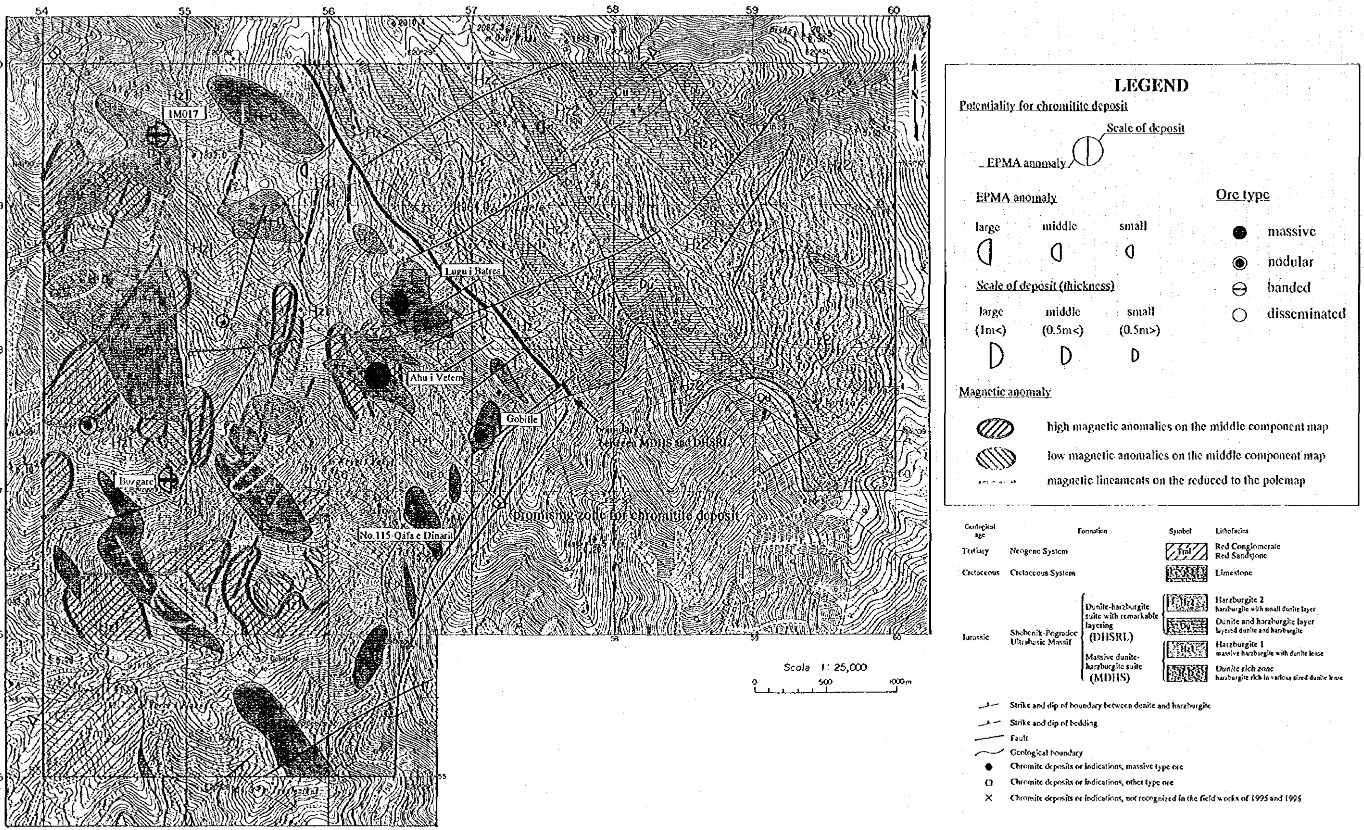


Figure 3-2-1 Interpretation map of the Central Shebenik area

Chapter 4 Conclusions and Recommendation

Chapter 4 Conclusions and Recommendation

4-1 Conclusions

The conclusions based on the results of the geological, magnetic, drilling surveys and the laboratory tests are as follows:

a) Central Shebenik Area

- Of the ultrabasic rocks distributed in the Central Shebenik area, the Dunite-rich zone of the Massive dunite-harzburgite suite (MDHS) is where there is considerable expectancy of finding comparatively large-scale chrome deposits, it being particularly promising in the vicinity of the boundary with the Dunite-harzburgite suite with remarkable layering (DHSRL).
- The most promising chrome indications and deposits are the five localities, i.e. Gobille, No. 115, Buzgare, Ahu i Vetem and Lugu i Batres, where comparatively large-scale massive chromitite is distributed and many EPMA anomalies have been detected, Ahu i Vetem warranting particular attention as the place with the most EPMA anomalies.
- It is possible that this area is endowed with several tens of thousands to several hundreds of thousands of tons of chrome deposit or deposits considering the Cr# of the chromian spinel in harzburgite, the surface chrome indications and how it compares with other regions in the world.
- The results of the magnetic survey show that chrome deposits are located in and near magnetic anomalies, and it is possible that there is particularly high correlation between low magnetic anomalies and chrome deposits.
- Some of the harzburgite has reverse remanent magnetization, and the dunite has quite a high probability of that. That being the case, there is considerable possibility of extraction of dunite or dunite containing chromitite as a low magnetic anomaly.

b) Drilling Survey Areas

- Of the 8 areas in which the drilling survey was carried out, chromitite was encountered in the two areas, Bregu i Pishes and Qarri i Zi, both of which have been selected as the areas having EPMA anomalies in the phase I survey.
- In the EPMA analysis of drill cores Qarri i Zi was recognized as the area with the most anomalies, and anomalies were also detected in the Bregu i Pishes, Pishkash South and Mbi Skroske.
- In none of the three areas where extensions of known deposits were explored, i.e. Gjorduke, Shesh Bush No.1 and Murriq, significant concentrations of chromitite were recognized. The reasons why chromitite was not encountered in those areas were migrations of the ore body by faulting in the Gjorduke and Shesh Bush No.1 and too small size of chrome indications in the Murriq .
- Concentrations of chromian spinel as chromitite were not found in any of the 3 areas in which the drilling survey was carried out to investigate zones of magnetic anomalies: Fusha e Madhe, Pishkash South and Mbi Skroske. The cause of the magnetic anomalies in the Fusha e Madhe is thought to be formation of magnetite in faulted, brecciated and fractured zones. The reasons, however, was not elucidated in the other two areas.

c) Other Areas

- In a gallery exploration carried out by Gjeoalba new massive chromitite has been discovered in the Hija e Zeze area of the Pogradec ultrabasic massif.
- The Pishkash-5 ore body is contained in a series of harzburgite with Cr# EPMA anomalies between two areas of Pishkash South and Mbi Skroske. Locating the part of the ore body that has migrated by faulting is now an urgent task.

4-2 Recommendation

On the basis of the above conclusions it is recommended to carry out drilling surveys as the third year exploration of the Shebenik area in order to confirm and to determine the underground distributions of ore bodies at chrome indications where many EPMA anomalies have been noted within the Central Shebenik area, at areas where newly encountered with chromitite among the drilling survey areas as well as throughout the whole Shebenik area at areas where ore has been newly encountered by gallery and at extensions of deposits for which prospecting is urgently needed.

A total of five areas have been selected for that purpose considering geological conditions, topographical restrictions, etc.: the Ahu i Vetem area including the 5 localities, i.e. Ahu i Vetem, Gobille, Qafa e Dinarit, Buzgare and Lugu i Batres, in the Central Shebenik area; the two areas, i.e. Bregu i Pishes and Qarri i Zi among the phase II drilling survey areas; and the two areas, i.e. Hija e Zeze and Pishkash-5 as other areas. Their locations are indicated in Fig. 4-2-1.

Those 5 areas are also given in Table 4-2-1 below along with the order of priority of each area, reasons for selection and purposes of the survey:

Table 4-2-1 Target areas for the third year exploration in the Shebenik area

Rank	Name of area	Method	Reason for selection	Purpose of survey
1	Bregu i Pishes	Drilling	-Ore found in MJAS-1, 2 and EPMA anomalies	-Exploration for northern downward extension of ore encountered in of MJAS-1, 2. -Confirmation of scale of ore body.
2	Ahu i Vetem	Drilling	-Many chrome outcrops and EPMA anomalies	-Downward exploration Ahu i Vetem, Qafa e Dinarit and Lugu i Batres (Gobille).
3	Hija e Zeze	Drilling	-Massive ore encountered in the galley survey	-Exploration for northern extension of the newly encountered ore.
4	Pishkash-5	Drilling	-In EPMA anomaly zone, -Ore lost to east of faults	-Detection of ore body displaced by faulting
5	Qarri i Zi	Drilling	-Many EPMA anomalies -Ore found by MJAS-8,9	-Exploration for northern extension of the dunite with chromitite and EPMA anomaly

The order of priority of chrome indications within the Ahu i Vetem area is given in Table 4-2-2 along with the EPMA anomaly conditions.

Table 4-2-2 Ranking of the chrome indications in the Ahu i Vetem area

Rank	Locality	Ore type	Thickness	EPMA anomaly					Anomaly by
				Cr#	TiO_2	Fe^{3+}#	Cr#-V_2O_3	Total	24 elements
1	Ahu i Vetem	Massive	1.5	-	-	3/3	2/3	0.625	●
2	Lugu i Batres	Massive	2	-	-	-	1/2	0.167	●
3	No.115	Disseminated	0.7×0.5(pods)	-	1/1	1/2	1/2	0.500	
4	Gobille	Nodular	1.5	1/1	-	1/2	1/2	0.500	
5	Buzgare(IM009)	Massive	0.1	-	-	1/2	-	0.167	
6	Buzgare(IM005)	Banded	0.3	-	-	2/2	1/2	0.500	
7	IM017	Banded	1.5	-	-	1/2	1/2	0.333	
8	Qerroi i Qukut	Nodular	0.5	-	-	1/2	1/2	0.333	

Remarks; " - " is an abbreviation for "0/1", ND; not determined

In such drilling survey recommended for the phase III survey it will be necessary to first confirm the surface ore bodies on a scale of at least 1:500 and then consider the locations, inclinations and directions of the drill holes. Furthermore, considerable access roads improvement and construction will be necessary for the drilling in the Ahu i Vetem area in view of the fact that it is situated in a high mountain area with poor road conditions, and it will also be necessary to complete the field survey work by the end of September since snowfall begins there early.

Appendix 4-2-1 gives the geology, access conditions, etc. of chrome indications in the Ahu i Vetem area.

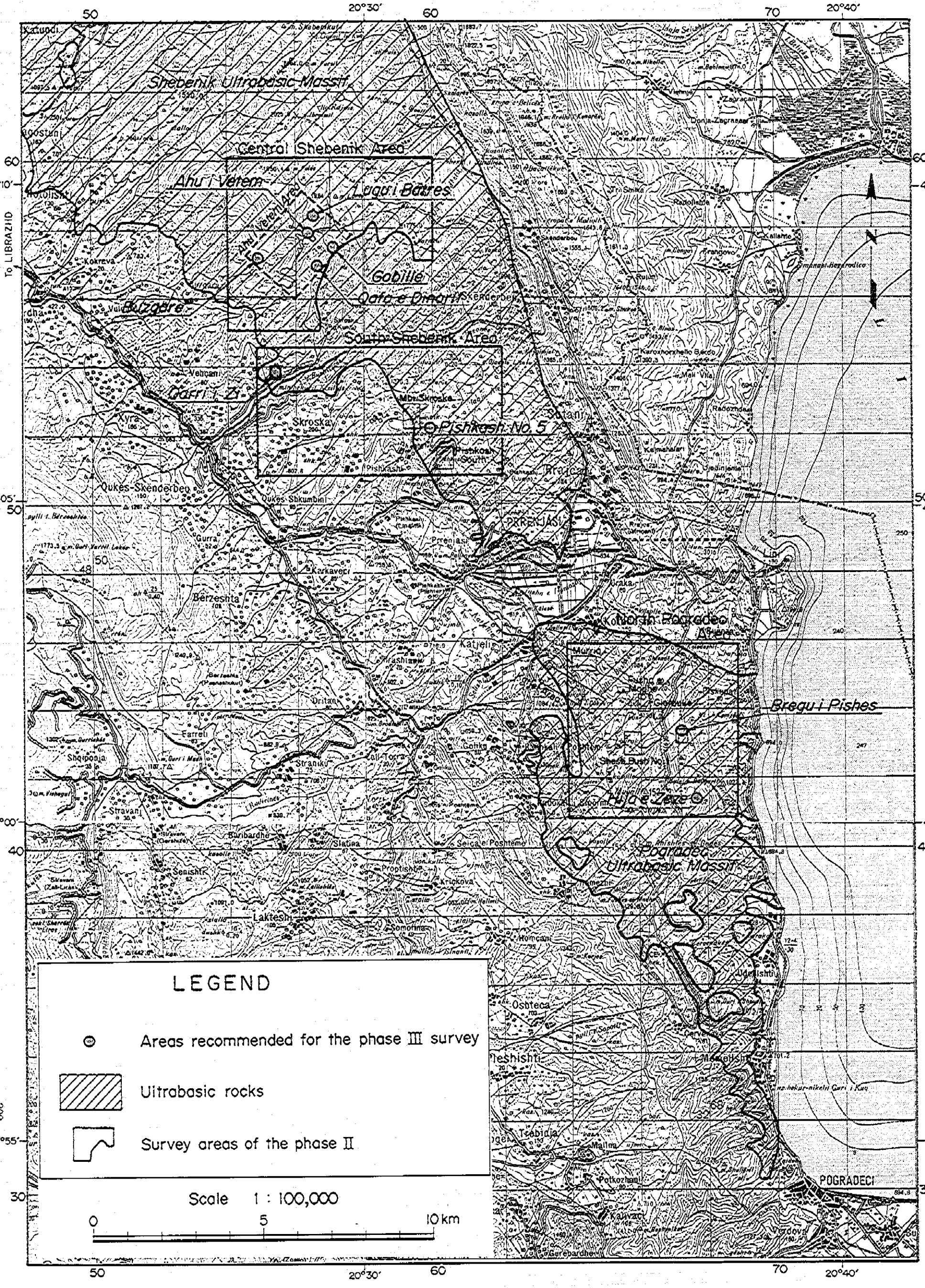


Fig. 4-2-1 Recommended areas for the Phase III survey in 1997

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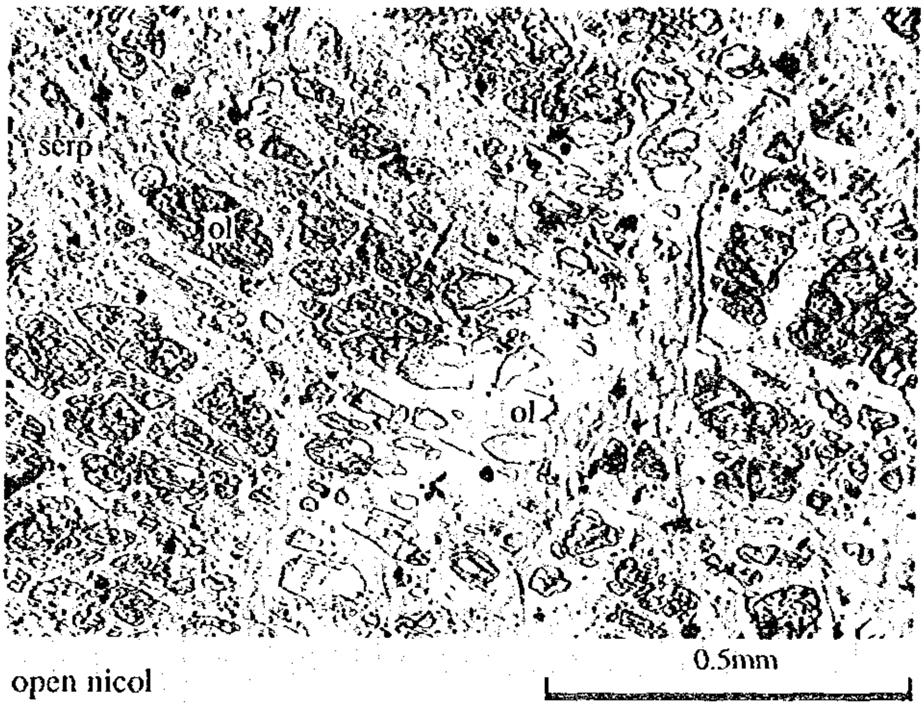
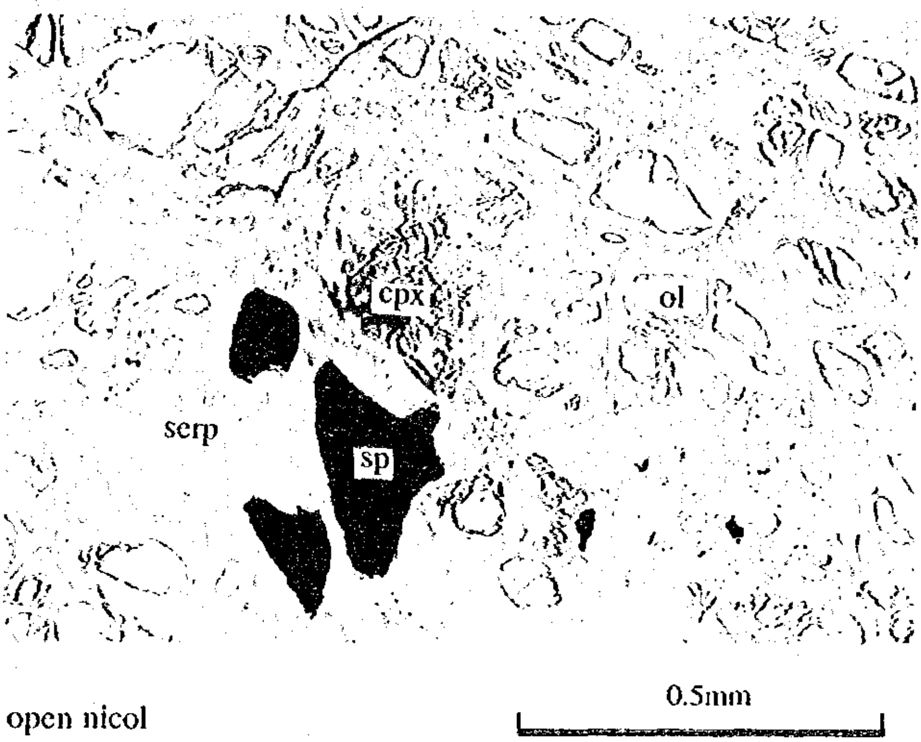
Appendices

Apx. 2-1-1(1) Microphotographs of rock samples



open nicol

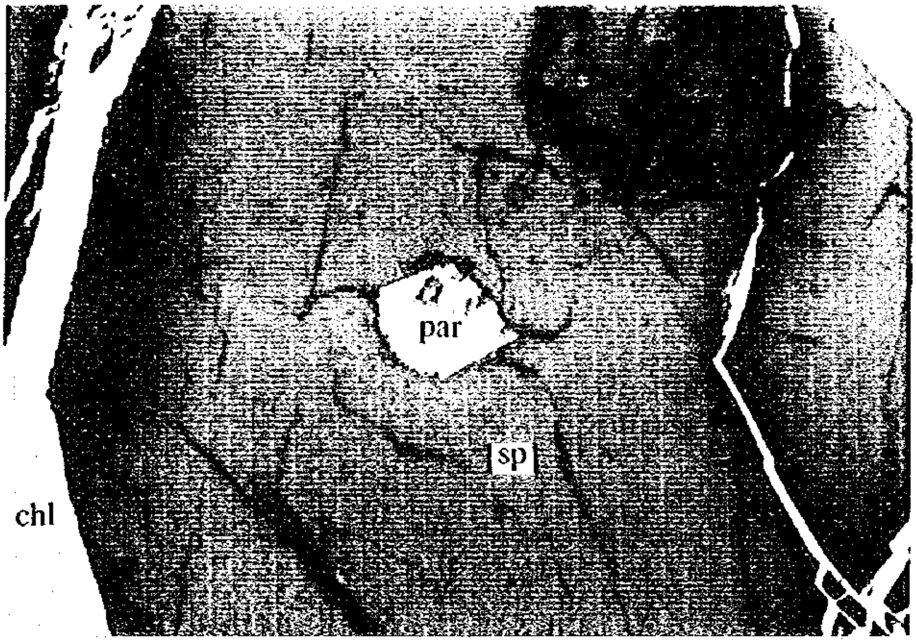
Sample number : IM002Du
Rock type : dunite
Note : clear olivine + dusty olivine



open nicol

Sample number : IM005Du
Rock type : dunite
Note : spinel + clinopyroxene

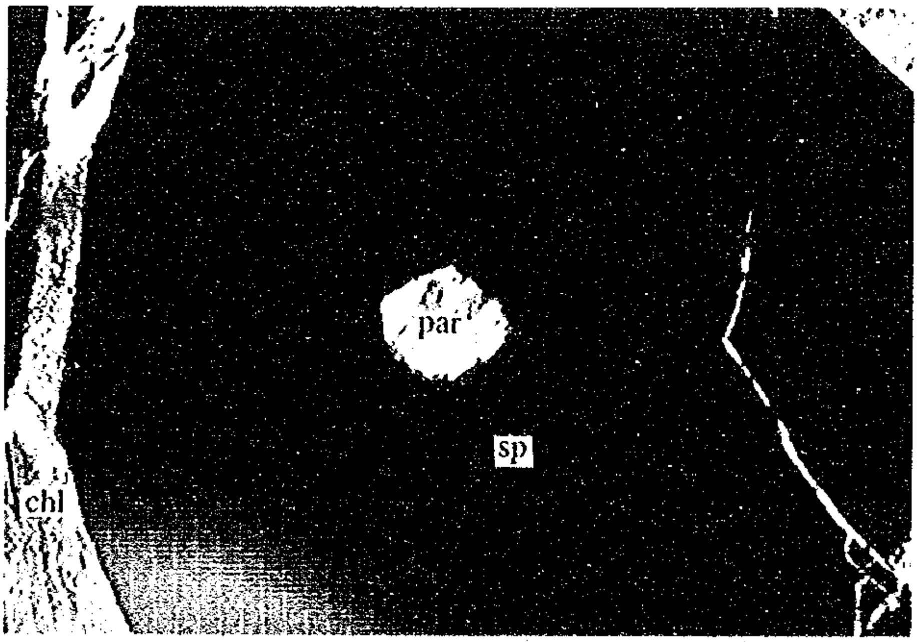
Apx. 2-1-1(2) Microphotographs of rock samples



open nicol

0.5mm

Sample number : IM009Cr
Rock type : chromitite
Note : pargasite in spinel

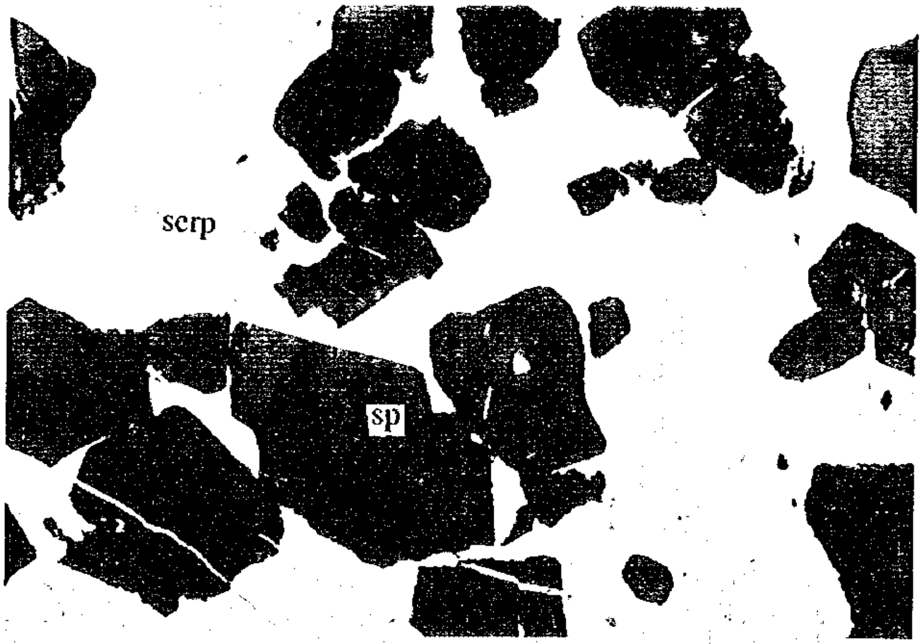


cross nicol

0.5mm

Sample number : IM009Cr
Rock type : chromitite
Note : pargasite in spinel

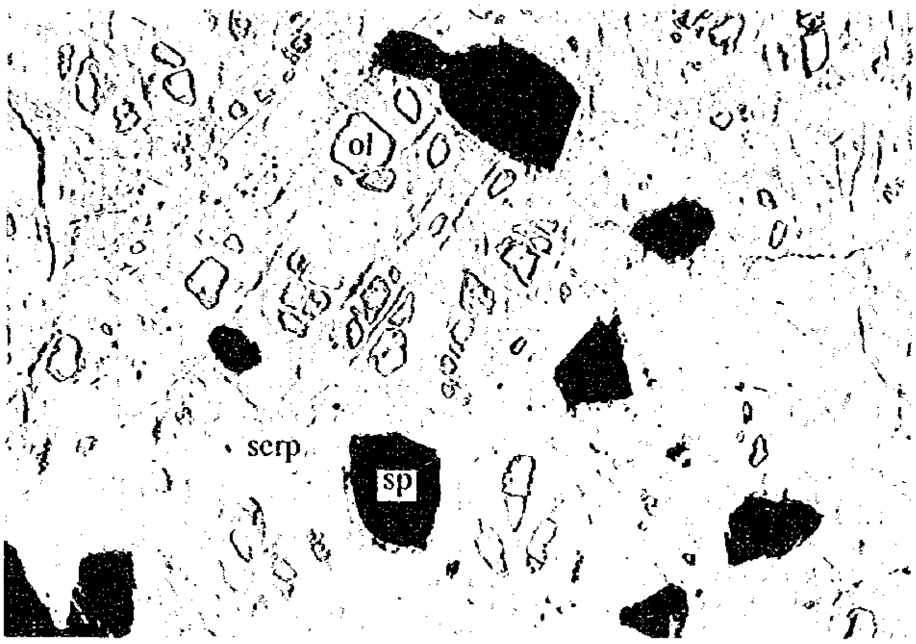
Apx. 2-1-1(3) Microphotographs of rock samples



open nicol

0.5mm

Sample number : IM011Cr
Rock type : chromitite
Note : olivine chromitite (relatively fine)

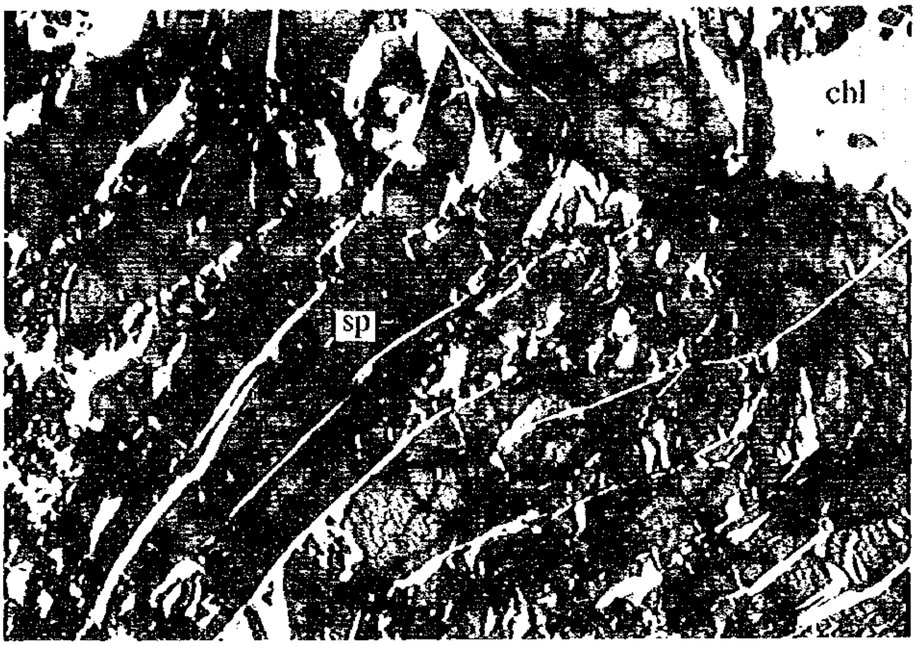


open nicol

0.5mm

Sample number : IM011Du
Rock type : dunite
Note : spinel rich part and relic olivine

Apx. 2-1-1(4) Microphotographs of rock samples



open nicol

0.5mm

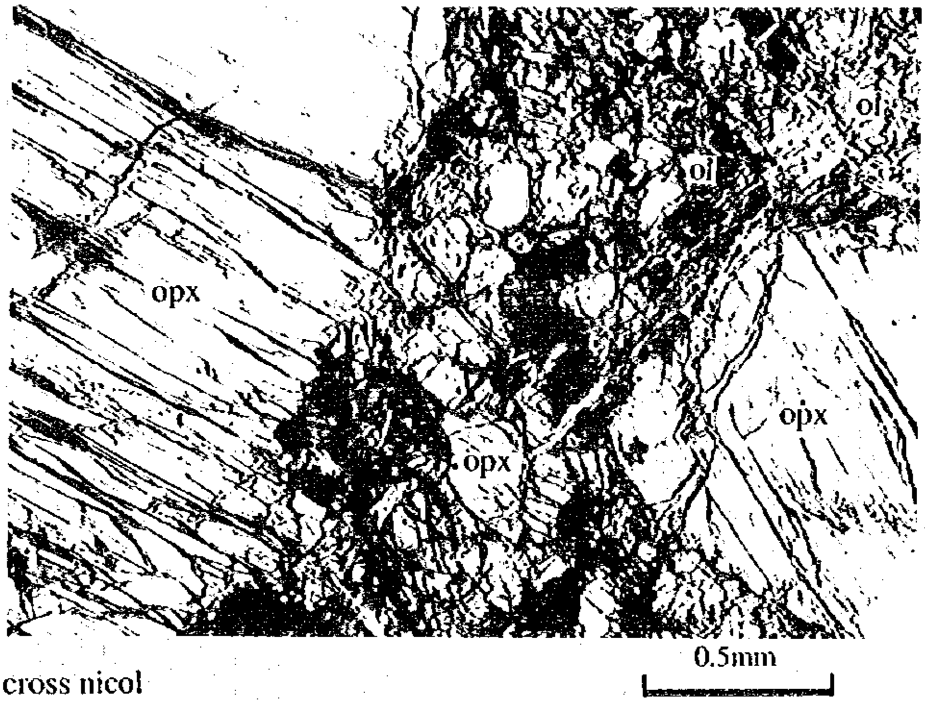
Sample number : IM013Cr
Rock type : chromitite
Note : olivine chromitite (cracked)

cross nicol

0.5mm

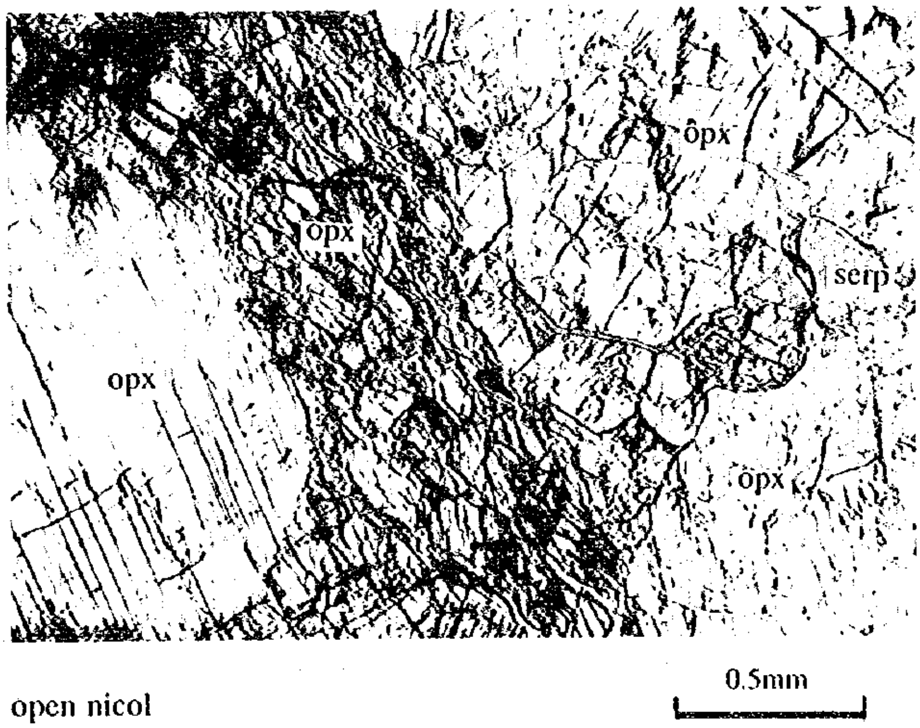
Sample number : IM013Hz
Rock type : harzburgite
Note : kinked orthopyroxene

Apx. 2-1-1(5) Microphotographs of rock samples



cross nicol

Sample number : IM014Hz
Rock type : harzburgite
Note : porphyroclastic texture



open nicol

Sample number : IM020Px
Rock type : orthopyroxenite
Note : porphyroclastic texture