^{40}AR/^{39}AR ANALYTICAL TECHNIQUES & DATA

Hornblende crystals (60–100 mesh) were hand selected from a heavy mineral concentrate produced by application of standard density and magnetic methods. These 5–15 mg aggregates were wrapped in copper foil, packed in quartz tubes that were evacuated and sealed, and irradiated for 15 hours in the McMaster Reactor (Ontario, Canada). Production of ^{39}Ar from ^{39}K was monitored with Fish Canyon sanidine (27.8 ± 0.3 Ma; Cebula et al., 1986) that had been interspersed with samples in each tube (1 cm spacing). Correction factors for nucleogenic K- and Ca-derived argon were determined by measuring K_2SO_4 and CaF_2 salts.

Incremental heating was conducted with a double vacuum Ta furnace (details provided in Lovera et al., 1997). Evolved gas was transferred by expansion and purified with an SAES ST-101 50 l/s getter pump in a LABVIEW automated, all-stainless steel extraction line. Note that values quoted for absolute quantities of ^{39}Ar have been normalized to 100% gas delivery to the mass spectrometer. Although 66% of the gas was generally transferred to the mass spectrometer, quantities of gas that exceeded the linear range of the detection system were split statically according to previously calibrated procedures. Argon isotopic measurements were performed using an automated VG1200S mass spectrometer equipped with a Baur-Signar ion source and an axially fitted electron multiplier (Quidelleur et al, 1997). The instrument is typically operated at an Ar sensitivity of 4×10^{-17} mol/mV. Apparent ages were calculated using conventional decay constants and isotopic abundances (Steiger and Jager, 1977).

322-11 hornblende (7.4 mg)

Step	Temp. (°C)	Time (min.)	$^{40}Ar/^{39}Ar$§	$^{38}Ar/^{39}Ar$§ x 10^{-2}	$^{37}Ar/^{39}Ar$§	$^{36}Ar/^{39}Ar$§ x 10^{-3}	^{39}Ar§,† x 10^{-15} (mol)	Cumulative ^{39}Ar (%)	Radiogenic# ^{40}Ar (%)	Apparent Age¥ ± 1 σ s.d. (Ma)
1	750	15	29.41	10.07	0.5900	50.06	12.91	25.5	49.7	92.9 ± 1.3
2	950	15	29.69	13.35	3.360	13.00	13.85	52.9	87.8	162.7 ± 1.0
3	1010	15	29.52	54.95	14.63	17.51	12.98	78.6	86.3	160.5 ± 1.2
4	1050	15	27.79	58.76	11.23	14.72	5.643	89.8	87.4	153.0 ± 2.1
5	1150	15	33.43	70.75	16.46	38.25	3.052	95.8	69.9	148.1 ± 4.4
6	1300	15	41.12	121.0	23.23	68.52	2.095	99.9	55.1	144.6 ± 6.4
7	1450	15	1309	157.8	11.55	4409	0.030	100	0.5	43 ± 2690

§Corrected for backgrounds (mean values in mol: m/e40 = $1.4x10^{-16}$; m/e39 = $7.6 x10^{-17}$; m/e38 = $3.5 x10^{-17}$; m/e37 = $5.4 x10^{-17}$; m/e36 = $5.5 x10^{-17}$), mass discrimination (measured $^{40}Ar/^{36}Ar$ = 293.5±0.5), abundance sensitivity (5 ppm), and radioactive decay (irradiated: 07-13-2002; analyzed: 09-07-2002)

†Normalized to 100% delivery to mass spectrometer

#Includes static blank

¥Corrected for atmospheric argon and nucleogenic interferences $^{40}Ar/^{39}Ar_K$ = 0.0306; $^{36}Ar/^{37}Ar_{Ca}$ = 0.00027; $^{39}Ar/^{37}Ar^{Ca}$ = 0.00077)
J-factor = 0.003609 (assumes Fish Canyon sanidine = 27.8 Ma)

322-12 hornblende (11.5 mg)

Step	Temp. (°C)	Time (min.)	$^{40}Ar/^{39}Ar$§	$^{38}Ar/^{39}Ar$§ x 10^{-2}	$^{37}Ar/^{39}Ar$§	$^{36}Ar/^{39}Ar$§ x 10^{-3}	^{39}Ar§,† x 10^{-15} (mol)	Cumulative ^{39}Ar (%)	Radiogenic# ^{40}Ar (%)	Apparent Age¥ ± 1 σ s.d. (Ma)
1	750	15	58.53	21.19	2.717	140.3	4.795	19.8	29.5	109.2 ± 4.5
2	950	15	27.54	41.13	14.23	33.21	4.248	37.4	68.3	119.9 ± 3.2
3	1010	15	29.55	109.3	22.78	38.56	2.784	49.0	67.3	127.6 ± 4.7
4	1050	15	29.58	193.7	32.11	36.01	4.776	68.7	72.5	138.0 ± 3.3
5	1150	15	30.64	181.6	29.48	41.03	4.356	86.8	67.9	133.8 ± 3.3
6	1300	15	37.00	220.8	36.11	61.43	3.102	99.6	58.6	139.8 ± 4.3
7	1450	15	343.6	33.20	1.288	1100.3	0.097	100	5.35	117 ± 261

§ Corrected for backgrounds (mean values in mol: m/e40 = 1.4 $x10^{-16}$; m/e39 = 6.8 $x10^{-17}$; m/e38 = 2.8 $x10^{-17}$; m/e37 = 4.8 $x10^{-17}$; m/e36 = 4.9 $x10^{-17}$), mass discrimination (measured $^{40}Ar/^{36}Ar$ = 293.5±0.5), abundance sensitivity (5 ppm), and radioactive decay (irradiated: 07-13-2002; analyzed: 09-07-2002)

† Normalized to 100% delivery to mass spectrometer

Includes static blank

¥ Corrected for atmospheric argon and nucleogenic interferences $^{40}Ar/^{39}Ar_K$ = 0.0306; $^{36}Ar/^{37}Ar_{Ca}$ = 0.00027; $^{39}Ar/^{37}Ar_{Ca}$ = 0.00077);
J-factor = 0.003609 (assumes Fish Canyon sanidine = 27.8 Ma)

San Roque hornblende (7.6 mg)

Step	Temp. (°C)	Time (min.)	$^{40}Ar/^{39}Ar$§	$^{38}Ar/^{39}Ar$§ x 10^{-2}	$^{37}Ar/^{39}Ar$§	$^{36}Ar/^{39}Ar$§ x 10^{-3}	^{39}Ar§,† x 10^{-15} (mol)	Cumulative ^{39}Ar (%)	Radiogenic# ^{40}Ar (%)	Apparent Age¥ ± 1 σ s.d. (Ma)
1	750	15	39.23	45.51	0.4239	74.23	5.805	16.6	44.1	109.3 ± 2.8
2	950	15	31.47	45.88	3.930	26.98	6.274	34.6	75.5	149.0 ± 2.1
3	1010	15	30.71	160.8	18.29	30.28	10.59	65.0	75.5	147.0 ± 1.6
4	1050	15	27.14	131.3	13.18	21.08	4.346	77.4	80.7	138.8 ± 2.8
5	1150	15	29.34	152.0	16.69	32.94	4.353	89.9	71.2	132.9 ± 2.7
6	1300	15	36.83	166.5	17.86	60.67	3.446	99.8	55.0	129.3 ± 3.8
7	1450	15	357.7	49.55	1.602	1246	0.083	100	0.0	-

§ Corrected for backgrounds (mean values in mol: m/e40 = $1.3x10^{-16}$; m/e39 = $6.1x10^{-17}$; m/e38 = $2.7x10^{-17}$; m/e37 = $4.3x10^{-17}$; m/e36 = $4.2x10^{-17}$), mass discrimination (measured $^{40}Ar/^{36}Ar$ = 293.5±0.5), abundance sensitivity (5 ppm), and radioactive decay (irradiated: 07-13-2002; analyzed: 09-09-2002)

† Normalized to 100% delivery to mass spectrometer

Includes static blank

¥ Corrected for atmospheric argon and nucleogenic interferences $^{40}Ar/^{39}Ar_K$ = 0.0306; $^{36}Ar/^{37}Ar_{Ca}$ = 0.00027; $^{39}Ar/^{37}Ar_{Ca}$ = 0.00077);
J-factor = 0.003609 (assumes Fish Canyon sanidine = 27.8 Ma)

81TA26 hornblende (9.1 mg)

Step	Temp. (°C)	Time (min.)	$^{40}Ar/^{39}Ar$ [§]	$^{38}Ar/^{39}Ar$ [§] x 10^{-2}	$^{37}Ar/^{39}Ar$ [§]	$^{36}Ar/^{39}Ar$ [§] x 10^{-3}	^{39}Ar [§,†] x 10^{-15} (mol)	Cumulative ^{39}Ar (%)	Radiogenic [#] ^{40}Ar (%)	Apparent Age [¥] ± 1 σ s.d. (Ma)
1	750	15	35.64	28.74	0.2696	69.34	10.02	19.1	42.5	96.0 ± 1.9
2	950	15	24.13	7.748	0.9593	20.14	8.611	35.6	75.5	115.0 ± 2.0
3	1010	15	28.95	44.46	16.84	28.67	13.43	61.2	75.3	138.4 ± 1.5
4	1050	15	23.80	39.55	10.57	11.49	6.382	73.4	89.1	134.2 ± 1.6
5	1150	15	23.53	50.22	15.39	15.46	9.076	90.7	85.6	128.2 ± 1.5
6	1300	15	26.50	59.92	16.42	28.98	4.590	99.5	72.4	122.5 ± 2.2
7	1450	15	80.44	6.453	0.8688	248.4	0.264	100	8.73	45.6 ± 43.9

[§] Corrected for backgrounds (mean values in mol: m/e40 = 1.1 x10^{-16}; m/e39 = 6.0 x10^{-17}; m/e38 = 2.7 x10^{-17}; m/e37 = 4.5 x10^{-17}; m/e36 = 4.2 x10^{-17}), mass discrimination (measured $^{40}Ar/^{36}Ar$ = 293.5±0.5), abundance sensitivity (5 ppm), and radioactive decay (irradiated: 07-13-2002; analyzed: 09-10-2002)

[†] Normalized to 100% delivery to mass spectrometer

[#] Includes static blank

[¥] Corrected for atmospheric argon and nucleogenic interferences $^{40}Ar/^{39}Ar_K$ = 0.0306; $^{36}Ar/^{37}Ar_{Ca}$ = 0.00027; $^{39}Ar/^{37}Ar_{Ca}$ = 0.00077); J-factor = 0.003609 (assumes Fish Canyon sanidine = 27.8 Ma)

80EC55G hornblende (6.0 mg)

Step	Temp. (°C)	Time (min.)	$^{40}Ar/^{39}Ar$ [§]	$^{38}Ar/^{39}Ar$ [§] x 10^{-2}	$^{37}Ar/^{39}Ar$ [§]	$^{36}Ar/^{39}Ar$ [§] x 10^{-3}	^{39}Ar [§,†] x 10^{-15} (mol)	Cumulative ^{39}Ar (%)	Radiogenic [#] ^{40}Ar (%)	Apparent Age [¥] ± 1 σ s.d. (Ma)
1	750	15	24.14	6.734	0.4712	14.26	16.88	21.6	82.5	125.4 ± 0.9
2	950	15	22.04	4.385	1.5609	13.26	7.094	30.6	82.5	115.0 ± 1.8
3	1010	15	23.34	11.23	1.7939	9.822	4.947	36.9	87.9	129.3 ± 2.4
4	1050	15	25.13	27.62	5.281	8.267	10.93	50.9	91.8	145.0 ± 1.6
5	1150	15	25.84	32.21	6.318	8.498	34.59	95.1	92.1	149.5 ± 0.6
6	1300	15	23.09	23.08	5.615	21.76	3.800	99.9	73.8	108.4 ± 4.0
7	1450	15	542.3	33.66	0.531	1594	0.058	100	13.1	414 ± 430

[§] Corrected for backgrounds (mean values in mol: m/e40 = 1.4 x10^{-16}; m/e39 = 7.2 x10^{-17}; m/e38 = 3.3 x10^{-17}; m/e37 = 4.6 x10^{-17}; m/e36 = 4.9 x10^{-17}), mass discrimination (measured $^{40}Ar/^{36}Ar$ = 293.5±0.5), abundance sensitivity (5 ppm), and radioactive decay (irradiated: 07-13-2002; analyzed: 09-09-2002)

[†] Normalized to 100% delivery to mass spectrometer

[#] Includes static blank

[¥] Corrected for atmospheric argon and nucleogenic interferences $^{40}Ar/^{39}Ar_K$ = 0.0306; $^{36}Ar/^{37}Ar_{Ca}$ = 0.00027; $^{39}Ar/^{37}Ar^{Ca}$ = 0.00077); J-factor = 0.003610 (assumes Fish Canyon sanidine = 27.8 Ma)

925-13 hornblende (16.9 mg)

Step	Temp. (°C)	Time (min.)	$^{40}Ar/^{39}Ar$ [§]	$^{38}Ar/^{39}Ar$ [§] x 10^{-2}	$^{37}Ar/^{39}Ar$ [§]	$^{36}Ar/^{39}Ar$ [§] x 10^{-3}	^{39}Ar [§,†] x 10^{-15} (mol)	Cumulative ^{39}Ar (%)	Radiogenic [#] ^{40}Ar (%)	Apparent Age [¥] ± 1 σ s.d. (Ma)
1	750	15	52.30	13.52	1.592	121.2	2.896	10.2	31.7	105.0 ± 6.5
2	950	15	33.60	39.88	5.276	82.05	1.653	16.1	28.9	62.6 ± 7.7
3	1010	15	34.37	100.4	14.26	65.19	0.893	19.2	46.9	103.7 ± 10.8
4	1050	15	30.61	172.1	37.62	29.07	12.34	62.8	81.6	160.3 ± 1.3
5	1150	15	29.83	227.0	34.96	29.73	7.657	89.9	79.8	152.7 ± 1.8
6	1300	15	34.40	177.6	51.58	51.15	2.668	99.3	67.8	152.0 ± 4.7
7	1450	15	147.2	48.53	21.48	455.9	0.198	100	9.55	91.4 ± 72.7

[§] Corrected for backgrounds (mean values in mol: m/e40 = 1.3x10^{-16}; m/e39 = 6.9x10^{-17}; m/e38 = 3.0x10^{-17}; m/e37 = 5.0x10^{-17}; m/e36 = 5.1x10^{-17}), mass discrimination (measured $^{40}Ar/^{36}Ar$ = 293.5±0.5), abundance sensitivity (5 ppm), and radioactive decay (irradiated: 07-13-2002; analyzed: 09-09-2002)

[†] Normalized to 100% delivery to mass spectrometer

[#] Includes static blank

[¥] Corrected for atmospheric argon and nucleogenic interferences $^{40}Ar/^{39}Ar_K$ = 0.0306; $^{36}Ar/^{37}Ar_{Ca}$ = 0.00027; $^{39}Ar/^{37}Ar^{Ca}$ = 0.00077); J-factor = 0.003610 (assumes Fish Canyon sanidine = 27.8 Ma)

Campo Nuevo hornblende (12.2 mg)

Step	Temp. (°C)	Time (min.)	$^{40}Ar/^{39}Ar$[§]	$^{38}Ar/^{39}Ar$[§] x 10^{-2}	$^{37}Ar/^{39}Ar$[§]	$^{36}Ar/^{39}Ar$[§] x 10^{-3}	^{39}Ar[§,†] x 10^{-15} (mol)	Cumulative ^{39}Ar (%)	Radiogenic[#] ^{40}Ar (%)	Apparent Age[¥] ± 1 σ s.d. (Ma)
1	750	15	92.92	13.50	0.4812	257.0	9.162	19.1	18.3	107.4 ± 4.5
2	950	19	26.23	8.461	0.7365	7.868	14.52	49.3	91.2	149.7 ± 1.0
3	1010	18	27.04	29.52	7.802	8.966	10.75	71.6	92.3	156.8 ± 1.0
4	1050	19	25.25	16.10	2.042	5.403	9.436	91.2	94.1	148.9 ± 1.0
5	1150	15	30.49	415.1	30.71	38.53	3.255	98.0	70.5	138.3 ± 4.2
6	1300	15	49.83	626.0	22.51	98.76	0.834	99.8	44.8	143 ± 14
7	1450	15	264.9	182.4	4.112	856.4	0.120	100	4.56	78 ± 171

[§]1 Corrected for backgrounds (mean values in mol: m/e40 = 1.0 x10^{-16}; m/e39 = 5.8 x10^{-17}; m/e38 = 2.4 x10^{-17}; m/e37 = 4.2 x10^{-17}; m/e36 = 4.4 x10^{-17}), mass discrimination (measured $^{40}Ar/^{36}Ar$ = 293.5±0.5), abundance sensitivity (5 ppm), and radioactive decay (irradiated: 07-13-2002; analyzed: 09-09-2002)

[†] Normalized to 100% delivery to mass spectrometer

[#] Includes static blank

[¥] Corrected for atmospheric argon and nucleogenic interferences $^{40}Ar/^{39}Ar_K$ = 0.0306; $^{36}Ar/^{37}Ar_{Ca}$ = 0.00027; $^{39}Ar/^{37}Ar_{Ca}$ = 0.00077); J-factor = 0.003612 (assumes Fish Canyon sanidine = 27.8 Ma)

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GEOCHEMISTRY SAMPLE DESCRIPTIONS

East Sierra Placer mélange—plutonic block in serpentinite matrix mélange

80GT-17 Hornblende gabbro. Medium grained equigranular; Plag, ~55%; hb, ~35%, cpx, ~3%, opaques, ~5%, qz, 5%, apatite, ksp 2% ; plag is euhedral, xtals have overall general alignment, poiloblastic by containing resorbed ratty cpx, qz is interstial, ksp forms large very late interstial poikiliitc xtals. 114° 18.16'; 27° 27.31'

80GT-40A Hornblende diorite. Equigranular, medium-grained, plag 65%, qz 3%, ksp, trace; hb 25%, bt 2%, opaques 5%; plag strongly zoned, euhedral; mafics mainly green hb, altered to chlorite and biotite, euhedral, bt interstial, qz, ksp are interstial; studded with coarse euhedral opaques. 114° 20.00'; 27° 21.17'

West Sierra Placer mélange—plutonic block in serpentinite matrix mélange

79-AR-53 GNEISSIC HORNBLENDE TONALITE. GRANOBLASTIC; M GRD; ACCESS AP, SPH, ZR; QZ POLYGONIZED; PL REPLACED BY EP + WM + AB; BT REPLACED BY CHL; HB RIMMED BY ACT; STRONG FOLIATION; PROMINENTLY FOLIATED CA. 2 KM^2 PLUTON, 12 KM SSE OF SAN JOSE DE CASTRO. CONTAINS SPARSE MAFIC XENOLITHS; BORDERED BY AMPHIBOLITIZED MAFIC VOLCANIC ROCKS OF SAAC. PLUTON AND WALL ROCKS ARE TECTONIZED AND SURROUNDED BY SERPENTINITE-MATRIX MELANGE OF SIERRA PLACER MELANGE. 114°25' 30.3", 27°26' 04.1"

EP 95 GNEISSIC HORNBLENDE TONALITE ENGULFED IN SHEARED SERPENTINITE MATRIX OF SIERRA PLACER MÉLANGE; THIS SAMPLE FROM SAME BLOCK AS SAMPLE 79-AR-53; MARGIN OF BLOCK IS 5-10 M-WIDE INTENSELY MYLONITIZED ZONE W/ WELL-DEVELOPED LINEATION. 114°25' 36.0", 27°26' 09.4"

TRES AMIGOS PLUTON

81TA-1 Chloritized biotite tonalite. Medium grained equigranular; Plag ~55%; qz ~25%, mafics ~20%, consists of fine mixture of chlorite, epidote, biotite, opaques filling interstial areas between subhedral plag, and qz. 114° 13.57'; 27° 19.43'

81TA-26 Biotite tonalite. Coarse grained equigranular; Plag, 50%, qz, 30%; Biotite, 15%; Ksp, 2%, opaques, 2%; good green-brown biotite; plag euhedral-subhedral, qz subhedral-anhedral; biotite, ksp, opaques interstitial. Satellite body(?) of Tres Amigos pluton 114° 15.11'; 27° 17.41'

CN 95 Hornblende-biotite tonalite; hypd gr; m/c grained / weakly foliated, scattered sparse mafic inclusions, 1-2 m wide pink leucocratic cross-cutting aplite dikes Largest granitoid pluton (ca. 40 km^2) in Vizcaino Peninsula - Tres Amigos pluton of Barnes (1982) 114° 10'13.6", 27°18'34.5"

SAN PABLO PLUTON

81SP-31 Chloritized biotite granodiorite. Medium grained equigranular; Plag, ~40%, qz ~35%, ksp ~20%, chloritized biotite ~2%, chloritized hb, ~1%, opaques ~1%; Plag is euhedral, strong

zoning, calcic cores strongly altered (sausserite); qz subhedral in large subdivided grains, ksp is interstial; Mafics mostly chlorite, interstial. 114° 27.76'; 27° 15.26'

81SP-47D Hornblende diorite. Equigranular, medium grained; Plag 55%, qz 10-15%, hb 35; oaque 2%, ksp-trace. Plag is oscillatory zoned, euhedral; hb green-brown, ehudral, altered locally to brown biotite, qz, ksp are interestial. 114° 25.97'; 27° 14.76'

81SP-49 Hornblende granodiorite. Equigranular, coarse grained; Plag, 45%, qz 30%, ksp 20%, hornblende ~10%, biotite, 2%, opaques 1%; plag oscillatory zoned, calcic cores altered, euderal; qz subhedral-anhedral, large grains; hb is green brown, locally altered to biotite, euhedral; ksp is interstial. 114° 26.47'; 27° 15.76'

322-10 Biotite tonalite. hydp gr; m grd; QAP=39:5:56 (632); C.I.=6; access op, ap, zr, ep; pl contains primary and ms inclusions and normally zoned rims; ab + ep + wm replaces pl cores; chl replaces some bt. Strongly tectonized pluton of VPB exposed over a 2 km^2 area, located 3 km NE of San Pablo town. Pluton intrudes partly amphibolitized cumulate gabbro and peridotite of VPO and displays inclusion-rich margins of wall-rock lithologies. 114°26' 38.8", 27°14' 40.3"

SAN ROQUE PLUTON

81SRq-1 Biotite tonalite. Equigranular-slightly porphyritic, coarse-grained; Plag 60%, qz 30%, Ksp 5%, brown bt 10%, green hb 2%, opaques 2%. Plag euhedral-subhedral, slightly porphyritic, qz , oscillatory zoned; qz is interstial, most mafics interstitial, hb ragged and altered to bt. 114° 24.94'; 27° 10.16'

81SRq-8G Porphyritic biotite granodiorite. Plag, 45%, qz 30%, ksp 10%, brown biotite 5%, opaques 2%; plag is oscillatory zoned, sodic, rims grade into intersticies; ksp is interstial, mafics interstial. Late interstial grains look somewhat polygonized: slight strain in late stage of crystallization? From Isla San Roque. 114° 22.96'; 27° 08.79'

ASUNCION AREA

81AS-18 Biotite tonalite. Porphyritic biotite tonalite; plag 50%, qz 30%, ksp, trace, bt 5%, hb trace, epidote trace, opaques 2%. Plag phenocrysts, sodic, hb altered to bt; bt mostly altered to chlorite; groundmass is polygonized (granoblastic texture). Rock probably has seen low-grade metamorphism. From hills west of Asuncion town 114° 18.48'; 27° 08.62'

81AS-19 Biotite tonalite. Equigranular, coarse-grained, plag 40%, qz 40%, ksp 5%, bt 10%, hb 5%, opaques, 5%; plag is euhedral, zoned; qz in large grains, subhedral; green hb, euhedral, mostly altered to brown bt; bt also interstial; ksp interstial. From hills west of Asuncion town 114° 18.57'; 27° 08.87'

SA95B Hornblende diorite. Collected near Rancho San Andres near Barnes (1982) U/Pb sample BVP-153 dated by Jim Wright $^{206*}Pb/^{238}U$ = 153 Ma and $^{207*}Pb/^{206*}Pb$ = 158 Ma. Plutonic complex here is a highly fractured mixed gabbroic/dioritic assemblage. 114° 21'45.0"; 27° 15'53.6"

Puerto Nuevo

PN95 Gneissic tonalite. Block in Puerto Nuevo mélange exposed on coast. Greenschist mineral assemblage – highly sheared at margin adjacent to serpentinite matrix. The biggest block in the mélange mapped by Tom Moore Area (<1 km^2). 114° 38’09.1”; 27° 29’25.8”

PUNTA NORTE PLUTONS – CEDROS ISLAND

PN829-1 Granophyric leucotonalite. m gr; hypd gr; ab+qz intergrowths; bt to chl; patches of chl+ep+clay; access op, zr, ap, Largest plutonic unit in Punta Norte headland area at hill 1714'; sharp vertical intrusive contact w/ ~1500' of relief; volcanic+hypabyssal wallrock; block stoping & schieleran parallel to contacts, 28°22' 06", 115°13' 01"

PN829-2 Tonalite. from largest plutonic unit in Punta Norte headland area at hill 1714'; sharp vertical intrusive contact w/ ~1500' of relief; volcanic+hypabyssal wallrock; block stoping & schieleran parallel to contacts

PN830-5 Hornblende tonalite. Contains rafts of hornblende-clinopyroxene quartz diorite and quartz monzodiorite, and other gabbroic and dioritic rocks; Campo Punta Norte

PN830-6 Hornblende-clinopyroxene monzodiorite – large stope block intruded by hornblende tonalite (830-5); Campo Punta Norte