Mortimer et al. GSA Data Repository Item 2006035 Appendices DR1-7, 27 p.

Appendix DR1

ADDITIONAL INFORMATION ABOUT REGIONAL SETTING

The Zealandia micro-continent consists of the two main islands of New Zealand and the submerged Chatham Rise, Campbell plateau and Challenger Rise, formed from highly thinned continental crust. Basement rocks on the Chatham Islands are Mesozoic schists that continue into New Zealand's South Island as the Haast Schist and are the deeply exhumed part of a Jura-Cretaceous accretionary prism (Mortimer, 2004). The Hikurangi Plateau is a Cretaceous large igneous province (LIP; Wood and Davy, 1994; Mortimer and Parkinson, 1996), which was confirmed on the SO168 cruise (Hoernle et al., 2003).

WISHBONE RIDGE

Seismic reflection data show that the west fork of the Wishbone Ridge consists of a system of southeast-facing tilted block ridges extending at least 150 km north-east from the eastern Chatham Rise slope (Davy, 2004). On the *Sonne* 168 cruise, the highest and steepest (up to 41° slope angle) segment of the Wishbone Ridge was targeted for dredging (Fig. 1). The 1800 m high ridge lacks the clear individual and coalesced cone-like shapes that characterise volcanic ridges on the Hikurangi Plateau (Hoernle et al., 2003). Three dredges were made (Fig. DR1). It was anticipated that mid-ocean ridge basalts would be sampled but, surprisingly, this was not the case. 12 kg of indurated sandstones were recovered from dredge 54, 20 kg of sandstones and lava from dredge 55, and 50 kg of siliceous igneous rocks from dredge 56. All rocks were soft and bleached in hand specimen, and showed some secondary porosity in thin section. Basalts were conspicuously absent (but see below).

Igneous rocks

The igneous rocks dredged from Wishbone Ridge are plagioclase + biotite + oxide ± hornblende ± augite ± quartz porphyritic dacites and rhyolites. Maximum phenocryst content is c. 50%; mafic phenocrysts are variably altered to oxychlorite and/or smectite clay. 5-10% total porosity is evident in thin section and Mn oxide dendrites pervade many rocks (removed from analysed samples).

The $\delta^{18}O_{magma}$ value calculated from the West Wishbone Ridge clinopyroxene (+4.5 ‰) is +5.4 ‰ ($\delta^{18}O_{magma\text{-}cpx}$ = 0.9; Bindeman et al., 2004), indistinguishable from values of mantle peridotite (+5.5 ±0.2 ‰; Mattey et al., 1994). The calculated $\delta^{18}O_{magma}$ value, however, is lower than values calculated for typical adakites from the Adak, Cook Islands and Panama (values between 6.4 and 7.3 ‰; Bindeman et al., 2005).

Sedimentary rocks

Sandstones are moderately sorted, subangular, and fine, medium and coarse grained feldspathic volcanic litharenites. They are all soft and are pervaded by Mn oxide dendrites along cracks. Typical composition is that of a feldspathic volcanic litharenite with approximate detrital mode 60% volcanic lithic grains, 20% feldspar, 10% green amphibole (and other minor heavy minerals), 5% matrix/cement and 5% pore space. Primary detrital quartz is absent. One or two grains of detrital green epidote were observed in some sandstones. Laumontite and heulandite are present as cement. Lithic grains consist mainly of varitextured mafic-felsic volcanics, including some brown devitrified hyalopilitic basalts, and plagioclase-hornblende porphyritic lavas (as described above); rare clasts of hornblende gabbro and amphibolite are also present. The Wishbone lavas described above appear to be a good match for most clasts, but are clearly too felsic to match others.

TAKAHE SEAMOUNT

Takahe is the informal name given to a seamount located on the eastern tip of the Chatham Rise, c. 50 km south of the main axis. Swath mapping showed Takahe to be an irregular shaped c. 20x10 km crescentic plateau with a flat top at 2500-2600 m water depth. The northern side of the plateau has relatively steep, 600 m high sides. The southern flanks slope gently down to the Southern Ocean abyssal plain at 4200 m water depth (Fig. DR1).

A single dredge (SO168-dredge 62) across the northwestern corner of the plateau gave half a dozen large (up to 1.5 m) blocks of Mn-crusted, moderately weathered, hypabyssal xenolith-bearing granitoids of total weight c. 1000 kg. No other rock types were present in the dredge. The main rock type was a porphyritic biotite leucogranite (biotite is pseudomorphed by oxychlorite and/or smectite). Samples typically contain 0.5-5% open cavities and cracks lined with drusy quartz, oxychlorite and calcite. More equigranular (0.2-0.3 mm) biotite leucogranodiorites occur as xenoliths in the granite. The contacts between the xenoliths and enclosing porphyries are generally quite distinct, but no chilling or alteration is evident. Most of the rocks contain thin (<0.5 cm) mylonite zones and most boulders are cut by epidotised and/or hematised microfaults 1-10 cm apart.

We interpret the bathymetric data to indicate that Takahe seamount is a south-tilted fault block; the cataclastic nature of many dredge samples also supports faulting in the sample area.

STUTTGART SEAMOUNT

An isolated seamount, informally named Stuttgart, lies beyond the foot of the continental slope on the south side of the Chatham Rise, some 380 km east-south-east of the Chatham Islands (Fig. DR1). Swath mapping revealed no volcanic cone features on Stuttgart, but showed it to be a broad east-west trending c. 12x25 km long asymmetric ridge with a crestline at c. 3800 m water depth. The Southern Ocean abyssal plain surrounds the 1000 m high seamount on all sides. Dredge SO168-dredge 71 from the steepest, south-eastern corner of Stuttgart, yielded 20 kg of banded greenish-grey schists.

Coarse grained schists contain red almandine porphyroblasts up to 5 mm in diameter, in an 0.2-0.3 mm matrix. Banding is defined by changes in mineral modes which range from 25-45% plagioclase (sericitised and saussauritised), 10-35% biotite (almost all chloritised), 0-18% green pleochroic hornblende, 7-35% quartz, 8-12% garnet (mostly retrograded to chlorite and epidote), 0-15% muscovite, 1-5% opaque oxide (mainly retrograded to titanite), and accessory tourmaline. K-feldspar or Al_2SiO_5 polymorphs are absent. Quartz ribbons have been internally annealed into equigranular mosaics.

Fine grained schists (grain size c. 0.05 mm) are subordinate, occur in separate hand specimens, and not seen in contact with the coarser schists. One typical sample, P67456, consists of 65% chlorite, 12% hornblende, 10% epidote, 7% plagioclase, and c. 2% each of titanite, muscovite and quartz. Some chlorite has a porphyroblastic habit, possibly after biotite or amphibole. The fine grain size, and homogeneity (lack of banding), suggest a basaltic tuff protolith.

Rare 1-5 mm boudinaged bands of weakly foliated quartzofeldspathic granitic gneiss form layers in the coarse and fine grained schists. Mineral percentages vary from 25-100% quartz (ribbons aligned with foliation), c. 70% porphyroblastic (probably relict porphyritic?) plagioclase and c. 5% muscovite. K-feldspar is again absent. The gneiss probably represents deformed injected igneous veins or possibly siliceous tuff layers.

Dark pink cryptocrystalline phosphatised limestone adheres to the outside of the one of the schist hand specimen. This material was processed for microfossils but none were found.

Geochemistry

Electron microprobe analyses show that garnets are normally zoned with up to 3.5wt% MgO in the rims. Albite, oligoclase and epidote are present, indicative of epidote amphibolite facies. The presence of both ilmenite and titanite is also consistent with lower amphibolite facies.

The garnet biotite schist and garnet hornblende schist both have whole rock K_2O/Na_2O <0.8 which suggests a volcanic arc-related protolith (New Zealand's Caples, Maitai, Murihiku and Brook Street terranes), rather than a continental margin origin (New Zealand's Western Province or Torlesse Terrane; Roser and Korsch, 1986). Other key petrogenetic indicators such as SiO_2/Al_2O_3, Th/Sc, La/Sc and La/Y (not shown in this paper) also clearly support this protolith interpretation. It should be noted that, of these four likely terranes, only the Caples Terrane approaches amphibolite facies in onland New Zealand.

The textures, mineralogy and chemistry of the fine grained schists suggest a mafic tuffaceous, rather than sedimentary protolith: P67456 has just 44 wt% SiO_2 in contrast to New Zealand metagreywackes which have 54-90 wt% SiO_2 (Roser and Korsch, 1986). On a multi-element normalised diagram (not shown) P67456 has a flattish pattern, with no negative Nb or Ti anomaly, not enrichment in LIL elements. The protolith is inferred to be somewhat similar to a mid-ocean ridge basalt.

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ANALYTICAL METHODS

Precise dredge locations, swath bathymetric maps and complete rock sample descriptions are given in Hoernle et al. (2003). Samples prefixed P have been catalogued in the Institute of Geological and Nuclear Sciences Petrology Collection whose data can be viewed on the PETLAB database (http://data.gns.cri.nz/pet). At all dredge sites discussed here, the monotony of rock types, faces broken across Mn crusts, and moderately weathered nature of much of the rock collectively indicate an in-place (and non-ice transported) origin.

Prior to crushing for chemical analysis Mn rinds and dendrites were ground off, and rock slabs were soaked in deionised water for a week. Standard methods of analysis were employed with XRF major and trace element analyses, and electron microprobe analyses (following Mortimer and Parkinson, 1996) and ICP-MS trace element (for analytical details see Garbe-Schönberg et al. 1993) and TIMS Sr, Nd and Pb isotopic analytical procedures (described in Hoernle et al., 2004) (analyses of siliceous lavas were made on fused beads to ensure complete digestion of zircon). U-Pb dating by the excimer laser ablation (ELA-ICP-MS) followed procedures described by Ballard et al. (2001), and oxygen isotope analyses (done in duplicate) Faure and Brathwaite (2000).

Argon isotopic analyses were performed at The Australian National University, Research School of Earth Sciences (ANU). The samples were weighed, packed in Al foil and stacked in a quartz tube for irradiation. We utilized synthetic K-glass to monitor production ratios associated with interfering reactions, cadmium shielding to limit thermal neutrons, and the fluence monitor GA 1550 biotite (98.5 Ma; Spell and McDougall, 2003). Irradiation was conducted at the HIFAR reactor, Lucas Heights, Australia, thanks to the Australian Science and Technology Organisation and the Australian Institute of Nuclear Science and Engineering. During the course of the step-heating experiments, temperatures of extraction were monitored by a thermocouple inserted into the base of a tantalum crucible. Temperatures were maintained through feedback to a furnace controller. Based on the signal from the thermocouple, the precision of the temperature reading is expected to be ±1 °C; however, the absolute temperature experienced by the samples may vary significantly (±30 °C) from the values quoted due to the use of a loosely fitted molybdenum liner inside the crucible. Analysis of sample gas and treatment of the data are similar to that described by Dunlap and Wysoczanski (2002). After active gases were removed by two Zr-Al getters operating at ~700 °C and ~20 °C on the extraction line, all five isotopes of Ar were measured. Ion-beam measurement was through an electron muliplier, and the signal was measured using a digital electrometer with a $1x10^{11}$ ohm resistor. The sensitivity was about 8×10^{-17} mol/mV on ^{40}Ar. Correction factors for Ar produced in the reactor from K and Ca were either determined using the K-glass or taken from previous analysis of CaF_2. Correction factors are as follows: $^{(36/37)}Ca$=3.5x10-4, $^{(39/37)}Ca$=7.86x10-4, $^{(40/39)}K$=0.027 ± 0.002 (one sigma). J factors for sample aliquots were determined by curve fitting of the fluence monitor data for the linearly stacked sample array. Decay constants and abundance of ^{40}K recommended by the IUGS Subcommission on Geochronology were used (Steiger and Jäger, 1977).

Full analytical data are available from the authors on request. All reported age errors in the text are two sigma.

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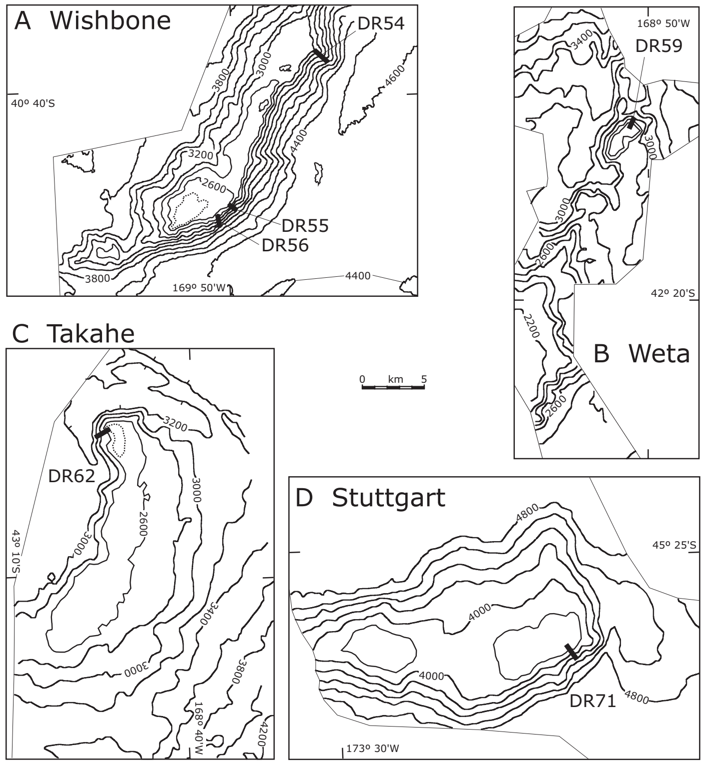
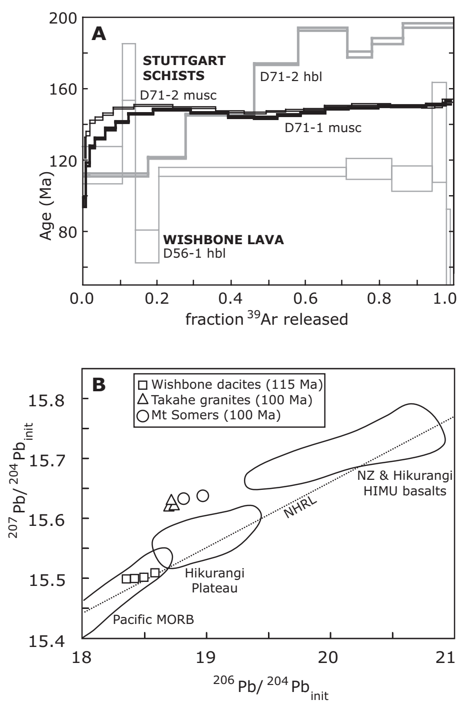
Figure Captions:

Figure DR1. Bathymetry at the four dredge sites.

Figure DR2. A. Argon spectra of hornblende phenocrysts from Wishbone dacite and metamorphic minerals from Stuttgart. B. Pb isotope diagram for Takahe and Wishbone igneous rocks.



Appendix DR1 Figure DR1



Appendix DR1 Figure DR2

GNS#	FieldNumber	Date	Lat	Long	Site_Description	Top(m)	Bottom(m)	Rock_Description	Colour	Rock_Types	Comments
P67407	SO168-DR54-03	31-Dec-02	-40.6373	-169.7442	Wishbone Ridge A. NE end of surveyed part	3030	3750	pale grey-brown medium sandstone, similar in compare to DR54-1	5 Y 7/2	sandst	weathering rind / front is cut by 7mm Mn-rind; indicates exposure to seafloor before brecciation
P67414	SO168-DR55-01	1-Jan-03	-40.7508	-169.8312	Wishbone Ridge B. Southern part of ridge, upper part of SE slope	2567	3300	light grey porphyritic ?dacitic lava with abundant (<5mm) Mn-spots and small through-going Mn-coated fractures. 10-15 % feldspar	5 GY 5/2	rhy, trach, hyp-acid	thin (< 2 mm) Mn-crust. Mn cut off and fresh inner core separated for geochem. Extra bag of sample for mineral separation
P67415	SO168-DR55-04	1-Jan-03	-40.7508	-169.8312	Wishbone Ridge B. Southern part of ridge, upper part of SE slope	2567	3300	coarse grained green-olive pebbly sandstone, no Mn-crust, size of the clasts 1-8 mm (average 2-3 mm). Clasts are mainly volcanic	10 Y 6/2	sandst	Check TS to see if sample contains datable mineral phases e.g. biotite, amphibole
P67416	SO168-DR56-01	1-Jan-03	-40.7607	-169.8438	Wishbone Ridge B. Southern part of ridge, upper part of SE slope	2752	3548	light grey porphyritic ?dacitic lava, partly fresh matrix. 10-15% feldspar phenocrysts (1-7mm, possibly two 2 types, milky kspar	5 Y 4/1	rhy, trach, hyp-acid	possible candidate for zircon dating. No Mn-crust
P67417	SO168-DR56-02	1-Jan-03	-40.7607	-169.8438	Wishbone Ridge B. Southern part of ridge, upper part of SE slope	2752	3548	pale grey fsp and ?quartz porphryritic ?rhyolite. rock, 20% phenos, mainly feldspars (kspar 5%, plag 12%?), poss 3% smoky quart	10 YR 5/4	rhy, hyp-acid	dacitic or rhyolitic? A tuff? No Mn-crust. Slickensides on one side of sample
P67418	SO168-DR56-03	1-Jan-03	-40.7607	-169.8438	Wishbone Ridge B. Southern part of ridge, upper part of SE slope	2752	3548	greyish-green plagioclase pptic (15%) dacitic lava, no milky fsp. Matrix is dissected by numerous fractures along which it is al	5 Y 7/2	rhy, trach, hyp-acid	no Mn-crust
P67434	SO168-DR59-01	2-Jan-03	-42.2808	-168.8505	Weta Seamounts A. Northeastward facing slope of biggest Weta seamount	2436	2907	brownish-grey olivine pptic (10%) basalt. 15% round to oval vesicles, 50% filled with soft brown mud	5 R 2/2	bas	Initial description "No recognizable phenocrysts, 10% orange spots are most likely Fe hydroxides"
P67436	SO168-DR62-01	3-Jan-03	-43.0619	-168.7539	Takahe Plateau. Across nose of northwestern plateau margin	2441	3102	light grey (N7) hypabyssal feldspar porphyry of prob dacitic-granitic composition. Phenos 30-40% fsp (plag and ?Kspar to 8mm), 5	10 Y 6/2	rhy, trach, hyp-acid	DR62 rocks very hard to saw. Possible zc dating. Some Mn nucleation within sample; DR62-1 is freshest and cleanest of the set for geochem; also has the finest grained groundmass. 1-2 % open holes with vuggy quartz: poss result of weathering. 2-3cm Mn rind
P67437	SO168-DR62-02A	3-Jan-03	-43.0619	-168.7539	Takahe Plateau. Across nose of northwestern plateau margin	2441	3102	two rock types A: greyish orange pink (5YR7/2) fsp pptic (60%) hb (altd 5%) granite-granodiorite.	5 Y 7/2	hyp-acid, grnt	DR62-2A broadly similar to DR62-1 but groundmass is distinctly coarsest of the dredge so it has plutonic rock name. Pptic granite is locally mylonitic, both rock types cut by epidotised microfaults spaced a few cm apart; some slickensides. 2-3cm Mn rind
P67439	SO168-DR62-03A	3-Jan-03	-43.0619	-168.7539	Takahe Plateau. Across nose of northwestern plateau margin	2441	3102	composite like DR62-2 A: light grey fsp porphyritic dacite/granite w 5% altd mafics	10 YR 6/2	rhy, trach, hyp-acid	DR62-3A groundmass coarser than DR62-1, finer than DR62-2A. 2-3cm Mn rind
P67440	SO168-DR62-03B	3-Jan-03	-43.0619	-168.7539	Takahe Plateau. Across nose of northwestern plateau margin	2441	3102	composite like DR62-2 B: medium grey fg equigranular hb (5%, altd) diorite, prob as xenolith	5 G 6/1	dior, xeno	
P67454	SO168-DR71-01	6-Jan-03	-45.4887	-173.2612	Stuttgart Seamount B. Southeastern corner, upper slope	3654	4240	dark greenish grey qtz-feldspar-chlorite-muscovite schist. 3-4% feldspathic or lithic "augen" appear rotated. Quartz segregatio	5 Y 3/2	grysch	Resembles greenschist facies textural zone 4 schist from Caples Terrane, Otago
P67455	SO168-DR71-02	6-Jan-03	-45.4887	-173.2612	Stuttgart Seamount B. Southeastern corner, upper slope	3654	4240	dark greenish grey qtz-feldspar-chlorite-muscovite schist. Perhaps more micaceous than DR71-01. Reddish mineral (possible garnet	5 GY 5/2	grysch	
P67456	SO168-DR71-03	6-Jan-03	-45.4887	-173.2612	Stuttgart Seamount B. Southeastern corner, upper slope	3654	4240	moderate greenish grey schist, more fissile and finer grained than DR71-01 and 02.	5 Y 4/4	grysch	1cm Mn crust. Either a lower rgade schist than DR71-1 and 2, or an ultramylonite
P67458	SO168-DR71-07	6-Jan-03	-45.4887	-173.2612	Stuttgart Seamount B. Southeastern corner, upper slope	3654	4240	similar to DR71-1	5 B 6/2	grysch	
P67460	SO168-DR71-09	6-Jan-03	-45.4887	-173.2612	Stuttgart Seamount B. Southeastern corner, upper slope	3654	4240	Mix of hammered pieces from DR71-1 to 3 and smaller individual pieces	5 GY 5/2	grysch	<2mm Mn rinds. All pieces to GNS

GNS#	FieldNumber	Material	Part	Investigator	Method	Laboratory	Analysis_Date	SiO2	TiO2	Al2O3	Fe2O3T	MnO	MgO	CaO	Na2O	K2O	P2O5	LOI
Wishbone																		
P67407	SO168-DR54-03	whole rock		Mortimer, N.	XRF	Spectrachem	16-May-03	54.57	1.48	17.63	6.93	0.18	4.40	5.05	3.49	2.17	0.14	3.87
P67407	SO168-DR54-03	whole rock		Hauff, F.	ICP-MS	Kiel U	17-Nov-04											
P67414	SO168-DR55-01	whole rock		Mortimer, N.	XRF	Spectrachem	16-May-03	65.62	0.47	17.38	3.00	bd	1.01	4.69	5.38	1.09	0.36	0.99
P67414	SO168-DR55-01	whole rock		Hauff, F.	ICP-MS	Kiel U	19-May-04											
P67415	SO168-DR55-04	whole rock		Mortimer, N.	XRF	Spectrachem	23-Mar-04	60.09	0.51	18.34	4.19	0.03	2.37	5.20	4.55	2.34	0.56	1.68
P67416	SO168-DR56-01	whole rock		Mortimer, N.	XRF	Spectrachem	16-May-03	66.01	0.39	16.27	3.64	0.03	2.22	4.60	4.70	0.78	0.16	1.17
P67416	SO168-DR56-01	whole rock		Hauff, F.	ICP-MS	Kiel U	19-May-04											
P67417	SO168-DR56-02	whole rock		Mortimer, N.	XRF	Spectrachem	16-May-03	68.50	0.31	14.80	2.54	0.02	1.53	3.99	3.95	2.00	0.75	1.46
P67417	SO168-DR56-02	whole rock		Hauff, F.	ICP-MS	Kiel U	17-Nov-04											
P67418	SO168-DR56-03	whole rock		Mortimer, N.	XRF	Spectrachem	16-May-03	67.01	0.36	16.55	2.82	0.02	1.44	3.78	5.10	1.15	0.17	1.28
P67418	SO168-DR56-03	whole rock		Hauff, F.	ICP-MS	Kiel U	17-Nov-04											
Weta																		
P67434	SO168-DR59-01	whole rock		Werner, R.	XRF	Kiel U	1-Jan-05	48.23	2.63	18.68	9.84	0.28	1.50	8.63	3.69	2.26	1.78	2.21
P67434	SO168-DR59-01	whole rock		Werner, R.	ICP-MS	Kiel U	1-Jan-05											
Takahe																		
P67436	SO168-DR62-01	whole rock		Mortimer, N.	XRF	Spectrachem	16-May-03	68.43	0.46	15.11	3.31	0.06	0.86	1.73	3.66	4.70	0.12	0.99
P67436	SO168-DR62-01	whole rock		Hauff, F.	ICP-MS	Kiel U	19-May-04											
P67437	SO168-DR62-02A	whole rock		Mortimer, N.	XRF	Spectrachem	16-May-03	67.57	0.53	15.94	3.47	0.03	1.29	1.18	3.40	3.89	0.14	2.11
P67437	SO168-DR62-02A	whole rock		Hauff, F.	ICP-MS	Kiel U	17-Nov-04											
P67439	SO168-DR62-03P	whole rock	Porphyry	Mortimer, N.	XRF	Spectrachem	16-May-03	66.86	0.48	15.34	3.36	0.04	1.37	1.52	2.89	5.86	0.11	1.76
P67439	SO168-DR62-03P	whole rock	Porphyry	Hauff, F.	ICP-MS	Kiel U	17-Nov-04											
P67439	SO168-DR62-03X	whole rock	Xenolith	Mortimer, N.	XRF	Spectrachem	16-May-03	62.30	1.08	16.74	5.97	0.09	2.33	1.54	3.80	2.99	0.22	2.59
P67439	SO168-DR62-03X	whole rock	Xenolith	Hauff, F.	ICP-MS	Kiel U	19-May-04											
P67440	SO168-DR62-03B	whole rock		Mortimer, N.	XRF	Spectrachem	16-May-03	64.05	0.62	15.16	4.24	0.07	2.73	1.71	3.10	4.91	0.15	3.24
P67440	SO168-DR62-03B	whole rock		Hauff, F.	ICP-MS	Kiel U	19-May-04											
Stuttgart																		
P67454	SO168-DR71-01	whole rock		Mortimer, N.	XRF	Spectrachem	16-May-03	60.09	0.96	17.13	7.49	0.09	3.25	2.78	3.69	1.65	0.21	2.58
P67454	SO168-DR71-01	whole rock		Hauff, F.	ICP-MS	Kiel U	17-Nov-04											
P67455	SO168-DR71-02G	whole rock	Granitic vein	Mortimer, N.	XRF	Spectrachem	16-May-03	66.00	0.10	20.05	0.49	bd	0.25	2.58	7.49	1.37	0.06	1.25
P67455	SO168-DR71-02G	whole rock	Granitic vein	Hauff, F.	ICP-MS	Kiel U	17-Nov-04											
P67455	SO168-DR71-02S	whole rock	Schist	Mortimer, N.	XRF	Spectrachem	16-May-03	51.14	2.89	16.69	11.84	0.21	4.73	4.82	2.73	1.87	0.84	2.19
P67455	SO168-DR71-02S	whole rock	Schist	Hauff, F.	ICP-MS	Kiel U	17-Nov-04											
P67456	SO168-DR71-03	whole rock		Mortimer, N.	XRF	Spectrachem	16-May-03	44.17	2.19	16.82	12.45	0.18	9.30	7.58	2.77	0.74	0.22	3.53
P67456	SO168-DR71-03	whole rock		Hauff, F.	ICP-MS	Kiel U	17-Nov-04											
P67458	SO168-DR71-07	whole rock		Mortimer, N.	XRF	Spectrachem	25-Nov-03	56.55	1.15	17.19	9.07	0.19	4.14	4.69	3.09	1.80	0.20	1.85
P67460	SO168-DR71-09	whole rock		Mortimer, N.	XRF	Spectrachem	25-Nov-03	61.87	0.83	17.35	6.58	0.05	2.57	1.80	4.15	1.96	0.20	2.57

GNS#	FieldNumber	Majors_total	Li	Cs	Rb	Sr	Ba	Sc	V	Cr	Co	Ni	Cu	Zn	Ga	As	Y	Zr	Nb	Mo	Sn	Sb	La	Ce	Pr
Wishbone																									
P67407	SO168-DR54-03	99.91			19	161	bd	42	285	371		155	72	114	17	bd	32	105	5				bd	22	
P67407	SO168-DR54-03		21.4	0.461	18.2	178	27.6	36.1	249		44.4	133	68.6	112	18.8		34.1	92.1	2.09	0.810	1.02	0.781	9.51	10.3	2.99
P67414	SO168-DR55-01	100.01			6	275	90	9	36	33		27	6	74	20	bd	11	187	5				14	45	
P67414	SO168-DR55-01		15.0	0.031	5.21	234	45.2	4.86	30.5	30.5	43.7	21.6	6.89	60.9	18.0		10.7	150	2.12	0.220	0.550	0.086	11.5	25.6	3.58
P67415	SO168-DR55-04	99.89		bd	19	241	35	10	50	45		51	28	114	21	bd	19	168	bd				10	37	
P67416	SO168-DR56-01	99.96			8	201	77	11	54	36		47	26	132	19	bd	13	169	5				9	34	
P67416	SO168-DR56-01		25.5	0.361	8.31	199	45.3	6.42	43.3	31.2	40.3	40.3	27.7	124	17.9		13.6	138	3.18	0.262	0.593	0.196	10.1	23.7	3.22
P67417	SO168-DR56-02	99.85			19	210	104	8	23	28		53	28	190	18	1	26	157	5				21	49	
P67417	SO168-DR56-02		16.9	1.05	20.3	209	74.7	4.28	27.1	22.1	42.3	43.9	28.4	183	18.8		27.7	23.2	2.49	0.146	0.649	0.271	26.1	28.4	4.87
P67418	SO168-DR56-03	99.68			12	239	91	9	30	26		30	19	107	18	2	7	158	bd				13	43	
P67418	SO168-DR56-03		23.1	0.594	12.2	273	63.4	4.55	33.5	26.4	53.1	27.9	21.1	104	20.4		9.56	172	3.59	0.340	0.785	0.197	12.4	27.3	3.58
Weta																									
P67434	SO168-DR59-01	99.73			40	585	344		211	148	36	121		125	22		45	290	37					84	
P67434	SO168-DR59-01		4.82	0.86	35.2	546	344	18.1	169	115	28.1	103	82.2	113	21.5		39.9	259	17.7	2.80	1.00	2.53	36.8	70.7	9.61
Takahe																									
P67436	SO168-DR62-01	99.44			174	160	639	7	35	8		11	12	60	20	7	28	318	15				28	107	
P67436	SO168-DR62-01		25.1	4.61	184	170	691	6.98	33.8	7.45	77.3	8.59	15.9	75.0	21.0		29.4	100	10.8	1.45	4.48	0.763	33.5	71.6	8.61
P67437	SO168-DR62-02A	99.53			159	157	730	8	51	7		11	2	56	20	6	25	320	14				35	75	
P67437	SO168-DR62-02A		19.2	5.35	162	160	794	7.16	41.3	6.98	30.9	7.51	7.18	57.8	21.2		26.4	352	11.7	0.902	3.14	0.727	27.9	58.1	7.12
P67439	SO168-DR62-03P	99.58			249	151	717	10	40	8		13	11	66	20	11	27	320	13				28	83	
P67439	SO168-DR62-03P		25.9	6.26	257	154	783	6.89	37.2	9.55	53.9	10.0	14.3	74.4	20.4		27.7	269	8.36	0.520	3.58	1.08	28.2	59.4	7.13
P67439	SO168-DR62-03X	99.65			132	179	381	17	110	bd		11	29	91	19	8	32	194	15				26	82	
P67439	SO168-DR62-03X		37.1	4.46	127	180	381	16.7	95.4	2.92	44.1	7.24	29.7	92.4	20.9		31.1	118	11.7	1.021	4.46	0.875	26.7	57.5	7.47
P67440	SO168-DR62-03B	99.99			215	130	511	14	72	47		27	32	86	15	12	29	330	15				33	73	
P67440	SO168-DR62-03B		47.2	7.11	210	131	548	11.1	57.8	30.7	31.4	22.8	32.1	86.4	18.5		28.1	243	12.1	0.561	3.25	1.12	27.8	62.3	7.55
Stuttgart																									
P67454	SO168-DR71-01	99.92			65	252	387	20	163	103		52	38	118	20	3	27	157	10				19	59	
P67454	SO168-DR71-01			2.57	68.2	268	386		134					120	23.0		28.9	159	9.09				21.7	54.2	6.14
P67455	SO168-DR71-02G	99.63			31	431	228	bd	bd	bd		4	3	11	13	bd	bd	bd	bd				bd	77	
P67455	SO168-DR71-02G		1.07	0.491	34.6	491	195	0.512	14.8	2.56	146	4.91	8.07	12.1	13.2		1.20	5.32	0.650	0.162	1.12	0.180	1.55	2.58	0.236
P67455	SO168-DR71-02S	99.95			79	236	410	22	218	21		26	41	153	26	3	46	279	49				32	129	
P67455	SO168-DR71-02S		15.5	5.19	84.7	277	374	18.9	211	19.7	45.3	19.3	39.3	156	26.7		51.9	195	30.1	0.254	3.12	0.540	49.9	116	13.6
P67456	SO168-DR71-03	99.96			18	158	bd	40	333	300		154	60	210	24	10	38	172	10				bd	30	
P67456	SO168-DR71-03		35.3	0.528	20.6	182	151	37.1	303	244	45.2	138	56.1	196	24.8		41.9	150	6.97	0.190	2.02	0.747	10.5	24.8	4.11
P67458	SO168-DR71-07	99.96			73	267	400	23	201	155		71	28	111	21	2	33	165	10				21	61	
P67460	SO168-DR71-09	99.97			60	231	421	14	156	70		31	35	96	19	4	19	161	8				13	70	

GNS#	FieldNumber	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	Tl	Pb	Th	U
Wishbone																		
P67407	SO168-DR54-03															bd	bd	bd
P67407	SO168-DR54-03	14.4	4.18	1.57	5.39	1.04	5.94	1.22	3.34	0.472	3.10	0.439	2.57	0.174	2.55	2.78	0.236	0.315
P67414	SO168-DR55-01															bd	bd	bd
P67414	SO168-DR55-01	14.2	2.92	0.945	2.61	0.344	1.79	0.331	0.865	0.125	0.825	0.123	3.64	0.207	0.036	0.943	0.984	0.367
P67415	SO168-DR55-04															4	bd	bd
P67416	SO168-DR56-01															bd	bd	bd
P67416	SO168-DR56-01	12.8	2.75	0.877	2.72	0.395	2.31	0.451	1.27	0.194	1.32	0.208	3.47	0.246	0.272	1.47	0.925	0.369
P67417	SO168-DR56-02															10	bd	bd
P67417	SO168-DR56-02	18.9	3.56	1.07	3.67	0.532	2.99	0.621	1.79	0.267	1.80	0.277	0.949	0.177	1.20	7.68	1.27	0.646
P67418	SO168-DR56-03															bd	bd	bd
P67418	SO168-DR56-03	14.2	2.93	0.980	2.51	0.359	1.84	0.330	0.869	0.123	0.859	0.127	4.82	0.232	0.913	1.77	1.24	0.371
Weta																		
P67434	SO168-DR59-01																	
P67434	SO168-DR59-01	39.1	8.20	2.6	8.51	1.24	7.33	1.42	3.86	0.550	3.62	0.530	5.87	1.12	1.09	5.93	4.24	1.54
Takahe																		
P67436	SO168-DR62-01															29	20	bd
P67436	SO168-DR62-01	30.9	6.24	0.668	6.02	0.916	5.44	1.06	2.97	0.443	3.00	0.429	3.62	0.851	1.93	31.3	15.9	2.10
P67437	SO168-DR62-02A															19	12	bd
P67437	SO168-DR62-02A	26.7	5.53	0.864	5.24	0.799	4.98	0.982	2.84	0.425	2.94	0.427	9.59	0.576	2.21	20.5	11.7	1.71
P67439	SO168-DR62-03P															24	17	3
P67439	SO168-DR62-03P	26.2	5.41	0.780	5.05	0.829	5	1.00	2.91	0.440	3.09	0.464	7.46	0.093	4.94	26.1	14.1	2.67
P67439	SO168-DR62-03X															14	14	3
P67439	SO168-DR62-03X	28.1	5.93	0.902	5.95	0.912	5.55	1.11	3.12	0.471	3.13	0.460	3.39	0.730	1.87	17.6	13.1	1.67
P67440	SO168-DR62-03B															19	16	3
P67440	SO168-DR62-03B	27.7	5.70	0.516	5.48	0.819	4.84	0.947	2.66	0.393	2.63	0.379	5.96	0.656	4.78	17.2	14.9	2.85
Stuttgart																		
P67454	SO168-DR71-01															10	6	bd
P67454	SO168-DR71-01	24.1	5.34	1.26	5.19	0.835	5.34	1.08	3.01	0.454	3.03	0.447	4.94			15.1	8.57	1.91
P67455	SO168-DR71-02G															17	bd	bd
P67455	SO168-DR71-02G	0.926	0.194	bd	0.210	0.033	0.180	0.033	0.087	0.012	0.085	0.011	0.141	0.092	0.607	13.1	0.337	0.050
P67455	SO168-DR71-02S															11	8	4
P67455	SO168-DR71-02S	54.5	11.7	3.65	11.5	1.74	10.1	1.96	5.24	0.733	4.76	0.693	4.85	2.81	0.976	11.1	8.05	2.40
P67456	SO168-DR71-03															9	bd	bd
P67456	SO168-DR71-03	19.9	6.01	2.14	7.23	1.24	8.02	1.62	4.45	0.645	4.26	0.618	4.33	0.446	0.195	6.65	0.816	0.349
P67458	SO168-DR71-07															15	10	2
P67460	SO168-DR71-09															13	10	3

GNS#	FieldNumber	Material	Part	Investigator	Method	Laboratory	Analysis_Date	Analysis_Comments	d18O	87Sr/86Sr	2 sigma abs	143Nd/144Nd
P67407	SO168-DR54-03	whole rock		Hauff, F.	TIMS	IFM-GEOMAR	17-Nov-04	leached 6N HCl 1 hr; inits from ICPMS traces		0.703461	0.000002	0.513057
P67414	SO168-DR55-01	whole rock		Hauff, F.	TIMS	IFM-GEOMAR	17-Nov-04	leached 6N HCl 1 hr; inits from ICPMS traces		0.702891	0.000002	0.513001
P67416	SO168-DR56-01	whole rock		Hauff, F.	TIMS	IFM-GEOMAR	17-Nov-04	leached 6N HCl 1 hr; inits from ICPMS traces		0.702976	0.000002	0.513024
P67417	SO168-DR56-02	whole rock		Hauff, F.	TIMS	IFM-GEOMAR	17-Nov-04	leached 6N HCl 1 hr; inits from ICPMS traces		0.703163	0.000002	0.512999
P67418	SO168-DR56-03	whole rock		Hauff, F.	TIMS	IFM-GEOMAR	17-Nov-04	leached 6N HCl 1 hr; inits from ICPMS traces		0.702973	0.000002	0.512979
P67436	SO168-DR62-01	whole rock		Hauff, F.	TIMS	IFM-GEOMAR	17-Nov-04	leached 6N HCl 1 hr; inits from ICPMS traces		0.709537	0.000002	0.512630
P67437	SO168-DR62-02A	whole rock		Hauff, F.	TIMS	IFM-GEOMAR	17-Nov-04	leached 6N HCl 1 hr; inits from ICPMS traces		0.709055	0.000002	0.512642
P67439	SO168-DR62-03A	whole rock	X	Hauff, F.	TIMS	IFM-GEOMAR	17-Nov-04	leached 6N HCl 1 hr; inits from ICPMS traces		0.707943	0.000004	0.512667
P67439	SO168-DR62-03A	whole rock	P	Hauff, F.	TIMS	IFM-GEOMAR	17-Nov-04	leached 6N HCl 1 hr; inits from ICPMS traces		0.712277	0.000004	0.512650
P67440	SO168-DR62-03B	whole rock		Hauff, F.	TIMS	IFM-GEOMAR	17-Nov-04	leached 6N HCl 1 hr; inits from ICPMS traces		0.712674	0.000004	0.512590
P67454	SO168-DR71-01	whole rock		Hauff, F.	TIMS	IFM-GEOMAR	17-Nov-04	leached 6N HCl 1 hr; inits from ICPMS traces		0.708392	0.000004	0.512413
P67455	SO168-DR71-02	whole rock	G	Hauff, F.	TIMS	IFM-GEOMAR	17-Nov-04	leached 6N HCl 1 hr; inits from ICPMS traces		0.707803	0.000004	0.512571
P67455	SO168-DR71-02	whole rock	S	Hauff, F.	TIMS	IFM-GEOMAR	17-Nov-04	leached 6N HCl 1 hr; inits from ICPMS traces		0.708002	0.000004	0.512689
P67456	SO168-DR71-03	whole rock		Hauff, F.	TIMS	IFM-GEOMAR	17-Nov-04	leached 6N HCl 1 hr; inits from ICPMS traces		0.705152	0.000005	0.512968
P67416	SO168-DR56-01	composite mineral	i - cpx & hbl	Faure, K.	gas spectrometry	GNS	17-Mar-04		4.7			
P67416	SO168-DR56-01	composite mineral	ii - cpx & hbl	Faure, K.	gas spectrometry	GNS	17-Mar-04	dup	4.6			
P67416	SO168-DR56-01	pyroxene	i	Faure, K.	gas spectrometry	GNS	17-Mar-04		4.5			
P67416	SO168-DR56-01	pyroxene	ii	Faure, K.	gas spectrometry	GNS	17-Mar-04	dup	4.5			

GNS#	FieldNumber	2 sigma abs	206Pb/204Pb	2 sigma abs	207Pb/204Pb	2 sigma abs	208Pb/204Pb	2 sigma abs	assumed age (Ma)	87Sr/86Sr(i) calc	e Nd(i) calc
P67407	SO168-DR54-03	0.000002	18.975	0.003	15.559	0.003	38.187	0.007	100	0.703029	8.19
P67414	SO168-DR55-01	0.000003	18.742	0.002	15.516	0.001	38.078	0.004	100	0.702800	7.09
P67416	SO168-DR56-01	0.000002	18.748	0.002	15.513	0.001	38.085	0.004	100	0.702805	7.54
P67417	SO168-DR56-02	0.000002	18.645	0.001	15.511	0.001	38.019	0.002	100	0.702793	7.05
P67418	SO168-DR56-03	0.000002	18.596	0.002	15.508	0.001	38.012	0.004	100	0.702789	6.66
P67436	SO168-DR62-01	0.000002	18.792	0.001	15.627	0.001	38.613	0.002	100	0.705101	-0.16
P67437	SO168-DR62-02A	0.000003	18.775	0.001	15.623	0.001	38.589	0.001	100	0.704984	0.08
P67439	SO168-DR62-03A	0.000006	18.827	0.001	15.622	0.001	38.622	0.002	100	0.705047	0.58
P67439	SO168-DR62-03A	0.000004	18.825	0.001	15.624	0.001	38.620	0.001	100	0.705813	0.25
P67440	SO168-DR62-03B	0.000002	18.902	0.001	15.651	0.001	38.757	0.001	100	0.706081	-0.93
P67454	SO168-DR71-01	0.000002	18.790	0.001	15.627	0.001	38.684	0.002	150	0.706825	-4.38
P67455	SO168-DR71-02	0.000010	18.541	0.001	15.625	0.001	38.401	0.002	150	0.707346	-1.29
P67455	SO168-DR71-02	0.000002	19.164	0.001	15.647	0.001	38.901	0.001	150	0.706031	1.01
P67456	SO168-DR71-03	0.000002	18.725	0.001	15.615	0.001	38.498	0.001	150	0.704404	6.44
P67416	SO168-DR56-01										
P67416	SO168-DR56-01										
P67416	SO168-DR56-01										
P67416	SO168-DR56-01										

U-Th-Pb isotope data for sample P67414 Wishbone dacite.

Spot No.	Pb* (ppm)	U (ppm)	atomic Th/U	Measured isotope ratios and 1σ (%) internal errors								Corrected ages and 1σ absolute internal errors (Ma)						6*/38 -7*/35 concord-ance(%)	% common 206Pb	Spot MSWD	Selected age and 1σ absolute external error (Ma)	
				206Pb/238U	±	207Pb/235U	±	207Pb/206Pb	±	208Pb/232Th	±	206Pb*/238U	±	207Pb*/235U	±	207Pb*/206Pb*	±					
5b	1.31	75	0.41	0.01707	1.5	0.1429	7.4	0.0607	7.2	0.00570	5.2	109.1	1.7	129.0	12.2	520.8	40.7	85	0.37	1.04		
14	1.95	109	0.38	0.01747	1.0	0.1238	5.8	0.0514	5.7	0.00600	2.7	111.4	1.1	107.7	7.5	37.2	2.6	104	0.58	2.00	111.4	1.1
10	1.09	53	0.75	0.01821	2.0	0.2315	9.4	0.0922	9.1	0.00790	3.5	111.6	2.4	116.1	23.8	231.9	44.8	96	5.36	1.46	111.6	2.4
7	1.07	55	0.75	0.01749	1.4	0.1394	6.9	0.0578	6.8	0.00583	3.5	111.7	1.7	118.9	13.7	280.6	29.6	94	0.73	1.02	111.7	1.7
4	1.90	100	0.66	0.01741	1.0	0.1154	6.2	0.0481	6.1	0.00551	2.8	111.9	1.2	109.5	9.4	73.2	6.3	102	0.07	1.09	111.9	1.2
11	1.43	72	0.75	0.01770	1.5	0.1472	6.4	0.0603	6.2	0.00577	2.9	113.3	1.8	130.0	13.1	462.0	39.3	87	0.51	1.67	113.3	1.8
13	2.07	105	0.69	0.01774	1.2	0.1507	5.6	0.0616	5.4	0.00602	3.2	113.3	1.4	129.2	11.9	447.2	35.2	88	0.71	1.63	113.3	1.5
5a	0.74	42	0.33	0.01768	1.7	0.1565	7.0	0.0642	6.8	0.00538	6.3	113.4	2.0	149.7	11.4	777.9	43.5	76	-0.11	2.00	113.4	2.0
15	0.56	30	0.37	0.01810	2.9	0.1877	11	0.0752	11	0.00788	7.9	113.4	3.3	129.1	21.4	439.4	62.2	88	2.48	2.00	113.4	3.3
9	1.69	83	0.77	0.01798	1.9	0.1516	12	0.0612	12	0.00643	5.4	113.8	2.4	109.1	22.5	30.8	6.5	104	1.82	1.20	113.8	2.4
12	1.18	65	0.38	0.01782	1.2	0.1376	6.1	0.0560	6.0	0.00599	4.4	113.8	1.4	123.0	9.6	313.9	22.1	92	0.41	0.94	113.8	1.4
17	0.90	48	0.54	0.01788	1.7	0.1408	6.9	0.0571	6.7	0.00606	3.8	113.9	1.9	117.3	11.4	198.8	18.3	97	0.87	1.27	113.9	2.0
3	1.97	96	0.84	0.01792	1.2	0.1068	5.7	0.0432	5.5	0.00565	2.6	115.3	1.5	101.3	10.9	rd		114	0.09	1.64	115.3	1.6
16	1.34	68	0.60	0.01820	1.5	0.1426	7.5	0.0568	7.4	0.00614	3.5	116.1	1.8	121.0	14.4	231.2	26.0	96	0.75	1.34	116.1	1.9
19	0.65	33	0.48	0.01857	3.0	0.2024	11	0.0790	10	0.00708	7.6	116.8	3.6	148.7	25.3	702.7	91.5	79	2.06	0.97	116.8	3.6
2	1.70	80	0.90	0.01827	2.0	0.1481	10	0.0588	10	0.00593	4.3	117.1	2.6	127.1	22.6	340.7	54.4	92	0.68	1.38	117.1	2.6
8	1.51	79	0.46	0.01837	1.3	0.1371	6.1	0.0541	5.9	0.00631	3.3	117.1	1.6	117.0	9.4	127.4	10.1	100	0.69	2.00	117.1	1.6
6	1.42	71	0.63	0.01839	1.2	0.1383	5.9	0.0545	5.8	0.00609	3.0	117.4	1.5	118.8	10.3	161.2	13.6	99	0.65	1.03	117.4	1.5
18	0.63	34	0.37	0.01855	1.8	0.1665	8.8	0.0651	8.6	0.00558	5.8	119.0	2.2	157.6	14.4	794.4	53.3	75	-0.07	2.00	119.0	2.2
1	1.60	82	0.47	0.01874	1.5	0.1191	6.6	0.0461	6.4	0.00610	5.4	119.9	1.8	109.7	10.9	rd		109	0.22	1.00		
pooled age (N = 18 of 20, MSWD = 1.68, 1σ absolute external error)																					**114.0**	**0.5**

All errors are 1σ, * = radiogenic component only, d = discordant, i = inherited, rd = reversely discordant.

U-Th-Pb isotope data for sample P67415 volcaniclastic sandstone.

Grain-Spot No.	Pb* (ppm)	U (ppm)	atomic Th/U	Measured isotope ratios and 1σ (%) internal errors								Corrected ages and 1σ absolute internal errors (Ma)						6*/38 -7*/35 concord-ance(%)	% common 206Pb	Spot MSWD	Selected age and 1σ absolute external error (Ma)	
				206Pb/238U	±	207Pb/235U	±	207Pb/206Pb	±	208Pb/232Th	±	206Pb*/238U	±	207Pb*/235U	±	207Pb*/206Pb*	±					
2a	0.46	25	0.36	0.01746	2.8	0.1669	13.5	0.0694	13.	0.00899	6.9	107.8	3.1	82.1	24.5	rd		131	4.15	1.33	107.8	3.1
7b	1.00	51	0.88	0.01718	1.7	0.1641	7.3	0.0693	7.1	0.00516	3.6	111.3	1.9	167.1	14.0	1068.3	58.7	67	-0.72	1.36	111.3	2.0
9a	0.73	38	0.57	0.01769	1.5	0.1246	8.8	0.0511	8.6	0.00631	4.7	112.2	1.8	91.1	14.1	rd		123	1.48	2.00	112.2	1.8
3b	1.09	57	0.58	0.01779	2.3	0.1341	10	0.0547	10	0.00602	5.2	113.5	2.7	114.1	16.1	139.1	19.1	99	0.72	1.46	113.5	2.7
6b	0.67	36	0.37	0.01804	2.0	0.1714	8.1	0.0689	7.9	0.00683	5.7	114.4	2.4	140.6	14.3	616.2	49.4	81	1.08	2.00	114.4	2.4
9b	1.51	74	0.83	0.01776	1.8	0.1034	7.4	0.0422	7.2	0.00547	3.1	114.5	2.1	104.8	12.1	rd	0.1	109	-0.25	1.57	114.5	2.2
1	0.56	29	0.55	0.01823	1.9	0.1789	9.2	0.0712	9.0	0.00643	5.2	115.4	2.3	138.7	18.2	571.1	60.6	83	1.52	0.89	115.4	2.3
2b	0.52	28	0.34	0.01820	2.0	0.1772	9.4	0.0706	9.2	0.00653	6.7	115.8	2.3	150.7	16.7	750.8	62.2	77	0.80	2.00	115.8	2.4
5b	0.44	23	0.50	0.01820	2.5	0.1951	10	0.0777	10	0.00580	6.7	116.1	3.0	172.5	20.8	1044.3	83.8	67	0.46	2.00	116.1	3.0
8	0.47	24	0.57	0.01834	2.4	0.2028	8.0	0.0802	7.7	0.00565	6.5	117.6	2.8	188.2	17.3	1208.7	69.2	63	-0.04	2.00	117.6	2.9
younger population pooled age (N = 10 of 10, MSWD = 1.09, 1σ absolute external error)																					**113.7**	**0.9**
6a	0.65	34	0.33	0.01904	2.1	0.1588	7.7	0.0605	7.4	0.00718	7.3	120.5	2.6	125.6	14.1	230.6	24.2	96	1.21	2.00	120.5	2.6
5a	1.16	57	0.52	0.01911	1.5	0.1496	7.1	0.0568	7.0	0.00699	3.9	121.0	1.8	113.2	12.8	rd		107	1.41	1.09	121.0	1.9
7a	0.48	23	0.64	0.01903	2.3	0.1555	12	0.0593	11	0.00549	6.8	123.0	2.9	160.0	20.7	761.5	73.9	77	-0.66	2.00	123.0	2.9
4	0.70	35	0.53	0.01926	2.0	0.1618	9.2	0.0609	8.9	0.00595	5.7	123.5	2.5	153.4	16.4	652.9	54.7	80	-0.06	1.32	123.5	2.5
3a	0.55	28	0.36	0.01943	1.9	0.2139	9.2	0.0799	9.0	0.00677	5.8	123.8	2.3	185.8	17.8	1078.6	68.6	67	0.57	2.00	123.8	2.4
older population pooled age (N = 5 of 5, MSWD = 0.40, 1σ absolute external error)																					**122.2**	**0.7**

All errors are 1σ, * = radiogenic component only, d = discordant, i = inherited, rd = reversely discordant.

U-Th-Pb isotope data for sample P67416 Wishbone dacite.

Spot No.	Pb* (ppm)	U (ppm)	atomic Th/U	Measured isotope ratios and 1σ (%) internal errors								Corrected ages and 1σ absolute internal errors (Ma)						6*/38 -7*/35 concord-ance(%)	% common 206Pb	Spot MSWD	Selected age and 1σ absolute external error (Ma)	
				206Pb/238U	±	207Pb/235U	±	207Pb/206Pb	±	208Pb/232Th	±	206Pb*/238U	±	207Pb*/235U	±	207Pb*/206Pb*	±					
16b	0.55	28	0.77	0.01722	2.5	0.1552	10.2	0.0653	9.9	0.00570	5.3	109.7	2.9	125.0	20.3	444.9	61.5	88	1.19	1.65	109.7	2.9
4	0.38	22	0.44	0.01723	2.7	0.2409	7.9	0.1014	7.5	0.00574	7.5	109.8	3.0	209.6	18.6	1568.1	75.3	52	0.57	2.00	109.8	3.0
5	0.61	31	0.75	0.01737	2.0	0.1564	9.0	0.0653	8.8	0.00621	4.5	109.8	2.3	106.4	18.3	61.3	10.7	103	2.27	2.00	109.8	2.3
21	0.63	31	0.80	0.01786	2.5	0.2455	7.6	0.0997	7.2	0.00710	5.4	110.3	2.9	155.0	22.6	917.7	93.6	71	3.94	1.62	110.3	3.0
20	0.90	45	0.82	0.01749	1.7	0.1520	8.6	0.0630	8.4	0.00579	3.6	111.5	2.0	123.8	16.9	385.1	46.1	90	1.08	2.00	111.5	2.0
15	0.86	43	0.76	0.01774	1.8	0.1615	9.3	0.0660	9.1	0.00587	4.2	113.2	2.1	134.2	18.1	542.1	59.9	84	0.96	1.60	113.2	2.1
22	0.98	51	0.61	0.01776	1.8	0.1306	7.9	0.0533	7.7	0.00568	3.1	113.6	2.1	117.3	12.3	203.8	20.3	97	0.39	1.77	113.6	2.1
16a	0.66	34	0.75	0.01780	1.8	0.1819	7.5	0.0741	7.3	0.00538	4.1	115.0	2.2	176.1	14.9	1118.6	61.1	65	-0.35	1.10	115.0	2.2
13	0.55	28	0.69	0.01795	2.4	0.1897	10	0.0767	9.9	0.00573	6.7	115.2	2.8	174.2	20.6	1087.3	84.4	66	0.12	2.00	115.2	2.8
7	0.31	17	0.43	0.01876	3.4	0.3237	13	0.1251	12	0.00791	6.6	115.8	4.1	214.4	38.3	1520.7	153.7	54	4.13	2.00	115.8	4.1
14	0.42	23	0.37	0.01836	2.4	0.2422	8.8	0.0957	8.4	0.00667	8.4	116.3	2.9	200.6	19.9	1365.3	80.0	58	1.10	2.00	116.3	2.9
6	0.71	34	0.69	0.01896	2.0	0.2625	7.3	0.1004	7.0	0.00829	4.9	116.4	2.5	145.1	22.7	665.4	81.2	80	5.06	2.00	116.4	2.5
10	0.89	43	0.81	0.01820	1.9	0.1746	8.5	0.0696	8.3	0.00588	4.2	116.5	2.3	153.7	18.1	788.9	68.9	76	0.52	2.00	116.5	2.3
19	0.96	47	0.76	0.01821	1.7	0.1518	7.0	0.0605	6.8	0.00570	4.6	117.2	2.1	144.8	14.8	639.2	51.2	81	-0.07	2.00	117.2	2.1
18b	0.32	16	0.57	0.01857	3.2	0.2932	10	0.1145	9.7	0.00661	9.0	117.3	3.9	231.7	28.6	1656.8	109.6	51	1.70	2.00	117.3	3.9
1	0.79	35	0.80	0.01973	2.7	0.3625	9.5	0.1333	9.1	0.00945	5.5	117.8	3.4	170.9	35.9	1012.0	145.1	69	8.25	2.00	117.8	3.5
3	0.64	31	0.62	0.01906	1.8	0.2411	7.9	0.0917	7.7	0.00831	6.5	118.4	2.3	149.1	21.8	689.3	78.0	79	3.79	1.25	118.4	2.3
9	0.84	41	0.76	0.01846	1.6	0.1730	7.7	0.0679	7.6	0.00583	3.5	118.6	2.0	159.0	14.8	827.4	56.2	75	0.16	1.07	118.6	2.0
8	0.64	34	0.48	0.01853	2.3	0.1727	9.0	0.0676	8.7	0.00560	5.3	118.8	2.8	160.8	16.0	843.6	60.3	74	0.05	2.00	118.8	2.8
11	0.66	31	0.82	0.01872	2.0	0.1738	9.7	0.0673	9.5	0.00598	4.3	119.9	2.5	152.9	20.0	717.0	71.5	78	0.51	1.18	119.9	2.5
23	5.24	210	1.56	0.01853	1.3	0.1268	5.5	0.0496	5.3	0.00575	1.5	120.9	1.7	131.6	12.8	366.1	31.6	92	-0.52	1.76		
12	0.81	38	0.72	0.01906	2.5	0.1791	13	0.0681	13	0.00622	6.3	121.9	3.2	156.5	25.8	732.8	91.7	78	0.55	1.46		
17	0.60	30	0.51	0.01915	2.3	0.1985	7.7	0.0752	7.3	0.00585	5.9	122.7	2.9	182.2	16.1	1054.7	61.3	67	0.08	2.00		
18a	0.65	31	0.55	0.01947	2.5	0.1964	11	0.0732	11	0.00644	5.8	124.3	3.2	172.9	21.3	912.5	79.2	72	0.47	2.00		
2	0.45	20	0.66	0.02019	3.6	0.2845	11	0.1022	10	0.00826	9.3	126.1	4.7	207.4	31.5	1278.5	119.1	61	2.47	2.00		
youngest grains pooled age (N = 20 of 25, MSWD = 1.67, 1σ absolute external error)																					**115.0**	**0.7**

All errors are 1σ, * = radiogenic component only, d = discordant, i = inherited, rd = reversely discordant.

U-Th-Pb isotope data for sample P67437 Takahe granite.

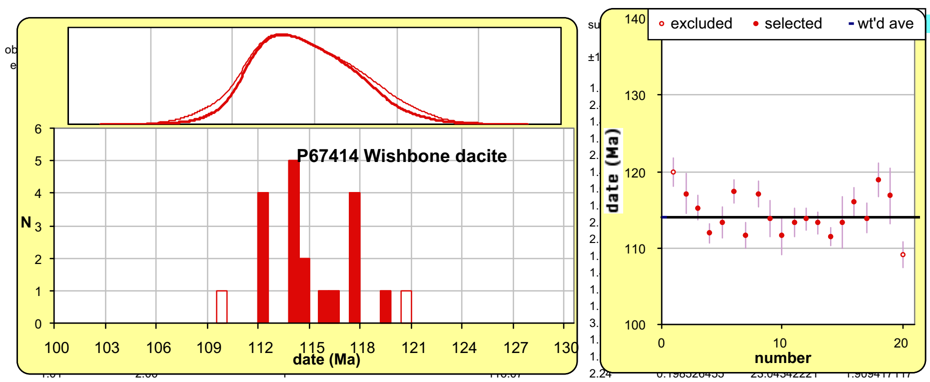
Spot No.	Pb* (ppm)	U (ppm)	atomic Th/U	Measured isotope ratios and 1σ (%) internal errors: 206Pb/238U	±	207Pb/235U	±	207Pb/206Pb	±	208Pb/232Th	±	Corrected ages and 1σ absolute internal errors (Ma): 206Pb*/238U	±	207Pb*/235U	±	207Pb*/206Pb*	±	6*/38 -7*/35 concord-ance(%)	% common 206Pb	Spot MSWD	Selected age and 1σ absolute external error (Ma)	
22	2.73	173	0.58	0.01458	1.1	0.1247	4.2	0.0620	4.1	0.00546	2.3	92.3	1.0	89.6	6.7	39.1	3.0	103	1.91	1.84		
4	1.93	122	0.50	0.01482	1.1	0.1126	4.8	0.0551	4.6	0.00579	2.6	93.5	1.0	77.1	6.7	rd		121	1.95	1.23	93.5	1.1
21	2.18	133	0.56	0.01506	1.2	0.1608	5.0	0.0774	4.9	0.00660	3.9	93.6	1.2	91.6	10.5	61.9	7.2	102	3.84	1.58		
6	1.58	97	0.48	0.01522	2.0	0.1377	8.5	0.0656	8.3	0.00705	6.0	94.5	2.0	69.2	16.5	rd		136	3.85	1.06	94.5	2.0
11	5.94	345	0.91	0.01476	0.8	0.0899	3.3	0.0442	3.2	0.00460	1.6	95.6	0.8	92.7	6.0	41.2	2.7	103	-0.32	2.00	95.6	0.9
29	2.05	131	0.49	0.01496	1.1	0.0993	5.8	0.0482	5.7	0.00499	3.1	95.6	1.1	87.9	7.1	rd		109	0.50	1.41	95.6	1.1
18	3.60	211	0.85	0.01492	1.1	0.1059	5.3	0.0515	5.2	0.00460	2.2	96.4	1.1	106.0	9.9	345.2	28.7	91	-0.23	1.86	96.4	1.2
20	2.38	151	0.46	0.01510	1.0	0.1069	4.2	0.0514	4.1	0.00518	2.9	96.4	1.0	91.9	6.0	rd		105	0.68	1.20	96.4	1.1
10	2.62	165	0.53	0.01506	1.4	0.1101	6.8	0.0530	6.7	0.00483	2.8	96.6	1.4	103.8	8.1	280.2	19.7	93	0.14	1.55	96.6	1.4
28	1.90	116	0.59	0.01519	1.2	0.1022	6.1	0.0488	6.0	0.00517	2.3	96.9	1.2	85.3	7.6	rd	0.0	114	0.81	1.30	96.9	1.2
8	2.14	135	0.48	0.01513	1.0	0.1128	5.1	0.0541	5.0	0.00491	3.0	97.0	1.0	105.0	6.6	300.1	16.9	92	0.21	1.05	97.0	1.0
23	3.46	216	0.48	0.01523	1.6	0.1086	8.3	0.0517	8.2	0.00539	3.9	97.0	1.5	88.7	10.3	rd		109	0.96	1.66	97.0	1.6
1	9.33	500	1.31	0.01480	1.3	0.1191	7.4	0.0584	7.3	0.00445	1.9	97.2	1.3	135.0	11.1	891.9	51.3	72	-1.29	1.97	97.2	1.4
12	2.82	177	0.52	0.01513	1.1	0.1110	9.2	0.0532	9.2	0.00478	5.0	97.2	1.2	105.2	11.7	301.2	30.4	92	0.10	0.57	97.2	1.2
3	2.41	122	0.54	0.01751	2.7	0.3825	8.0	0.1585	7.5	0.01472	8.6	97.3	3.2	79.1	42.9	rd		123	16.92	1.39	97.3	3.2
26	2.31	143	0.53	0.01523	1.2	0.1075	5.7	0.0512	5.5	0.00495	2.7	97.6	1.2	99.2	7.1	147.3	10.2	98	0.27	1.53	97.6	1.3
30	2.55	156	0.52	0.01538	1.0	0.1105	5.8	0.0521	5.7	0.00559	2.4	97.7	1.0	83.7	7.2	rd		117	1.36	2.00	97.7	1.1
24	2.43	149	0.51	0.01547	1.1	0.1260	4.4	0.0591	4.3	0.00557	2.5	98.3	1.1	100.5	6.6	164.2	10.3	98	1.21	1.52	98.3	1.2
14	1.65	104	0.48	0.01530	1.3	0.1194	6.3	0.0566	6.1	0.00477	2.9	98.4	1.2	115.5	7.8	494.3	27.6	85	-0.06	2.00	98.4	1.3
19	2.31	138	0.54	0.01564	1.1	0.1411	5.2	0.0654	5.1	0.00593	2.7	98.7	1.1	102.9	8.4	213.1	16.4	96	1.88	1.41	98.7	1.2
13	1.71	94	0.60	0.01647	1.6	0.2477	6.0	0.1090	5.8	0.00882	4.3	98.8	1.7	103.3	19.5	230.3	40.7	96	7.72	1.47	98.8	1.8
17	2.04	124	0.51	0.01557	1.2	0.1272	4.8	0.0592	4.6	0.00550	2.6	99.0	1.2	103.9	7.0	226.9	14.2	95	1.06	2.00	99.0	1.3
7	1.89	108	0.55	0.01611	1.2	0.1877	5.8	0.0845	5.7	0.00766	3.7	99.1	1.3	94.4	13.4	rd		105	4.94	1.30	99.1	1.4
16	3.31	198	0.62	0.01547	1.4	0.1068	5.8	0.0501	5.7	0.00492	2.9	99.4	1.4	102.3	8.7	181.4	14.7	97	0.05	2.03	99.4	1.5
25	2.11	117	0.65	0.01614	2.2	0.1789	8.1	0.0804	7.8	0.00709	5.5	99.5	2.4	87.2	21.5	rd		114	4.87	2.31	99.5	2.4
9	2.27	135	0.50	0.01582	1.6	0.1390	8.7	0.0637	8.6	0.00629	4.1	99.6	1.6	95.3	13.3	rd		105	2.20	1.39	99.6	1.6
2	2.24	135	0.50	0.01573	1.1	0.1080	5.3	0.0498	5.2	0.00527	2.7	100.6	1.1	95.3	6.7	rd		106	0.52	2.00		
5	2.24	136	0.53	0.01566	1.2	0.1005	5.5	0.0465	5.3	0.00487	3.3	100.8	1.3	98.3	7.9	54.2	4.4	102	-0.06	1.78		
27	4.11	229	0.59	0.01634	1.0	0.1529	4.4	0.0679	4.3	0.00697	2.2	101.6	1.0	83.1	9.5	rd		122	3.60	1.81		
15	0.74	37	0.50	0.01893	1.9	0.1020	13	0.0391	133	0.00625	4.8	120.8	2.4	84.2	17.0	rd		143	0.69	1.34	i	
pooled age (N = 24 of 30, MSWD = 1.47, 1σ absolute external error)																					**97.1**	**0.3**

All errors are 1σ, * = radiogenic component only, d = discordant, i = inherited, rd = reversely discordant.

U-Th-Pb isotope data for sample P67439 Takahe quartz monzonite.

Spot No.	Pb* (ppm)	U (ppm)	atomic Th/U	Measured isotope ratios and 1σ (%) internal errors								Corrected ages and 1σ absolute internal errors (Ma)						6*/38 -7*/35 concord-ance(%)	% common 206Pb	Spot MSWD	Selected age and 1σ absolute external error (Ma)	
				206Pb/238U	±	207Pb/235U	±	207Pb/206Pb	±	208Pb/232Th	±	206Pb*/238U	±	207Pb*/235U	±	207Pb*/206Pb*	±					
25	2.67	165	0.69	0.01455	1.6	0.1189	5.3	0.0593	5.1	0.00521	2.6	92.3	1.5	88.8	9.6	rd		104	1.61	2.08		
27	1.69	109	0.55	0.01454	1.4	0.0975	6.4	0.0486	6.3	0.00479	3.6	93.1	1.3	87.1	8.8	rd		107	0.46	1.10		
11	3.00	188	0.64	0.01463	1.2	0.1148	4.7	0.0569	4.6	0.00485	2.3	93.7	1.1	102.3	6.8	320.8	18.8	92	0.51	2.00		
22	1.60	104	0.48	0.01473	1.2	0.1107	5.3	0.0545	5.2	0.00515	3.7	93.9	1.2	92.5	7.4	70.7	5.6	101	0.88	2.00		
18	2.18	137	0.49	0.01498	1.2	0.1066	5.3	0.0516	5.2	0.00577	2.9	94.5	1.1	71.8	7.5	rd		132	1.91	1.71	94.5	1.2
19	3.30	194	0.69	0.01514	2.9	0.1193	13	0.0572	13	0.00600	6.9	94.7	2.9	65.1	22.3	rd		145	3.04	0.89	94.7	2.9
26	3.85	237	0.62	0.01490	1.7	0.1098	7.8	0.0534	7.6	0.00525	3.3	94.9	1.7	87.1	9.4	rd		109	1.15	1.73	94.9	1.7
8	4.34	269	0.61	0.01487	0.7	0.1066	3.8	0.0520	3.7	0.00503	1.6	95.0	0.7	91.4	4.8	rd		104	0.71	1.28	95.0	0.8
28	7.03	429	0.71	0.01478	0.9	0.1038	3.7	0.0509	3.6	0.00473	1.9	95.1	0.9	98.7	5.2	201.6	9.9	96	0.09	1.67	95.1	0.9
17	4.08	219	0.72	0.01616	1.9	0.2760	5.5	0.1239	5.1	0.00910	5.0	95.2	1.9	95.5	19.6	136.4	27.3	100	10.16	3.34		
5	3.74	236	0.54	0.01489	1.1	0.0988	4.6	0.0481	4.5	0.00493	2.4	95.3	1.1	87.9	6.0	rd		108	0.47	1.87	95.3	1.1
10	2.39	150	0.54	0.01497	1.2	0.1084	4.1	0.0525	3.9	0.00499	2.3	95.7	1.2	95.3	5.8	99.3	5.9	100	0.56	2.00	95.7	1.2
14	1.67	106	0.50	0.01502	1.0	0.0993	4.9	0.0479	4.8	0.00496	3.1	96.2	1.0	89.5	6.4	rd		107	0.40	0.93	96.2	1.0
12	2.16	125	0.63	0.01554	1.4	0.1513	5.3	0.0706	5.1	0.00652	3.4	96.8	1.4	86.7	10.5	r		112	3.47	1.32	96.8	1.5
21	2.10	132	0.51	0.01509	1.1	0.1090	5.4	0.0524	5.3	0.00487	3.1	96.8	1.0	102.7	6.8	250.9	15.3	94	0.14	1.22	96.8	1.1
29	2.03	127	0.53	0.01507	1.0	0.1071	4.7	0.0516	4.6	0.00475	2.9	96.8	1.0	102.6	6.4	250.1	14.3	94	0.04	1.27	96.8	1.1
1	6.54	398	0.65	0.01511	0.9	0.1200	3.5	0.0576	3.4	0.00475	2.3	97.2	0.9	116.4	5.9	539.5	22.2	84	-0.08	1.30	97.2	0.9
7	2.17	130	0.57	0.01542	1.0	0.1292	5.1	0.0607	5.0	0.00596	2.9	97.2	1.0	87.0	8.5	rd		112	2.21	1.22	97.2	1.1
20	2.08	130	0.55	0.01511	1.1	0.1051	5.5	0.0504	5.3	0.00471	2.8	97.2	1.1	103.0	7.0	250.5	15.6	94	-0.10	1.33	97.2	1.1
30	2.11	128	0.61	0.01524	1.2	0.0993	5.4	0.0473	5.2	0.00504	2.8	97.5	1.2	87.3	7.3	rd		112	0.52	1.41	97.5	1.3
4	4.44	251	0.64	0.01588	1.3	0.1933	7.7	0.0882	7.6	0.00717	6.9	97.7	1.6	102.0	22.2	222.0	45.5	96	4.86	1.10	97.7	1.6
13	1.91	118	0.51	0.01536	1.5	0.1084	8.3	0.0512	8.2	0.00514	3.3	98.1	1.5	94.8	10.1	27.8	3.0	103	0.58	1.18	98.1	1.5
16	13.05	761	0.76	0.01526	0.8	0.0996	3.0	0.0473	2.9	0.00485	1.1	98.2	0.8	95.4	4.7	45.2	2.2	103	0.05	2.84	98.2	0.9
23	2.83	169	0.59	0.01545	2.3	0.0933	13	0.0438	13	0.00539	5.7	98.4	2.3	73.5	15.3	rd		134	1.01	0.92	98.4	2.3
24	4.16	243	0.75	0.01526	0.8	0.1066	4.0	0.0506	3.9	0.00483	2.2	98.5	0.9	106.6	9.3	306.2	24.0	92	-0.23	1.04	98.5	1.0
2	3.66	224	0.54	0.01540	1.0	0.1035	5.1	0.0487	5.0	0.00503	2.7	98.7	1.0	94.6	6.6	rd		104	0.32	1.38		
9	3.89	219	0.60	0.01603	1.2	0.1591	5.6	0.0720	5.5	0.00728	2.7	98.8	1.3	73.6	11.4	rd		134	4.60	1.55		
3	1.94	120	0.49	0.01544	1.2	0.1148	5.0	0.0539	4.8	0.00506	3.1	98.9	1.2	104.8	6.8	251.7	14.9	94	0.33	1.56	98.9	1.3
6	1.68	102	0.52	0.01560	1.2	0.1191	6.3	0.0554	6.1	0.00507	2.7	100.0	1.2	109.1	8.0	324.3	21.1	92	0.30	2.00	100.0	1.3
15	2.11	129	0.48	0.01577	1.2	0.1161	5.6	0.0534	5.5	0.00486	3.3	101.4	1.2	114.9	7.3	412.5	22.2	88	-0.20	1.03		
pooled age (N = 22 of 30, MSWD = 1.61, 1σ absolute external error)																					**96.8**	**0.3**

All errors are 1σ, * = radiogenic component only, d = discordant, i = inherited, rd = reversely discordant.



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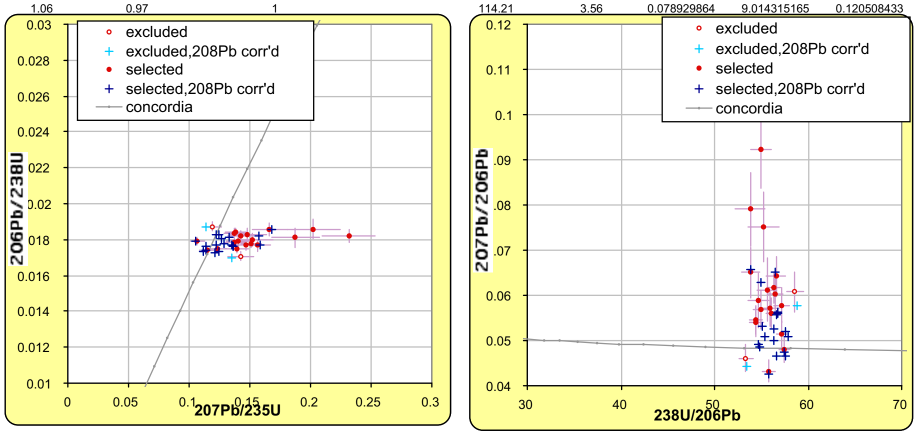

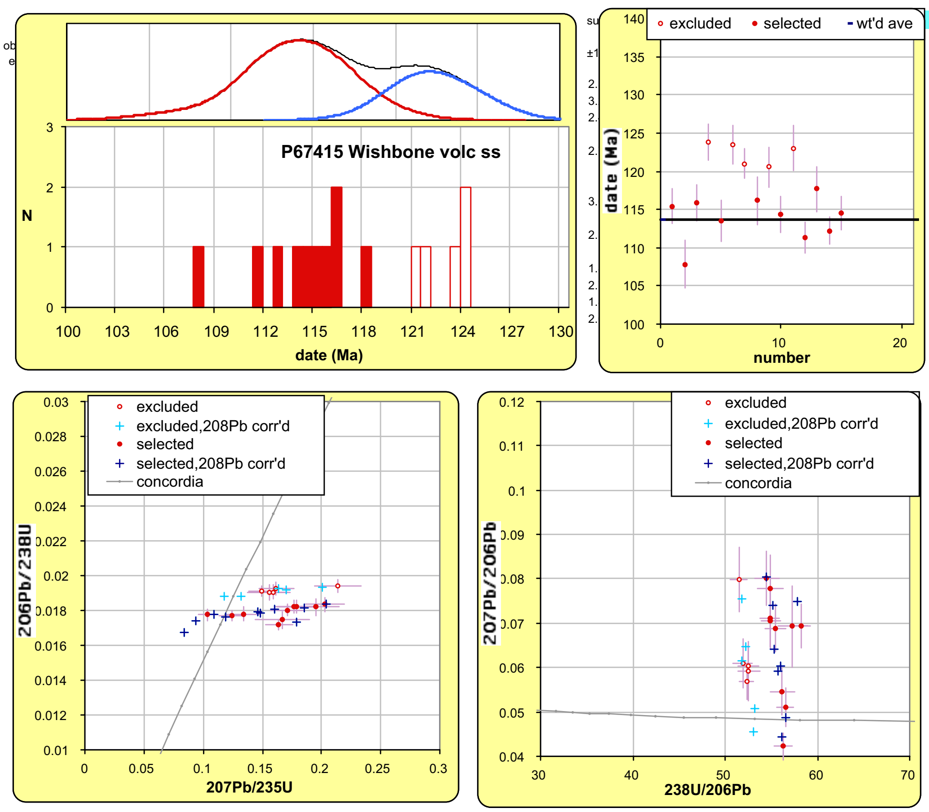
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date (Ma)
excluded
selected
wt'd ave
date (Ma)
number
excluded
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selected
selected,208Pb corr'd
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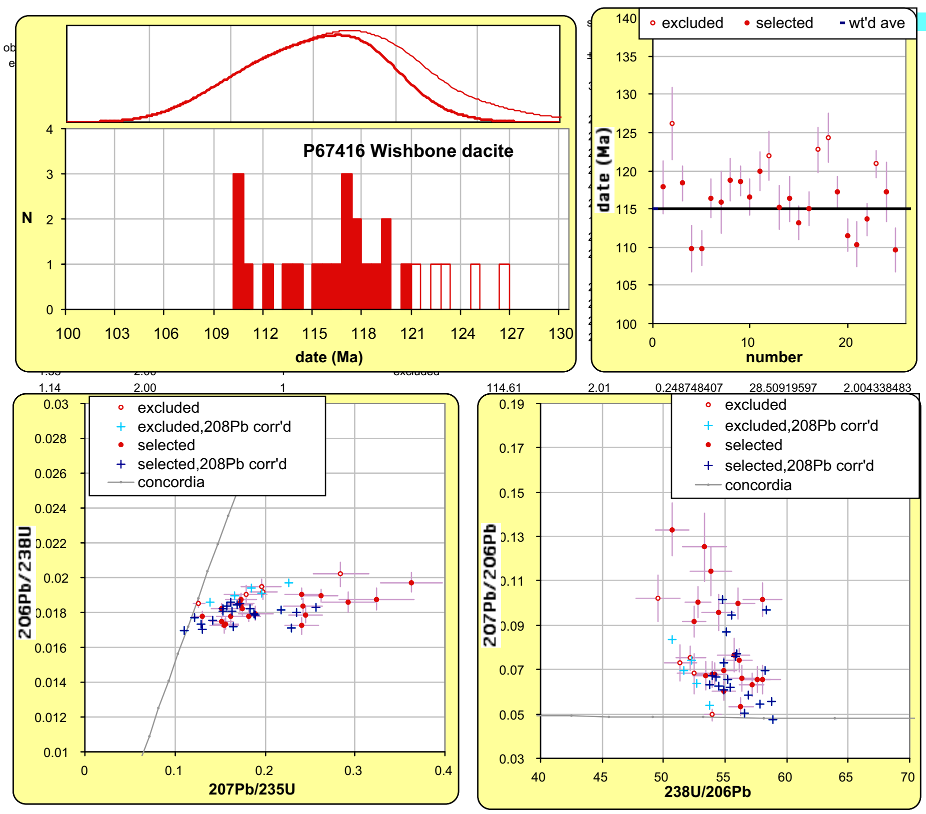
238U/206Pb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N
date (Ma)
excluded
selected
wt'd ave
date (Ma)
number
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2.00
1
114.61
2.01
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28.50919597
2.004338483
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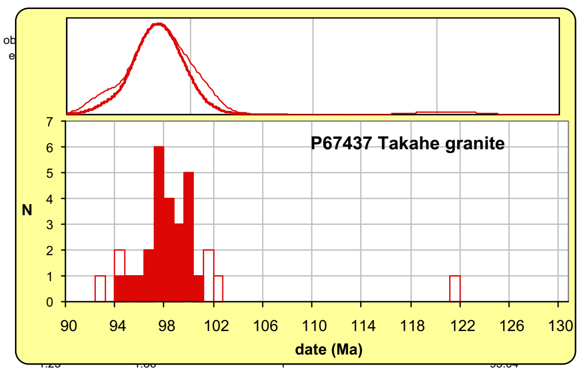
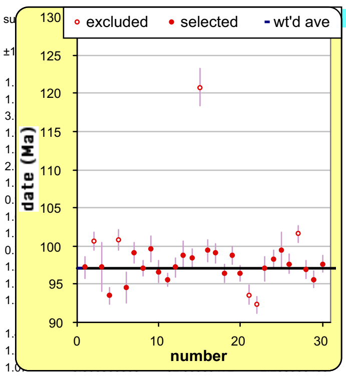
selected
selected,208Pb corr'd
concordia
206Pb/238U
207Pb/235U
207Pb/206Pb
238U/206Pb





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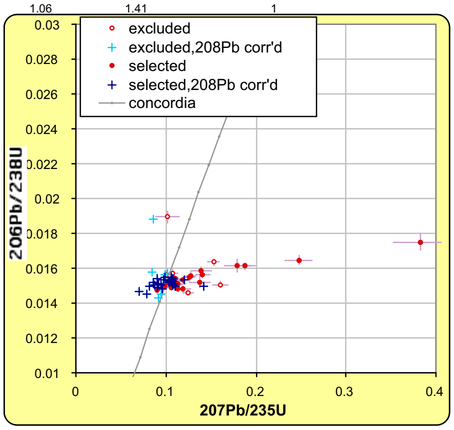

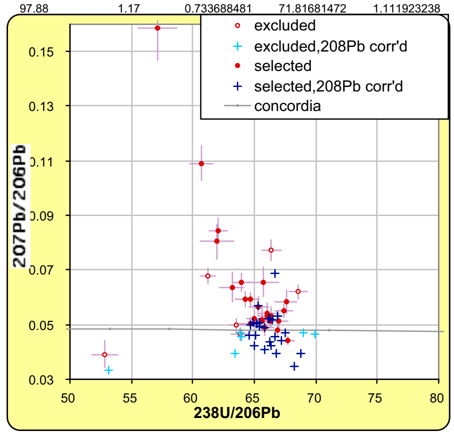

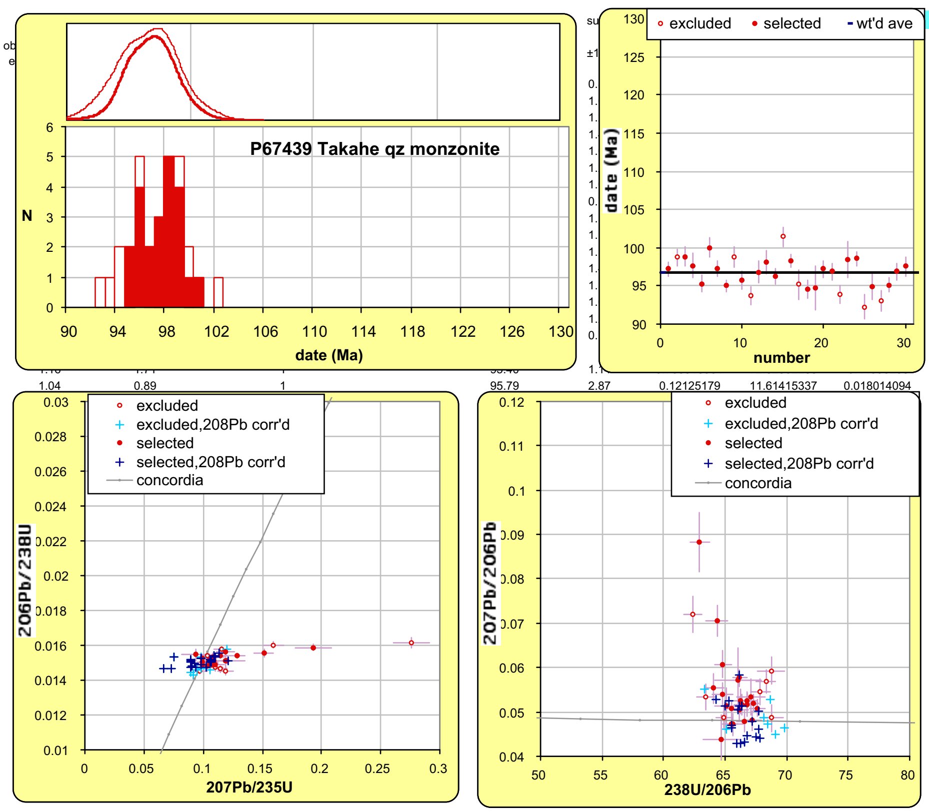
P67439 Takahe qz monzonite
N
date (Ma)
excluded
selected
wt'd ave
date (Ma)
number
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selected,208Pb corr'd
concordia
206Pb/238U
207Pb/235U
207Pb/206Pb
238U/206Pb
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1
95.79
2.87
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0.018014094

Sample P67416 Amphibole

Temp (C)	Ar36 (mol)	Ar37 (mol)	Ar39 (mol)	Ar40 (mol)	%Ar40*	Ar40*/Ar39(K)	Cumulate Ar39(%)	Calculated_Age (Ma±1s.d.)		Error age	Ca/K
800	8.981E-17	7.596E-16	4.277E-16	3.281E-14	19.3	14.84	10.9	117.3	±	10.4	3.38E+00
900	1.570E-17	7.303E-16	1.423E-16	7.645E-15	40.3	21.73	14.5	169.3	±	15.8	9.79E+00
1000	2.797E-17	3.096E-15	2.503E-16	1.017E-14	21.8	8.936	20.8	71.6	±	8.9	2.37E+01
1080	1.344E-16	1.793E-13	2.127E-15	4.958E-14	57.2	14.29	71.3	113.1	±	2.5	1.72E+02
1110	4.963E-17	4.439E-14	5.179E-16	1.710E-14	41.0	14.52	83.6	114.9	±	5.8	1.75E+02
1140	5.542E-17	4.324E-14	4.638E-16	1.786E-14	33.3	13.83	94.5	109.6	±	6.7	1.91E+02
1170	5.331E-17	2.369E-14	1.679E-16	1.587E-14	16.2	17.20	98.3	135.3	±	28.0	3.02E+02
1200	6.329E-17	1.334E-14	5.390E-17	1.738E-14	0.3	1.233	99.4	10.1	±	82.5	5.84E+02
1230	7.451E-17	9.035E-15	2.497E-17	2.184E-14	3.5	42.53	99.8	317.8	±	355.9	9.61E+02
1290	9.230E-17	5.516E-15	8.576E-18	2.735E-14	2.4	153.1	99.9	950.5	±	2574.4	2.47E+03
1450	6.251E-16	1.630E-16	2.439E-18	1.863E-13	0.9	688.5	100.0	2553.6	±	46779.7	1.34E+02
Total	1.281E-15	3.232E-13	4.186E-15	4.039E-13		14.90		117.8	±	38.9	
Lambda	K40= 5.54E-10		J=0.0045288								

Sample P67454 Muscovite

Temp (C)	Ar36 (mol)	Ar37 (mol)	Ar39 (mol)	Ar40 (mol)	%Ar40*	Ar40*/Ar39(K)	Cumulate Ar39(%)	Calculated_Age (Ma±1s.d.)		Error age	Ca/K
600	2.695E-16	1.417E-16	4.584E-15	1.343E-13	40.6	11.90	0.7	96.1	±	2.6	5.88E-02
650	8.367E-17	9.764E-17	5.814E-15	1.096E-13	77.3	14.58	1.6	117.1	±	0.9	3.19E-02
700	7.204E-17	1.015E-16	1.059E-14	1.892E-13	88.6	15.83	3.2	126.8	±	0.6	1.82E-02
750	9.811E-17	1.246E-16	1.751E-14	3.173E-13	90.7	16.44	5.9	131.5	±	0.5	1.35E-02
780	7.948E-17	1.370E-16	1.806E-14	3.328E-13	92.8	17.10	8.7	136.6	±	0.7	1.44E-02
810	1.184E-16	6.088E-17	2.401E-14	4.583E-13	92.2	17.60	12.3	140.4	±	0.5	4.82E-03
840	1.526E-16	1.056E-16	4.234E-14	8.168E-13	94.3	18.20	18.8	145.0	±	0.4	4.74E-03
870	1.610E-16	1.035E-16	6.699E-14	1.289E-12	96.2	18.50	29.1	147.3	±	0.4	2.93E-03
900	9.477E-17	1.038E-16	6.736E-14	1.260E-12	97.6	18.27	39.4	145.5	±	0.4	2.93E-03
920	7.024E-17	1.318E-16	4.631E-14	8.537E-13	97.4	17.96	46.5	143.2	±	0.4	5.41E-03
940	6.466E-17	1.675E-16	3.915E-14	7.211E-13	97.2	17.91	52.5	142.8	±	0.5	8.13E-03
970	6.237E-17	1.885E-16	4.240E-14	7.879E-13	97.5	18.12	59.0	144.4	±	0.4	8.45E-03
1000	6.060E-17	1.940E-16	4.245E-14	7.955E-13	97.6	18.29	65.5	145.7	±	0.4	8.68E-03
1030	5.131E-17	2.215E-16	4.246E-14	8.049E-13	98.0	18.57	72.0	147.9	±	0.5	9.91E-03
1060	6.375E-17	2.205E-16	5.173E-14	9.842E-13	97.9	18.63	79.9	148.3	±	0.4	8.10E-03
1100	6.037E-17	5.261E-16	8.594E-14	1.633E-12	98.8	18.76	93.1	149.3	±	0.4	1.16E-02
1150	2.322E-17	9.108E-16	3.462E-14	6.606E-13	98.8	18.86	98.4	150.0	±	0.3	5.00E-02
1200	2.579E-17	1.281E-15	8.328E-15	1.660E-13	95.4	19.01	99.6	151.2	±	0.9	2.92E-01
1450	2.683E-16	2.243E-15	2.348E-15	1.238E-13	36.1	19.05	100.0	151.5	±	4.0	1.82E+00
Total	1.880E-15	7.061E-15	6.530E-13	1.244E-11		18.17		144.8	±	0.5	
Lambda	K40 = 5.54E-10		J = 0.0045986								

Sample P67455 Muscovite

Temp (C)	Ar36 (mol)	Ar37 (mol)	Ar39 (mol)	Ar40 (mol)	%Ar40*	Ar40*/Ar39(K)	Cumulate Ar39(%)	Calculated_Age (Ma±1s.d.)		Error age	Ca/K
600	6.212E-16	3.446E-17	1.095E-15	2.031E-13	9.6	17.80	0.3	138.8	±	19.9	5.98E-02
650	1.606E-16	5.240E-17	1.715E-15	7.512E-14	36.8	16.11	0.7	126.0	±	5.9	5.81E-02
700	6.413E-17	5.803E-17	3.530E-15	7.964E-14	76.1	17.17	1.6	134.0	±	1.2	3.12E-02
750	6.801E-17	4.040E-17	6.657E-15	1.404E-13	85.6	18.05	3.3	140.7	±	0.9	1.15E-02
780	5.762E-17	2.464E-17	8.068E-15	1.646E-13	89.5	18.27	5.3	142.3	±	0.9	5.80E-03
810	7.056E-17	1.014E-16	1.132E-14	2.319E-13	90.9	18.63	8.2	145.0	±	0.6	1.70E-02
840	1.056E-16	2.630E-17	2.196E-14	4.505E-13	92.9	19.06	13.7	148.3	±	0.5	2.28E-03
870	1.222E-16	4.320E-17	4.192E-14	8.451E-13	95.6	19.27	24.3	149.8	±	0.5	1.96E-03
900	7.822E-17	3.796E-17	4.631E-14	9.082E-13	97.3	19.09	35.9	148.4	±	0.5	1.56E-03
920	5.434E-17	4.643E-17	2.940E-14	5.693E-13	97.0	18.79	43.4	146.2	±	0.4	3.00E-03
940	5.917E-17	6.012E-17	2.426E-14	4.714E-13	96.2	18.68	49.5	145.4	±	0.5	4.71E-03
960	5.016E-17	9.644E-17	2.091E-14	4.087E-13	96.2	18.81	54.7	146.4	±	0.4	8.76E-03
980	4.468E-17	3.777E-17	1.950E-14	3.821E-13	96.4	18.89	59.6	147.0	±	0.4	3.68E-03
1010	5.276E-17	7.060E-17	2.253E-14	4.435E-13	96.3	18.97	65.3	147.5	±	0.4	5.95E-03
1040	5.706E-17	9.513E-17	2.897E-14	5.744E-13	96.9	19.22	72.6	149.4	±	0.4	6.24E-03
1070	5.869E-17	1.533E-16	4.208E-14	8.320E-13	97.8	19.33	83.2	150.3	±	0.4	6.92E-03
1100	3.500E-17	3.302E-16	3.250E-14	6.334E-13	98.2	19.14	91.4	148.9	±	0.4	1.93E-02
1150	3.069E-17	6.844E-16	1.409E-14	2.791E-13	96.6	19.15	95.0	148.9	±	0.6	9.23E-02
1200	2.715E-17	8.425E-16	8.107E-15	1.638E-13	95.0	19.21	97.0	149.3	±	0.7	1.97E-01
1450	2.274E-16	2.933E-15	1.183E-14	2.992E-13	77.5	19.61	100.0	152.4	±	0.9	4.71E-01
Total	2.045E-15	5.769E-15	3.968E-13	8.156E-12		19.01		147.8	±	0.6	
Lambda	K40 = 5.54E-10		J = 0.0044929								

Sample P67455 Amphibole

Temp (C)	Ar36 (mol)	Ar37 (mol)	Ar39 (mol)	Ar40 (mol)	%Ar40*	Ar40*/Ar39(K)	Cumulate Ar39(%)	Calculated_Age (Ma±1s.d.)		Error age	Ca/K
800	2.739E-16	2.828E-15	7.338E-15	1.853E-13	56.4	14.24	17.2	111.3	±	0.9	7.33E-01
900	3.016E-17	2.091E-15	4.310E-15	7.569E-14	88.4	15.52	27.3	121.0	±	0.5	9.22E-01
1000	4.100E-17	3.593E-14	8.035E-15	1.590E-13	94.6	18.79	46.0	145.5	±	0.5	8.53E+00
1040	3.386E-17	3.820E-14	5.040E-15	1.195E-13	94.8	22.62	57.7	173.8	±	0.7	1.45E+01
1080	3.523E-17	5.008E-14	5.865E-15	1.529E-13	96.5	25.32	71.4	193.5	±	0.8	1.63E+01
1120	4.341E-17	3.088E-14	2.869E-15	7.617E-14	87.3	23.37	78.0	179.2	±	1.9	2.06E+01
1170	4.876E-17	4.451E-14	3.506E-15	9.447E-14	89.5	24.36	86.2	186.5	±	1.5	2.44E+01
1230	7.676E-17	5.356E-14	5.847E-15	1.659E-13	89.6	25.60	99.8	195.5	±	0.9	1.75E+01
1290	1.293E-16	9.516E-16	9.740E-17	3.980E-14	4.3	17.65	100.0	137.0	±	80.2	1.87E+01
1450	5.842E-16	1.431E-16	1.072E-17	1.758E-13	1.8	301.6	100.0	1540.2	±	6059.5	2.56E+01
Total	1.297E-15	2.592E-13	4.292E-14	1.245E-12		20.77		160.2	±	2.5	
Lambda	K40 = 5.543E-10		J=0.0044704								

GNS#	FieldNumber	Material	Part_Analysed	Investigator	Analysis_Method	Laboratory	Lab_Number	Analysis_Date	Analysis_Comments	SiO2	TiO2	Al2O3	FeOT	MnO	MgO	CaO	Na2O	K2O	Majors_total
P67407	SO168-DR54-03	amphibole	amphA pclast	Mortimer, N.	electron probe	Otago U	47	22-Apr-04	in wr clast A	54.14	0.16	3.18	7.38	0.19	21.01	9.52	0.49	0.03	96.10
P67407	SO168-DR54-03	amphibole	amphB	Mortimer, N.	electron probe	Otago U	48	22-Apr-04	in clast B: plutonic, random part TS	45.89	0.42	7.37	19.98	0.12	10.57	10.89	1.29	0.10	96.63
P67407	SO168-DR54-03	amphibole	amphC	Mortimer, N.	electron probe	Otago U	56	11-May-04	free detrital grain	37.63	0.13	24.14	11.41	0.32	0.06	19.96	bd	bd	93.68
P67407	SO168-DR54-03	amphibole	amphD	Mortimer, N.	electron probe	Otago U	57	11-May-04	amph in gabbro clast	49.98	0.84	4.58	15.26	0.22	14.50	9.76	0.63	0.10	95.93
P67407	SO168-DR54-03	epidote group	epidA	Mortimer, N.	electron probe	Otago U	44	22-Apr-04	detrital grain	38.21	0.04	28.94	5.51	bd	0.08	23.23	bd	bd	96.01
P67407	SO168-DR54-03	oxide	opaqA	Mortimer, N.	electron probe	Otago U	42	22-Apr-04	detrital grain	bd	46.81	bd	50.70	1.34	0.03	0.01	bd	0.01	98.90
P67407	SO168-DR54-03	oxide	opaqB	Mortimer, N.	electron probe	Otago U	50	22-Apr-04	in clast B: plutonic	bd	50.01	bd	47.51	2.11	0.12	0.23	0.02	bd	100.00
P67407	SO168-DR54-03	plagioclase	plagA	Mortimer, N.	electron probe	Otago U	43	22-Apr-04	detrital grain (qtz confirmed too)	54.91	0.10	27.84	0.35	bd	0.02	9.84	5.59	0.07	98.72
P67407	SO168-DR54-03	plagioclase	plagB	Mortimer, N.	electron probe	Otago U	49	22-Apr-04	in clast B: plutonic	60.35	0.02	24.64	0.64	0.02	0.17	5.90	7.72	0.42	99.88
P67407	SO168-DR54-03	pyroxene	cpxA core	Mortimer, N.	electron probe	Otago U	41	22-Apr-04	detrital grain, TS area 2	52.12	0.70	3.20	8.39	0.25	16.67	16.77	0.48	0.01	98.59
P67407	SO168-DR54-03	whole rock	wrA	Mortimer, N.	electron probe	Otago U	46	22-Apr-04	round clast, mafic (hb rich?) 40um beam, TS area 2	35.49	0.09	10.01	7.96	0.05	14.30	6.82	1.25	0.23	76.20
P67407	SO168-DR54-03	whole rock	wrB	Mortimer, N.	electron probe	Otago U	51	22-Apr-04	mafic lava gmass, random clast	41.28	1.60	18.00	6.92	bd	2.07	6.58	4.08	1.05	81.58
P67415	SO168-DR55-04	amphibole	hbA pheno	Mortimer, N.	electron probe	Otago U	23	22-Apr-04	in wrB clast, has reaction rim	48.07	1.48	5.97	11.82	0.09	16.56	9.84	2.05	0.03	95.91
P67415	SO168-DR55-04	amphibole	hbA	Mortimer, N.	electron probe	Otago U	19	22-Apr-04	detrital hb, TS area 1	43.83	2.88	9.97	10.78	0.83	15.25	9.77	2.44	bd	95.75
P67415	SO168-DR55-04	oxide	opaqA pheno	Mortimer, N.	electron probe	Otago U	25	22-Apr-04	in wrB clast	bd	40.19	0.04	53.93	0.37	1.95	0.03	bd	bd	96.51
P67415	SO168-DR55-04	plagioclase	plagA pheno	Mortimer, N.	electron probe	Otago U	24	22-Apr-04	in wrB clast	56.04	0.05	26.64	0.35	bd	bd	7.63	6.70	0.10	97.51
P67415	SO168-DR55-04	pyroxene	pxA pheno	Mortimer, N.	electron probe	Otago U	22	22-Apr-04	in wrB clast, TS area2	53.09	0.20	0.80	7.81	0.18	15.58	19.67	0.28	bd	97.61
P67415	SO168-DR55-04	whole rock	wrAii	Mortimer, N.	electron probe	Otago U	21	22-Apr-04	different spot	43.15	0.40	15.22	1.74	bd	0.68	6.75	5.09	3.46	76.49
P67415	SO168-DR55-04	whole rock	wrB	Mortimer, N.	electron probe	Otago U	26	22-Apr-04	100um beam	64.86	0.28	10.09	1.11	bd	0.09	1.86	4.69	0.66	83.64
P67415	SO168-DR55-04	whole rock	wrC	Mortimer, N.	electron probe	Otago U	27	22-Apr-04	felsic gmass (rock has plag, bi phenos), TS area 3	68.51	0.18	10.31	0.79	bd	0.09	1.51	4.81	0.70	86.90
P67415	SO168-DR55-04	whole rock	wrD	Mortimer, N.	electron probe	Otago U	28	22-Apr-04	mafic gmass, TS area 4	42.01	bd	14.80	2.85	bd	2.36	4.00	4.95	1.01	71.98
P67415	SO168-DR55-04	whole rock	wrE	Mortimer, N.	electron probe	Otago U	29	22-Apr-04	mafic aphyric gmass, spotty altn. TS area 5	53.70	0.36	14.81	1.70	bd	0.29	4.36	5.32	1.01	81.55
P67415	SO168-DR55-04	whole rock	wrAi	Mortimer, N.	electron probe	Otago U	20	22-Apr-04	100um beam	40.65	0.10	13.52	1.94	0.23	0.68	6.78	4.70	2.70	71.30
P67415	SO168-DR55-04	whole rock	wrF	Mortimer, N.	electron probe	Otago U	30	22-Apr-04	mafic gmass, (rock has plag phenos) TS area 6	33.83	0.11	12.13	3.78	0.03	3.12	3.90	3.32	1.44	61.66
P67415	SO168-DR55-04	whole rock	wrG	Mortimer, N.	electron probe	Otago U	31	22-Apr-04	mafic gmass (rock has plag, hb phenos), TS area 7	46.03	0.23	15.84	2.14	bd	0.37	3.63	5.27	3.73	77.24
P67416	SO168-DR56-01	amphibole	hbA	Mortimer, N.	electron probe	Otago U	3	22-Apr-04	pheno, TS area 1	47.72	1.36	5.67	11.71	0.16	16.47	11.18	1.32	0.02	95.61
P67416	SO168-DR56-01	amphibole	hbC rim	Mortimer, N.	electron probe	Otago U	17	22-Apr-04	TS area 4	48.68	1.30	5.85	11.50	0.06	16.50	10.39	1.40	0.02	95.70
P67416	SO168-DR56-01	amphibole	hbB core	Mortimer, N.	electron probe	Otago U	4	22-Apr-04	pheno	47.05	1.53	6.25	12.29	0.10	15.62	10.97	2.30	0.04	96.15
P67416	SO168-DR56-01	amphibole	hbB core	Mortimer, N.	electron probe	Otago U	5	22-Apr-04	pheno	46.58	1.54	6.11	12.39	0.19	15.76	11.13	1.43	0.06	95.19
P67416	SO168-DR56-01	biotite	biA	Mortimer, N.	electron probe	Otago U	8	22-Apr-04	oxidised, TS area 2	39.55	0.09	7.87	14.14	0.05	15.10	1.97	0.34	0.46	79.57
P67416	SO168-DR56-01	oxide	opaqA	Mortimer, N.	electron probe	Otago U	9	22-Apr-04	TS area 3	bd	44.58	0.03	50.30	1.05	1.73	0.02	bd	bd	97.71
P67416	SO168-DR56-01	plagioclase	plagA core	Mortimer, N.	electron probe	Otago U	6	22-Apr-04	low Z (BEI)	56.73	bd	27.20	0.23	bd	bd	9.51	6.12	0.06	99.85
P67416	SO168-DR56-01	plagioclase	plagA rim	Mortimer, N.	electron probe	Otago U	7	22-Apr-04	high Z (BEI): Fe?	56.83	0.02	27.41	0.46	bd	0.02	9.63	6.07	0.02	100.46
P67416	SO168-DR56-01	plagioclase	plagB rim	Mortimer, N.	electron probe	Otago U	15	22-Apr-04		57.55	bd	26.66	0.34	bd	bd	8.41	6.67	0.05	99.68
P67416	SO168-DR56-01	plagioclase	plagC core	Mortimer, N.	electron probe	Otago U	18	22-Apr-04		58.46	bd	25.42	0.29	bd	bd	7.33	7.19	0.05	98.74
P67416	SO168-DR56-01	pyroxene	pxA core	Mortimer, N.	electron probe	Otago U	10	22-Apr-04		51.51	0.28	0.96	7.32	0.16	15.53	21.75	0.32	bd	97.83
P67416	SO168-DR56-01	pyroxene	pxA rim (010)	Mortimer, N.	electron probe	Otago U	11	22-Apr-04	low SiO2? Redo Si std	51.15	0.33	1.22	7.71	0.13	15.32	20.53	0.35	bd	96.74
P67416	SO168-DR56-01	pyroxene	pxB core	Mortimer, N.	electron probe	Otago U	12	22-Apr-04		52.38	0.37	1.80	7.71	0.09	15.16	21.31	0.34	bd	99.16
P67416	SO168-DR56-01	pyroxene	pxB rim (001)	Mortimer, N.	electron probe	Otago U	13	22-Apr-04		52.80	0.20	0.77	7.65	0.06	15.04	21.46	0.32	bd	98.30
P67416	SO168-DR56-01	pyroxene	pxC core	Mortimer, N.	electron probe	Otago U	14	22-Apr-04		52.82	0.27	1.09	8.06	0.19	15.32	20.88	0.31	bd	98.94
P67416	SO168-DR56-01	pyroxene	pxD rim (001)	Mortimer, N.	electron probe	Otago U	16	22-Apr-04		52.52	0.25	1.09	8.17	0.15	14.87	20.44	0.33	bd	97.82
P67439	SO168-DR62-03A	alkali feldspar	67439P. kspA	Mortimer, N.	electron probe	Otago U	8	11-May-04	groundmass adj qtz	65.02	0.05	18.55	bd	bd	bd	0.02	0.55	15.12	99.33
P67439	SO168-DR62-03A	biotite	67439P. biC	Mortimer, N.	electron probe	Otago U	15	11-May-04	chloritised bi pheno	29.17	bd	13.51	28.87	0.34	13.22	0.20	0.04	0.25	85.64
P67439	SO168-DR62-03A	biotite	67439P. biA	Mortimer, N.	electron probe	Otago U	5	11-May-04	chloritised bi pheno	27.80	0.07	14.34	29.58	0.40	12.60	0.20	0.04	0.23	85.30
P67439	SO168-DR62-03A	biotite	67439P. biB	Mortimer, N.	electron probe	Otago U	6	11-May-04	chloritised bi pheno	29.20	bd	13.21	29.18	0.29	13.04	0.19	0.07	0.36	85.56
P67439	SO168-DR62-03A	biotite	67439P. biD	Mortimer, N.	electron probe	Otago U	15	11-May-04	chloritised bi pheno	27.88	bd	12.91	28.71	0.39	13.06	0.21	0.02	0.23	83.44
P67439	SO168-DR62-03A	oxide	67439P. opaqB	Mortimer, N.	electron probe	Otago U	7	11-May-04	micropheno 200um	bd	50.83	bd	48.77	0.98	0.23	bd	0.02	bd	100.84
P67439	SO168-DR62-03A	oxide	67439P. opaqA	Mortimer, N.	electron probe	Otago U	7	11-May-04	pheno	bd	50.69	bd	48.52	1.07	0.22	0.06	bd	bd	100.59
P67439	SO168-DR62-03A	plagioclase	67439P. plagA core	Mortimer, N.	electron probe	Otago U	11	11-May-04	1mm pheno	60.86	0.04	24.15	0.24	bd	bd	6.03	7.39	0.92	99.64
P67439	SO168-DR62-03A	plagioclase	67439P. plagA rim	Mortimer, N.	electron probe	Otago U	12	11-May-04	1mm pheno	63.17	bd	22.85	0.29	bd	bd	4.24	8.11	1.19	99.87
P67439	SO168-DR62-03A	plagioclase	67439P. plagB rim	Mortimer, N.	electron probe	Otago U	14	11-May-04	3mm pheno	62.95	bd	23.07	0.21	bd	bd	4.17	8.40	0.80	99.63
P67439	SO168-DR62-03A	plagioclase	67439P. plagB core	Mortimer, N.	electron probe	Otago U	13	11-May-04	3mm pheno	60.75	bd	24.62	0.22	bd	bd	6.25	7.27	0.83	99.97
P67454	SO168-DR71-01	alkali feldspar	kspA	Mortimer, N.	electron probe	Otago U	36	11-May-04	large grain, area 4	63.64	0.06	18.13	0.66	0.02	0.30	0.18	0.38	14.91	98.30
P67454	SO168-DR71-01	amphibole	hbA	Mortimer, N.	electron probe	Otago U	25	11-May-04	area5	42.42	0.74	15.62	14.83	0.07	9.44	10.59	1.78	0.60	96.14
P67454	SO168-DR71-01	amphibole	hbB core	Mortimer, N.	electron probe	Otago U	29	11-May-04		42.40	0.67	15.88	14.65	0.02	9.39	10.48	1.79	0.59	95.91
P67454	SO168-DR71-01	amphibole	hbB rim	Mortimer, N.	electron probe	Otago U	28	11-May-04	area4	42.78	0.51	15.88	14.61	0.03	9.45	11.18	1.60	0.52	96.61
P67454	SO168-DR71-01	biotite	biotA	Mortimer, N.	electron probe	Otago U	67	22-Apr-04	random part TS	35.77	1.52	16.98	20.84	0.05	10.64	bd	0.08	8.87	94.75
P67454	SO168-DR71-01	biotite	biD	Mortimer, N.	electron probe	Otago U	41	11-May-04	adj gtB mid outer	35.85	1.44	17.01	19.55	0.13	10.34	0.07	0.07	8.95	93.45
P67454	SO168-DR71-01	biotite	biEii	Mortimer, N.	electron probe	Otago U	43	11-May-04	adj gtB mid south	36.10	1.49	17.57	19.59	0.07	10.32	bd	0.03	9.25	94.46

GNS#	FieldNumber	Material	Part_Analysed	Investigator	Analysis_Method	Laboratory	Lab_Number	Analysis_Date	Analysis_Comments	SiO2	TiO2	Al2O3	FeOT	MnO	MgO	CaO	Na2O	K2O	Majors_total
P67454	SO168-DR71-01	biotite	biB	Mortimer, N.	electron probe	Otago U	27	11-May-04	adj hbA	36.11	1.62	16.89	18.72	0.12	10.84	0.02	0.02	9.22	93.60
P67454	SO168-DR71-01	biotite	biEi	Mortimer, N.	electron probe	Otago U	42	11-May-04	adj gtB mid south	35.94	1.35	17.30	20.43	0.16	9.50	0.02	0.05	8.98	93.76
P67454	SO168-DR71-01	biotite	biC	Mortimer, N.	electron probe	Otago U	30	11-May-04	parallel foliation	36.24	1.49	17.06	19.09	0.09	10.52	0.03	0.06	8.99	93.61
P67454	SO168-DR71-01	chlorite	chlA	Mortimer, N.	electron probe	Otago U	26	11-May-04		25.03	0.06	20.80	24.10	0.17	15.77	0.04	bd	0.07	86.07
P67454	SO168-DR71-01	garnet	gtA core	Mortimer, N.	electron probe	Otago U	63	22-Apr-04	TS area 1	37.07	0.11	20.61	30.17	2.67	1.67	7.46	bd	bd	99.76
P67454	SO168-DR71-01	garnet	gtA rim	Mortimer, N.	electron probe	Otago U	64	22-Apr-04		37.25	bd	21.01	30.22	0.72	3.00	7.05	bd	bd	99.25
P67454	SO168-DR71-01	garnet	gtA middle	Mortimer, N.	electron probe	Otago U	65	22-Apr-04		37.17	0.08	20.64	30.67	1.75	1.75	8.69	bd	bd	100.75
P67454	SO168-DR71-01	garnet	gtB rim west	Mortimer, N.	electron probe	Otago U	37	11-May-04	area 3	37.56	0.08	21.09	29.70	1.22	3.02	7.81	bd	bd	100.52
P67454	SO168-DR71-01	garnet	gtB core	Mortimer, N.	electron probe	Otago U	38	11-May-04		36.75	0.04	20.81	30.20	1.96	1.96	8.31	bd	bd	100.07
P67454	SO168-DR71-01	garnet	gtB mid inner	Mortimer, N.	electron probe	Otago U	39	11-May-04		37.10	0.09	20.67	30.50	1.68	2.60	6.95	bd	bd	99.62
P67454	SO168-DR71-01	garnet	gtB mid outer	Mortimer, N.	electron probe	Otago U	40	11-May-04		37.49	0.31	20.99	29.64	1.27	2.74	8.03	bd	bd	100.49
P67454	SO168-DR71-01	garnet	gtB mid south	Mortimer, N.	electron probe	Otago U	44	11-May-04		37.46	0.13	20.78	29.59	1.50	2.45	8.28	0.02	bd	100.24
P67454	SO168-DR71-01	oxide	ilmA	Mortimer, N.	electron probe	Otago U	31	11-May-04	rim on rutile	bd	54.43	bd	43.88	2.80	0.09	0.30	bd	0.01	101.52
P67454	SO168-DR71-01	plagioclase	plagA	Mortimer, N.	electron probe	Otago U	66	22-Apr-04	TS area 2	62.02	bd	23.75	bd	bd	bd	5.07	9.09	0.08	100.01
P67454	SO168-DR71-01	plagioclase	plagB	Mortimer, N.	electron probe	Otago U	32	11-May-04	high Z adj qtz, An16	64.58	bd	22.48	bd	bd	bd	3.28	9.67	0.07	100.09
P67454	SO168-DR71-01	plagioclase	plagC rim	Mortimer, N.	electron probe	Otago U	33	11-May-04	low Z alb rim, An1	70.72	bd	21.39	0.21	bd	bd	0.24	10.82	0.04	103.45
P67454	SO168-DR71-01	plagioclase	plagC core	Mortimer, N.	electron probe	Otago U	34	11-May-04	plag hi Z core, An~17	65.21	bd	24.22	0.06	bd	bd	3.71	8.84	0.08	102.14
P67454	SO168-DR71-01	plagioclase	plagD	Mortimer, N.	electron probe	Otago U	35	11-May-04	high Z, An19	63.90	bd	22.44	0.02	bd	bd	4.04	9.34	0.09	99.85
P67454	SO168-DR71-01	plagioclase	plagE	Mortimer, N.	electron probe	Otago U	45	11-May-04	high Z, An18 (Or7!)	61.92	bd	23.66	0.27	bd	0.24	3.71	8.30	1.20	99.34
P67454	SO168-DR71-01	plagioclase	plagF	Mortimer, N.	electron probe	Otago U	46	11-May-04	low Z, An11	66.15	bd	21.40	0.04	bd	bd	2.23	10.40	0.07	100.30
P67454	SO168-DR71-01	plagioclase	plagG	Mortimer, N.	electron probe	Otago U	47	11-May-04	albite random, An4	68.29	0.02	20.31	0.16	bd	bd	0.78	11.25	0.07	100.91
P67455	SO168-DR71-02	biotite	67455G biotA	Mortimer, N.	electron probe	Otago U	34	22-Apr-04	in granitic vein	34.76	1.73	16.52	21.09	0.35	10.06	bd	0.10	8.95	93.56
P67455	SO168-DR71-02	biotite	67455S biA	Mortimer, N.	electron probe	Otago U	60	22-Apr-04	TS area 3	35.26	1.54	17.15	20.24	0.15	10.57	0.08	0.03	8.33	93.35
P67455	SO168-DR71-02	biotite	67455S biB	Mortimer, N.	electron probe	Otago U	61	22-Apr-04	rutile & apat in area 3 too	34.43	1.49	17.23	20.91	0.14	10.96	0.11	0.08	6.87	92.22
P67455	SO168-DR71-02	chlorite	67455S. chlA adj gtA N rim	Mortimer, N.	electron probe	Otago U	20	11-May-04		24.45	bd	20.53	25.47	0.13	14.63	0.05	bd	0.02	85.31
P67455	SO168-DR71-02	epidote group	67455S. epA	Mortimer, N.	electron probe	Otago U	23	11-May-04	random, parallel foliation	38.35	0.28	27.24	6.94	0.03	bd	22.77	bd	bd	95.63
P67455	SO168-DR71-02	garnet	67455S gtA core	Mortimer, N.	electron probe	Otago U	56	22-Apr-04	TS area 2	36.56	0.22	20.36	27.05	6.28	0.73	8.42	0.02	bd	99.64
P67455	SO168-DR71-02	garnet	67455S gtA rim	Mortimer, N.	electron probe	Otago U	57	22-Apr-04		37.46	bd	21.00	30.87	0.66	3.50	5.90	0.02	bd	99.41
P67455	SO168-DR71-02	garnet	67455S gtA middle bottom	Mortimer, N.	electron probe	Otago U	58	22-Apr-04	in within southern band of qtz inclusions	37.32	0.14	20.83	29.69	1.05	2.88	8.20	bd	bd	100.11
P67455	SO168-DR71-02	garnet	67455S gtA middle top	Mortimer, N.	electron probe	Otago U	59	22-Apr-04	on core side of northern band of qtz incls	37.05	0.13	20.86	29.86	0.92	2.24	9.17	0.03	bd	100.26
P67455	SO168-DR71-02	garnet	67455S. gtA western rim	Mortimer, N.	electron probe	Otago U	18	11-May-04	Area 2	36.97	0.17	20.78	27.89	1.59	1.83	9.85	0.02	bd	99.14
P67455	SO168-DR71-02	garnet	67455S. gtA northern rim	Mortimer, N.	electron probe	Otago U	19	11-May-04		37.22	0.08	20.91	30.83	0.20	2.48	8.32	bd	bd	100.06
P67455	SO168-DR71-02	plagioclase	67455G plagA	Mortimer, N.	electron probe	Otago U	33	22-Apr-04	in granitic vein	62.13	bd	23.35	bd	0.08	bd	4.52	9.26	0.09	99.43
P67455	SO168-DR71-02	plagioclase	67455S , plagB	Mortimer, N.	electron probe	Otago U	35	22-Apr-04	pblast in schist, TS area 3	64.48	bd	24.12	bd	bd	bd	4.51	8.77	0.07	101.95
P67455	SO168-DR71-02	plagioclase	67455S plagB core	Mortimer, N.	electron probe	Otago U	54	22-Apr-04	also An 22 18 32 10 22 25 grains by EDS	62.28	0.02	23.60	0.48	bd	0.27	3.31	8.94	0.93	99.83
P67455	SO168-DR71-02	plagioclase	67455S plagB rim	Mortimer, N.	electron probe	Otago U	55	22-Apr-04	albite rim	72.85	bd	22.12	0.03	bd	bd	0.64	8.78	0.06	104.48
P67455	SO168-DR71-02	titanite	67455S. titA	Mortimer, N.	electron probe	Otago U	21	11-May-04	random, small	30.09	40.71	0.30	0.64	bd	bd	26.97	0.01	0.01	98.76
P67455	SO168-DR71-02	titanite	67455S. titB	Mortimer, N.	electron probe	Otago U	22	11-May-04	rim on rutile	30.15	39.49	1.55	0.20	0.03	bd	28.36	bd	bd	99.80
P67455	SO168-DR71-02	tourmaline	67455S tourmA core	Mortimer, N.	electron probe	Otago U	52	22-Apr-04	TS area 1	35.89	0.81	30.99	6.30	bd	8.60	0.48	2.75	bd	85.82
P67455	SO168-DR71-02	white mica	67455G muscA	Mortimer, N.	electron probe	Otago U	32	22-Apr-04	in granitic vein, TS area 1	44.96	0.36	34.18	1.82	bd	1.07	0.06	0.96	9.70	93.11
P67455	SO168-DR71-02	white mica	67455S muscA	Mortimer, N.	electron probe	Otago U	53	22-Apr-04		45.87	0.40	34.66	1.13	bd	1.10	0.03	1.23	9.29	93.71
P67455	SO168-DR71-02	white mica	67455S muscB	Mortimer, N.	electron probe	Otago U	62	22-Apr-04		46.48	0.48	34.62	1.23	bd	1.29	bd	1.71	8.50	94.31
P67455	SO168-DR71-02	white mica	67455S. muscC	Mortimer, N.	electron probe	Otago U	24	11-May-04	random matrix	46.49	0.54	33.23	1.45	bd	1.39	0.04	0.97	9.41	93.57
P67456	SO168-DR71-03	amphibole	amphA	Mortimer, N.	electron probe	Otago U	37	22-Apr-04	large, in feldspathic band	44.04	0.43	13.12	15.29	0.20	10.66	10.75	1.69	0.29	96.47
P67456	SO168-DR71-03	amphibole	amphB in mafic part (main rock)	Mortimer, N.	electron probe	Otago U	40	22-Apr-04	TS area 2	44.81	0.35	11.73	14.80	0.30	11.21	10.84	1.54	0.32	95.90
P67456	SO168-DR71-03	amphibole	amphC	Mortimer, N.	electron probe	Otago U	48	11-May-04	area 2, parallel fol	37.74	0.12	25.91	9.08	0.18	0.05	21.83	bd	bd	94.93
P67456	SO168-DR71-03	amphibole	amphD	Mortimer, N.	electron probe	Otago U	51	11-May-04	not parallel fol	42.57	0.45	14.76	15.33	0.27	9.82	10.19	1.92	0.34	95.67
P67456	SO168-DR71-03	chlorite	chlA	Mortimer, N.	electron probe	Otago U	49	11-May-04	lge, parallel fol	25.11	0.10	20.97	21.71	0.24	17.83	0.07	bd	bd	86.07
P67456	SO168-DR71-03	epidote group	epidA	Mortimer, N.	electron probe	Otago U	39	22-Apr-04	TS area 2	37.70	0.06	25.80	9.26	0.08	bd	21.53	bd	bd	94.43
P67456	SO168-DR71-03	epidote group	epidA reanal	Mortimer, N.	electron probe	Otago U	50	11-May-04		37.67	0.02	25.98	9.26	0.11	bd	20.97	bd	bd	94.04
P67456	SO168-DR71-03	plagioclase	plagA	Mortimer, N.	electron probe	Otago U	36	22-Apr-04	in fsp band: has quartz inside, TS area 1	60.35	bd	23.25	0.01	bd	bd	5.20	8.57	0.06	97.44
P67456	SO168-DR71-03	plagioclase	plagB	Mortimer, N.	electron probe	Otago U	38	22-Apr-04	albite; confirm some in band too	71.76	bd	21.35	bd	bd	0.02	0.42	8.58	0.14	102.27
P67456	SO168-DR71-03	plagioclase	plagC	Mortimer, N.	electron probe	Otago U	52	11-May-04	lowZ An11	65.57	bd	21.94	0.11	0.02	bd	2.25	10.26	0.06	100.24
P67456	SO168-DR71-03	plagioclase	plagD	Mortimer, N.	electron probe	Otago U	53	11-May-04	highZ An24	61.28	bd	24.50	0.06	bd	bd	4.84	8.56	0.07	99.34
P67456	SO168-DR71-03	white mica	muscA	Mortimer, N.	electron probe	Otago U	54	11-May-04	prob composite: musc+qtz?	52.62	0.74	30.62	3.23	bd	3.49	0.07	0.09	7.77	98.67
P67456	SO168-DR71-03	white mica	muscB	Mortimer, N.	electron probe	Otago U	55	11-May-04		46.03	0.15	29.85	3.79	0.05	3.48	0.09	0.19	9.67	93.34