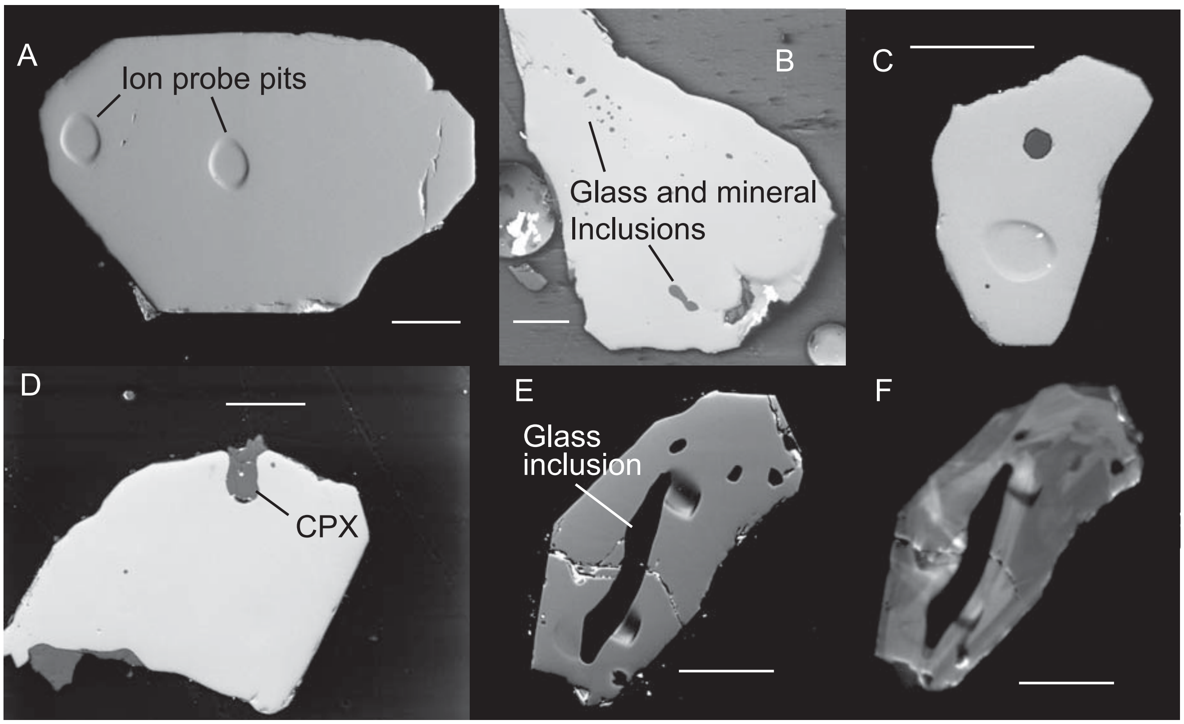

Figure DR1. Backscattered-electron images of euhedral to anhedral zircons from (A) ~40 ka and (B, C, D) ~250 ka diorites from Hualalai and Mauna Kea (E-F). Zircon in D is intergrown with clinopyroxene. Panel F is a cathodoluminescence image showing zoning of zircon in panel E. Scale bars: 100 µm.

DR2007179

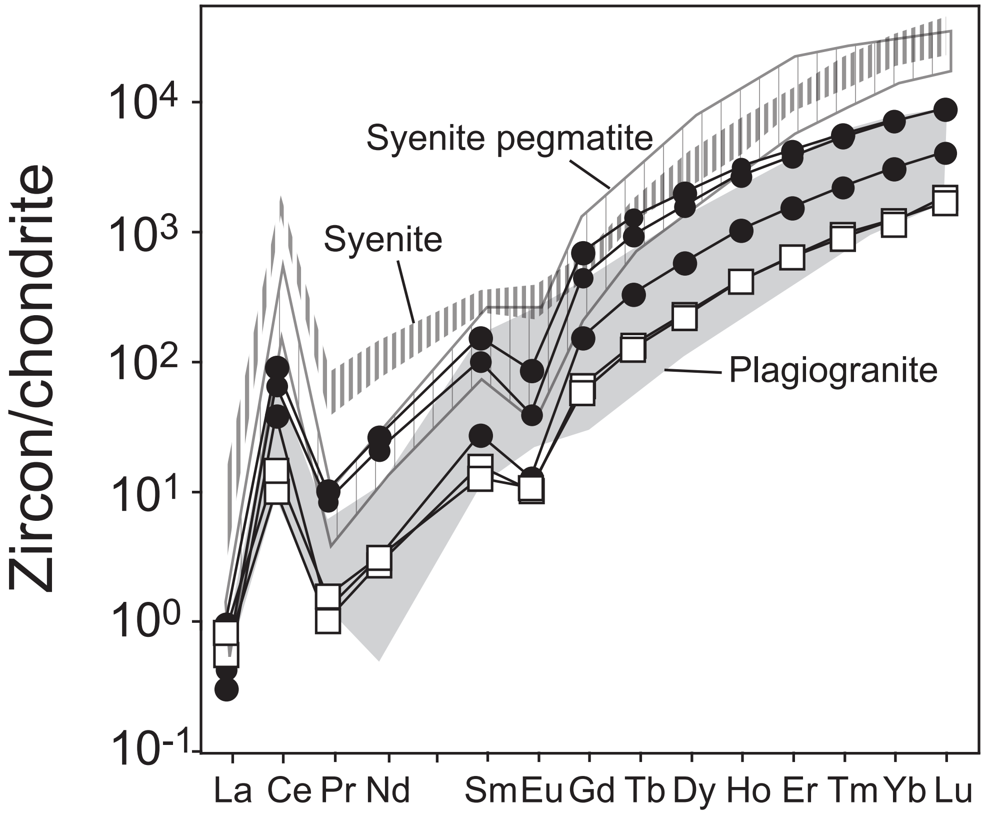

Figure DR2. REE concentrations of Hualalai zircons are similar to zircons from ophiolitic plagiogranite (Hoskin and Ireland, 2000), yet are lower than zircons from syenite (Schmitt, 2006) and syenite pegmatite (Belousova et al., 2002). Concentrations normalized to chondrite values from McDonough and Sun (1995). Circles: HM16, squares: HM43.

References

Belousova, E.A., Griffin, W.L., O'Reilly, S.Y., and Fisher, N.I., 2002, Igneous zircon: Trace element composition as an indicator of source rock type: Contributions to Mineralogy and Petrology, v. 143, p. 602-622.

Hoskin, P.W.O., and Ireland, T.R., 2000, Rare earth element chemistry of zircon and its use as a provenance indicator: Geology, v. 28, p. 627-630.

McDonough, W.F., and Sun, S.-S., 1995, The composition of the Earth: Chemical Geology, v. 120, p. 223-253.

Schmitt, A.K., 2006, Laacher See revisited: High-spatial resolution zircon dating indicates rapid formation of a zoned magma chamber: Geology, v. 34, p.597-600.

TABLE DR1. U AND Th ISOTOPE ACTIVITY RATIOS AND CONCENTRATIONS FOR HUALALAI AND MAUNA KEA ZIRCONS

Sample number	$(^{230}Th)/(^{232}Th)$	(±)	$(^{238}U)/(^{232}Th)$	(±)	U	Th
Hualalai						
HM09						
g2s1	2.45	0.19	2.645	0.022	108	121
g3s1	2.50	0.19	3.104	0.008	136	130
g4s2	2.03	0.04	2.057	0.003	2260	2960
g8s1	1.93	0.10	1.891	0.004	3373	4864
HM45						
g1s1	1.54	0.36	4.655	0.018	53	34
g3s1	1.11	0.07	1.751	0.006	294	499
g5s1	3.71	0.83	4.406	0.021	47	32
g6s1r	1.66	0.17	3.126	0.013	108	103
g6s2c	1.46	0.31	2.916	0.013	39	40
g8s1	1.09	0.04	1.478	0.006	585	1175
g10s1	1.12	0.12	1.676	0.015	156	277
g11s1	1.46	0.15	2.429	0.007	71	87
g12s1	1.25	0.10	2.540	0.017	144	168
hgs1c	1.62	0.16	2.831	0.007	69	73
hgs1r	1.77	0.18	3.107	0.009	64	61
HM08						
g1s1	2.81	0.11	3.115	0.004	446	425
g4s1	6.39	0.54	6.393	0.019	106	49
g10s1	3.89	0.31	4.199	0.014	235	166
g11s1	4.58	0.27	5.008	0.012	278	165
AHX01						
g11s1	4.01	0.20	4.390	0.021	415	281
g12s1	5.41	0.25	5.976	0.016	274	136
g13s1	2.80	0.12	2.900	0.008	563	576
g17s1	5.09	0.36	5.080	0.016	567	331
g15s1	4.69	0.24	4.917	0.032	553	334
g14s1	3.49	0.20	3.863	0.029	345	265
g1s1	2.18	0.08	2.286	0.016	1607	2087
g2s1	3.60	0.18	3.857	0.018	499	384
HM22						
g1s1	2.17	0.13	2.280	0.013	172	224
g2s1	1.00	0.04	1.003	0.003	745	2203

AH02						
g2s1	4.49	0.86	4.216	0.032	33	23
AH07						
g2s1	1.92	0.09	3.708	0.010	265	212
g17s1	2.50	0.21	3.728	0.024	102	81
HM43						
g2s1	1.50	0.24	2.588	0.031	119	127
g3s1	1.52	0.20	2.952	0.008	206	193
g4s1	1.67	0.15	3.173	0.008	379	330
g5s1	1.85	0.35	3.697	0.000	103	77
g7s1	2.63	0.78	5.905	0.023	58	31
g8s1	2.24	0.93	5.160	0.034	30	16
g10s1	2.39	1.02	5.905	0.026	79	37
g13s1	1.70	0.35	2.814	0.026	142	139
HM04						
r1g6s1	1.57	0.22	3.394	0.013	187	152
r2g6s1	2.05	0.30	3.670	0.012	111	83
r3g4s1	1.35	0.20	3.752	0.009	182	134
r3g9s1	1.32	0.15	2.381	0.007	183	212
r5g1s1	1.74	0.65	5.656	0.027	44	22
r2g5s1	1.72	0.16	3.835	0.008	156	110
HM16						
r2g1s1	1.91	0.52	1.942	0.009	64	92
r1g5s1	0.89	0.20	1.051	0.000	57	151
r2g1s2	1.49	0.24	1.625	0.005	86	147
r2g3s1	3.81	0.85	3.725	0.021	59	44
Mauna Kea						
MKS-1						
bg12s1	2.46	0.25	4.361	0.010	67	46
bg17s1	2.21	0.14	3.811	0.017	156	122
bg20s1	1.81	0.20	2.360	0.014	54	68
bg20s3	0.98	0.13	1.399	0.004	68	145
bg21s1	2.12	0.26	4.039	0.016	40	29
bg22s1	3.14	0.28	4.101	0.009	73	53
MKS-2						
g5s1	2.20	0.24	3.954	0.037	56	42
g1s1	2.29	0.13	2.678	0.018	142	157
g2s1	2.70	0.19	3.598	0.011	168	138
g6s1	1.77	0.44	2.559	0.083	3080	3571

Note: Analyses of 1.1 Ga zircon standard AS3 yields a weighted mean (^{230}Th)/(^{238}U) of 0.98±0.02

(2σ, n=17), as expected for zircon in ^{238}U-^{230}Th secular equilibrium. Samples are denoted by grain number and spot number, and in some cases row number. Core and rim analyses on the same crystal are denoted by c and r, respectively. Uncertainties are 1σ. U and Th concentrations are in parts per million and determined by reference to standard 91500 (81 and 27 ppm, U and Th, respectively), as per Schmitt (2006). Uncertainties on U and Th are ≤10%. Decay constants used for activities: λ_{230}: 9.1577 x 10^{-6}yr^{-1}, λ_{232}: 4.9475 x 10^{-11}yr^{-1}, λ_{238}: 1.55125 x 10^{-10}yr^{-1}

TABLE DR2. U-Pb ISOTOPE RESULTS FOR HUALALAI ZIRCONS

Sample	^{238}U/^{206}Pb	±	^{207}Pb/^{206}Pb	±	U	Th
HM16						
r2g5s2	10549	1580	0.59	0.12	117	231
r2g2s1	23095	3499	0.41	0.09	97	234
r3g1s1	1397	82	0.75	0.05	50	79
r3g4s1	14599	1125	0.62	0.09	177	356
r4g2s1	14859	2173	0.79	0.18	65	162
g1xs1	10714	1008	0.55	0.07	134	456
g2xs1	850	69	0.85	0.04	49	78
r2g7s1	27878	2091	0.15	0.02	465	727
r1g3s1	15838	1839	0.42	0.06	654	1922
r2g2s1	4682	822	0.63	0.06	95	139
r3g3s1	17718	1563	0.32	0.06	154	449
r4g1s1	64599	13258	0.37	0.06	530	1662
AHX01						
g1s2	28588	1689	0.10	0.02	533	436
g2s2	10342	940	0.75	0.05	389	366
g11s2	29438	2580	0.17	0.04	262	134
g12s2	29744	2131	0.16	0.04	277	183
g13s2	30321	3096	0.36	0.07	161	118
g17s2	32669	1826	0.15	0.03	476	285
HM09						
g15s1	11777	845	0.55	0.04	199	231
g14s1	6892	484	0.70	0.04	115	92
g13s1	13945	815	0.44	0.04	217	320
g4s3	20786	1200	0.28	0.04	1972	3099
g2s2	17498	1680	0.42	0.09	95	86
g3s3	2705	230	0.76	0.06	134	135

Note: Sample designations are as in Table 1. Analytical protocol, ion microprobe conditions, and U-Th concentration calculations are the same as those described by Schmitt (2006).

TABLE DR3. REPRESENTATIVE COMPOSITIONS OF MELT INCLUSIONS IN HUALALAI ZIRCONS

Oxide	HM16.m9	HM16.m15	HM16.m18	HM01.m20
SiO_2	66.8	67.3	69.6	66.3
TiO_2	0.52	0.28	0.20	0.38
Al_2O_3	15.2	13.8	12.8	16.9
FeO	1.86	2.55	2.37	1.23
MgO	0.25	0.74	0.42	0.61
MnO	b.d.	0.02	0.02	0.02
CaO	0.87	0.78	0.51	1.08
Na_2O	4.87	3.63	2.63	3.43
K_2O	6.05	5.80	6.62	5.76
Total	96.4	94.9	95.2	95.7

Note: Concentrations in weight %. Analyses performed using a Jeol 8200 Superprobe at UCLA with defocused 5 micrometer spot and 15 kV accelerating voltage. To minimize alkali loss, Na and K were counted first. Below detection limits: b.d.

TABLE DR4. RARE EARTH ELEMENT CONCENTRATIONS FOR HUALALAI ZIRCONS

Element	HM43g2	HM43g3	HM16g3	HM16g2	HM16g1
La	0.13	0.19	0.22	0.10	0.07
Ce	6.1	8.9	54.9	39.7	23.3
Pr	0.1	0.1	1.0	0.8	0.1
Nd	1.2	1.4	12.0	9.4	1.4
Sm	2.3	1.8	22.5	14.7	4.00
Eu	0.6	0.6	4.7	2.2	0.7
Gd	12.9	11.3	136.9	88.2	30.1
Tb	4.9	4.4	46.0	33.2	11.8
Dy	56.1	53.9	484.6	380.2	141.4
Ho	22.6	22.5	172.3	145.4	56.2
Er	101.5	99.8	666.8	596.1	243.0
Tm	23.6	22.1	138.9	131.1	54.9
Yb	206.7	194.01	1151.4	1118.7	487.9
Lu	45.6	41.3	217.4	217.1	100.6

Note: Concentrations in part per million. Ion microprobe conditions are as described by Schmitt (2006). External precision based on repeated analyses of zircon standard 91500 is ≤10% for each element.