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Supporting Online Material for

Stone Adze Compositions and the Extent of Ancient Polynesian Voyaging and Trade

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Supporting Online Material

(1) Materials and Methods

Sources of Adzes Analyzed in this Study

The 19 adzes analyzed in our study were collected from archaeological contexts through the course of field survey and also purchased from private collections; the provenience of these specimens are detailed in Table S1. Representative adze styles are illustrated in Fig. S1.

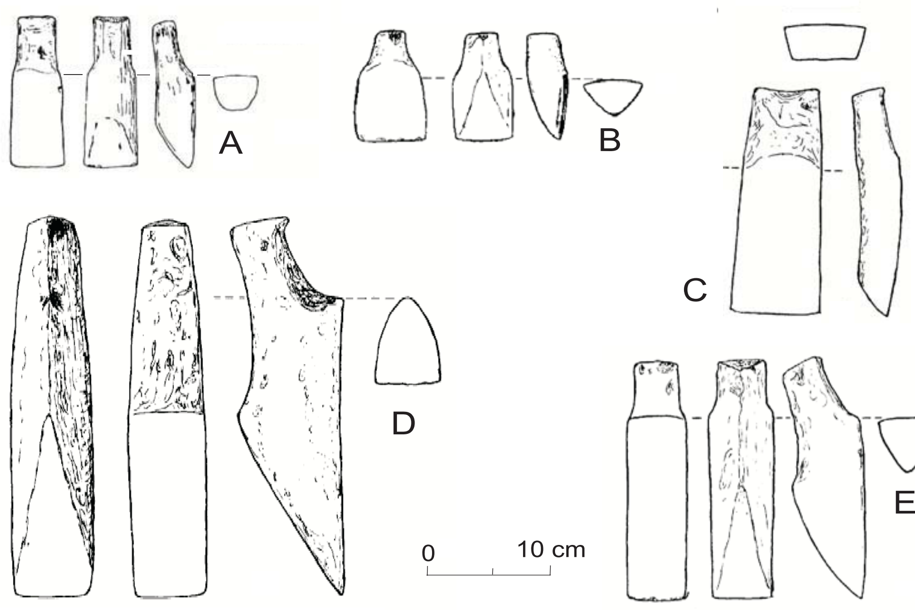

Fig. S1: Types of Tuamotu basalt adzes investigated in this study. **A** C7725, a type 3A adze collected from Nukutavake, **B** C7727, a type 3A adze from Napuka, **C** C2365, a typical quadrangular sectioned Hawaiian adze type 1A adze from Arakita, **D** C2292, a type 4A adze from Taiaroa, **E** C3876, a type 3B adze from Katiu. The figure was compiled from illustrations in (*22*).

Based at the Bishop Museum, Hawaiʻi Kenneth Emory conducted pioneering ethnographic and archaeological field work throughout Polynesia beginning in 1920. Emory (*22*) obtained adzes during his 1929-30 survey of the west and central

Tuamotus, and in 1934 in the eastern atolls. On March 3,1930, Emory wrote the Bishop Museum director Herbert Gregory, after his 11day stay on Makatea, a raised limestone island in the western Tuamotus where large-scale phosphate mining was underway. Beginning about 1929 the phosphate company supervisor, Mr. Beautiaux, collected stone artifacts found during the phosphate excavations. These were not available for sale to Emory, but he drew and photographed each specimen. Emory states, "There is no place in SE Polynesia where excavation is going on in such a thorough manner over ancient Polynesian sights [sic]. I have told them to inform me of anything special and I shall try to run up from time to time to keep tabs on the sites. They have gone through at least five maraes [sic] and two score house sites, finding burials and all sorts of things. We might as well profit by this army of 900 diggers." …." Thirty-six of the 70 adzes reported by Emory (*22*; Table 1) were collected from Makatea.

The Gooding collection was made on Makatea between 1929 and 1934. Peter Throckmorton of Waimanalo, Hawai‘i purchased a portion of the collection consisting of 38 adzes and pounders from Tahiti and Makatea and resold them for US$100 to the Bishop Museum in 1953 (letter from Kenneth Emory to Bishop Museum director, Alexander Spoehr, March 12, 1953). Gooding kept a catalog of his collections noting the size of the specimen, back and side views illustrated in outline, and whether they were collected from Tahiti or Makatea. In his catalog (BPBM accession no. 4441) he states that the adzes originated on Makatea and were obtained during the extraction of phosphates during 1929 to 1934. Another Makatea adze used in our study was "Found in phosphate sands by G. P. Wilder on November 3, 1932"

(Emory's accession entry January 3, 1940) and was donated to the Bishop Museum by his wife.

Paul Nordman was an avid collector of ethnographic materials in Tahiti and acquired genealogical manuscripts and other Polynesian artifacts for the Bishop Museum. From collections made in 1931-33, Nordman, in 1933, sold the Bishop Museum 56 Polynesian adzes (for US$75), 11 of which were from Ahe, Manihi, and Takapoto atolls in the Tuamotus. Adze number C2367 is listed as coming from Takaroa by Emory (*22*), but in the BPBM online database, it is recorded as from Arakita. This is probably a data-entry error.

Polynesian Adze Source Compositions

The locations of basalt samples from sources in Polynesia that were analyzed in this study are given in Table S2. Some of these samples were kindly contributed by M. Allen, D. Burley, R. Green, D. Herdrich, P. Kirch, Y. Sinoto, and R. Wallace

Table S1: Inventory of Analyzed Adzes.

BPBM[1] Adze Catalog Number	Island Adze Collected	Region	Adze Type	Adze Weight (gm)	Adze Condition	Comments
C2292	Taiaro	NW	4A	1669.4	Complete finished	"Found in 1929, dug up" (Emory accession catalog 20/9/29)
C2319	Arakita	NW	1A with poll lugs	2234.5	Complete preform	Accessioned by Emory 20/9/29
C2320	Takaroa	NW	3A	1309.4	Complete finished	Accessioned by Emory 20/9/29
C2321	Takaroa	NW	4A	139.0	Complete finished	Accessioned by Emory 20/9/29
C2322	Takaroa	NW	3B	384.4	Finished butt fragment	Accessioned by Emory 20/9/29
C2365	Arakita	NW	1A with poll lugs	823.7	Complete finished	Accessioned by Emory 28/1/30
C2366	Arakita	NW	3A	515.3	Complete finished	Accessioned by Emory 28/1/30
C2367	Takaroa	NW	4A	968.8	Complete finished	Accessioned by Emory 28/1/30
C2692	Makatea	NW	1A	1668.3	Complete finished	"Comes out of the ground at Makatea" (Emory accession catalog 18/3/30)
C2962	Napuka	N central	3A	196.1	Finished butt fragment	Accessioned by Emory 17/7/30
C3876	Katiu	NW	3B	982.8	Complete finished	Accessioned by Emory 1930
C6399	Manihi	NW	3A	489.6	Complete preform	Accessioned 20/7/33
C6401	Ahe	NW	3A	724.8	Complete preform	Accessioned 20/7/33
C7725	Nukutavake	SE	3A	285.6	Complete finished	"Found in 1934 in washed away sand bank" (Emory accession 29/10/34)
C7727	Napuka	N central	1A	196.9	Complete finished	Accessioned by Emory 29/10/34
C8464	Makatea	NW	1A	64.3	Complete finished	Accessioned by Emory 6/3/31
C9229	Makatea	NW	1A	543.0	Complete finished	"Found in phosphate sands by G. P. Wilder on 3/11/32." Gift of Mrs G. P. Wilder 3/1/40
D464	Makatea	NW	1E	387.9	Complete preform	Gooding collection purchased by Throckmorton, then sold to Bishop Museum. Accessioned 31/10/52
D465	Makatea	NW	5B	598.1	Complete preform	Gooding collection purchased by Throckmorton, then sold to Bishop Museum. Accessioned 31/10/52

[1]BPBM - Bernice Pauahi Bishop Museum, Honolulu, Hawai'i.

Table S2: Sample Details of Polynesian Basalt Sources.

Lab No.	Archipelago	Island	Placename	Site Type	Material	Other Provenance Information
KC-05-1	Australs	Rurutu	Marae Tararoa	religious site	flake	L-1, 10-15cm. 100m from shore
TP-2	Australs	Rapa	Togorutu	habitation site	flake	RA-2, 60-100cm, black layer
KC-05-2	Cooks	Aitutaki	Moturakau Islet	source	flake	Site MRI-1-6-9a
KC-05-3	Cooks	Mangaia	Mata'are	source	flake	Mata'are-11 (91-61)
KC-05-4	Easter Island	Easter Island	Te Toki	source	flake	SW of Anakena pit 2
KC-05-5	Easter Island	Easter Island	Poike Peninsula	source	flake	Kikiriroa ahu
KC-05-6	Hawaiian Islands	Moloka'i	Mo'omomi	source	flake	Site 50-60-02-29-5
KC-05-7	Hawaiian Islands	Kaho'olawe	Pu'u Moiwi	source	flake	Site KH-Q1-3
KC-05-8	Hawaiian Islands	Lana'i	Kapohaku	source	flake	Sample C
KC-05-9	Hawaiian Islands	Maui	Haleakala	source	flake	Site 50-Ma-MH101
KC-05-10	Hawaiian Islands	Hawai'i	Mauna Kea	source	flake	Site 50-Ha-G28-14-R1
KC-05-11	Marquesas	Eiao	Eiao	source	flake	AMNH[2] sample 85/832-1
KC-05-12	Marquesas	Nukuhiva	Ha'aupaupa	source	flake	Ha'aupaupa-3
KC-05-13	Pitcairn Group	Pitcairn Island	Tautama	source	flake	Surface collection
KC-05-14	Samoa	Tutuila	Tatagamatau	source	flake	Surface collection
KC-05-15	Samoa	Tutuila	Fagaitua	source	flake	Behind W end of village
KC-05-16	Samoa	Tutuila	Lau'agae Ridge	source	flake	Site AS-21-100
KC-05-17	Samoa	Tutuila	Fagasa	source	flake	Surface collection
KC-05-18	Samoa	Tutuila	Tatagamatau	source	flake	Surface collection
KC-05-19	Samoa	Tutuila	Tatagamatau	source	flake	Surface collection
KC-05-20	Society Islands	Tahiti	Papeno'o	source	geological[1]	Papeno'o-1, dike margin
KC-05-21	Society Islands	Ra'iatea	Avera	source	adze preform	BPBM[3] sample TR-767
KC-05-22	Society Islands	Ra'iatea	Vaitopatapata	source	adze preform	BPBM[3] sample TR-89
KC-05-23	Society Islands	Ra'iatea	Avera Iti	source	adze preform	BPBM[3] sample TR-443
KC-05-24	Tonga	Vava'u	Late	source	geological[1]	Surface collection
KC-05-25	Tonga	'Ata	'Ata	source	flake	Upper terrace, surface
KC-05-26	Tonga	Tofua	Ha'apai, Mele Havea	habitation site	geological[1]	Unit 4, level 1 (0-15) MH2:62
KC-05-27	New Zealand	North Island	Opito Bay	habitation site	flake	Tahanga basalt. T10/400 & 490

[1] Geological material refers to rock sample.
[2] AMNH - American Museum of Natural History, New York.
[3] BPBM - Bernice Pauahi Bishop Museum, Honolulu, Hawai'i.

Analytical Techniques

Sampling

Core sampling of adzes was dictated by practical matters such as the number of adzes of a particular type, whether the specimens were whole or broken, and the general size. We tried to sample the range of types and gave priority to large, broken specimens (that could be cored through a broken surface) and selected 19 from a total of 82 adzes. Samples for analysis were taken by a hollow diamond bit mounted on a drill press to remove small 0.25 x 1 cm cores from each artifact. To preserve the integrity of the adzes as museum quality specimens, drill holes were filled with putty and painted to match the color of the basalt. Chemical compositions of our adze samples were not affected by weathering induced elemental mobility because fine-grained unaltered rocks were selected for adze manufacture in prehistory.

Major Element Chemistry

Sample Preparation

Artifact cores were first ground with abrasive to remove traces of contamination left by the drill bit. These together with the quarry samples were coarsely crushed in a hardened steel press. The chips were then washed in de-ionized water, dried and crushed in an agate ball mill to a fine powder. Approximately 2 g of the crushed sample was placed in a dried and weighed ceramic crucible and dried at 105°C for 1 hour. Samples were then placed in a desiccator and allowed to cool to room temperature.

Whole-Rock Major Element Concentrations

Whole-rock major element concentrations were determined at the University of Queensland by inductively coupled plasma optical emission spectrometry (ICP OES) on a Perkin Elmer Optima 3300DV system. Samples were digested using lithium metaborate fusion techniques. This involved heating samples and flux in graphite crucibles at 1000°C for 1 hour. The fused beads were poured directly into cleaned 50 ml Teflon beakers containing 25ml of 10% HNO_3 (Univar AR grade acid diluted with Millipore RO water). The HNO_3 was spiked with 10 ppm Lu which provided an internal standard to correct for instrumental drift. Instrumental drift was also monitored using Li. Following dissolution, 0.25 ml of concentrated HF (50% Univar) was added to dissolve any gelatinous silica. The solutions were diluted to 50 ml with RO water and analysed by ICPOES. Blanks and standards were prepared in exactly the same way. Random samples were selected for duplicate fusions to ensure the reproducibility of the results.

Sample intensities were compared to the signal intensities of the calibration standards (W2) to determine weight percent oxide concentrations. Where possible three separate wavelengths were chosen for each element. They were measured in either axial or radial view mode depending on the intensity of the emission line being monitored. Each emission line was monitored individually to ascertain presence of interferences. If no interferences were observed, the final result is an average of all analytical wavelengths. When interferences were detected, the interfered wavelength is excluded for all samples, and the remaining emission lines were averaged, or the analytically best wavelength (based on signal to noise ratio and residual standard deviation) was chosen.

The totals of the 10 major oxides were adjusted to account for the observed loss on ignition and then summed along with bound water and carbon dioxide to give the final total. For internal quality control purposes, every tenth sample was re-analyzed to confirm results, and the calibration was checked multiple times during each analysis session.

To determine loss on ignition, an aliquot of dried sample was heated in a furnace at 1000°C for 1 hour, cooled to room temperature and reweighed.

The accuracy and precision of major element data in this paper can be assessed from the measured concentrations for the rock standard BCR-2 in Table S3 (*S1*).

Trace Element Data

Trace elements were analyzed using a Fisons PQ2+ ICP-MS at the University of Queensland. Approximately 100 mg of each sample was weighed and digested first in HF-HNO_3 followed by HCl using high pressure PTFE bombs in an oven at 180°C. Instrument operating conditions as well as analytical and drift correction procedures follow (*S2*) except that W-2 was used as the calibration standard rather than BHVO-1 and Tm was not used as an internal standard. Other modifications to the method are outlined in (*S3*). Our preferred concentrations for W-2 are shown in Table S3. The accuracy and precision of the technique can be assessed from the measured concentrations and relative standard deviations for the rock standard BHVO-1 in Table S3.

TABLE S3: Major Element (wt%) and Trace Element (ppm) Data for Basalt Standards.

	BCR-2 Mean[#]	±1SD	BCR-2 Cert.	±1SD		W-2[1] Mean[#]	BCR-2[1] Mean[#]	SD%	BHVO-1[1] Mean[#]	SD%	BHVO-2[2#]
SiO_2	54.77	0.11	54.1	0.8	Li	9.16	9.25	0.85	4.70	1.30	4.43
TiO_2	2.38	0.11	2.26	0.05	Be	0.62	2.09	9.80	0.91	2.30	0.97
Al_2O_3	13.53	0.17	13.5	0.2	Sc	36.07	33.80	1.78	31.87	1.67	31.83
$Fe_2O_{3(t)}$	2.08	0.04	13.8	0.2	V	262	412	1.18	310	1.38	306
FeO	10.59	0.19			Cr	92.79	15.49	4.80	295.3	2.65	295.5
MnO	0.20	0.001	0.24	0.12	Co	44.53	37.54	1.62	45.06	1.40	44.84
MgO	3.63	0.03	3.59	0.05	Ni	69.99	12.49	6.71	116.6	3.91	117.53
CaO	7.18	0.05	7.12	0.11	Cu	103	20.39	15.69	140	5.80	123
Na_2O	3.21	0.08	3.16	0.11	Zn	77	135	3.45	105	5.41	101
K_2O	1.81	0.03	1.79	0.05	Ga	17.42	21.67	1.00	21.10	1.17	20.8
P_2O_5	0.39	0.0005	0.35	0.02	Rb	19.8	46.64	1.01	9.31	0.83	9.09
	99.76				Sr	195	337	0.51	396	0.55	393
					Y	20.11	33.66	0.88	24.61	0.80	24.46
					Zr	87.87	185	0.91	170	1.40	169.9
					Nb	7.28	12.41	0.95	18.48	1.00	18.15
					Sn	1.95	2.37	7.99	2.25	14.77	2.03
					Cs	0.89	1.14	1.10	0.097	2.26	0.10
					Ba	170	677	0.43	132	0.76	129.7
					La	10.52	24.92	0.98	15.43	0.76	15.06
					Ce	23.22	52.98	0.66	38.25	0.69	37.49
					Pr	3.03	6.87	0.69	5.46	0.68	5.38
					Nd	12.91	28.57	0.54	24.73	0.61	24.38
					Sm	3.27	6.57	0.75	6.13	0.89	6.14
					Eu	1.09	1.93	0.73	2.07	0.92	2.04
					Gd	0.62	1.06	0.86	6.29	0.79	6.23
					Tb	3.71	6.76	0.82	0.95	0.93	0.94
					Dy	3.81	6.37	1.02	5.30	0.89	5.22
					Ho	0.8	1.33	0.97	1.01	0.85	1.01
					Er	2.22	3.67	1.01	2.53	0.96	2.52
					Tm	0.33	0.54	1.43	0.34	1.22	0.34
					Yb	2.06	3.40	0.92	2.01	1.01	2.00
					Lu	0.3	0.50	1.26	0.28	1.33	0.28
					Hf	2.36	4.85	0.90	4.35	1.42	4.38
					Ta	0.45	0.77	1.48	1.16	1.24	1.14
					W	0.24	0.44	1.51	0.20	3.82	0.19
					Tl	0.09	0.25		0.04	5.49	0.02
					Pb	7.53	10.14	9.88	2.02	4.14	1.66
					Th	2.1	5.79	0.47	1.20	1.06	1.18
					U	0.51	1.70	1.16	0.43	1.27	0.42

[*] Certified values BCR-2 (*S1*).
[#] UQ Values.
[1] Determined from 60 digestions over a five year period. Number of analyses 254.
[2] Analyzed with samples.

Sr-Nd-Pb Isotopes

All isotope measurements were carried out on a VG 54-30 Sector multicollector mass spectrometer in static mode at the University of Queensland. Procedures were identical to those of (*S4*). Prior to dissolution for separation of Pb for isotope analysis, samples were leached in a 7N HNO3/6N HCl solution for 1 hour. This was done to remove possible radiogenic Pb caused by alteration or contamination subsequent to sample collection. The long-term (9 years) reproducibility (2σ) of the NBS SRM 987 Sr and Ames Nd metal standards is $^{87}Sr/^{86}Sr$ = 0.710251±24 and $^{143}Nd/^{144}Nd$ = 0.511977±11, respectively. During the course of this study, the Pb standard NBS SRM 981 yielded an average fractionation of 0.00077 per mass unit under pyrometer control. The following mean ratios (n=6) were achieved: $^{206}Pb/^{204}Pb$ = 16.9406±0.0080, $^{207}Pb/^{204}Pb$ = 15.4942±0.0097, $^{208}Pb/^{204}Pb$ = 36.7177±0.0321, $^{207}Pb/^{206}Pb$ = 0.91461±0.00018 and $^{208}Pb/^{206}Pb$ = 2.16746±0.00098 during analysis of the samples given in Tables 1, S4, and S5.

TABLE S4: Major element (wt%) and trace element (μg/g) abundances, trace element ratios and isotopic compositions of stone adzes.

Specimen	C2319	C2365	D464	D465	C7727
Rock Type	**Hawaiite**	**Basanite**	**Hawaiite**	**Basanite**	**Hawaiite**
Artifact Type	**1A w/ lugs**	**1A w/ lugs**	**1E**	**5B**	**3A**
Island Collected	**Arakita**	**Arakita**	**Makatea**	**Makatea**	**Napuka**
Assigned Source	**Pitcairn**	**Rurutu**	**Rapa**	**Eiao Marquesas**	**Loa Trend Hawaii**
SiO_2	49.85	43.23	48.22	45.23	46.76
TiO_2	2.84	4.29	4.05	3.90	4.65
Al_2O_3	15.88	14.73	15.85	15.66	14.75
FeO	12.30	15.42	10.86	13.12	12.00
MnO	0.21	0.23	0.17	0.21	0.18
MgO	3.62	6.11	4.57	5.04	4.90
CaO	7.25	8.35	9.50	10.82	10.44
Na_2O	4.62	4.57	3.40	3.35	3.11
K_2O	2.07	1.78	2.53	1.89	2.43
P_2O_5	1.36	1.31	0.84	0.77	0.79
TOTAL	100.0	100.0	100.0	100.0	100.0
Trace Element Abundances (μg/g)					
Li	9.35	11.26	9.72	6.25	6.64
Be	2.61	3.06	2.14	1.58	1.61
Sc	15.40	14.35	15.80	21.74	31.25
Ti	15816	25694	23158	22989	18920
V	106.2	207.8	262.9	292.7	317.1
Cr	0.39	9.41	1.95	75.22	296.56
Co	22.44	49.58	33.99	45.98	46.30
Ni	1.03	39.83	27.18	97.20	115.33
Cu	7.81	51.39	24.05	34.86	65.31
Zn	149.6	169.8	125.5	137.0	120.0
Ga	27.96	23.45	25.95	8.48	20.29
As	1.81	2.22	1.98	0.96	1.22
Rb	48.62	38.87	58.03	24.09	34.19
Sr	606.0	1071.0	919.6	600.4	649.8
Y	45.01	36.72	31.69	33.62	26.74
Zr	410.8	434.8	425.8	312.3	252.5
Nb	71.48	106.57	64.89	29.30	45.13
Mo	3.63	3.25	2.83	1.73	2.01
Cd	0.22	0.25	0.22	0.20	0.17
Sn	4.12	3.07	3.32	2.69	2.78
Sb	0.13	0.10	0.12	0.06	0.05
Cs	0.29	0.38	0.64	0.25	0.58
Ba	455.1	396.6	549.9	192.1	372.4
La	57.46	75.17	55.08	26.69	33.33
Ce	128.8	159.7	122.3	64.6	74.9
Pr	16.56	18.93	15.43	8.82	9.61
Nd	68.62	73.15	62.02	39.28	39.91
Sm	14.67	13.73	12.62	9.56	8.61
Eu	4.61	4.17	3.73	3.08	2.65
Gd	13.36	11.63	10.75	9.53	7.87
Tb	1.87	1.57	1.47	1.38	1.11
Dy	10.00	8.13	7.40	7.40	5.94
Ho	1.84	1.49	1.30	1.37	1.10
Er	4.45	3.58	3.05	3.32	2.66
Tm	0.59	0.48	0.39	0.44	0.36
Yb	3.42	2.82	2.15	2.54	2.02
Lu	0.47	0.39	0.29	0.35	0.28
Hf	9.33	9.10	9.54	7.34	5.91
Ta	4.32	6.32	3.93	1.87	2.79
W	0.79	0.72	0.36	0.36	0.37
Tl	0.04	0.04	0.12	0.02	0.06
Pb	4.56	3.56	5.16	2.20	3.81
Th	6.17	7.38	6.90	2.97	3.43
U	1.55	2.10	2.68	0.91	1.02
Trace Element Ratios					
Ba/Th	73.71	53.75	79.67	64.65	108.5
Y/Ho	24.50	24.71	24.40	24.61	24.42
Zr/Hf	44.01	47.77	44.66	42.52	42.69
Ce/Pb	28.26	44.88	23.69	29.30	19.66
Nb/Th	11.58	14.44	9.40	9.86	13.15
Nb/U	46.10	50.75	24.20	32.37	44.39
Nb/La	1.244	1.418	1.178	1.098	1.354
Th/U	3.98	3.51	2.57	3.28	3.38
Nb/Ta	16.55	16.86	16.50	15.67	16.18
Hf/Ta	2.161	1.440	2.424	3.930	2.120
Ce/Sr	0.212	0.149	0.133	0.108	0.115
Ta/U	2.79	3.01	1.47	2.07	2.74
Hf/Lu	19.89	23.18	33.36	21.17	21.03
Sm/Nd	0.2138	0.1876	0.2035	0.2433	0.2158
Zr/Nb	5.75	4.08	6.56	10.66	5.59
Li/Yb	2.74	3.99	4.52	2.46	3.28
Be/Nb	0.0365	0.0287	0.0330	0.0539	0.0357
Ba/Nb	6.37	3.72	8.47	6.56	8.25
Sr/Nd	8.83	14.64	14.83	15.28	16.28
Ni/Sc	0.067	2.776	1.720	4.472	3.691
Cr/Ni	0.378	0.236	0.072	0.774	2.57
V/Cr	272.1	22.08	134.9	3.89	1.07
Sr/Nb	8.48	10.05	14.17	20.49	14.40
Rb/Sr	0.0802	0.0363	0.0631	0.0401	0.0526
U/Pb	0.34	0.59	0.52	0.41	0.27
Th/Pb	1.36	2.07	1.34	1.35	0.90
La/Yb	16.82	26.65	25.64	10.49	16.47
Isotopic Compositions					
$^{87}Sr/^{86}Sr$	0.70360	0.70330	0.70477	0.70400	0.704069
$^{143}Nd/^{144}Nd$	0.512820	0.512933	0.512778	0.512943	0.512897
$^{206}Pb/^{204}Pb$	18.437±0.025	20.289±0.018	19.046±0.046	19.133±0.014	17.997±0.076[1]
$^{207}Pb/^{204}Pb$	15.488±0.021	15.674±0.014	15.568±0.039	15.552±0.011	15.480±0.026[1]
$^{208}Pb/^{204}Pb$	38.948±0.054	39.760±0.036	38.7458±0.094	38.852±0.029	37.667±0.063[1]
$^{207}Pb/^{204}Pb$	0.8401±0.0002	0.7726±0.0001	0.8174±0.0003	0.8128±0.0001	0.8578±0.0004[1]
$^{208}Pb/^{206}Pb$	2.1127±0.0004	1.9597±0.0003	2.0344±0.0007	2.0306±0.0004	2.0882±0.0003[1]
$^{208}Pb^*/^{206}Pb^*$	1.038	0.937	0.952	0.954	0.942±0.003[1]
$^{207}Pb^*/^{206}Pb^*$	0.569	0.490	0.542	0.535	0.595±0.001[1]

[1]Mean and SD of triplicate analyses listed in Table 1.

TABLE S4: Major Element (wt%) and Trace Element (μg/g) Abundances, Trace Element Ratios and Isotopic Compositions of Stone Adzes.

Specimen	C2321	C2367	C2962	C6401	C8464	C9229	C2292
Rock Type	Basalt	Basalt	Basalt	Basanite	Basalt/Hawaiite	Phono-tephrite	Basalt
Artifact Type	4A	4A	3A	3A	1A	1A	4A
Island Collected	Takaroa	Takaroa	Napuka	Ahe	Makatea	Makatea	Taiaro
Assigned Source	[2]Society	[2]Society	[2]Society	[2]Society	[2]Society	[2]Society	[2]Society
SiO_2	45.72	46.53	45.64	45.01	46.87	51.04	47.62
TiO_2	3.28	3.26	3.25	4.40	3.91	2.47	3.96
Al_2O_3	12.89	12.70	12.83	15.62	14.80	17.81	15.04
FeO	11.59	11.56	11.46	11.90	12.04	8.60	12.68
MnO	0.18	0.18	0.18	0.18	0.18	0.22	0.17
MgO	8.29	8.17	8.65	5.08	5.57	3.33	6.40
CaO	13.32	13.21	13.83	11.06	10.89	7.04	9.30
Na_2O	2.91	2.62	2.49	3.32	3.12	5.23	3.27
K_2O	1.30	1.28	1.16	2.64	1.93	3.11	1.01
P_2O_5	0.51	0.49	0.50	0.79	0.68	1.15	0.53
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Trace Element Abundances (μg/g)							
Li	6.35	6.02	6.26	8.48	7.40	11.30	8.10
Be	1.42	1.31	1.33	2.17	1.80	3.65	2.35
Sc	31.72	31.77	33.51	16.69	22.03	4.37	14.58
Ti	18759	18685	18356	25071	22290	13800	22958
V	316.3	317.7	320.0	327.7	305.3	72.3	348.7
Cr	313.35	303.66	350.07	22.01	32.21	0.92	0.32
Co	47.83	47.31	47.80	39.35	43.74	6.45	39.92
Ni	126.51	122.29	138.14	55.70	69.40	0.78	20.62
Cu	66.13	62.81	61.96	80.06	78.69	0.00	40.92
Zn	95.3	95.7	92.6	111.9	111.7	157.5	133.6
Ga	20.01	19.70	19.65	23.77	23.50	23.35	23.53
As	1.11	1.11	1.04	1.83	1.65	2.94	1.61
Rb	33.08	31.22	28.64	77.13	42.59	63.28	47.95
Sr	638.4	619.1	1012.4	929.6	808.0	1982.6	935.6
Y	26.54	25.53	26.03	32.43	30.88	45.52	33.18
Zr	241.6	234.8	237.4	365.9	334.0	613.1	346.1
Nb	43.58	41.80	42.39	71.45	51.49	94.21	66.89
Mo	1.80	1.69	1.81	2.98	2.49	4.11	2.72
Cd	0.16	0.14	0.15	0.16	0.15	0.41	0.21
Sn	2.30	2.27	2.26	3.26	3.25	3.82	2.69
Sb	0.05	0.05	0.05	0.12	0.11	0.16	0.09
Cs	0.54	0.48	0.51	1.07	0.73	0.72	0.69
Ba	347.3	331.1	378.1	656.1	521.0	872.7	626.4
La	32.77	30.22	31.05	53.12	42.74	83.65	50.79
Ce	72.2	68.4	70.3	116.8	95.8	192.6	112.5
Pr	9.42	8.99	9.19	14.75	12.47	24.60	13.91
Nd	39.18	37.50	38.27	58.61	51.72	99.42	56.00
Sm	8.48	8.24	8.43	11.75	11.17	18.74	11.34
Eu	2.64	2.55	2.59	3.49	3.35	5.66	3.43
Gd	7.80	7.46	7.73	10.15	9.81	15.13	9.99
Tb	1.10	1.07	1.10	1.41	1.37	2.03	1.39
Dy	5.92	5.71	5.86	7.35	7.15	10.25	7.40
Ho	1.09	1.05	1.07	1.33	1.26	1.83	1.35
Er	2.68	2.56	2.60	3.21	2.99	4.32	3.29
Tm	0.35	0.33	0.34	0.42	0.38	0.57	0.43
Yb	2.03	1.95	1.99	2.41	2.21	3.26	2.55
Lu	0.28	0.27	0.27	0.33	0.29	0.43	0.35
Hf	5.81	5.67	5.79	8.09	7.86	12.70	7.54
Ta	2.69	2.57	2.60	4.35	3.06	5.70	4.04
W	0.37	0.31	0.33	0.56	0.49	0.84	0.35
Tl	0.06	0.05	0.04	0.05	0.05	0.10	0.07
Pb	2.54	2.71	2.42	6.01	4.28	6.43	3.65
Th	3.32	3.12	3.19	6.15	5.27	8.39	5.48
U	1.00	0.97	0.97	1.87	1.56	2.63	1.60
Trace Element Ratios							
Ba/Th	104.60	106.14	118.71	106.74	98.93	104.01	114.35
Y/Ho	24.40	24.41	24.34	24.47	24.46	24.91	24.51
Zr/Hf	41.61	41.40	41.04	45.22	42.50	48.29	45.91
Ce/Pb	28.44	25.21	29.09	19.44	22.40	29.95	30.87
Nb/Th	13.13	13.40	13.31	11.62	9.78	11.23	12.21
Nb/U	43.72	42.89	43.59	38.26	32.96	35.78	41.92
Nb/La	1.330	1.383	1.365	1.345	1.205	1.126	1.317
Th/U	3.33	3.20	3.28	3.29	3.37	3.19	3.43
Nb/Ta	16.21	16.25	16.32	16.41	16.83	16.53	16.56
Hf/Ta	2.160	2.204	2.228	1.859	2.569	2.229	1.866
Ce/Sr	0.113	0.111	0.069	0.126	0.119	0.097	0.120
Ta/U	2.70	2.64	2.67	2.33	1.96	2.16	2.53
Hf/Lu	20.93	21.27	21.30	24.87	26.67	29.22	21.62
Sm/Nd	0.2164	0.2199	0.2201	0.2005	0.2159	0.1885	0.2025
Zr/Nb	5.54	5.62	5.60	5.12	6.49	6.51	5.17
Li/Yb	3.13	3.09	3.14	3.51	3.34	3.47	3.17
Be/Nb	0.0325	0.0313	0.0314	0.0304	0.0350	0.0387	0.0352
Ba/Nb	7.97	7.92	8.92	9.18	10.12	9.26	9.37
Sr/Nd	16.30	16.51	26.45	15.86	15.62	19.94	16.71
Ni/Sc	3.988	3.849	4.122	3.336	3.150	0.180	1.414
Cr/Ni	2.4768	2.4832	2.5341	0.3952	0.4641	1.1659	0.0153
V/Cr	1.01	1.05	0.91	14.89	9.48	79.00	1103.15
Sr/Nb	14.65	14.81	23.88	13.01	15.69	21.05	13.99
La/Yb	16.15	15.53	15.59	22.01	19.32	25.66	19.88
Isotopic Compositions							
$^{87}Sr/^{86}Sr$	0.70415	0.70414	0.70449	0.70450	0.70467	0.70429	0.70390
$^{143}Nd/^{144}Nd$	0.512929	0.512896	0.512934	0.512843	0.512811	0.512836	0.512889
$^{206}Pb/^{204}Pb$	18.895±0.112	18.792±0.010	19.010±0.036	18.788±0.032	18.974±0.010[1]	19.148±0.012	18.891±0.018
$^{207}Pb/^{204}Pb$	15.545±0.091	15.563±0.009	15.675±0.030	15.566±0.028	15.566±0.012[1]	15.601±0.010	15.527±0.015
$^{208}Pb/^{204}Pb$	38.499±0.240	38.496±0.029	38.961±0.084	38.511±0.065	38.667±0.040[1]	38.805±0.003	38.502±0.036
$^{207}Pb/^{206}Pb$	0.8227±0.0006	0.8291±0.0001	0.8246±0.0001	0.8285±0.0002	0.8199±0.0004[1]	0.8147±0.0001	0.82190±0.0001
$^{208}Pb/^{206}Pb$	2.0373±0.0009	2.0508±0.0004	2.0496±0.0006	2.0498±0.0005	2.0379±0.0011[1]	2.0266±0.0003	2.0381±0.0031
$^{208}Pb^*/^{206}Pb^*$	0.941	0.951	0.978	0.953	0.951±0.003[1]	0.948	0.942
$^{207}Pb^*/^{206}Pb^*$	0.548	0.556	0.555	0.556	0.5455±0.0007[1]	0.539	0.546

[1] Mean and SD of duplicate analyses

[2] High Ba/Th Society source: Ra'iatea, Taha'a or Huahine

TABLE S4: Major Element (wt%) and Trace Element (μg/g) Abundances, Trace Element Ratios and Isotopic Compositions of Stone Adzes.

Specimen	C2320	C2322	C2692	C2366	C3876	C6399	C7725
Rock Type	Basanite	Basalt	Basalt/Hawaiite	Basalt	Basanite	Basanite	Hawaiite
Artifact Type	3A	3B	1A w/o lugs	3A	3B	3A	3A
Island Collected	Takaroa	Takaroa	Makatea	Arakita	Katiu	Manihi	Nukutavake
Assigned Source	Tahiti	Tahiti	Tahiti	Tahiti	Tahiti	Tahiti	Tahiti
SiO_2	45.27	45.30	47.88	45.57	44.41	45.12	46.28
TiO_2	4.52	4.22	3.90	3.90	4.96	4.63	4.70
Al_2O_3	14.62	14.66	14.53	14.48	14.79	15.45	14.93
FeO	12.62	13.03	12.99	12.55	13.45	12.40	12.13
MnO	0.18	0.19	0.18	0.18	0.20	0.19	0.18
MgO	5.23	5.64	5.29	6.56	4.82	4.91	4.93
CaO	11.08	11.54	9.57	11.80	10.83	10.71	10.49
Na_2O	3.59	3.03	3.28	2.92	3.55	3.17	3.16
K_2O	2.09	1.70	1.77	1.45	2.11	2.59	2.42
P_2O_5	0.79	0.70	0.61	0.58	0.89	0.84	0.79
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Trace Element Abundances (μg/g)							
Li	7.82	7.59	7.86	8.46	8.54	8.38	9.32
Be	2.02	1.99	1.90	1.74	2.12	2.44	2.14
Sc	19.99	23.33	22.72	25.97	17.31	13.37	18.51
Ti	26049	25129	22560	21971	28251	26844	26981
V	338.7	353.6	334.2	360.0	333.8	320.4	326.8
Cr	24.13	32.33	4.64	98.22	3.58	1.54	22.47
Co	42.89	46.69	42.36	47.91	43.89	35.97	38.72
Ni	63.59	78.27	40.87	114.09	37.77	4.78	52.93
Cu	77.67	74.57	61.65	85.70	112.10	5.70	88.51
Zn	119.3	138.7	141.5	119.2	128.0	139.7	119.6
Ga	24.78	23.39	23.85	22.21	26.14	24.16	24.83
As	1.95	1.45	1.11	1.01	1.55	2.29	2.27
Rb	43.35	39.57	37.58	36.57	47.93	43.02	51.70
Sr	865.8	802.0	580.4	680.6	894.8	935.6	1269.4
Y	33.43	32.73	32.74	29.09	36.78	36.44	34.33
Zr	407.7	375.2	318.3	285.3	418.3	425.3	415.5
Nb	62.91	54.26	47.25	45.51	64.24	63.89	62.47
Mo	2.75	2.45	2.28	1.91	3.00	2.98	2.72
Cd	0.18	0.19	0.19	0.17	0.18	0.25	0.19
Sn	3.65	3.24	3.48	2.71	3.71	4.04	3.77
Sb	0.12	0.11	0.09	0.08	0.11	0.11	0.14
Cs	0.50	0.42	0.25	1.05	0.57	0.53	0.46
Ba	532.7	441.6	464.1	378.4	467.0	506.2	561.8
La	50.61	44.72	40.07	36.00	51.90	53.31	53.29
Ce	116.1	103.4	88.6	81.9	120.8	123.6	121.0
Pr	15.00	13.23	11.11	10.53	15.88	15.82	15.59
Nd	60.82	54.84	45.90	44.18	65.11	64.98	63.49
Sm	12.49	11.47	10.02	9.57	13.72	13.29	13.27
Eu	3.72	3.48	3.08	2.96	4.12	4.01	3.89
Gd	10.80	10.18	9.35	8.79	11.98	11.60	11.34
Tb	1.50	1.42	1.34	1.24	1.65	1.60	1.55
Dy	7.71	7.39	7.17	6.59	8.51	8.34	7.97
Ho	1.38	1.33	1.33	1.20	1.52	1.49	1.41
Er	3.26	3.18	3.26	2.87	3.55	3.54	3.32
Tm	0.41	0.41	0.43	0.37	0.45	0.45	0.42
Yb	2.38	2.41	2.53	2.17	2.55	2.57	2.41
Lu	0.31	0.32	0.35	0.29	0.34	0.35	0.32
Hf	9.22	8.56	7.44	6.83	9.51	9.47	9.48
Ta	3.78	3.34	2.81	2.79	3.89	3.95	3.77
W	0.66	0.49	0.61	0.32	0.48	0.34	0.46
Tl	0.05	0.04	0.04	0.08	0.04	0.07	0.06
Pb	7.18	3.91	4.06	2.78	4.91	4.50	5.13
Th	5.50	5.02	5.23	4.02	5.14	5.65	6.33
U	1.74	1.53	1.43	1.19	1.67	1.78	1.98
Trace Element Ratios							
Ba/Th	96.87	88.04	88.74	94.13	90.90	89.64	88.77
Y/Ho	24.30	24.55	24.67	24.25	24.21	24.51	24.38
Zr/Hf	44.22	43.83	42.77	41.78	43.97	44.90	43.84
Ce/Pb	16.17	26.44	21.83	29.51	24.62	27.48	23.58
Nb/Th	11.44	10.82	9.04	11.32	12.50	11.31	9.87
Nb/U	36.15	35.36	33.00	38.21	38.49	35.88	31.56
Nb/La	1.243	1.213	1.179	1.264	1.238	1.198	1.172
Th/U	3.16	3.27	3.65	3.38	3.08	3.17	3.20
Nb/Ta	16.65	16.25	16.80	16.29	16.52	16.18	16.56
Hf/Ta	2.441	2.564	2.646	2.444	2.445	2.398	2.513
Ce/Sr	0.134	0.129	0.153	0.120	0.135	0.132	0.095
Ta/U	2.17	2.18	1.96	2.35	2.33	2.22	1.91
Hf/Lu	29.55	26.54	21.45	23.44	27.88	27.28	29.61
Sm/Nd	0.2054	0.2092	0.2182	0.2167	0.2107	0.2045	0.2090
Zr/Nb	6.48	6.91	6.74	6.27	6.51	6.66	6.65
Li/Yb	3.29	3.15	3.11	3.90	3.34	3.25	3.87
Be/Nb	0.0321	0.0366	0.0402	0.0383	0.0330	0.0382	0.0342
Ba/Nb	8.47	8.14	9.82	8.32	7.27	7.92	8.99
Sr/Nd	14.24	14.63	12.64	15.41	13.74	14.40	20.00
Ni/Sc	3.181	3.355	1.799	4.393	2.181	0.357	2.860
Cr/Ni	0.3795	0.4130	0.1135	0.8609	0.0947	0.3229	0.4245
V/Cr	14.03	10.94	72.03	3.67	93.30	207.62	14.55
Sr/Nb	13.76	14.78	12.28	14.95	13.93	14.64	20.32
La/Yb	21.29	18.54	15.85	16.61	20.33	20.71	22.15
Isotopic Compositions							
$^{87}Sr/^{86}Sr$	0.70453	0.70433	0.70422	0.70400	0.70427	0.70433	0.70475
$^{143}Nd/^{144}Nd$	0.512837	0.512842	0.512775	0.512839	0.512866	0.512831	0.512807
$^{206}Pb/^{204}Pb$	18.713±0.042	19.020±0.040[1]	19.038±0.010	19.099±0.008	19.051±0.019	19.034±0.006	19.082±0.066
$^{207}Pb/^{204}Pb$	15.5557±0.0339	15.553±0.030[1]	15.598±0.008	15.579±0.007	15.667±0.015	15.593±0.005	15.568±0.054
$^{208}Pb/^{204}Pb$	38.4474±0.0875	38.635±0.0764[1]	38.823±0.023	38.771±0.017	38.873±0.041	38.691±0.014	38.703±0.136
$^{207}Pb/^{206}Pb$	0.83134±0.0003	0.8177±0.0002[1]	0.8193±0.0001	0.81571±0.0001	0.8224±0.00001	0.8192±0.0001	0.8158±0.0003
$^{208}Pb/^{206}Pb$	2.0546±0.0004	2.0312±0.004[1]	2.0392±0.0002	2.0301±0.0024	2.0404±0.0002	2.0327±0.0002	2.0282±0.0005
$^{208}Pb^*/^{206}Pb^*$	0.954	0.943±0.0040	0.961	0.949	0.964	0.947	0.944
$^{207}Pb^*/^{206}Pb^*$	0.560	0.542±0.001	0.545	0.540	0.552	0.5458	0.540

[1] Mean and SD of duplicate analyses

TABLE S5: Major Element (wt%) and Trace Element (μg/g) Abundances, Trace Element Ratios and Isotopic Compositions of Adze Sources in Polynesia.

Specimen	KC-05-1	KC-05-2	KC-05-3	KC-05-4	KC-05-5	TP-2	KC-05-13
Chain	Australs	Cooks	Cooks	Easter Island	Easter Island	Australs	Pitcairn Gp.
Island	Rurutu	Aititaki	Mangaia			Rapa	Pitcairn Is.
Island Collected		Moturakau Islet	Mata'are	Te Toki	Kikiriroa ahu		Tautama
SiO_2	46.98	41.68	46.72	52.72	61.34	45.95	51.27
TiO_2	3.15	2.64	3.35	2.70	1.23	3.65	2.73
Al_2O_3	16.16	11.72	14.66	14.72	16.06	13.49	15.41
FeO	13.27	11.88	13.04	12.76	7.53	12.14	11.99
MnO	0.22	0.19	0.20	0.24	0.12	0.16	0.21
MgO	4.45	12.02	5.69	3.33	1.42	9.94	3.50
CaO	7.37	12.85	12.17	7.28	4.29	9.82	7.04
Na_2O	5.56	3.98	2.96	4.17	5.30	2.82	4.57
K_2O	1.67	1.77	0.76	1.25	2.28	1.39	1.99
P_2O_5	1.17	1.26	0.45	0.83	0.45	0.64	1.30
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Trace Element Abundances (μg/g)							
Li	12.22	15.14	6.60	9.58	8.13	6.48	10.05
Be	2.84	2.75	1.69	2.21	3.31	1.97	2.57
Sc	9.87	17.36	28.50	25.12	16.26	20.12	15.54
Ti	17710.64	14873.25	19170.53	15739.10	6861.08	21478.38	15788.53
V	105.34	167.08	324.67	171.65	21.39	228.22	105.95
Cr	4.64	236.80	49.10	0.85	0.06	368.90	2.02
Co	30.26	55.10	50.25	24.81	8.31	58.35	23.10
Ni	10.08	176.30	56.75	1.32	0.39	225.10	2.53
Cu	10.09	40.41	76.10	13.55	7.56	44.24	9.68
Zn	134.86	118.16	105.25	143.13	139.46	129.52	156.67
Ga	21.96	18.98	22.16	27.17	29.62	21.51	27.87
As	1.88	1.44	1.29	0.85	1.06	1.68	1.01
Rb	38.16	44.54	18.05	20.62	45.92	27.00	39.83
Sr	1312.45	1356.17	543.56	298.87	236.27	815.49	606.65
Y	37.31	30.45	26.95	63.27	77.00	20.86	44.66
Zr	418.79	229.30	215.98	439.29	625.01	291.78	381.02
Nb	99.62	93.11	51.35	50.93	66.42	56.98	71.72
Mo	3.20	0.95	1.68	2.00	2.71	2.42	3.33
Cd	0.19	0.14	0.15	0.26	0.34	0.18	0.21
Sn	2.91	2.24	2.34	4.19	6.04	2.52	3.21
Sb	0.10	0.07	0.07	0.07	0.09	0.07	0.09
Cs	0.47	0.46	0.31	0.22	0.41	0.25	0.26
Ba	448.30	561.82	228.14	218.02	336.53	323.08	458.90
La	81.75	89.36	36.16	36.62	51.30	41.97	57.07
Ce	167.91	166.20	77.39	86.55	110.31	92.00	127.27
Pr	19.86	18.62	9.66	11.82	14.55	11.24	16.30
Nd	74.79	69.68	38.85	51.44	60.10	44.99	67.68
Sm	13.90	13.38	8.24	12.85	14.33	9.04	14.50
Eu	4.26	4.06	2.59	3.96	4.11	2.84	4.56
Gd	11.59	11.25	7.59	13.70	15.13	7.69	13.28
Tb	1.59	1.48	1.09	2.17	2.42	1.03	1.86
Dy	8.19	7.27	5.94	12.56	14.33	5.03	9.82
Ho	1.50	1.23	1.11	2.54	2.95	0.88	1.80
Er	3.69	2.77	2.79	6.75	8.06	1.97	4.45
Tm	0.50	0.34	0.37	0.96	1.19	0.24	0.59
Yb	2.94	1.81	2.21	5.87	7.37	1.36	3.37
Lu	0.41	0.23	0.30	0.85	1.08	0.18	0.47
Hf	8.94	4.85	5.32	10.04	14.31	6.55	8.97
Ta	5.72	4.59	3.07	3.03	3.79	3.52	4.31
W	0.95	1.03	0.40	0.45	0.72	0.24	0.64
Tl	0.02	0.01	0.03	0.04	0.05	0.05	0.13
Pb	3.80	12.22	2.40	2.14	3.31	2.97	4.07
Th	8.65	15.88	3.94	3.51	5.79	4.21	6.17
U	2.45	2.94	1.20	1.07	1.84	1.22	1.52
Trace Element Ratios							
Ba/Th	51.82	35.38	57.93	62.19	58.10	76.79	74.34
Y/Ho	24.82	24.68	24.24	24.96	26.13	23.81	24.83
Zr/Hf	46.83	47.25	40.56	43.76	43.69	44.57	42.48
Ce/Pb	44.15	13.60	32.18	40.38	33.31	30.99	31.23
Nb/Th	11.52	5.86	13.04	14.53	11.47	13.54	11.62
Nb/U	40.59	31.63	42.92	47.66	36.16	46.80	47.33
Nb/La	1.219	1.042	1.420	1.391	1.295	1.358	1.257
Th/U	3.52	5.39	3.29	3.28	3.15	3.46	4.07
Nb/Ta	17.42	20.30	16.73	16.84	17.53	16.19	16.63
Hf/Ta	1.564	1.058	1.735	3.319	3.775	1.861	2.080
Ce/Sr	0.128	0.123	0.142	0.290	0.467	0.113	0.210
Ta/U	2.33	1.56	2.56	2.83	2.06	2.89	2.85
Hf/Lu	21.65	20.95	17.50	11.84	13.28	36.73	19.10
Sm/Nd	0.1858	0.1921	0.2120	0.2499	0.2385	0.2008	0.2143
Zr/Nb	4.20	2.46	4.21	8.62	9.41	5.12	5.31
Li/Yb	4.15	8.37	2.98	1.63	1.10	4.77	2.98
Be/Nb	0.0285	0.0296	0.0330	0.0434	0.0498	0.0345	0.0358
Ba/Nb	4.50	6.03	4.44	4.28	5.07	5.67	6.40
Sr/Nd	17.55	19.46	13.99	5.81	3.93	18.13	8.96
Ni/Sc	1.022	10.156	1.992	0.053	0.024	11.186	0.163
Cr/Ni	0.4606	1.3431	0.8652	0.6405	0.1466	1.6389	0.7984
V/Cr	22.68	0.71	6.61	202.96	374.41	0.62	52.53
Sr/Nb	13.17	14.56	10.58	5.87	3.56	14.31	8.46
Rb/Sr	0.029	0.033	0.033	0.069	0.194	0.033	0.066
U/Pb	0.645	0.241	0.498	0.499	0.555	0.4102	0.372
Th/Pb	2.275	1.299	1.638	1.636	1.749	1.417	1.515
Isotopic Compositions							
$^{87}Sr/^{86}Sr$	0.70352	0.70512	0.70292	0.70301	0.70320	0.70385	0.70357
$^{143}Nd/^{144}Nd$	0.512918	0.512701	0.512877	0.513028	0.513063	0.512808	0.512826
$^{206}Pb/^{204}Pb$	20.313±0.027	18.978±0.019	21.329±0.020	19.238±0.010	19.320±0.014	19.101±0.006	18.455±0.009
$^{207}Pb/^{204}Pb$	15.696±0.031	15.658±0.015	15.768±0.014	15.558±0.009	15.596±0.010	15.539±0.006	15.497±0.007
$^{208}Pb/^{204}Pb$	39.838±0.104	39.255±0.039	40.222±0.039	38.799±0.021	38.969±0.027	38.912±0.007	38.996±0.019
$^{207}Pb/^{206}Pb$	0.7727±0.0005	0.8251±0.0001	0.7393±0.0001	0.8088±0.0001	0.8073±0.0001	0.8135±0.0012	0.8397±0.0001
$^{208}Pb/^{206}Pb$	1.9612±0.0026	2.0685±0.0003	1.8858±0.0002	2.0168±0.0002	2.0170±0.0001	2.0372±0.0015	2.1130±0.0002
$^{208}Pb^*/^{206}Pb^*$	0.942±0.007	1.011	0.894	0.939	0.948	0.964	1.041
$^{207}Pb^*/^{206}Pb^*$	0.491±0.002	0.555	0.455	0.530	0.530	0.536	0.569

TABLE S5: Major element (wt%) and trace element (μg/g) abundances, trace element ratios and isotopic compositions of possible OIB adze sources in the Hawaiian Islands.

Specimen	KC-05-6	29-GEO-2[1]	71WMOL4[1]	KC-05-7	KC-05-8	KC-05-9	KC-05-10
Island	Moloka'i	Moloka'i	W. Moloka'i	Kaho'olawe	Lana'i	Maui	Hawai'i
Island Collected	Mo'omomi	Mo'omomi					Mauna Kea
SiO_2	45.59	44.95	47.55	53.56	52.53	51.17	48.98
TiO_2	4.30	4.38	3.66	3.08	2.19	2.36	4.12
Al_2O_3	15.86	15.72	16.10	14.08	14.39	17.52	13.45
FeO	14.13	14.69	13.50	11.82	10.93	9.86	13.74
MnO	0.19	0.19	0.26	0.17	0.17	0.25	0.20
MgO	6.46	6.46	4.84	4.68	6.29	2.88	5.06
CaO	8.49	8.64	7.50	8.23	10.20	6.87	9.56
Na_2O	3.46	3.41	4.16	3.10	2.48	5.97	3.18
K_2O	0.86	0.88	1.49	0.87	0.56	2.08	1.13
P_2O_5	0.67	0.68	0.94	0.40	0.26	1.03	0.58
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Trace Element Abundances (μg/g)							
Li	6.74			6.01	4.89	10.69	6.02
Be	1.64			1.31	0.95	2.79	1.59
Sc	17.82	18.4	14.8	26.91	29.01	4.94	27.01
Ti	25808	26283	21968	17820.03	12386.69	13839.55	23916.46
V	294.80			325.35	297.19	61.21	408.05
Cr	6.32			54.33	308.43	0.55	12.27
Co	56.12			39.13	44.49	13.21	46.17
Ni	84.25			55.06	117.86	0.65	31.40
Cu	24.37			68.62	93.65	4.35	47.75
Zn	139.32			122.99	106.65	127.57	124.07
Ga	23.80			23.56	19.53	23.21	24.54
As	0.78			1.46	1.36	1.42	0.76
Rb	13.90	14.8	26.1	17.19	8.76	48.53	24.22
Sr	811.83	730	912	400.31	357.97	1131.33	557.23
Y	34.82	41.5	57.1	112.40	158.47	37.49	36.77
Zr	290.87	296	429	220.83	130.54	380.23	299.18
Nb	25.44	26.1	42.8	17.10	10.08	75.85	36.59
Mo	1.50			1.02	0.60	3.46	1.56
Cd	0.16			0.16	0.11	0.24	0.14
Sn	2.83			2.17	1.47	2.83	2.91
Sb	0.05			0.04	0.02	0.08	0.06
Cs	0.16	0.21	0.27	0.22	0.13	0.58	0.16
Ba	228.13	238	486	351.67	116.48	804.13	351.59
La	22.93	24.1	40.6	76.61	57.94	58.77	30.73
Ce	57.68	60.4	91.4	194.39	157.82	126.48	72.20
Pr	8.44	9.1	13.8	26.88	24.49	15.76	9.85
Nd	38.58	41.5	61.9	120.98	113.93	63.18	42.87
Sm	9.80	10.4	14.3	31.41	31.18	12.79	10.11
Eu	3.25	3.21	4.47	10.41	10.75	4.04	3.25
Gd	9.67	9.97	13.53	31.33	33.43	11.25	9.86
Tb	1.42	1.5	2	4.72	5.28	1.58	1.45
Dy	7.67	8.06	10.57	25.94	30.73	8.23	7.93
Ho	1.42	1.49	1.92	4.74	6.05	1.51	1.50
Er	3.50	3.62	4.66	11.74	15.78	3.68	3.71
Tm	0.46	0.5	0.63	1.61	2.17	0.50	0.51
Yb	2.65	2.8	3.6	9.54	12.57	2.93	2.90
Lu	0.36	0.38	0.49	1.26	1.74	0.41	0.40
Hf	6.92	7.07	9.81	5.52	3.35	8.24	7.30
Ta	1.56	1.68	2.63	1.07	0.63	4.38	2.21
W	0.25			0.19	0.11	0.70	0.37
Tl	0.03			0.05	0.02	0.03	0.02
Pb	1.77	1.77	2.35	1.92	1.10	3.77	1.89
Th	1.49	1.68	2.83	1.62	0.67	5.13	2.31
U	0.57	0.61	0.99	0.49	0.22	1.59	0.79
Trace Element Ratios							
Ba/Th	152.76	141.7	171.7	217.02	174.95	156.89	152.11
Y/Ho	24.59	27.9	29.7	23.72	26.20	24.78	24.52
Zr/Hf	42.06	41.9	43.7	39.99	39.02	46.14	41.00
Ce/Pb	32.59	34.1	38.9	101.37	143.10	33.53	38.25
Nb/Th	17.03	15.5	15.1	10.56	15.13	14.80	15.83
Nb/U	44.54	42.8	43.2	34.87	45.51	47.71	46.03
Nb/La	1.110	1.08	1.05	0.223	0.174	1.291	1.191
Th/U	2.61	2.75	2.86	3.30	3.01	3.22	2.91
Nb/Ta	16.28	15.5	16.3	15.98	15.93	17.31	16.57
Hf/Ta	4.425	4.21	3.73	5.159	5.289	1.880	3.305
Ce/Sr	0.071	0.08	0.10	0.486	0.441	0.112	0.130
Ta/U	2.74	2.75	2.66	2.18	2.86	2.76	2.78
Hf/Lu	19.09	18.6	20.0	4.40	1.92	20.32	18.19
Sm/Nd	0.2540	0.25	0.23	0.2597	0.2737	0.2024	0.2359
Zr/Nb	11.43	11.3	10.0	12.91	12.96	5.01	8.18
Li/Yb	2.54			0.63	0.39	3.65	2.07
Be/Nb	0.0644			0.0766	0.0945	0.0368	0.0435
Ba/Nb	8.97	9.12	11.4	20.56	11.56	10.60	9.61
Sr/Nd	21.04	17.6	14.7	3.31	3.14	17.91	13.00
Ni/Sc	4.728			2.046	4.062	0.133	1.163
Cr/Ni	0.0750			0.9868	2.6170	0.8362	0.3908
V/Cr	46.64			5.99	0.96	111.82	33.25
Sr/Nb	31.91	28.0	21.3	23.40	35.53	14.92	15.23
Rb/Sr	0.017	0.02	0.03	0.043	0.025	0.043	0.044
U/Pb	0.323	0.34	0.42	0.256	0.201	0.422	0.421
Th/Pb	0.844	0.95	1.20	0.845	0.604	1.359	1.225
Isotopic Compositions							
$^{87}Sr/^{86}Sr$	0.70370	0.703622	0.703662	0.70420	0.70417	0.70328	0.70348
$^{143}Nd/^{144}Nd$	0.513009	0.513005	0.512985	0.512866	0.512801	0.513042	0.513009
$^{206}Pb/^{204}Pb$	18.398±0.002	18.426±0.003	18.419	18.258±0.013	17.922±0.016	18.256±0.008	18.354±0.035
$^{207}Pb/^{204}Pb$	15.451±0.001	15.487±0.002	15.489	15.474±0.009	15.438±0.014	15.451±0.007	15.467±0.026
$^{208}Pb/^{204}Pb$	37.842±0.010	37.957±005	37.985	37.986±0.026	37.699±0.033	37.826±0.021	37.883±0.061
$^{207}Pb/^{204}Pb$	0.8399±0.0001	0.840	0.8409	0.8475±0.0001	0.8614±0.002	0.8464±0.0001	0.8428±0.0002
$^{208}Pb/^{206}Pb$	2.0569±0.0009	2.057	2.0623	2.0805±0.0002	2.1039±0.0003	2.0720±0.0003	2.0643±0.0004
$^{208}Pb^*/^{206}Pb^*$	0.920	0.930	0.934	0.951	0.955	0.933	0.929
$^{207}Pb^*/^{206}Pb^*$	0.567	0.570	0.570	0.579	0.597	0.576	0.572

1. Data from (*S5*)

TABLE S5: Major Element (wt%) and Trace Element (μg/g) Abundances, Trace Element Ratios and Isotopic Compositions of Adze Sources in Polynesia.

Specimen	KC-05-11	KC-05-12	KC-05-14	KC-05-15	KC-05-16	KC-05-17	KC-05-18	KC-05-19
Chain	Marquesas	Marquesas	Samoa	Samoa	Samoa	Samoa	Samoa	Samoa
Island	Eiao	Nukuhiva	Tutuila	Tutuila	Tutuila	Tutuila	Tutuila	Tutuila
Island Collected		Ha'aupaupa	Tatagamatau	Fagaitua	Lau'agae Ridge	Fagasa	Tatagamatau	Tatagamatau
SiO_2	47.83	49.30	49.32	50.97	48.43	49.92	48.98	49.23
TiO_2	3.96	3.67	3.55	3.04	3.97	3.18	3.58	3.61
Al_2O_3	15.44	13.68	15.71	15.80	16.07	16.18	15.82	15.59
FeO	12.06	11.89	12.59	11.61	12.70	11.99	12.67	12.71
MnO	0.17	0.16	0.18	0.18	0.16	0.18	0.17	0.18
MgO	6.41	6.61	4.75	4.29	4.79	4.57	4.70	4.88
CaO	9.22	11.32	7.63	7.24	7.76	7.35	7.76	7.70
Na_2O	3.33	2.41	3.86	4.20	3.84	4.04	3.85	3.76
K_2O	1.05	0.58	1.56	1.71	1.50	1.73	1.60	1.51
P_2O_5	0.54	0.38	0.85	0.94	0.77	0.87	0.85	0.82
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Trace Element Abundances (μg/g)								
Li	6.45	3.49	9.72	11.14	8.45	9.29	8.51	9.13
Be	1.48	0.93	2.26	2.46	2.16	2.47	2.25	2.21
Sc	21.96	31.03	15.17	13.46	14.87	14.48	15.16	15.06
Ti	23283.29	21081.75	20552.97	17707.19	22955.46	18746.65	20592.03	20476.50
V	297.90	324.40	209.18	159.59	237.85	185.46	209.86	212.36
Cr	73.41	192.75	0.61	1.89	7.00	0.87	0.68	0.60
Co	46.67	42.95	35.86	25.69	40.63	33.81	35.82	37.07
Ni	120.07	77.33	2.64	1.95	20.95	2.39	2.58	2.88
Cu	40.04	88.25	6.94	2.70	13.53	7.46	6.99	12.38
Zn	121.70	104.58	186.84	184.32	163.35	175.66	174.09	175.16
Ga	24.13	21.77	29.63	29.63	28.32	29.09	29.53	28.74
As	0.68	0.64	0.89	1.01	0.77	0.99	1.14	0.77
Rb	22.07	8.62	40.70	43.40	31.59	47.08	47.39	39.26
Sr	602.94	421.09	726.64	770.77	783.81	681.14	731.37	710.96
Y	34.01	30.91	45.97	45.80	43.90	47.46	46.12	44.45
Zr	305.62	256.21	419.70	398.86	388.15	455.62	414.43	401.24
Nb	28.75	24.34	48.96	53.91	49.34	53.80	48.68	47.12
Mo	1.70	0.86	2.07	2.49	1.75	2.42	2.22	2.17
Cd	0.38	0.16	0.25	0.25	0.22	0.24	0.24	0.21
Sn	2.40	2.54	3.64	3.61	2.93	3.32	3.54	3.61
Sb	0.04	0.04	0.14	0.08	0.04	0.07	0.07	0.07
Cs	0.34	0.19	0.42	0.36	0.43	0.32	0.60	0.31
Ba	193.85	132.73	305.80	352.19	311.73	340.77	319.28	292.10
La	26.18	20.31	40.96	45.64	39.02	43.44	40.97	39.56
Ce	63.30	48.60	97.20	106.71	88.99	102.72	97.10	93.90
Pr	8.80	7.29	13.21	14.34	12.51	13.90	13.23	12.81
Nd	39.02	33.21	57.52	61.69	54.37	59.85	57.44	55.93
Sm	9.71	8.45	13.79	14.34	12.70	14.12	13.71	13.32
Eu	3.09	2.76	4.37	4.50	4.10	4.40	4.39	4.22
Gd	9.50	8.47	13.38	13.77	12.41	13.55	13.37	13.02
Tb	1.38	1.23	1.92	1.97	1.78	1.97	1.95	1.89
Dy	7.47	6.80	10.29	10.43	9.32	10.56	10.32	10.12
Ho	1.37	1.24	1.87	1.87	1.68	1.91	1.87	1.82
Er	3.39	3.10	4.51	4.50	4.06	4.71	4.55	4.42
Tm	0.44	0.41	0.59	0.59	0.52	0.61	0.59	0.58
Yb	2.56	2.35	3.33	3.26	2.92	3.52	3.34	3.26
Lu	0.35	0.32	0.45	0.43	0.38	0.48	0.45	0.43
Hf	7.22	6.33	9.82	9.50	9.09	10.51	9.69	9.49
Ta	1.81	1.59	3.09	3.35	3.10	3.37	3.06	3.00
W	0.29	0.17	0.48	0.53	0.32	0.57	0.46	0.50
Tl	0.02	0.02	0.04	0.02	0.02	0.05	0.05	0.04
Pb	2.06	1.44	4.43	4.27	2.75	3.05	3.08	3.58
Th	2.93	1.92	4.16	4.87	4.13	4.56	4.14	4.03
U	0.89	0.44	1.20	1.37	1.15	1.33	1.19	1.16
Trace Element Ratios								
Ba/Th	66.21	69.10	73.45	72.38	75.48	74.71	77.20	72.46
Y/Ho	24.74	24.85	24.60	24.53	26.12	24.85	24.65	24.49
Zr/Hf	42.33	40.48	42.73	41.98	42.69	43.35	42.75	42.28
Ce/Pb	30.76	33.65	21.92	25.00	32.41	33.67	31.53	26.23
Nb/Th	9.82	12.67	11.76	11.08	11.95	11.79	11.77	11.69
Nb/U	32.45	54.76	40.75	39.41	43.08	40.48	40.77	40.57
Nb/La	1.098	1.199	1.195	1.181	1.264	1.238	1.188	1.191
Th/U	3.30	4.32	3.47	3.56	3.61	3.43	3.46	3.47
Nb/Ta	15.85	15.35	15.85	16.11	15.94	15.96	15.89	15.70
Hf/Ta	3.979	3.990	3.179	2.839	2.937	3.119	3.164	3.162
Ce/Sr	0.105	0.115	0.134	0.138	0.114	0.151	0.133	0.132
Ta/U	2.05	3.57	2.57	2.45	2.70	2.54	2.57	2.58
Hf/Lu	20.92	19.67	21.90	21.84	23.76	22.02	21.63	21.96
Sm/Nd	0.2488	0.2543	0.2397	0.2324	0.2336	0.2359	0.2387	0.2382
Zr/Nb	10.63	10.52	8.57	7.40	7.87	8.47	8.51	8.52
Li/Yb	2.52	1.48	2.91	3.41	2.90	2.63	2.55	2.80
Be/Nb	0.0516	0.0382	0.0461	0.0457	0.0437	0.0460	0.0462	0.0469
Ba/Nb	6.74	5.45	6.25	6.53	6.32	6.33	6.56	6.20
Sr/Nd	15.45	12.68	12.63	12.49	14.42	11.38	12.73	12.71
Ni/Sc	5.467	2.492	0.174	0.145	1.409	0.165	0.170	0.191
Cr/Ni	0.6114	2.4924	0.2327	0.9739	0.3342	0.3639	0.2624	0.2093
V/Cr	4.06	1.68	341.04	84.23	33.97	212.84	310.30	352.21
Sr/Nb	20.97	17.30	14.84	14.30	15.89	12.66	15.02	15.09
Rb/Sr	0.037	0.021	0.056	0.056	0.040	0.069	0.065	0.055
U/Pb	0.43	0.308	0.271	0.321	0.417	0.436	0.388	0.324
Th/Pb	1.42	1.33	0.94	1.14	1.50	1.50	1.34	1.13
Isotopic Compositions								
$^{87}Sr/^{86}Sr$	0.70394	0.70383	0.70529	0.70518	0.70524	0.70505	0.70529	0.70528
$^{143}Nd/^{144}Nd$	0.512953	0.512881	0.512850	0.51285	0.51284	0.51285	0.51285	0.51286
$^{206}Pb/^{204}Pb$	19.132±0.019	19.189±0.037	18.872±0.014	18.876±0.010	18.890±0.033	18.964±0.015	18.930±0.030	18.891±0.021
$^{207}Pb/^{204}Pb$	15.576±0.017	15.549±0.029	15.551±0.011	15.567±0.007	15.582±0.028	15.574±0.013	15.619±0.026	15.568±0.018
$^{208}Pb/^{204}Pb$	38.915±0.041	38.965±0.073	38.757±0.028	38.782±0.019	38.830±0.076	38.873±0.034	38.969±0.069	38.817±0.048
$^{207}Pb/^{206}Pb$	0.8141±0.0002	0.8103±0.0002	0.8240±0.0001	0.8247±0.0001	0.8248±0.0002	0.8212±0.0001	0.8251±0.0001	0.8241±0.0002
$^{208}Pb/^{206}Pb$	2.0340±0.0005	2.0306±0.0004	2.0537±0.0002	2.0546±0.0003	2.0556±0.0005	2.0498±0.0004	2.0587±0.0005	2.0548±0.0004
$^{208}Pb^*/^{206}Pb^*$	0.962	0.960	0.970	0.973	0.976	0.973	0.987	0.975
$^{207}Pb^*/^{206}Pb^*$	0.538	0.532	0.550	0.551	0.552	0.547	0.554	0.550

TABLE S5: Major Element (wt%) and Trace Element (μg/g) Abundances, Trace Element Ratios and Isotopic Compositions of Adze Sources in Polynesia.

Specimen	KC-05-20	KC-05-21	KC-05-22	KC-05-23	KC-05-24	KC-05-25	KC-05-26	KC-05-27
Chain	Society Islands	Society Islands	Society Islands	Society Islands	Tonga	Tonga	Tonga	New Zealand
Island	Tahiti	Ra'iatea	Ra'iatea	Ra'iatea	Vava'u	'Ata	Tofua	North Island
Island Collected	Papeno'o	Avera	Vaitopatapata	Avera Iti	Late	'Ata	Mele Havea	Opito Bay
SiO_2	46.43	45.38	46.16	45.93	59.12	54.24	56.00	53.61
TiO_2	3.93	4.64	4.49	4.53	0.81	0.90	0.72	1.07
Al_2O_3	14.85	16.02	14.80	15.62	13.77	15.85	14.90	17.00
FeO	12.90	11.24	12.22	12.04	11.69	11.32	11.22	9.77
MnO	0.19	0.17	0.18	0.17	0.20	0.20	0.20	0.18
MgO	5.25	5.83	5.86	5.72	3.02	4.63	4.55	5.40
CaO	10.83	10.15	11.06	9.88	8.04	9.75	9.58	9.67
Na_2O	2.87	3.32	2.81	3.54	2.42	2.30	2.13	2.74
K_2O	2.01	2.22	1.74	1.91	0.77	0.66	0.57	0.40
P_2O_5	0.74	1.03	0.68	0.67	0.15	0.15	0.13	0.14
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Trace Element Abundances (μg/g)								
Li	8.60	8.71	7.51	7.34	7.47	3.66	6.53	7.38
Be	1.98	2.24	1.91	1.97	0.30	0.37	0.23	0.57
Sc	18.48	13.65	21.92	19.95	42.48	42.83	42.19	39.17
Ti	22939.90	26453.92	25694.24	25854.24	4746.50	5173.73	4118.64	6050.11
V	331.58	299.73	353.24	333.80	431.59	401.32	369.01	288.12
Cr	9.66	2.01	39.38	18.80	4.33	8.33	12.99	15.81
Co	44.34	34.05	42.60	42.20	31.62	36.53	38.05	33.00
Ni	49.34	29.20	74.58	52.43	6.84	10.88	18.83	7.09
Cu	102.46	18.22	80.35	29.26	196.78	159.79	161.01	29.76
Zn	118.37	118.96	115.42	109.87	100.54	87.01	93.48	85.10
Ga	23.83	24.83	24.69	24.58	15.61	16.46	14.95	17.97
As	1.13	2.00	1.53	1.70	2.64	0.54	1.38	0.52
Rb	48.82	55.05	40.60	43.03	9.87	10.89	7.40	9.74
Sr	825.71	1111.20	830.45	885.54	231.65	246.17	225.74	274.08
Y	33.54	31.18	32.14	33.35	19.82	18.98	17.84	21.28
Zr	345.56	352.69	348.05	365.67	35.49	40.06	32.74	81.92
Nb	61.67	65.29	56.50	54.53	0.42	0.75	0.47	3.69
Mo	2.74	2.71	2.56	2.17	1.41	0.64	1.76	0.35
Cd	0.17	0.20	0.18	0.19	0.07	0.07	0.07	0.11
Sn	3.29	3.03	3.16	3.21	0.59	0.73	0.63	1.01
Sb	0.11	0.15	0.11	0.09	0.05	0.03	0.05	0.02
Cs	0.57	0.75	0.58	0.51	0.36	0.27	0.33	0.31
Ba	559.29	650.21	429.24	457.61	147.21	175.98	150.98	165.23
La	50.35	51.33	45.23	43.04	2.75	4.79	2.22	8.06
Ce	110.19	113.56	102.60	99.76	7.21	11.44	5.96	19.17
Pr	13.85	14.54	13.37	13.12	1.22	1.74	1.03	2.63
Nd	55.43	60.03	55.31	54.85	6.31	8.41	5.44	11.63
Sm	11.28	12.47	11.67	11.75	2.13	2.57	1.90	3.13
Eu	3.39	3.80	3.55	3.55	0.75	0.88	0.68	1.05
Gd	10.03	10.85	10.36	10.38	2.89	3.13	2.56	3.60
Tb	1.42	1.48	1.44	1.45	0.52	0.53	0.47	0.61
Dy	7.45	7.37	7.45	7.67	3.39	3.44	3.06	3.87
Ho	1.37	1.26	1.32	1.36	0.78	0.76	0.70	0.85
Er	3.33	2.89	3.14	3.27	2.30	2.18	2.06	2.42
Tm	0.44	0.36	0.40	0.43	0.36	0.33	0.32	0.36
Yb	2.57	1.97	2.28	2.49	2.39	2.18	2.10	2.36
Lu	0.35	0.26	0.30	0.33	0.36	0.33	0.32	0.35
Hf	7.74	7.84	8.25	8.47	1.20	1.33	1.10	2.19
Ta	3.66	3.86	3.45	3.33	0.03	0.05	0.03	0.22
W	0.58	0.47	0.42	0.50	0.07	0.07	0.06	0.08
Tl	0.06	0.15	0.06	0.05	0.07	0.03	0.05	0.04
Pb	4.49	7.06	3.85	3.94	2.95	1.55	2.64	9.89
Th	6.31	6.40	5.31	5.03	0.24	0.62	0.21	1.36
U	1.84	1.86	1.55	1.45	0.22	0.26	0.17	0.32
Trace Element Ratios								
Ba/Th	88.60	101.58	80.80	90.94	607.07	284.98	711.24	121.75
Y/Ho	24.56	24.66	24.33	24.47	25.28	25.09	25.58	25.15
Zr/Hf	44.65	44.96	42.20	43.16	29.63	30.20	29.79	37.46
Ce/Pb	24.55	16.08	26.66	25.29	2.44	7.37	2.26	1.94
Nb/Th	9.77	10.20	10.64	10.84	1.74	1.21	2.20	2.72
Nb/U	33.44	35.16	36.42	37.47	1.92	2.91	2.74	11.60
Nb/La	1.225	1.272	1.249	1.267	0.153	0.156	0.210	0.457
Th/U	3.42	3.45	3.42	3.46	1.10	2.40	1.25	4.27
Nb/Ta	16.84	16.92	16.40	16.36	14.18	16.29	14.68	16.95
Hf/Ta	2.113	2.032	2.394	2.543	40.276	28.905	34.628	10.061
Ce/Sr	0.133	0.102	0.124	0.113	0.031	0.046	0.026	0.070
Ta/U	1.99	2.08	2.22	2.29	0.14	0.18	0.19	0.68
Hf/Lu	22.14	30.74	27.17	25.43	3.30	4.02	3.40	6.17
Sm/Nd	0.2034	0.2077	0.2109	0.2142	0.3376	0.3060	0.3493	0.2690
Zr/Nb	5.60	5.40	6.16	6.71	84.16	53.58	70.25	22.23
Li/Yb	3.35	4.42	3.29	2.95	3.13	1.68	3.11	3.13
Be/Nb	0.0321	0.0343	0.0338	0.0362	0.7004	0.4946	0.4983	0.1545
Ba/Nb	9.07	9.96	7.60	8.39	349.13	235.36	323.94	44.83
Sr/Nd	14.90	18.51	15.02	16.14	36.69	29.28	41.50	23.56
Ni/Sc	2.670	2.140	3.403	2.628	0.161	0.254	0.446	0.181
Cr/Ni	0.1957	0.0689	0.5280	0.3585	0.6327	0.7655	0.6895	2.2307
V/Cr	34.33	149.02	8.97	17.76	99.74	48.19	28.42	18.23
Sr/Nb	13.39	17.02	14.70	16.24	16.22	16.71	17.96	17.23
Rb/Sr	0.0591	0.0495	0.0489	0.0486	0.0426	0.0442	0.0328	0.0356
U/Pb	0.4107	0.2629	0.4032	0.3689	0.0745	0.1654	0.0645	0.0321
Th/Pb	1.4062	0.9062	1.3805	1.2756	0.0821	0.3977	0.0805	0.1373
Isotopic Compositions								
$^{87}Sr/^{86}Sr$	0.70448	0.70440	0.70419	0.70442	0.70384	0.70347	0.70355	0.70481
$^{143}Nd/^{144}Nd$	0.512847	0.512894	0.512878	0.512863	0.513006	0.513033	0.513008	0.512814
$^{206}Pb/^{204}Pb$	19.057±0.014	18.873±0.011	19.161±0.087	19.018±0.020	18.597±0.050	18.743±0.019	18.546±0.004	18.801±0.008
$^{207}Pb/^{204}Pb$	15.576±0.003	15.602±0.009	15.587±0.071	15.594±0.017	15.574±0.042	15.539±0.019	15.524±0.005	15.595±0.008
$^{208}Pb/^{204}Pb$	38.760±0.034	38.699±0.025	38.803±0.175	38.670±0.044	38.228±0.107	38.338±0.056	38.081±0.017	38.610±0.021
$^{207}Pb/^{206}Pb$	0.8267±0.0001	0.8267±0.0001	0.8135±0.0004	0.8200±0.0001	0.8292±0.0002	0.8291±0.0002	0.8372±0.0003	0.8294±0.0001
$^{208}Pb/^{206}Pb$	2.0506±0.0008	2.0505±0.0002	2.0251±0.0009	2.0349±0.0002	2.0462±0.0009	2.0455±0.0009	2.0544±0.0017	2.0536±0.0002
$^{208}Pb^*/^{206}Pb^*$	0.952	0.964	0.947	0.950	0.942	0.939	0.932	0.962
$^{207}Pb^*/^{206}Pb^*$	0.542	0.555	0.537	0.546	0.568	0.556	0.0.566	0.558

(2) Supporting Online Text

Sources of Comparative Chemical and Isotopic Data for OIBs from Polynesia

Aitutaki
Schiano *et al.,* (*S10*); Nakamura and Tatsumoto (*S11*); Palacz and Saunders (*S12*).
Rapa
Schiano *et al.,* (*S10*); Palacz and Saunders (*S12*); Hemond *et al.,* (*19*); Chauvel *et al.,* (*S13*).
Rurutu
Schiano *et al.,* (*S10*); Palacz and Saunders (*S12*); Nakamura and Tatsumoto (*S11*); Hauri and Hart (*S14*); Chauvel *et al.,* (*S15*).
Mangaia
Schiano *et al.,* (*S10*); Palacz and Saunders (*S12*); Nakamura and Tatsumoto (*S11*); Hauri and Hart (*S14*); Woodhead (*S16*).
Societies
Hemond *et al.,* (*19*); White and Duncan (*29*); Brousse *et al.,* (*S17*).
Tubuai
Schiano *et al.,* (*S10*); Chauvel *et al.,* (*S139*); Hauri and Hart (*S14*); Vidal *et al.,* (*S18*).
Easter Island
Cheng *et al.,* (*S19*).
Rarotonga
Schiano *et al.,* (*S10*); Palacz and Saunders (*S12*); Nakamura and Tatsumoto (*S11*); Hauri and Hart (*S11*).
Marquesas
Legendre *et al.,* (*S20*); Vidal *et al.,* (*S18*).
Samoa
Hart *et al.,* (*S21*); Wright and White (*S22*); Farley *et al.,* (*S239*).
Pitcairn
Woodhead and McCulloch (*S24*); Eisele *et al.,* (*S25*).
Haleakala, Maui
Chen *et al.,* (*S38*).
Mauna Kea, Hawai'i Island
Frey *et al.,* (*S39*).
Kahoʻolawe
Leeman *et al.,* (*24*); Huang *et al.,* (*26*).
Lanaʻi
Basu and Faggart (*25*).
West Molokaʻi
Xu *et al.,* (*S5*).

Definition of Obsidian

Obsidian is a dark colored silica-rich volcanic glass of rhyolitic composition with distinctive conchoidal fracture. It is rare on OIB volcanoes, however, glass of basaltic composition, termed tachylite, is common on the margins of dikes in Hawai'i (*S26*).

Petrological Classification of Adzes and Source Rocks

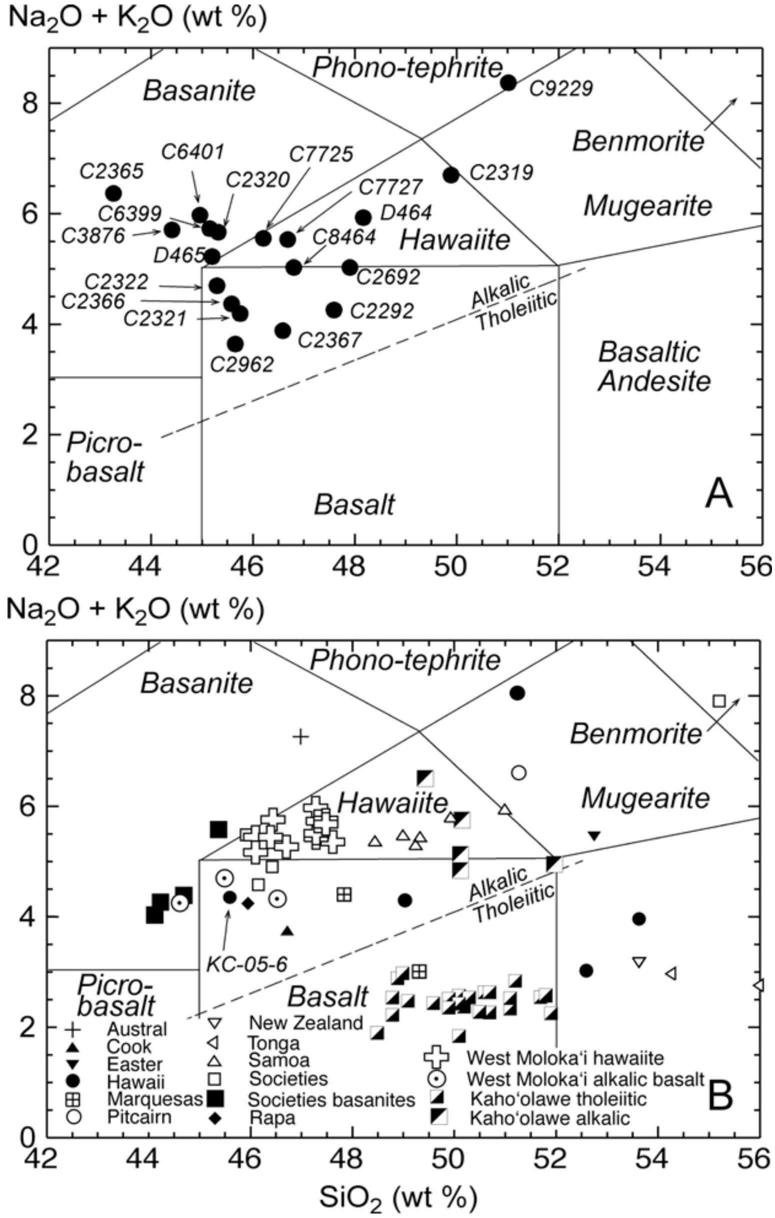

Fig. S2A Chemical classification of basalt adzes from the Tuamotus that were investigated in this study plotted from data in Table S2.

Fig. S2B Chemical classification of source rocks in Polynesia plotted from data in Table S3. Also shown are compositions of alkaline and tholeiitic basalts from Kahoʻolawe from (*24, 26, S27*). There is clearly extensive usage of alkali basalt for manufacture of the adzes (*S28*). This may reflect the fact that fresh tholeiites from the surface chilled rapidly and contain significantly greater amounts of interstitial glass than alkali basalts. Thus tholeiites would be more brittle and difficult to shape than more cryptocrystalline alkali basalts, the preferred adze raw material.

Compositional fields are from (*S29*). The subdivision between alkalic and tholeiitic rocks is from (*S30*). Although C7727 is similar to hawaiites from West Molokaʻi in total alkalies and SiO_2 illustrating their correct petrological classification, the isotopic composition of C7727 indicates a different source.

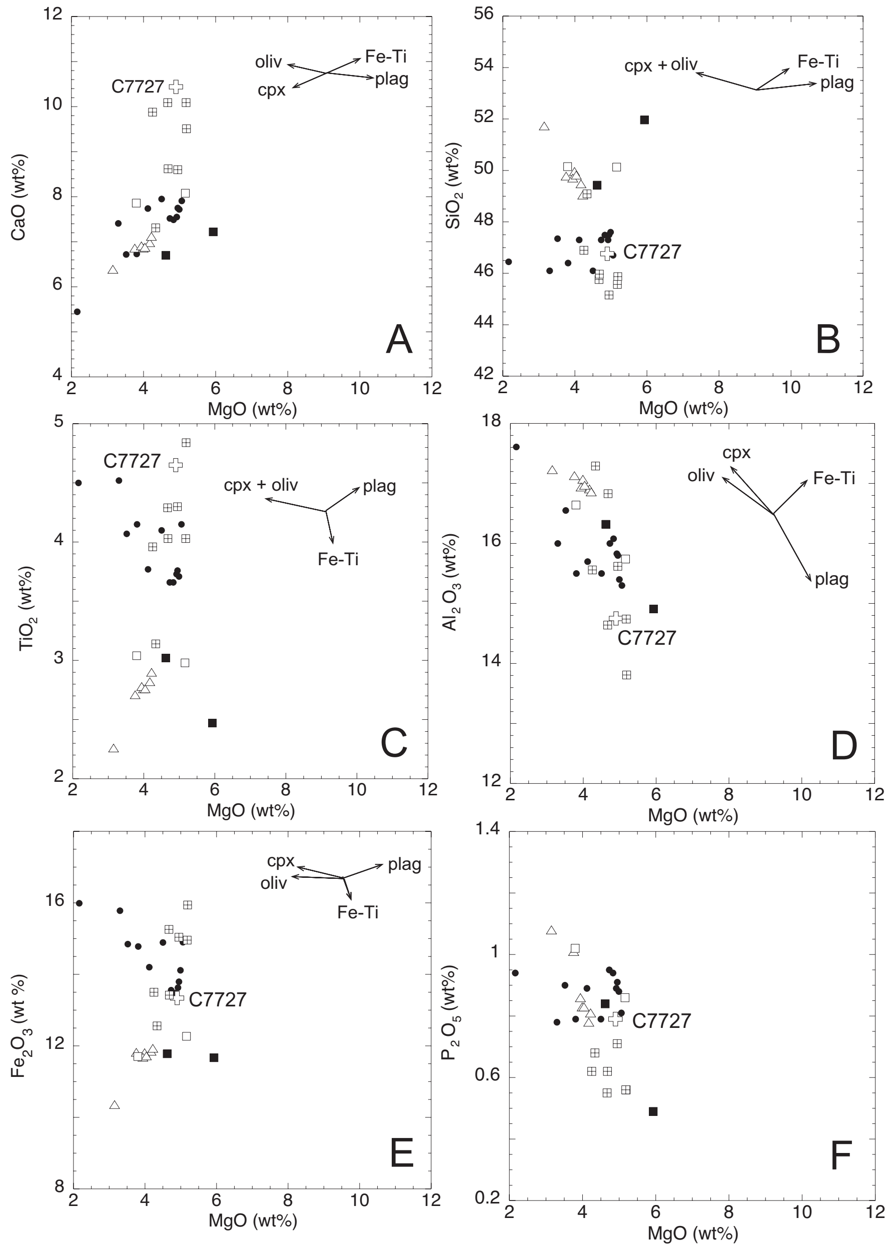

Fig. S3A-F MgO versus CaO, SiO_2, TiO_2, Al_2O_3, Fe_2O_3, and P_2O_5 comparing the chemistries of adze C7727 with the major element compositions of hawaiites from Kaho**ʻ**olawe - solid squares (*24*) and open squares (*S27*), West Molokaʻi - solid circles (S5), Maui (Haleakala) - crossed squares (*S38*) and Mauna Kea - open triangles (*S39*). The arrows in A-E show the effect of olivine, clinopyroxene, plagioclase, and Fe-Ti oxide fractionation. Hawaiites from Haleakala and West Molokaʻi show considerable variation in CaO (5.4 to ~10 wt %) (Fig. 3A). Adze C7727 is similar in CaO and TiO_2 to the Ca-rich hawaiites from Haleakala confirming a similar petrogenetic evolution which is different to hawaiites from Mauna Kea and West Molokaʻi. The higher CaO (and TiO_2) content of adze C7727 may reflect involvement of cumulate Ti augite during evolution of the hawaiite magma, possibly during transport of the magma through the lithosphere. C7727 lies within the compositional field for Hawaiian hawaiites (Fig. S3 B-F).

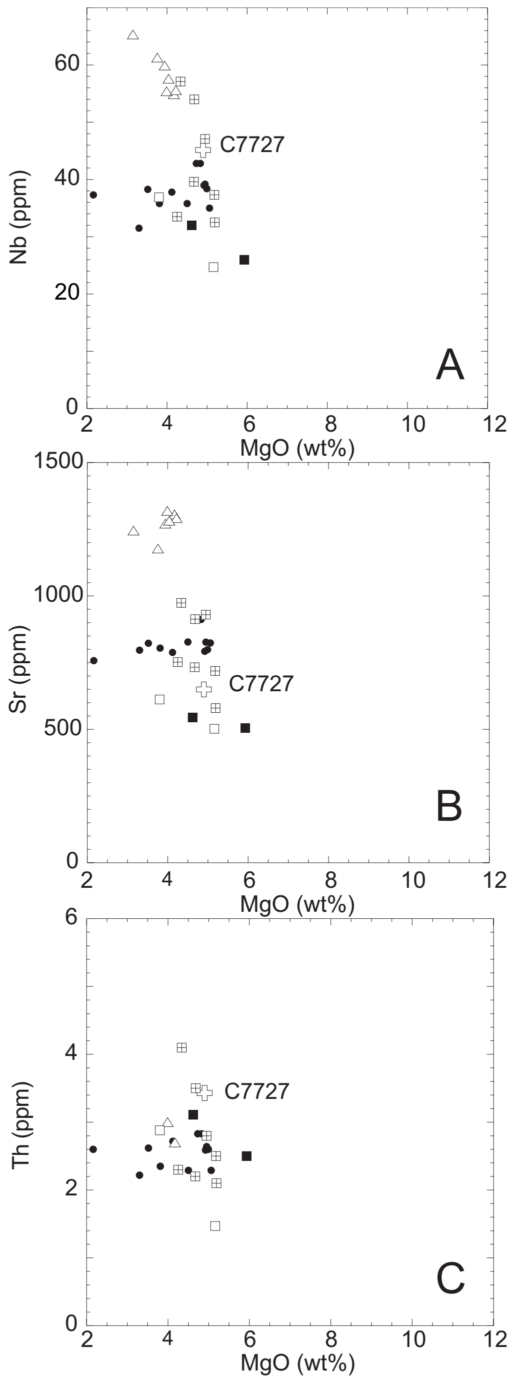

Fig. S4A-C Comparison of trace element abundances of Nb, Sr, and Th covariation with MgO in hawaiites. Adze C7727 fits within the fractionation induced variability of our Kaho'olawe - solid squares (*24*) and open squares (*S27*), West Moloka'i - solid circles (S5), Maui (Haleakala) - crossed squares (*S38*) and Mauna Kea - open triangles (*S39*) hawaiites.

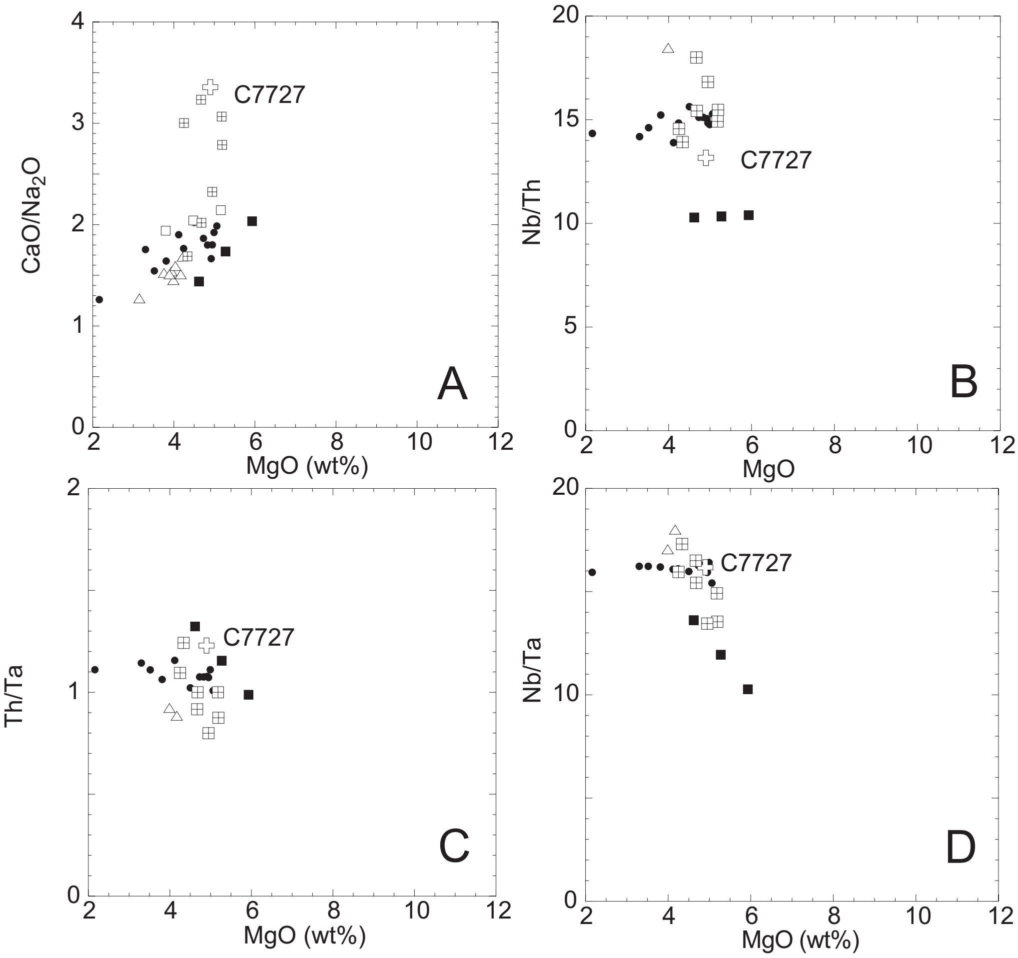

Fig. S5A-D Covariation between CaO/Na_2O, Nb/Th, Th/Ta, and Nb/Ta ratios with MgO in Hawaiian hawaiites. In Fig. S5A, CaO/Na_2O shows considerable variation (~1.3 to ~3.3) with adze C7727 plotting within analytical error of Haleakala hawaiites. In Figs. 5B-D, C7727 plots within the compositional field defined by Kaho‘olawe - solid squares (*24*) and open squares (*S27*), West Moloka‘i - solid circles (S5), Maui (Haleakala) - crossed squares (*S38*), and Mauna Kea - open triangles (*S39*) hawaiites.

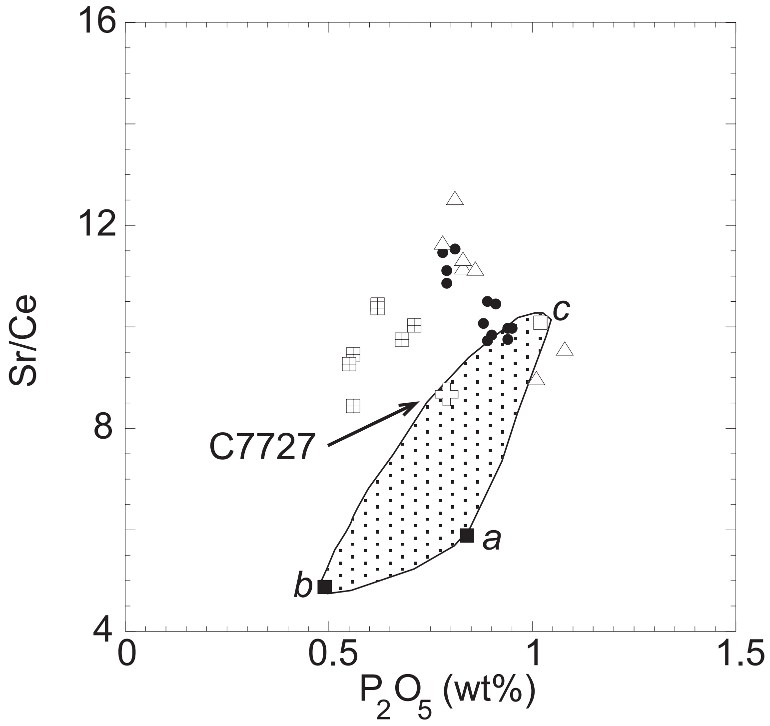

Fig. S6 Covariation between Sr/Ce and P_2O_5 for Hawaiian hawaiites. Adze C7727 plots within the broad compositional field of hawaiite from Kaho'olawe [solid squares -(a) H-1440, Waikanhalulu Bay and - (b) KW-14, Kanapou Bay (*24*) and open squares - (c) Kamama vent (*S27*)]. The role of plagioclase fractionation in the evolution of the hawaiite magmas is evident from the decrease in Sr/Ce ratio with increasing P_2O_5 shown by the hawaiites from West Moloka'i - solid circles (S5), and Mauna Kea - open triangles (*S39*). The hawaiites from Maui (Haleakala) are shown as crossed squares (*S38*). Kaho'olawe hawaiites (a & b) evolved by shallow low- pressure fractionation of plagioclase while the composition of Kamama vent (c) is the result of moderate-pressure clinopyroxene dominated fractionation.

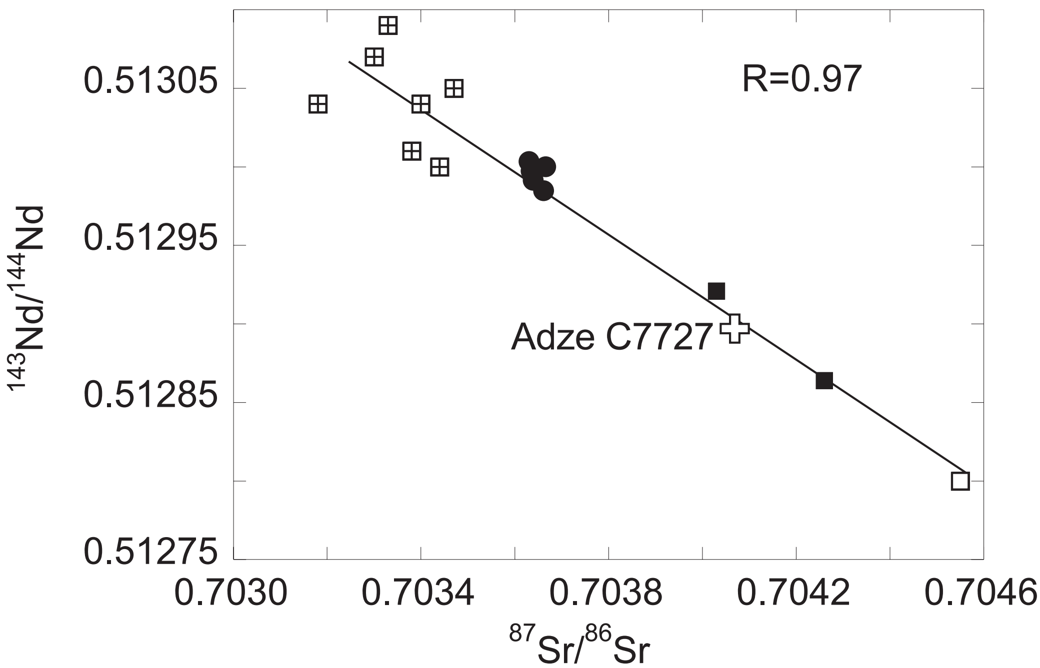

Fig. S7 Covariation between $^{87}Sr/^{86}Sr$ and $^{143}Nd/^{144}Nd$ showing adze C7727 plotting on the isotopic mixing trend defined by hawaiites from Kaho‘olawe - solid squares (*24*), West Moloka‘i - solid circles (*S5*), and Haleakala (Maui) - crossed square (*S38*). The open square symbol is hawaiite from Kaho‘olawe (Huang, pers. comm. 2007). The mixing line reflects involvement of an enriched (plume) component (with high Rb/Sr and low Sm/Nd) and a depleted (upper mantle) component (low Rb/Sr and high Sm/Nd) in the genesis of these hawaiites.

Explanation of Geochemical Projections

Several geochemical diagrams are shown (Fig. 3) that facilitate comparison of trace element data and thus identification of adze sources. As REEs form stable 3+ ions they have similar chemical properties and they have ionic radii that decrease with increasing atomic number. Because of these differences, they are fractionated relative to each other during partial melting and crystallization. To depict REE abundances they are normalized to values in chondritic meteorites and plotted on a Masuda diagram - a logarithmic plot of concentration versus atomic number (*S6*). This projection eliminates abundance variations between REEs with odd and even atomic numbers, and allows relative fractionations between REE's and chondritic meteorites to be shown (*S7*). Trends generated by connecting adjacent points with straight lines yield REE abundance patterns whose shape reflects the effect of similar petrogenetic processes on suites of basalts.

Another projection that allows geochemical comparison, involves plotting a primitive mantle normalized multi-element diagram showing elements grouped according to their relative incompatibility in mantle minerals. We use primitive mantle normalizating values of Sun and McDonough (*S8*), and the order of compatibility following Kamber et al., (*S9*). The order of elements in these "spider diagrams" shows increasing compatibility from left to right on the x-axis (Fig. 3). The diagram shows the contrasting behavior of the incompatible (more mobile) elements (Cs, Rb, Ba, Sr, and Eu) relative to the compatible (less mobile) elements such as the high field strength (HFS) elements (Y, Hf, Zr, Ti, Nb, and Ta). Incompatible elements tend to be partitioned into a melt while compatible elements remain in the solid residues.

Elemental Behavior During Melting and Crystallization

Incompatible elements preferentially enter a silicate liquid (partial melt), and thus are excluded from the melt source. Incompatible elements have low partition coefficients (C≤1) being partitioned preferentially into a liquid relative to the solid phase(s). Incompatibility occurs because of large ionic radius and high ionic charge that causes elements to be excluded from substituting into crystal lattice sites. The ratio of the charge/ionic size (ionic potential) allows incompatible elements to be subdivided as high field strength cations (HFSEs) with ionic potentials >2 or as large ion lithophile elements (LILEs) with ionic potentials <2. The HFSEs include, for example, the rare earth elements as well as Th, U, Y, Nb, Ta, Hf, and Zr. Whereas, the LILEs include Cs, Rb, K, Ba, Eu, Sr, and Pb. Incompatible elements that can be determined by XRF include: Ce, La, Nb, Nd, Pb, Rb, Sr, Th U, Y, and Zr but quality of data is compromised by lower detection limits.

Nature of Mantle End-members

Radiogenic isotope studies have allowed characterization of five mantle end-members that are involved in the genesis of recent OIBs (*22*). These end-members are: (1) HIMU (high μ - where μ = $^{238}U/^{204}Pb$), with the most radiogenic Pb isotopic compositions, radiogenic (high) $^{143}Nd/^{144}Nd$ isotopic compositions, and unradiogenic (low) $^{87}Sr/^{86}Sr$ isotopic compositions. These are derived from a source with high U/Pb and Sm/Nd and low Rb/Sr. Examples are St Helena, Mt Cameroon, Mangaia, Tubuai, and Rurutu. (2) EM-1 (enriched mantle-1) is characterized by unradiogenic $^{206}Pb/^{204}Pb$, $^{87}Sr/^{86}Sr$, and $^{143}Nd/^{144}Nd$ isotopic compositions and by radiogenic $^{207}Pb/^{204}Pb$ ratios e.g., Discovery Seamount, Tristan da Cuhna, and Pitcairn. As the enriched mantle component EM-1 plotted on the lower mantle Pb growth curve and

HIMU fell on the extension of this vector (*S31*), suggesting that both EM-1 and HIMU are lower mantle reservoirs; (3) EM-2 (enriched mantle-2) by contrast have radiogenic $^{87}Sr/^{86}Sr$ and unradiogenic $^{143}Nd/^{144}Nd$ isotopic compositions with $^{206}Pb/^{204}Pb$ and $^{207}Pb/^{204}Pb$ isotopic compositions that lie between HIMU and EM-1, e.g., Samoa and the Societies; (4) FOZO (focal zone) also termed C (common component) (*S32*) with composition defined as the point of convergence, in three dimensional isotope diagrams of linear arrays of individual OIBs; (5) DMM (depleted MORB mantle) with the highest $^{143}Nd/^{144}Nd$ ratios and lowest $^{87}Sr/^{86}Sr$, $^{206}Pb/^{204}Pb$, and $^{207}Pb/^{204}Pb$ isotopic compositions. Isotopic data for individual OIBs form essentially linear arrays indicating that they represent mixtures between enriched and depleted components (*11*; *S33*, *S34*). On a global scale both EM-1 and EM-2 occur in OIBs associated with the DUPAL anomaly (*S35*). Importantly, the DUPAL anomaly coincides with a broad region of low seismic velocities in the deep lower mantle (*S36*) indicating that these OIBs appear to be associated with deep sourced thermochemical upwellings.

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