Table I. Concentration means and standard deviations by NAA for nine geological samples from Charaña analyzed at MURR.

Element	Mean & Std Dev
Na (%)	2.89 ± 0.10
Al (%)	6.84 ± 0.14
Cl (ppm)	505 ± 43
K (%)	4.06 ± 0.21
Sc (ppm)	1.58 ± 0.01
Mn (ppm)	494 ± 10
Fe (%)	0.514 ± 0.007
Co (ppm)	0.26 ± 0.08
Zn (ppm)	35 ± 2
Rb (ppm)	137 ± 5
Sr (ppm)	131 ± 11
Zr (ppm)	117 ± 4
Sb (ppm)	0.12 ± 0.01
Cs (ppm)	3.26 ± 0.03
Ba (ppm)	552 ± 14
La (ppm)	29.1 ± 0.3
Ce (ppm)	49.6 ± 0.5
Nd (ppm)	16 ± 1
Sm (ppm)	2.39 ± 0.04
Eu (ppm)	0.42 ± 0.01
Tb (ppm)	0.22 ± 0.01
Dy (ppm)	1.12 ± 0.22
Yb (ppm)	1.07 ± 0.03
Lu (ppm)	0.26 ± 0.01
Hf (ppm)	3.63 ± 0.06
Ta (ppm)	0.96 ± 0.01
Th (ppm)	12.5 ± 0.1
U (ppm)	3.69 ± 0.19

Table II. Concentrations in artifacts assigned to Charaña analyzed by NAA at MURR and LBNL.

ANID	Site_Name	Na (%)	Al (%)	Cl	K (%)	Sc	Mn	Fe (%)	Co	Zn	Rb	Sr	Zr	Sb
KOWA05	Khonkho Wankané	2.94	7.62	504	4.43	1.49	508	0.486	0.16	43	131	145	108	0.11
KOWA06	Khonkho Wankané	2.59	6.73	571	4.58	1.52	480	0.494	0.16	44	140	163	110	0.13
KOWA07	Khonkho Wankané	3.07	7.06	626	4.01	1.51	502	0.494	0.17	46	132	130	122	0.12
KOWA08	Khonkho Wankané	3.11	6.72	611	3.84	1.51	508	0.491	0.16	43	132	168	119	0.11
KOWA09	Khonkho Wankané	2.96	6.90	442	3.88	1.60	485	0.521	0.19	35	137	138	115	0.12
KOWA13	Khonkho Wankané	2.85	6.94	463	4.37	1.59	488	0.514	0.18	35	137	122	100	0.13
KOWA15	Khonkho Wankané	3.06	7.23	441	4.03	1.60	502	0.517	0.18	34	135	128	119	0.12
KOWA16	Khonkho Wankané	3.06	6.54	462	3.89	1.60	490	0.520	0.18	38	135	132	134	0.13
KOWA17	Khonkho Wankané	3.04	7.22	461	3.95	1.62	544	0.524	0.19	37	139	112	117	0.12
TIMK02	Tiwanaku (Mollo Kontu)	2.77	7.50	927	4.34	1.57	499	0.507	0.19	32	137	147	109	0.12
TIMP01	Tiwanaku (Markapata)	3.04	7.42	671	4.00	1.57	503	0.518	0.26	51	137	128	127	0.14
RLB115	Omo	3.04	6.82	694	4.21	1.58	496	0.514	0.16	40	138	136	105	0.13
RLB351	Omo	2.90	6.73	591	3.70	1.57	484	0.507	0.17	27	134	109	112	0.13
RLB352	Omo	2.96	6.57	619	3.58	1.67	487	0.538	0.19	29	141	107	114	0.13
RLB383	Omo	3.04	6.44	653	4.13	1.63	503	0.523	0.19	39	138	220	109	0.13
RLB384	Omo	2.99	6.95	670	3.93	1.59	500	0.518	0.19	37	136	183	109	0.13
RLB385	Omo	3.05	6.86	809	3.99	1.60	514	0.518	0.18	36	138	156	115	0.12
KF022	Quelcatani	2.77	6.52	618	3.73	1.57	462	0.504	0.17	36	136	105	111	0.10
KF029	Quelcatani	2.99	7.18	641	3.93	1.58	497	0.514	0.18	37	136	123	117	0.10
KF030B	Quelcatani	2.88	6.91	718	4.28	1.54	499	0.527	0.24	40	135	120	117	0.14
BURG-30	Tumuku	2.64	7.18	nm	5.31	1.73	492	0.550	0.29	nm	168	31	nm	0.14
BURG-81	Tumuku	2.92	6.78	nm	4.61	1.70	495	0.550	0.21	nm	118	74	nm	0.10

nm = not measured at LBNL.

Table II. Concentrations in artifacts assigned to Charaña analyzed by NAA at MURR and LBNL (continued).

ANID	Cs	Ba	La	Ce	Nd	Sm	Eu	Tb	Dy	Yb	Lu	Hf	Ta	Th	U
KOWA05	3.15	524	28.2	48.2	12.4	2.32	0.39	0.21	1.18	0.96	0.20	3.43	0.94	12.1	4.14
KOWA06	3.19	535	28.4	48.6	13.9	2.30	0.40	0.25	1.24	0.98	0.20	3.47	0.95	12.3	3.94
KOWA07	3.17	524	28.4	48.6	12.5	2.31	0.40	0.19	1.14	1.00	0.20	3.55	0.95	12.3	3.54
KOWA08	3.22	518	27.6	48.3	11.7	2.25	0.41	0.25	1.09	1.00	0.20	3.45	0.95	12.2	4.05
KOWA09	3.24	556	29.4	51.8	15.3	2.43	0.42	0.21	1.33	0.99	0.23	3.61	0.96	12.8	3.07
KOWA13	3.25	551	29.1	51.0	17.0	2.42	0.42	0.21	1.29	1.13	0.26	3.59	1.00	12.7	4.07
KOWA15	3.27	563	29.6	52.1	15.7	2.40	0.44	0.24	1.24	1.06	0.26	3.68	0.98	12.8	3.30
KOWA16	3.27	549	29.2	51.7	15.9	2.43	0.44	0.25	1.01	1.11	0.25	3.81	1.00	12.7	4.06
KOWA17	3.28	567	29.5	52.0	18.9	2.41	0.44	0.23	1.30	1.04	0.30	3.70	0.97	12.8	3.14
TIMK02	3.24	529	28.5	49.7	14.0	2.43	0.41	0.22	1.70	1.05	0.18	3.53	0.97	12.5	3.55
TIMP01	3.26	528	28.8	49.5	13.7	2.37	0.42	0.23	1.36	1.05	0.21	3.71	0.99	12.6	3.54
RLB115	3.26	527	28.4	50.4	15.5	2.32	0.42	0.21	1.69	1.00	0.20	3.61	0.98	12.8	3.66
RLB351	3.21	546	27.9	48.5	16.3	2.45	0.42	0.23	1.07	0.97	0.21	3.60	0.97	12.4	3.70
RLB352	3.37	564	29.3	51.8	17.8	2.59	0.45	0.22	0.81	1.04	0.21	3.83	1.00	13.1	3.89
RLB383	3.32	566	29.7	51.8	17.7	2.50	0.45	0.22	0.50	1.04	0.23	3.68	1.00	12.9	3.64
RLB384	3.28	556	29.3	50.2	15.4	2.42	0.41	0.21	0.90	1.00	0.22	3.61	0.97	12.7	3.84
RLB385	3.30	551	29.0	50.4	13.7	2.40	0.42	0.23	1.00	1.00	0.19	3.65	0.97	12.8	3.56
KF022	3.24	544	28.4	48.8	16.3	2.37	0.41	0.20	1.39	1.00	0.20	3.56	0.99	12.6	4.71
KF029	3.25	560	29.0	50.0	13.1	2.37	0.43	0.20	1.42	1.03	0.20	3.58	0.96	12.5	4.71
KF030B	3.41	562	29.2	51.7	10.4	2.51	0.44	0.21	1.15	1.08	0.22	3.78	1.01	13.3	3.32
BURG-30	3.41	577	30.0	51.5	nm	2.12	0.42	nm	1.46	1.05	nm	3.67	0.94	13.4	3.38
BURG-81	3.36	556	29.4	53.3	nm	2.15	0.45	nm	1.48	1.07	nm	3.58	1.00	13.7	3.41

nm = not measured at LBNL.

Table III. Means and standard deviations for nine geological samples from Charaña analyzed by ED-XRF at MURR.

Element	Mean & Std. Dev.
Mn (ppm)	505.8 ± 38.2
Fe (ppm)	5655 ± 802
Zn (ppm)	26.3 ± 5.7
Rb (ppm)	146.5 ± 7.2
Sr (ppm)	110.7 ± 5.6
Y (ppm)	10.2 ± 0.9
Zr (ppm)	97.4 ± 5.8
Nb (ppm)	15.7 ± 1.1
Th (ppm)	13.8 ± 0.8

Table IV. Source assignments for artifacts analyzed from sites where Charaña obsidian has been found.

Site Name	Number	Charaña	Chivay	Aconcahua	Alca-1	Quispisisa	Sora Sora
Tumuku*	5	3	2	0	0	0	0
Chamaqta*	5	5	0	0	0	0	0
Chiripa**	4	1	3	0	0	0	0
Quelcatani	35	3	29	2	1	0	0
Khonko Wankané	15	9	6	0	0	0	0
Tiwanaku (Mollo Kontu sector)	13	1	9	0	0	2	1
Tiwanaku (Markapata sector)	1	1	0	0	0	0	0
Omo	11	6	2	0	2	1	0
Totals	89	29	51	2	3	3	1

* artifacts analyzed at LBNL; ** artifacts analyzed at LBNL and MURR. All others at MURR.

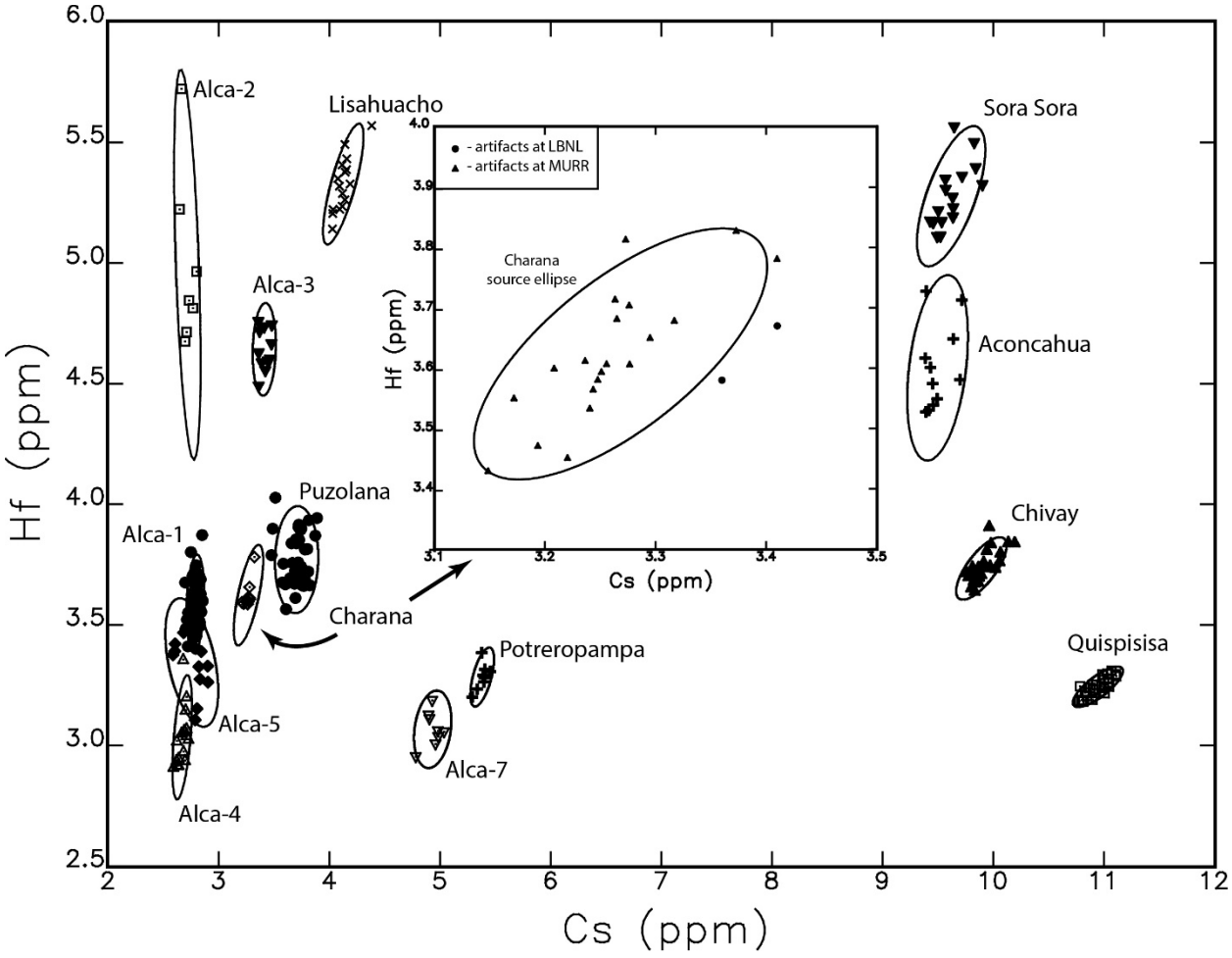

Figure 4. Scatterplot of Cs versus Hf showing obsidian sources in southern Peru and northern Bolivia with 90% confidence ellipses. The inset shows the artifacts from MURR and LBNL projected against the confidence ellipses and confirming their assignment.