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SOURCE PROVENANCE OF OBSIDIAN ARTIFACTS FROM T'ÍSIL, QUINTANA ROO, MEXICO

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INTRODUCTION

While Ixtepeque dominates the obsidian assemblage, typical in this region, there is some diversity in the source provenance including one of the La Union, Honduras sources (Figure 1).

ANALYSIS AND INSTRUMENTAL CONDITIONS

All archaeological samples are analyzed whole. The results presented here are quantitative in that they are derived from "filtered" intensity values ratioed to the appropriate x-ray continuum regions through a least squares fitting formula rather than plotting the proportions of the net intensities in a ternary system (McCarthy and Schamber 1981; Schamber 1977). Or more essentially, these data through the analysis of international rock standards, allow for inter-instrument comparison with a predictable degree of certainty (Hampel 1984).

The trace element analyses were performed in the Archaeological XRF Laboratory, Department of Earth and Planetary Sciences, University of California, Berkeley, using a Spectrace/ThermoNoran™ QuanX energy dispersive x-ray fluorescence spectrometer. The spectrometer is equipped with an air cooled Cu x-ray target with a 125 micron Be window, an x-ray generator that operates from 4-50 kV/0.02-2.0 mA at 0.02 increments, using an IBM PC based microprocessor and WinTrace™ reduction software. The x-ray tube is operated at 30 kV, 0.14 mA, using a 0.05 mm (medium) Pd primary beam filter in an air path at 200 seconds livetime to generate x-ray intensity Kα-line data for elements titanium (Ti), manganese (Mn), iron (as FeT), thorium (Th) using Lα line, rubidium (Rb), strontium (Sr), yttrium (Y), zirconium (Zr), and niobium (Nb). Trace element intensities were converted to concentration estimates by employing a least-squares calibration line established for each element from the analysis of international rock standards certified by the National Institute of Standards and Technology (NIST), the US. Geological Survey (USGS), Canadian Centre for Mineral and Energy

Technology, and the Centre de Recherches Pétrographiques et Géochimiques in France (Govindaraju 1994). Line fitting is linear (XML) for all elements but Fe where a derivative fitting is used to improve the fit for the high concentrations of iron and thus for all the other elements. Further details concerning the petrological choice of these elements in obsidian is available in Shackley (1995, 1998; also Mahood and Stimac 1991; and Hughes and Smith 1993). Specific standards used for the best fit regression calibration for elements Ti through Nb include G-2 (basalt), AGV-1 (andesite), GSP-1, SY-2 (syenite), BHVO-1 (hawaiite), STM-1 (syenite), QLO-1 (quartz latite), RGM-1 (obsidian), W-2 (diabase), BIR-1 (basalt), SDC-1 (mica schist), TLM-1 (tonalite), SCO-1 (shale), all US Geological Survey standards, BR-N (basalt) from the Centre de Recherches Pétrographiques et Géochimiques in France, and JR-1 and JR-2 (obsidian) from the Geological Survey of Japan (Govindaraju 1994). In addition to the reported values here, Ni, Cu, and Ga were measured, but these are rarely useful in discriminating glass sources and are not generally reported.

The data from the WinTrace software were translated directly into Excel for Windows software for manipulation and on into SPSS for Windows for statistical analyses. In order to evaluate these quantitative determinations, machine data were compared to measurements of known standards during each run. RGM-1 is analyzed during each sample run for obsidian artifacts to check machine calibration (see Table 1). Compilation and discussion of RGM-1 analyses are available at http://www.swxrflab.net/anlysis.htm. Source assignments were made with reference to the source standard library at Berkeley and published and unpublished data (Figures 2 and 3).

DISCUSSION

The dominance of Ixtepeque obsidian in sites in this region is certainly not unusual, but the presence of the one sample produced from obsidian from the La Union source in northern Honduras is somewhat unusual. This source, recently documented, is present in a variety of temporal contexts from Formative through Late and Terminal Classic sites in Honduras (Joyce et al. 2004). The source has previously been called San Luis, Quebrada Agua Helada and others (Ayoma 1999), but the primary dome is at La Union. The widespread occurrence of marekanites of similar elemental composition in the ash flow tuffs in northern Honduras is due to the unique genetic history of Central America (Carr et al. 1990; Sigurdsson 2000).

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Table 1. Elemental concentrations for the archaeological obsidian samples and measurements of the RGM1 standards. All measurements in parts per million (ppm).

Sample	Ti	Mn	Fe	Zn	Rb	Sr	Y	Zr	Nb	Th	Source
TS-11M-S68-00-08-1	1347	487	10085	33	93	159	13	164	7	6	Ixtepeque
TS-11M-S68-00-08-4	1453	442	9379	33	91	148	7	151	11	6	Ixtepeque
TS-11M-S68-00-08-6	1408	499	10358	40	99	157	13	162	10	16	Ixtepeque
TS-11M-S6B-00-08-3	1257	516	9747	38	109	149	16	145	0	19	Ixtepeque
TS-11M-S6B-00-08-5	1426	549	10964	37	105	176	14	172	12	6	Ixtepeque
TS-11M-S6B-00-08-7	1343	478	10072	32	98	165	15	164	10	7	Ixtepeque
TS-11M-S6B-00-08-8	1438	570	10565	44	99	147	20	146	5	8	Ixtepeque
TS-12N-S07-U03-0-08-18	1443	608	11181	32	99	150	4	167	24	6	Ixtepeque
TS-12N-S07-U03-01-08-17	1276	325	10635	41	140	33	29	183	12	8	La Union
TS-12N-S07-U03-03-08-01	1428	473	9836	36	97	156	11	162	9	6	Ixtepeque
TS-12N-S07-U03-04-08	1449	444	10286	36	97	156	20	164	16	6	Ixtepeque
TS-12N-SO7-U03-03-08-2	1359	559	10251	41	103	163	8	156	10	8	Ixtepeque
TS-12R-S01-00-08-9	2235	523	6366	46	113	113	19	89	13	26	S M Jilotepeque-2
TS-12T-S05-00-08-2	1485	508	10299	36	93	158	16	161	12	14	Ixtepeque
TS-13M-S02-U03-01-08-24	1365	418	9666	45	83	145	17	144	16	6	Ixtepeque
TS-13M-S02-U03-01-08-25	1516	580	12067	44	119	176	19	171	8	19	Ixtepeque
TS-13M-S02-U03-02-08-22	1118	447	8463	29	93	136	20	149	0	6	Ixtepeque
TS-13M-S02-U04-01-08-13	1559	461	9365	26	96	154	7	156	9	15	Ixtepeque
TS-13M-S02-U04-01-08-14	1307	445	9716	35	98	157	11	160	5	6	Ixtepeque
TS-13M-S02-U04-01-08-15	1421	505	10620	46	99	158	12	167	2	6	Ixtepeque
TS-13M-S02-U04-01-08-16	1435	515	9854	32	96	154	11	155	0	10	Ixtepeque
TS-13M-S02-U04-03-08-19	1473	418	9989	31	95	150	10	158	33	6	Ixtepeque
TS-13M-S02-U04-03-08-20	1399	484	10198	31	102	157	18	162	7	17	Ixtepeque
TS-13M-S02-U04-03-08-21	1692	504	9098	31	90	144	17	145	10	22	Ixtepeque
TS-13T-S04-U01-01-08-11	1364	734	8379	52	144	151	17	98	7	6	El Chayal
TS-13T-S04-U03-02-08-10	1285	745	8761	71	157	155	10	118	8	12	El Chayal
RGM1-H1	1500	306	13274	34	154	113	27	223	8	14	standard
RGM1-H1	1543	285	13404	34	152	112	22	218	6	9	standard

Figure 1. Distribution of sources of archaeological obsidian in the assemblage.

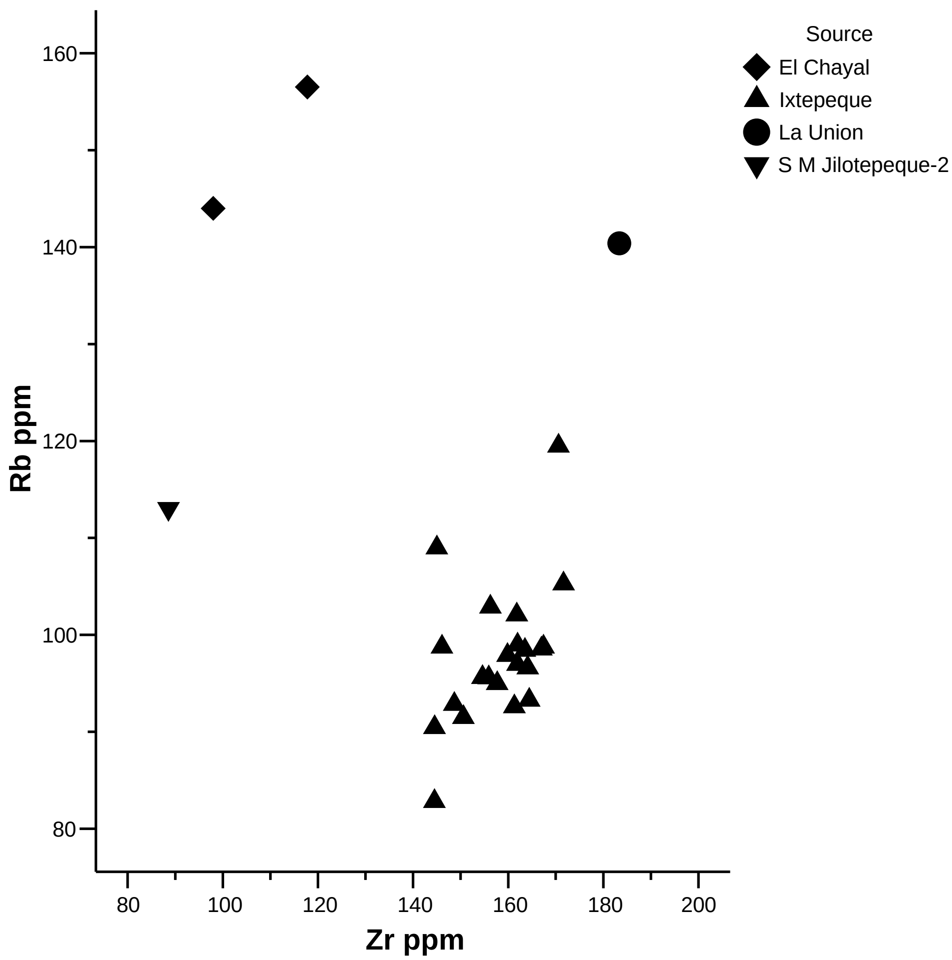

Figure 2. Rb versus Zr biplot of all the obsidian archaeological specimens.

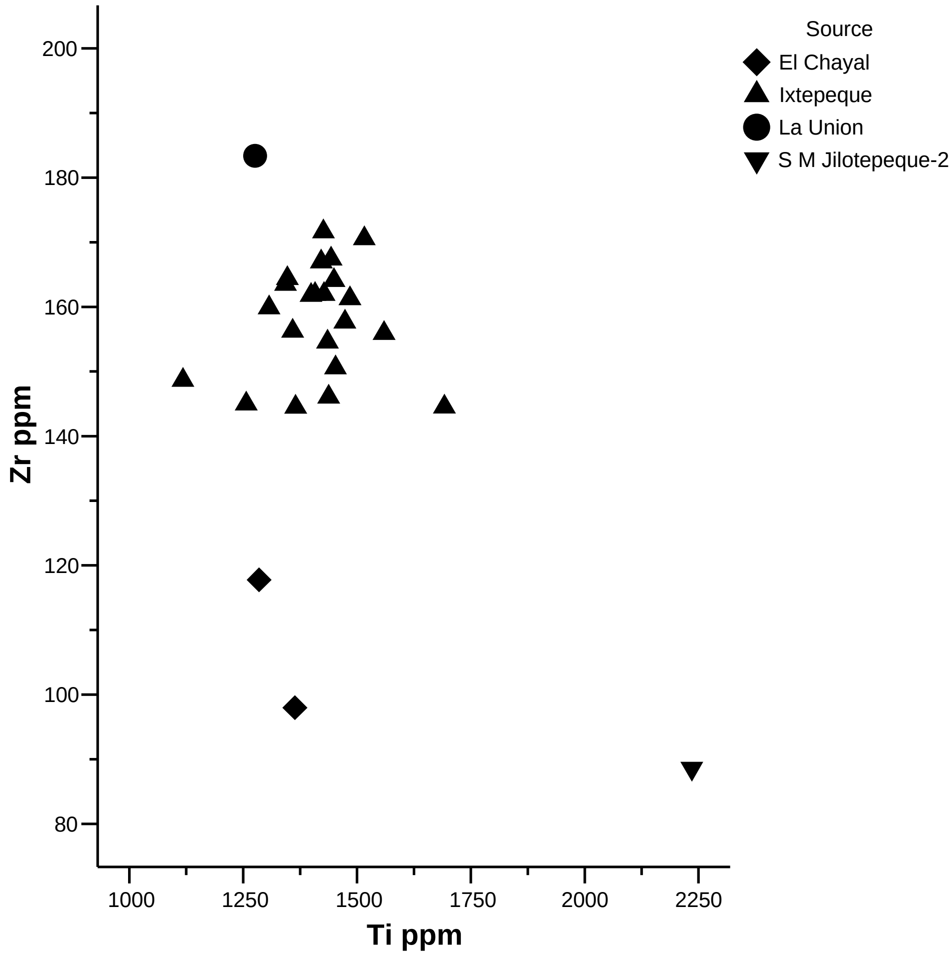

Figure 3. Ti versus Zr biplot of archaeological artifacts.