Supplemental paste composition data from the Manialtepec Basin, Oaxaca

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ABSTRACT

This data article contains archaeological context information and paste compositional data from 66 pottery sherds collected at seven archaeological sites in the Manialtepec Basin on the Pacific coast of Oaxaca, Mexico. The data include maps showing collection locations, a drawing of one archaeological profile, photographs of sherds, and compositional data produced by Instrumental Neutron Activation Analysis at the University of Missouri Research Reactor (MURR). The NAA data include a tabulation of principal components, data from log-based cluster analyses and compositional group defining discriminant analyses. The data also include bootstrapped Mahalanobis distance calculations. For data interpretation, refer to “Ceramic Production and Consumption in an In-Between Place: Instrumental Neutron Activation Analysis of Ceramics from the Manialtepec Basin of Oaxaca” [1].

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1. Data

These data include a map of the Manialtepec Basin showing the locations from which individual samples were collected (Fig. 1), a drawing of the stratigraphic profile from which samples obtained from an anthropogenic cut were collected (Fig. 2), photographs of sherds (Figs. A1–A70), and compositional data produced by Instrumental Neutron Activation Analysis (INAA) at the University of Missouri Research Reactor (MURR). The INAA data include a tabulation of principal components (Fig. 3; Table 1), data from log-based cluster analyses (Fig. 4), and compositional group defining discriminant analyses (Figs. 5 and 6; Table 2). The data also includes bootstrapped Mahalanobis distance calculations (Appendix B).

2. Experimental design, materials, and methods

2.1. Research area

The materials for this data set consisted of 66 ceramic sherds from seven archaeological sites in the Manialtepec Basin of Pacific coastal Oaxaca, Mexico. The Manialtepec Basin is a 60 km² coastal basin surrounded by the piedmont zone of the Sierra Madre del Sur mountain range and includes a 1200-ha lagoon. Two permanent rivers flow into the basin on either side of the lagoon: the Manialtepec River on the west and the Chila River on the east. Archaeological surface reconnaissance of the basin has identified 21 archaeological sites and 16 isolated surface finds of precolumbian materials dating from the Late Formative (400–150 BCE) to Late Postclassic periods (CE 1100–1522) (Fig. 1) [1]; see also [2].
Only four of these sites were larger than 25 ha in area: Bajos de Chila (288 ha), Linda Vista (115 ha), Chila Cementerio (62 ha), and Manilatepec 2 (57 ha).

2.2. Sample selection

Sample sherds were selected based on chronological sensitivity or because they appeared to be non-local to the Oaxaca coast. Sherds diagnostic of all pre-columbian time periods, based on the published ceramic chronology of the lower Río Verde valley\(^3\)\(^5\), were included. Later Formative (400 BCE – CE 250) and Late Postclassic samples were emphasized because there was a large extant database for these two time periods in the literature on Oaxacan paste composition groups. All samples were recovered either from surface collections \((n = 50; 76\%); \text{see Fig. 1}) or a cleaned and documented anthropogenic cut through pre-columbian architecture at Bajos de Chila \((n = 16; 24\%); \text{Fig. 2})\.

2.3. Sample preparation for INAA

In accordance with MURR protocols for INAA sample preparation\(^6\)\(^9\), 1 cm\(^2\) fragments were removed from each specimen using a silicon carbide burr. This removed all glaze, slip, paint, and adhering soil, thus minimizing the risk of erroneous measurement of contaminants. After removal, specimens were washed in deionized water and dried. To homogenize the specimens, each sherd fragment was then ground into a fine powder using an agate mortar and pestle and split into multiple analytical samples. When possible, a portion was archived for future research, while two analytical...
Fig. 2. Profile of the cleaned anthropogenic cut at Bajos de Chila. Samples were derived from stratum names in **bold**. Stratum 3 is the interior course of a pre-columbian retaining wall, the outer façade of which had been removed by the landowner.

Fig. 3. R–Q Mode biplot of the sample on principal component 1 and principal component 2.
The 200 mg samples in quartz vials were then subjected to a long 24-h irradiation at a neutron flux of 8 \times 10^{13} \text{ n cm}^{-2} \text{ s}^{-1} [6]. After this short irradiation, a gamma count of 720 seconds was recorded after an additional four weeks of decay to yield additional count of 8,500 seconds was recorded after an additional four weeks of decay to yield a second gamma count of 1800 seconds using a high resolution geranium detector coupled to an automatic sample changer. This count allows the recordation of seven medium half-life elements, including: arsenic (As), lanthanum (La), lutetium (Lu), neodymium (Nd), samarium (Sm), uranium (U), and ytterbium (Yb). Finally, an additional count of 8,500 seconds was recorded after an additional four weeks of decay to yield measurements of 17 long half-life elements, including: cerium (Ce), cobalt (Co), chromium (Cr), cesium (Cs), europium (Eu), iron (Fe), hafnium (Hf), nickel (Ni), rubidium (Rb), antimony (Sb), scandium (Sc), and silicon (Si). 

Table 1: Elemental loadings for the pottery sample on principal component axes 1 through 6.

| Variable | Average | PC1  | PC2  | PC3  | PC4  | PC5  | PC6  |
|----------|---------|------|------|------|------|------|------|
| Ba       | 992.571 | 0.063| 0.013| -0.152| 0.072| -0.155| -0.020|
| Al       | 100962.986| 0.029| 0.074| -0.069| 0.050| 0.014| 0.106|
| Mn       | 698.645 | -0.031| -0.154| 0.165| 0.811| 0.011| 0.038|
| Zn       | 125.273 | 0.014| 0.085| -0.085| 0.182| 0.223| 0.089|
| Na       | 12122.018| 0.022| 0.156| -0.337| 0.104| 0.469| 0.404|
| Sr       | 327.853 | 0.039| 0.017| -0.450| 0.023| -0.144| 0.111|
| Eu       | 1.412 | 0.059| -0.018| 0.029| 0.054| -0.033| -0.053|
| Ta       | 0.880 | 0.078| 0.332| 0.023| 0.116| 0.121| -0.013|
| Fe       | 43303.599| 0.089| -0.031| -0.217| 0.116| 0.042| 0.048|
| Dy       | 4.701 | 0.100| 0.143| 0.016| 0.092| 0.041| -0.109|
| K        | 17732.176| 0.116| 0.064| -0.064| -0.071| 0.017| -0.001|
| Ti       | 4699.426| 0.117| 0.009| -0.226| 0.070| 0.151| 0.012|
| Sc       | 13.819 | 0.121| -0.008| -0.111| 0.081| 0.097| -0.009|
| Tb       | 0.875 | 0.124| 0.142| 0.058| 0.136| 0.033| -0.028|
| Sm       | 6.818 | 0.149| 0.064| 0.071| 0.037| -0.104| -0.007|
| Rb       | 80.525 | 0.154| 0.148| 0.004| 0.037| 0.107| 0.036|
| Yb       | 2.408 | 0.158| 0.157| 0.029| 0.067| 0.031| -0.152|
| Lu       | 0.359 | 0.158| 0.156| -0.008| 0.063| 0.037| -0.138|
| U        | 2.470 | 0.160| 0.278| 0.003| -0.070| 0.083| 0.521|
| Co       | 12.401 | 0.168| -0.352| 0.025| 0.349| -0.083| 0.151|
| Hf       | 6.093 | 0.187| 0.235| -0.175| 0.063| -0.223| -0.457|
| Nd       | 32.011 | 0.190| 0.030| 0.106| -0.006| -0.111| -0.030|
| Zr       | 155.444| 0.192| 0.215| -0.162| 0.084| -0.166| -0.337|
| Ce       | 70.496 | 0.200| 0.021| 0.201| 0.081| -0.232| -0.047|
| La       | 33.912 | 0.217| 0.070| 0.166| -0.009| -0.208| -0.011|
| Ca       | 16209.269| 0.223| -0.030| -0.400| -0.025| 0.226| 0.055|
| V        | 86.843 | 0.245| -0.224| -0.222| 0.000| 0.256| 0.054|
| Cs       | 2.290 | 0.260| 0.205| 0.169| 0.019| 0.487| 0.046|
| Th       | 8.500 | 0.229| 0.136| 0.348| -0.112| -0.220| 0.328|
| Cr       | 46.445 | 0.526| -0.535| 0.013| -0.219| -0.075| -0.078|
| Eigenvalues: | | | | | |
| % of variation explained: | | 29.25% | 19.45% | 14.31% | 8.92% | 7.37% | 4.65% |

* Values in **bold** explain the greatest amount of variation within each component. Those in italics explain a significant portion of the variation, but less than those in bold.

After preparation, the samples were irradiated and subjected to three subsequent gamma counts. Each polyvial was sequentially irradiated through a pneumatic tube system two at a time for 5 s by a neutron flux of 8 \times 10^{13} \text{ n cm}^{-2} \text{ s}^{-1} [6]. After this short irradiation, a gamma count of 720 seconds was recorded after an additional four weeks of decay to yield a second gamma count of 1800 seconds using a high resolution geranium detector coupled to an automatic sample changer. This count allows the recordation of seven medium half-life elements, including: arsenic (As), lanthanum (La), lutetium (Lu), neodymium (Nd), samarium (Sm), uranium (U), and ytterbium (Yb). Finally, an additional count of 8,500 seconds was recorded after an additional four weeks of decay to yield measurements of 17 long half-life elements, including: cerium (Ce), cobalt (Co), chromium (Cr), cesium (Cs), europium (Eu), iron (Fe), hafnium (Hf), nickel (Ni), rubidium (Rb), antimony (Sb), scandium (Sc), and silicon (Si).
Fig. 4. Hierarchical cluster analysis.
Fig. 5. Bi-variate plot of the sample showing the chemical composition of sample on axes of Th and Cr.

Fig. 6. Bi-variate plot of the sample showing the chemical composition of sample on axes of U and Th.
Subsequently, data from all three counts were tabulated in parts per million.

2.4. Statistical analysis of INAA data

Interpretation of compositional data obtained from INAA included an array of statistical procedures discussed elsewhere \[6,9,10\e13]. In total, the gamma counts produced elemental concentration values for 33 elements. Nickel (Ni) and Arsenic (As), however, were removed from statistical analyses due to a high number of instances where concentrations fell below detection limits. All statistical analyses were then carried out on base-10 logarithms to account for differences in elemental magnitude through GAUSS 8.0 software. The dataset was initially characterized using primarily principal component analyses (PCA) (Fig. 3 and Table 1).

This information was then used in coordination with hierarchical cluster analysis (HCA) (Fig. 4), visual inspection of bivariate plots (Figs. 5 and 6), and canonical discriminant analysis (CDA) (Table 2; see also \[1\]: Fig. 3) to determine compositional groups. Bootstrapped multi-dimensional Mahalanobis distance was then calculated using principal components in adherence to the provenance postulate \[14\] (Appendix B). After discrimination of compositional groups, data was then compared to archived samples within MURR’s NAA database through visual inspection of bivariate plots (see Ref. \[1\]) and Euclidian distance searches using to assess potential provenance locales.

Table 2
Canonical discriminant analysis of identified compositional groups in manialtepec sample.

| Variable | CD1     | CD2     | CD3     | CD4     |
|----------|---------|---------|---------|---------|
| La       | 1.01013 | −0.49791| 0.03731 | −0.79517|
| Sm       | −0.94766| 0.439185 | 0.230063| −0.35269|
| Al       | −0.2924 | 0.145029 | 0.960746| −0.01059|
| Ce       | −0.36078| −0.53745 | −0.52466| 0.324969|
| Eu       | 0.556331| −0.53166 | −0.42021| 0.104332|
| Dy       | −0.3961 | 0.361694 | −0.0726 | 0.585709|
| Fe       | 0.183289| −0.68137 | −0.16741| 0.044277|
| Ta       | 0.053362| 0.501236 | 0.202153| −0.43516|
| Lu       | 0.330805| 0.546254 | 0.251123| 0.087043|
| Yb       | −0.23589| −0.57956 | −0.26365| 0.010992|
| Sc       | −0.21098| −0.35812 | −0.29294| −0.12941|
| Nd       | 0.101664| 0.435865 | −0.16689| 0.196881|
| Cr       | 0.010082| 0.196141 | 0.401964| −0.015 |
| Ti       | 0.043809| −0.25669 | −0.36154| 0.005561|
| Na       | −0.03503| 0.242598 | −0.20937| −0.03031|
| Cs       | 0.217389| 0.095078 | −0.04972| 0.200604|
| Zn       | −0.03008| 0.227572 | 0.192117| −0.00972|
| K        | 0.0658  | −0.25037 | −0.13574| −0.05636|
| Rb       | −0.19079| −0.08245 | −0.1731 | −0.11536|
| Th       | 0.146437| 0.089392 | −0.000248| 0.208651|
| Tb       | 0.155683| 0.138913 | 0.134585| −0.10172|
| Ba       | −0.05615| 0.138325 | −0.02458| 0.158131|
| Ca       | −7.7E-05| 0.041462 | 0.193157| −0.07456|
| Sr       | 0.123788| −0.10937 | −0.11089| −0.00491|
| Co       | 0.127855| −0.111    | −0.10133| −0.00744|
| Hf       | −0.14991| 0.021014 | 0.073442| 0.086472|
| Mn       | −0.04666| 0.101769 | 0.099362| −0.00932|
| U        | 0.034065| 0.038021 | 0.008713| 0.106311|
| Zr       | 0.040956| −0.05674 | 0.035313| 0.083834|
| V        | −0.0686 | 0.001351 | −0.0157 | 0.068594|

Total variance explained: 53.58% 33.73% 11.11% 1.57%

Wilk’s lambda: 0.000227
Approx. F: 5.924415
p-value: 1.1E-17
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Transparency document

Transparency document related to this article can be found online at dhttps://doi.org/10.1016/j.dib.2019.103805

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dib.2019.103805.

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