*Supplemental Materials*

For supplemental material accompanying this article, visit www.journals.cambridge.org/[AdvancesinArchaeologicalPractice].”

**Supplemental Figure Captions**

Supplemental Figure 1. Comparison of whole rock pXRF results and XRF results on powdered samples. Rb, Sr, and Y provided results with high r2 values and were statistically significant. Full list of Rb, Sr, and Y values are list in Supplemental Table 2 (from Tibbits 2016:55).

Supplemental Figure 2. The results of the Monte Carlo Simulation as shown by a bivariate chart. The average for n=5 is shown in red as a diamond. The average obtained by 5 random data points over 1000 simulations for Rb, Sr, and Y is always within one standard deviation of the average for 50 data points run through 1000 simulations (from Tibbits 2016:194).

Supplemental Figure 3. Calibration curves for all analyzed geochemical standard materials. Several elements were accurately and precisely analyzed without the need for a curve. The blue line represents all analyses taken from 2013 until the end of the 2015 season. The orange line represents the newest data obtained from the pXRF after routine maintenance and a software upgrade. Note that several of the r2 values were strengthened by the update. Al2O3, SiO2, MnO, TiO2, and Th were consistently beyond the range of expected variation for most geologic reference materials (from Tibbits 2016:195).

Supplemental Figure 1.

Supplemental Figure 2.



Supplemental Figure 3.

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**Supplemental Tables**

Supplemental Table 1. Sites and References for Table 1.

|  |  |  |  |
| --- | --- | --- | --- |
| Region  | Most common source for finished materials | Sites (Projects) | References |
| Northern Belize | Presumed\* local sedimentary rock (e.g., limestone), semi-local granite and non-local basalt less common, mostly metates | Altun Ha | Abramiuk and Meurer (2006) |
|  |  | Aventura | Sidrys and Andresen (1976) |
|  |  | Caye Coco  | Delu (2007:69). *Note:* majority GST semi-local with significant local manos and significant non-local metates |
|  |  | Cerros  | Garber (1989). *Note:* majority GST semi-local metamorphic quartzite and limestone |
|  |  | Chac Balam | Garber (1995), Guderjan (1995) |
|  |  | K’axob | McAnany and Ebersole (2004:325) |
|  |  | Laguna de On | Delu (2007:26) |
|  |  | Lamanai (Lamanai Archaeology Project) | Abramiuk and Meurer (2006), Graham (2015, 2016), Simmons (2004, 2006). *Note:* limestone, basalt, and granite all present in significant proportions |
|  |  | La Milpa and Dos Hombres  | Tibbits (2016:84) |
|  |  | Nohmul | Abramiuk and Meurer (2006) |
|  |  | San Estevan | Levi (1993). *Note:* basalt and granite also make up a significant portion of this assemblage |
|  |  | San Juan | Garber (1995:116), Guderjan (1995) |
|  |  | Santa Rita Corozal | Duffy (2011), Jaeger et al. (1988) |
| Upper Belize Valley | Local granite, some non-local basalt, and local/semi-local limestone, sandstone, andesite | Baking Pot, Cahal Pech, Lower Dover, Barton Ramie, Xunantunich (Belize Valley Archaeological Reconnaissance Project) | see e.g., Helmke and Awe (2006, 2008), Hoggarth and Awe (2009, 2010, 2011, 2014, 2015, 2016), Hoggarth et al. (2012, 2013), Ebert et al. (2017, 2018, 2019, 2020), Peniche May (2016), older samples also summarized in Abramiuk and Meurer (2006) |
|  |  | Blackman Eddy (Blackman Eddy Archaeological Project) | Garber et al. (1992, 1993, 1995, 2002) |
|  |  | Pacbitun (Pacbitun Regional Archaeology Project) | Skaggs et al. (2020), Ward (2013) |
| Middle Belize Valley | Semi-local granite | Hats Kaab, Hum Chaak, Ik’nal, Kaax Tsaabil, Ma’xan (Belize River East Archaeology Project) | Brouwer Burg et al. (2016), Harrison-Buck (ed.) 2013, Tibbits (2015a, 2016) |
| Maya Mountains | Local granite, limestone, quartzite, and non-local basalt common | Caracol (Caracol Archaeological Project) | Chase and Chase (2005:Figure 54B, 2006:Figure 34B, 2008:Figure 26, 2012:23, 2015:22-23, 2016:163, 2017:Figure 32I), Chase et al. (2019:Figures 31, 75, 76, 82) |
| Sibun Valley | Non-local basalt, then semi-local granite | Augustine Obispo, Samuel Oshon, Cedar Bank, Hershey, Queso Blanco, Actun Chanona, Arch Cave (Xibun Archaeological Research Project) | Thibodeau (2004:243, Table 17.1) |
| Southern Belize | Non-local basalt, local granite, other local volcanics | Lubaantun | Abramiuk and Meurer (2006:347). *Note:* non-local, vesicular basalt |
|  |  | Alabama (Stann Creek Regional Archaeology Project) | Peuramaki-Brown (2016). *Note:* local Cockscomb Basin granite |
|  |  | Ek Xux, Muklebal Tzul, Quebrada de Oro | Abramiuk and Meurer (2006). *Note:* local Bladen group volcanics |

*\*Sedimentary tool stone from northern Belize has not been tested, so is presumed to be local.*

Supplemental Table 2. Observed Average Modal Abundances of Mountain Pine, Hummingbird, and Cockscomb Granites (from Tibbits 2016:48).

|  |  |  |  |
| --- | --- | --- | --- |
| Pluton  | Major Minerals | Accessory Minerals | Additional Minerals |
| MPR | Quartz: 25%Plagioclase: 30%K-Spar: 35% | Biotite, chlorite, muscovite, apatite, Fe-Ti oxides (approx. total 10%) | --- |
| HBR | Quartz: 30%Plagioclase: 25%K-Spar: 30% | Muscovite > biotite, chlorite, apatite, Fe-Ti oxides (approx. total 15%) | --- |
| CCB | Quartz: 25%Plagioclase: 30%K-Spar: 30% | Biotite > muscovite, chlorite, margarite, Fe-Ti oxides (approx. total 15%) | Bateson and Hall (1977) report monazite and rutile |

Supplemental Table 3. Comparison of Values Obtained on Known Granite Geologic Reference Materials AC-E and GS-N (from Tibbits 2016:52).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Rb/Sr | Sr/Y | Al2O3 | K2O | MnO | P2O5 | SiO2 | TiO2 | Zn | Y | Sr | Rb | Zr |
| AC-E\* | 54.29 | 0.015 | 14.70 | 4.49 | 0.06 | 0.01 | 70.35 | 0.11 | 224 | 184 | 2.8 | 152 | 780 |
| AC-E,n = 31 | 130.5 | 0.006 | 14.05 | 4.82 | 0.07 | 0.16 | 55.59 | 0.68 | 252 | 190 | 1.5 | 151 | 822 |
| Standard deviation | -- | -- | 0.38 | 0.17 | 0.003 | 0.017 | 24.3 | 1.28 | 9.0 | 1.28 | 1.5 | 2.12 | 10.3 |
| GS-N\* | 0.32 | 35.6 | 14.90 | 4.63 | 0.06 | 0.28 | 65.80 | 0.68 | 48 | 16 | 570 | 185 | 235 |
| GS-N, n = 44 | 0.31 | 32.9 | 15.1 | 4.94 | 0.05 | 0.21 | 54.05 | 1.2 | 55 | 18 | 607 | 188 | 219 |
| Standard deviation over time | -- | -- | 1.53 | 0.25 | 0.005 | 0.04 | 21.4 | 1.37 | 8.7 | 1.8 | 9.4 | 4.6 | 6.6 |
| GS-Nstandard deviation repeated run  | -- | -- | 0.25 | 0.04 | 0.00 | 0.01 | 0.7 | 0.03 | 4.8 | 1.5 | 6.4 | 2.8 | 5.0 |
| AGV-2standard deviation repeated run | -- | -- | 0.22 | 0.02 | 0.00 | 0.01 | 0.38 | 0.03 | 4.6 | 1.5 | 5.3 | 2.0 | 3.2 |

\* = values obtained from results published on GeoReM. The other value is the average of multiple runs over time. Major elements are shown in percent oxide. Minor and trace elements are shown in ppm. Experimental data shown are from a year of analyses. The standard deviation for running these analyses on GS-N on repeat 25 times consecutively are included to demonstrate the consistency within a run. Results shown here are representative of the results for all geologic reference materials measured during this project (complete list in Tibbits 2016:Appendix B).

Supplemental Table 4. Comparison of pXRF and lLab-Based XRF Techniques Showing Rb, Sr, and Y Results (from Tibbits 2016:56).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Sample | Analysis | Rb, ppm | Sr, ppm | Y, ppm | Sr/Y | Rb/Sr |
| CS 5-28-5 | Whole Rock, pXRF  | 151 | 201 | 17 | 0.7 | 11.9 |
| Powdered Sample, pXRF  | 154 | 227 | 22 | 0.7 | 10.3 |
| Powdered Sample, XRF  | 152 | 230 | 24 | 0.7 | 9.5 |
| CS Aug Cr | Whole Rock, pXRF  | 139 | 196 | 41 | 0.7 | 4.8 |
| Powdered Sample, pXRF  | 168 | 184 | 29 | 0.9 | 6.3 |
| Powdered Sample, XRF  | 179 | 197 | 46 | 0.9 | 4.2 |
| HB-HRQ | Whole Rock, pXRF  | 276 | 46 | 10 | 6.0 | 4.6 |
| Powdered Sample, pXRF  | 273 | 48 | 10 | 5.7 | 4.8 |
| Powdered Sample, XRF  | 299 | 54 | 14 | 5.5 | 4.0 |
| HB-MC | Whole Rock, pXRF  | 296 | 74 | 16 | 4.0 | 4.5 |
| Powdered Sample, pXRF  | 339 | 76 | 22 | 4.5 | 3.4 |
| Powdered Sample, XRF  | 324 | 79 | 26 | 4.1 | 3.0 |
| HB-Teak | Whole Rock, pXRF  | 212 | 106 | 17 | 2.0 | 6.4 |
| Powdered Sample, pXRF\*  | 173 | 119 | 20 | 1.4 | 5.9 |
| Powdered Sample, XRF\* | 234 | 104 | 24 | 2.2 | 4.3 |
| HB-Teak-D | Whole Rock, pXRF  | 57 | 210 | 20 | 0.3 | 10.4 |
| Powdered Sample, pXRF  | 87 | 225 | 24 | 0.4 | 9.4 |
| Powdered Sample, XRF  | 88 | 233 | 28 | 0.4 | 8.4 |
| MPR 6-4-2 | Whole Rock, pXRF  | 297 | 28 | 61 | 10.6 | 0.5 |
| Powdered Sample, pXRF  | 355 | 47 | 79 | 7.5 | 0.6 |
| Powdered Sample, XRF  | 341 | 34 | 64 | 9.9 | 0.5 |
| MPR BP | Whole Rock, pXRF  | 252 | 18 | 19 | 14 | 0.9 |
| Powdered Sample, pXRF  | 362 | 29 | 42 | 12.5 | 0.7 |
| Powdered Sample, XRF  | 371 | 31 | 51 | 12 | 0.6 |
| MPR-BRF | Whole Rock, pXRF  | 312 | 37 | 38 | 8.4 | 1.0 |
| Powdered Sample, pXRF  | 327 | 38 | 38 | 8.6 | 1.0 |
| Powdered Sample, XRF  | 340 | 45 | 47 | 7.8 | 0.9 |
| RC-1 | Whole Rock, pXRF  | 284 | 45 | 53 | 6.3 | 0.9 |
| Powdered Sample, pXRF  | 313 | 61 | 45 | 5.1 | 1.4 |
| Powdered Sample, XRF  | 331 | 67 | 52 | 5.0 | 1.3 |
| RC-3 | Whole Rock, pXRF  | 135 | 148 | 35 | 0.9 | 4.3 |
| Powdered Sample, pXRF  | 122 | 134 | 35 | 0.9 | 3.8 |
| Powdered Sample, XRF  | 140 | 154 | 40 | 0.9 | 3.8 |
| SR-1 | Whole Rock, pXRF  | 117 | 140 | 22 | 0.8 | 6.4 |
| Powdered Sample, pXRF  | 140 | 148 | 29 | 1.0 | 5.1 |
| Powdered Sample, XRF  | 150 | 158 | 37 | 1.0 | 4.2 |
| SR-2 | Whole Rock, pXRF  | 115 | 183 | 28 | 0.6 | 6.5 |
| Powdered Sample, pXRF  | 130 | 175 | 38 | 0.7 | 4.6 |
| Powdered Sample, XRF  | 128 | 185 | 49 | 0.7 | 3.7 |
| WP-13 | Whole Rock, pXRF  | 380 | 24 | 37 | 15.6 | 0.7 |
| Powdered Sample, pXRF  | 416 | 28 | 66 | 14.9 | 0.4 |
| Powdered Sample, XRF  | 419 | 34 | 72 | 12.2 | 0.4 |

\* = only instances in which Spearman’s *rho* and the Pearson correlation value were not statistically significant at the 0.01 level for a two-tailed analysis.

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