

Site	Lat	Long	Source
Battonya-Vertán	46°21'45.74"N	20°58'44.05"E	Localized on Google Earth by comparison to military ordinance maps with field names listed
Békés Jégvermi-kert	46°47'46.61"N	21° 7'3.32"E	Approximate center point of site area, coordinates taken from Google Earth
Békés-Várdomb	46°47'37.48"N	21°17'12.32"E	Point at center of tell, coordinates from Google Earth
Berettyóújfalu-Herpály-Földvár	47°13'27.85"N	21°33'38.61"E	Point at center of tell, coordinates from Google Earth
Cornești-Iarcuri	45°55'58.21"N	21°14'16.53"E	Point at center of enclosures, coordinates from Google Earth
Füzesabony-Öregdomb	47°44'8.92"N	20°25'19.25"E	localized on Google Earth based on map in Horváth et al. 2016
Kakucs-Turján	47°13'15.74"N	19°20'29.70"E	Localized on Google Earth based on map in Staniuk et al. 2021
Kiszombor-Új-Élet Tsz	46°11'14.01"N	20°25'29.38"E	Center of town of Kiszombor
Klárafalva-Hajdova	46°13'18.37"N	20°19'29.56"E	Center of town of Klárafalva
Pecica "Șanțul Mare"	46° 9'8.85"N	20°59'9.22"E	Point at center of tell, coordinates from Google Earth
Százhalmobatta-Földvár	47°20'22.66"N	18°56'46.41"E	Point at center of tell, coordinates from Google Earth
Türkeve-Terehalom	47° 3'44.55"N	20°46'48.71"E	Point at center of tell, coordinates from Google Earth
Vésztő-Mágor	46°56'49.90"N	21°11'47.98"E	Point at center of tell, coordinates from Google Earth

Table S1. Site coordinates

	Average	%RSD		Average	%RSD		Average	%RSD
Li	139	4%	Cu	32	27%	Eu	1.6	18%
Be	3.2	9%	Zn	129	17%	Gd	6.0	14%
B	122	12%	Rb	175	5%	Tb	0.99	16%
Na	1645	15%	Sr	68	8%	Dy	5.5	16%
Mg	9390	5%	Y	27	18%	Ho	1.2	15%
Al	94481	6%	Zr	142	20%	Er	2.97	14%
Si	304412	2%	Nb	22	12%	Tm	0.66	27%
K	33101	5%	Mo	1.3	17%	Yb	3.31	15%
Ca	1417	32%	Sn	3.8	10%	Lu	0.57	17%
Sc	19	7%	Sb	1.9	69%	Hf	5.1	28%
Ti	6488	11%	Cs	9.6	6%	Ta	1.8	15%
V	231	6%	Ba	594	4%	W	3.7	25%
Cr	91	4%	La	39	13%	Pb	16.2	15%
Mn	327	17%	Ce	95	13%	Th	13.2	9%
Fe	65905	15%	Pr	9.8	15%	U	2.96	11%
Co	23	5%	Nd	35	14%			
Ni	75	4%	Sm	7.2	14%			

Table S2. Mean and % relative standard deviations based on repeated (n=50) measurements of New Ohio Red Clay (NORC) during LA-ICP-MS analyses of ceramics and clays. Concentrations are expressed in parts per million (ppm).

Fabric group	Samples	Raw material (general)	Amount of non-plastic inclusions	Sorting of natural non-plastics	Amount of calcareous inclusions	Added tempering material
1	Bowl (2, 12, 19, 23, 32, 36, 37, 56, 60, 77?) Jug (3, 13, 44, 64, 86) Lid (68) Miniature vessel (24) Mug (5, 25, 28, 33, 47, 51, 61, 75, 80) Storage vessel (8, 9, 17, 26, 34, 35, 38) Urn (1, 4, 11, 15, 29, 30, 40, 45, 55, 57, 62, 83) Urn or bowl (59) Undiagnostic (58, 92, 93, 94, 95, 96, 97, 98, 99, 101, 102, 103, 104, 105, 106)	VF(-F)	VF: mod-com F: ra M: ra-sp	well-sorted	<1%	grog (ra, sp)
2	Urn (21)	VF(-F)	VF: com F: ra	well-sorted	<u>ra</u>	grog (mod)
3	Bowl (10, 14, 20, 41, 42, 50, 76?) Jug (6, 54, 66, 73, 82, 84) Lid (46) Miniature vessel (67) Mug (43, 48, 72) Storage vessel (18, 27, 69) Urn (22, 39, 52, 63, 65, 70, 74, 79, 81, 85, 87, 89) Undiagnostic (88, 90, 100)	VF-F	VF: mod-com F: (ra)-sp-mod M: ra-sp	moderately-sorted	<1%	grog (ra-sp)
4	Bowl (71) Storage vessel (7) Urn (78)	VF-F	VF: mod-com F: ra-sp M: ra	moderately-sorted	<u>sp</u>	grog (ra)
5	Urn (53)	VF-F	VF: com F: sp M: ra	moderately-sorted	<u>sp</u> <u>+ calcareous matrix</u>	grog (sp)
6	Urn (31)	VF-F-M	VF: mod F: sp M: sp	poorly-sorted	<u>sp</u> <u>+ calcareous matrix</u>	grog (ra)

Supplemental table S3. Detailed results of petrographic fabric group assignments.

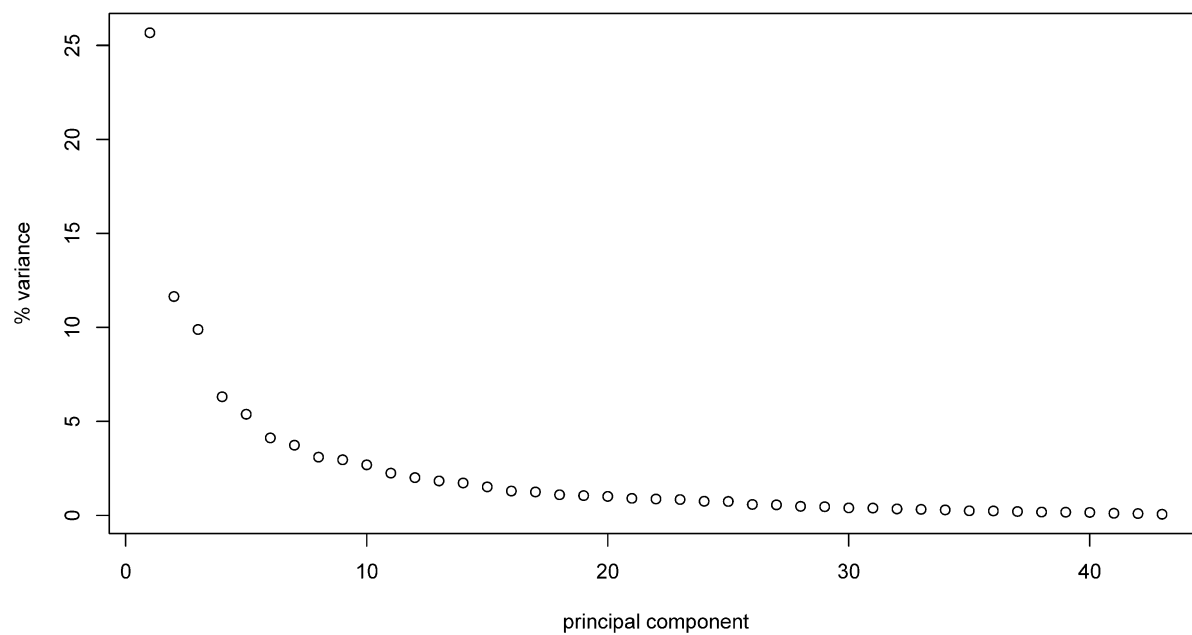


Figure S1. Screeplot of percent variance expressed on each extracted principal component.

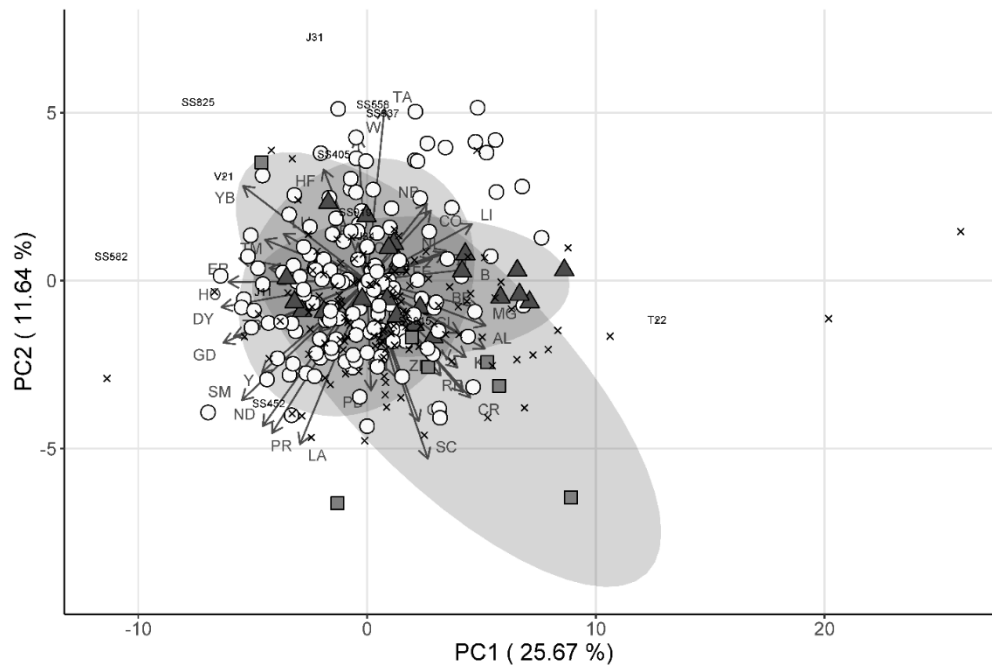


Figure S2. R-Q mode biplot of principal components 1 and 2 with ceramics samples plotted by chemical group surrounded by 90% confidence ellipses. Outlier sherds are indicated by sample number, while clay samples are represented by (x).

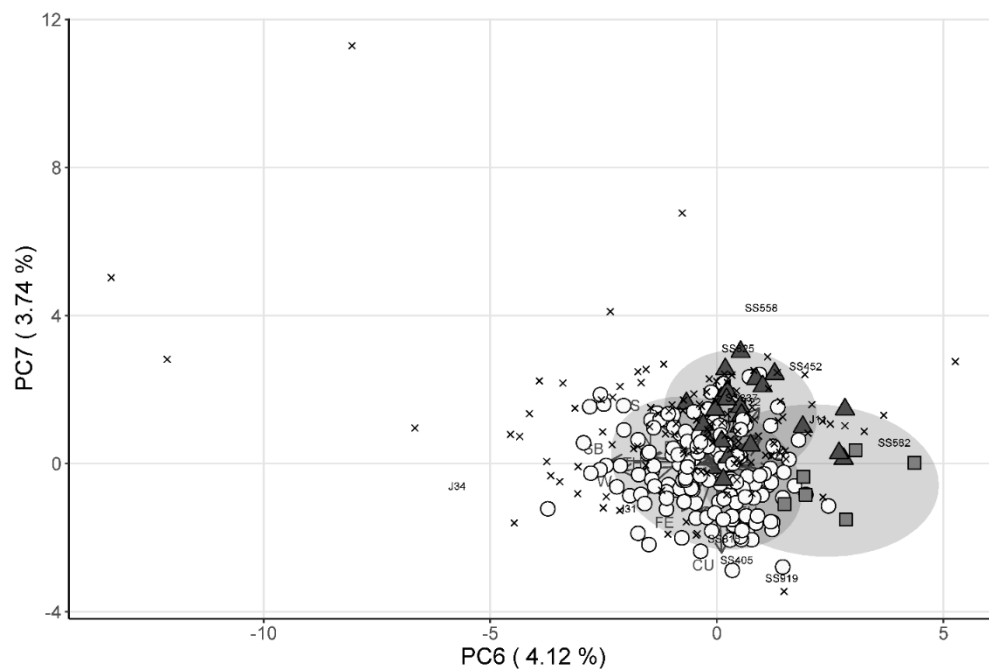


Figure S3. R-Q mode biplot of principal components 6 and 7 with ceramics samples plotted by chemical group surrounded by 90% confidence ellipses. Outlier sherds are indicated by sample number, while clay samples are represented by (x).

ID	Assigned	Group A	Group T	ID	Assigned	Group A	Group T	ID	Assigned	Group A	Group T
H1	Group A	92.162	4.45	M4	Group A	62.609	29.217	V4	Group A	73.071	0.08
H10	Group A	4.464	0.712	M5	Group A	78.11	23.054	V5	Group A	76.902	5.363
H11	Group A	1.372	1.911	M6	Group A	86.155	1.101	V6	Group A	92.169	3.968
H15	Group A	8.045	0.088	M7	Group A	30.167	0.063	V7	Group A	79.643	0.176
H16	Group A	92.628	0.59	M8	Group A	96.47	51.331	V8	Group A	71.306	0.223
H18	Group A	1.564	0.007	M9	Group A	76.389	6.339	V9	Group A	71.219	0.321
H19	Group A	30.941	2.821	SS1071	Group A	4.45	0	T1	Group T	0.668	33.181
H2	Group A	99.773	13.836	SS306	Group A	12.178	0	T11	Group T	10.274	0.282
H20	Group A	39.428	12.303	SS309	Group A	11.67	0	T12	Group T	37.88	66.596
H21	Group A	54.225	11.022	SS312	Group A	9.887	0	T13	Group T	11.826	80.887
H22	Group A	14.955	2.087	SS316	Group A	2.429	0	T14	Group T	49.84	46.397
H23	Group A	47.42	1.689	SS328	Group A	12.604	0	T15	Group T	33.438	59.859
H24	Group A	55.669	0.047	SS350	Group A	13.74	0	T16	Group T	18.316	8.299
H25	Group A	40.647	0.103	SS355	Group A	3.931	0	T17	Group T	7.785	2.746
H3	Group A	49.941	24.898	SS358	Group A	20.362	0	T18	Group T	15.218	20.045
H4	Group A	23.8	17.641	SS361	Group A	48.818	0	T19	Group T	29.444	96.727
H5	Group A	23.208	64.233	SS366	Group A	15.973	0.004	T2	Group T	3.418	45.666
H9	Group A	15.483	11.17	SS399	Group A	33.419	0.031	T20	Group T	39.504	81.843
J1	Group A	31.368	0.005	SS403	Group A	9.189	0	T21	Group T	0.022	48.03
J10	Group A	75.196	0.733	SS407	Group A	14.731	0	T23	Group T	1.751	16.313
J12	Group A	97.316	13.83	SS410	Group A	94.848	0.004	T24	Group T	2.174	38.842
J13	Group A	71.634	0.013	SS416	Group A	14.255	0	T25	Group T	6.727	90.802
J14	Group A	30.238	1.67	SS429	Group A	78.27	0	T3	Group T	77.502	62.316
J15	Group A	58.979	0.247	SS435	Group A	22.35	0	T4	Group T	40.405	16.87
J16	Group A	96.999	0.002	SS439	Group A	17.344	0.015	T5	Group T	10.08	77.737
J17	Group A	74.824	0.018	SS468	Group A	7.87	0	T6	Group T	49.869	98.161
J18	Group A	97.3	0.045	SS471	Group A	59.572	0	T7	Group T	0.768	60.541
J19	Group A	94.037	3.672	SS486	Group A	98.712	0.003	T8	Group T	91.942	52.142
J2	Group A	5.872	7.287	SS511	Group A	29.05	0	T9	Group T	9.046	69.852
J20	Group A	60.419	0.002	SS516	Group A	52.589	0.004	H12	Group B	3.677	0.343
J21	Group A	25.15	0.012	SS547	Group A	40.119	0	H13	Group B	2.864	0.105
J22	Group A	19.333	0	SS555	Group A	66.132	0	H14	Group B	0	0.002
J23	Group A	94.893	0.015	SS564	Group A	40.59	0	H17	Group B	0	0
J24	Group A	99.92	0.022	SS572	Group A	96.53	0.033	H6	Group B	5.194	0.106
J25	Group A	5.348	0	SS587	Group A	23.856	0.005	H7	Group B	0	0.012
J26	Group A	59.805	0	SS593	Group A	38.539	0	H8	Group B	1.118	0.012
J27	Group A	2.041	0	SS593B	Group A	92.982	0	J11	unassigned	2.197	0.04
J28	Group A	76.625	7.323	SS597	Group A	58.26	0	J31	unassigned	0.019	0
J29	Group A	1.534	0.001	SS604	Group A	62.102	0.001	J34	unassigned	0.053	0.004
J3	Group A	20.573	0.761	SS605	Group A	0.17	0.001	SS325	unassigned	0.001	0
J30	Group A	79.798	6.063	SS610	Group A	5.807	0	SS337	unassigned	0.022	0
J32	Group A	92.88	5.039	SS614	Group A	39.656	0	SS405	unassigned	0.469	0
J33	Group A	6.311	0.013	SS616	Group A	18.37	0	SS452	unassigned	0.026	0

ID	Assigned	Group A	Group T	ID	Assigned	Group A	Group T	ID	Assigned	Group A	Group T
J35	Group A	19.358	0.005	SS618	Group A	15.376	0.084	SS558	unassigned	0	0
J36	Group A	85.206	0.115	SS620	Group A	39.471	0	SS582	unassigned	0.003	0.001
J37	Group A	98.193	0.03	SS622	Group A	56.241	0.022	SS815	unassigned	0.192	0
J38	Group A	91.03	0.012	SS624	Group A	51.046	1.76	SS919	unassigned	0.622	0
J39	Group A	62.81	0.002	SS692	Group A	21.358	0	T22	unassigned	0	1.908
J4	Group A	98.195	38.693	SS762	Group A	0.856	0.029	V21	unassigned	0.007	0.003
J40	Group A	75.804	0.001	SS782	Group A	15.537	0				
J5	Group A	87.223	4.274	SS784	Group A	30.65	0				
J6	Group A	67.544	2.533	SS817	Group A	2.239	0				
J7	Group A	93.309	0.31	SS818	Group A	36.136	0				
J8	Group A	65.666	0.84	SS938	Group A	37.993	0.009				
J9	Group A	77.284	0.01	SS952	Group A	21.791	0				
M1	Group A	97.765	0.427	SS955	Group A	60.587	0.001				
M10	Group A	69.693	10.232	V1	Group A	48.239	4.307				
M11	Group A	95.576	5.621	V10	Group A	92.026	0.249				
M12	Group A	83.244	40.17	V11	Group A	75.446	2.429				
M13	Group A	70.78	0.628	V12	Group A	83.475	1.425				
M14	Group A	88.46	1.071	V13	Group A	89.408	0.053				
M15	Group A	80.97	15.826	V14	Group A	42.075	0.116				
M16	Group A	38.494	1.288	V15	Group A	4.826	0				
M17	Group A	40.135	0.284	V16	Group A	49.885	0.022				
M18	Group A	93.634	0.624	V17	Group A	29.924	0.043				
M19	Group A	65.652	15.79	V18	Group A	22.421	0				
M2	Group A	90.732	0.977	V19	Group A	35.548	0.219				
M20	Group A	69.582	4.238	V2	Group A	63.989	0.61				
M21	Group A	77.258	10.282	V20	Group A	75.769	0.317				
M22	Group A	46.938	7.266	V22	Group A	6.597	0.003				
M23	Group A	58.5	6.706	V23	Group A	13.795	4.081				
M24	Group A	61.058	0.853	V24	Group A	57.472	0.931				
M25	Group A	86.817	1.064	V25	Group A	61.323	1.309				
M3	Group A	97.457	6.762	V3	Group A	77.164	7.365				

Table S4. Mahalanobis distance-based probabilities (based on first ten principal components) of membership for ceramics compared to chemical groups A and T.

Linear regression results

Clays

Residuals:

Min	1Q	Median	3Q	Max
-0.7174	-0.2244	-0.0666	0.1618	1.6004

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.6724721	0.0065685	102.4	<2e-16 ***
clay.dist\$geo	0.0035481	0.0000791	44.8	<2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.324 on 9118 degrees of freedom
Multiple R-squared: 0.181, Adjusted R-squared: 0.181
F-statistic: 2.01e+03 on 1 and 9118 DF, p-value: <2e-16

All Bronze Age ceramics compared to clays

Residuals:

Min	1Q	Median	3Q	Max
-0.706	-0.185	-0.042	0.134	1.413

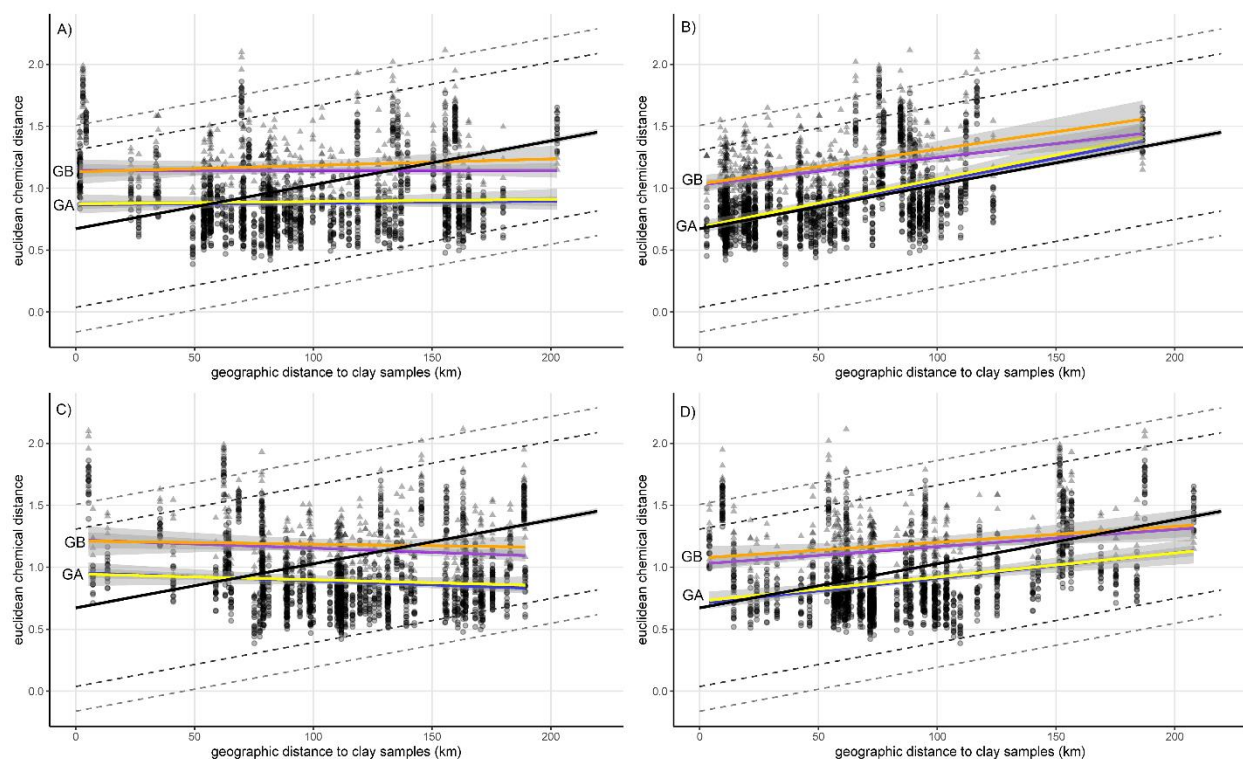
Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.7248630	0.0035079	206.6	<2e-16 ***
ba.dist\$geo	0.0034123	0.0000527	64.7	<2e-16 ***

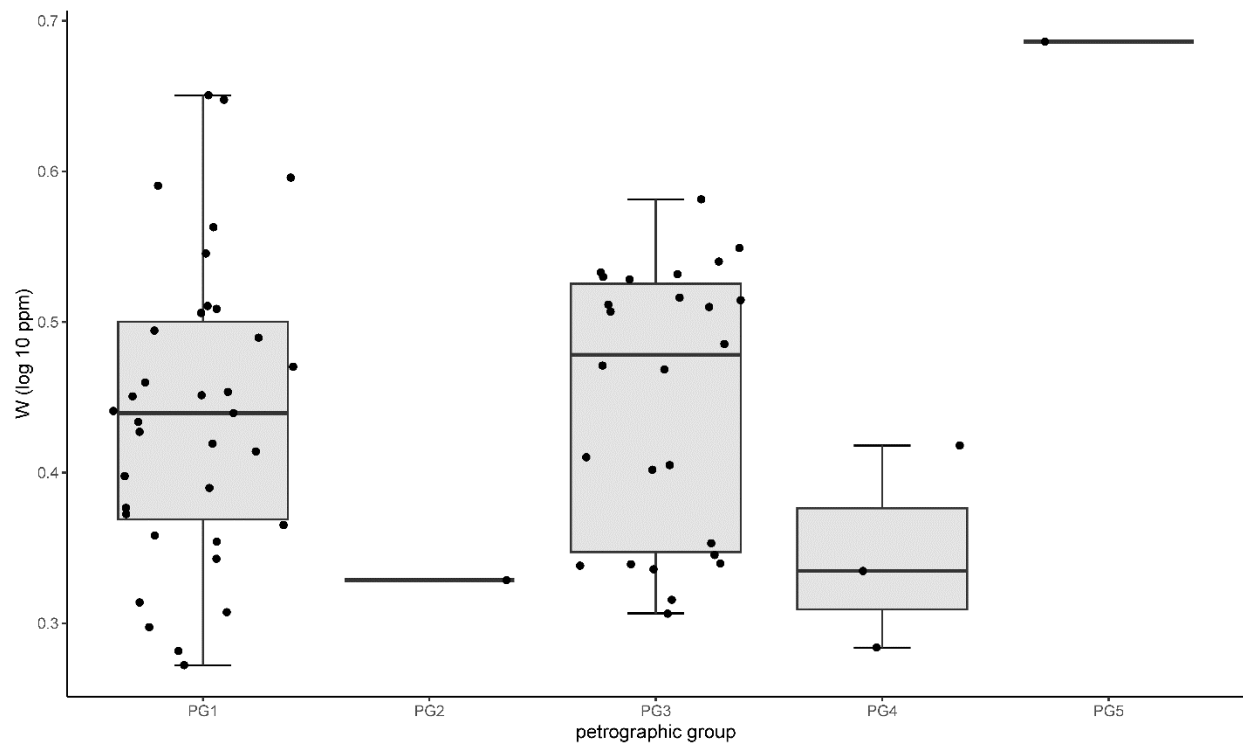
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.27 on 19006 degrees of freedom
Multiple R-squared: 0.181, Adjusted R-squared: 0.18
F-statistic: 4.19e+03 on 1 and 19006 DF, p-value: <2e-16

Supplemental table S5. Results of linear regressions between pair-wise Euclidean chemical distance and geographic distance for clays compared to clays, and for ceramics compared to clays.



Supplemental figure S4. Linear regression comparisons of ceramic-clay pair wise Euclidean distances and geographic distances for Berettyóújfalu-Herpály-Földvár when the site is placed at a variety of false geographic coordinates: A) c. 25km northwest from true location, near Debrecen; B) c. 50km south from true location in Körös drainage near Véstő; C) c. 80km northwestern from true location, far northern GHP near Jánoshida; D) c. 125km south from true location, far southern GHP (Maros fan in Romania). Regressions lines are shown for Group A fineware (blue) and coarseware (yellow) and Group B fineware (purple) and coarseware (orange).



Supplemental figure S5. Box and whisker plots of W concentrations measured in ceramics from Békés Jégvermi-kert divided by petrographic group. The vessel assigned to petrographic group 6 was not included in the LA-ICP-MS sample.