Supplementary material

S1. Clay samples

Table S1 gives a short description of the raw material samples collected for this study. Figure S1 presents the plot of the clay samples when projected onto the PCA biplot carried out in this analysis. Note that the clay samples are only supplementary individuals and therefore do not impact the PCA analysis.

	Location	Island	Type of raw material
DLA.A	Kalanka, Delimara	Malta	Red soil, erosion of Globigerina limestone
FC.A	Fort Chambray, Għajnsielem	Gozo	Blue Clay, sample from slope
GH.A	Gelmus Hill, Rabat	Gozo	Blue Clay, sample from hill (elevation: 85m)
GH.B	Gelmus Hill, Rabat	Gozo	Blue Clay, sample from hill, mid-slope (Asciak 2019, 54, sample 1)
GH.C	Gelmus Hill, Rabat	Gozo	Blue Clay, sample from hill (elevation: 100m), close to the Greensand layer (Asciak 2019, 54, sample 2)
GNB.B	Ġnejna Bay, Mġarr	Malta	Marly interbed from slope, within Globerigina limestone
GNB.D	Ġnejna Bay, Mġarr	Malta	Blue Clay from slope
GNB.E	Ġnejna Bay, Mġarr	Malta	Marly interbed within Globigerina limestone
GT.A	Għajn Tuffieħa, Mġarr	Malta	Blue Clay (elevation: 31m) from densely vegetated area
GT.B	Għajn Tuffieħa, Mġarr	Malta	Blue Clay (elevation: 28 m)
LP.A	Ta' Lippija, Mġarr	Malta	Terra Rossa, Upper Coralline Limestone
LP.E	Ta' Lippija, Mġarr	Malta	Terra Rossa, Upper Coralline Limestone
MG.A	Imġiebaħ, Selmun	Malta	Blue Clay? Clayey deposit, both Globigerina marl and Blue Clay present
MG.B	Imġiebaħ, Selmun	Malta	Blue Clay? Clayey deposit, both Globigerina marl and Blue Clay present
MX.A	Marsaxlokk	Malta	Soil eroded from Middle Globigerina marl
MX.D	Marsaxlokk	Malta	Soil eroded from Middle Globigerina marl, waterlogged
NF.A	In-Nuffara, Nadur	Gozo	Blue Clay, sample from hill (elevation: 27m)
NF.B	In-Nuffara, Nadur	Gozo	Blue Clay, sample from hill (elevation: 27m)
QL.A	Il-Qolla, Rabat	Malta	Blue Clay, sample from hill (elevation: 189m)
QL.B	Il-Qolla, Rabat	Malta	Blue Clay, sample from hill (elevation: 187 m)
QR.A	Il-Qarraba, Mġarr	Malta	Blue Clay, from the sea bed
QR.C	Il-Qarraba, Mġarr	Malta	Blue Clay from slope, rich in iron inclusions
QR.D	Il-Qarraba, Mġarr	Malta	Blue Clay from slope, below posidonia banquette

RIH.A	Ras il-Ħamrija, Qrendi	Malta	Blue Clay
RIH.B	Ras il-Ħamrija, Qrendi	Malta	Blue Clay, from the top of RIH, top of slope
RIH.D	Ras il-Ħamrija, Qrendi	Malta	Blue Clay, bottom of slope, within fault
RML.B	Ramla Bay, Xagħra	Gozo	Blue Clay, eastern part of Ramla Bay, bottom slope
RML.D	Ramla Bay, Xagħra	Gozo	Blue Clay, eastern part of Ramla Bay, bottom slope
RML.E	Ramla Bay, Xagħra	Gozo	Blue Clay from slope, clay running of from the slope after a storm, mixed with sand
SLF.A	Fort Leonard, Żabbar	Malta	Clay from ditch surrounding the fort, San Leonardo Beds
SLF.B	Fort Leonard, Żabbar	Malta	Clay from ditch surrounding the fort, San Leonardo Beds
TL.A	Ta' Leveċa, Għasri	Gozo	Blue Clay, sample from hill (elevation: 40m)
TL.B	Ta' Leveċa, Għasri	Gozo	Blue Clay, sample from hill (elevation: 30m)

Table S1. Geological samples for this study; codes referred to in Figure 8.

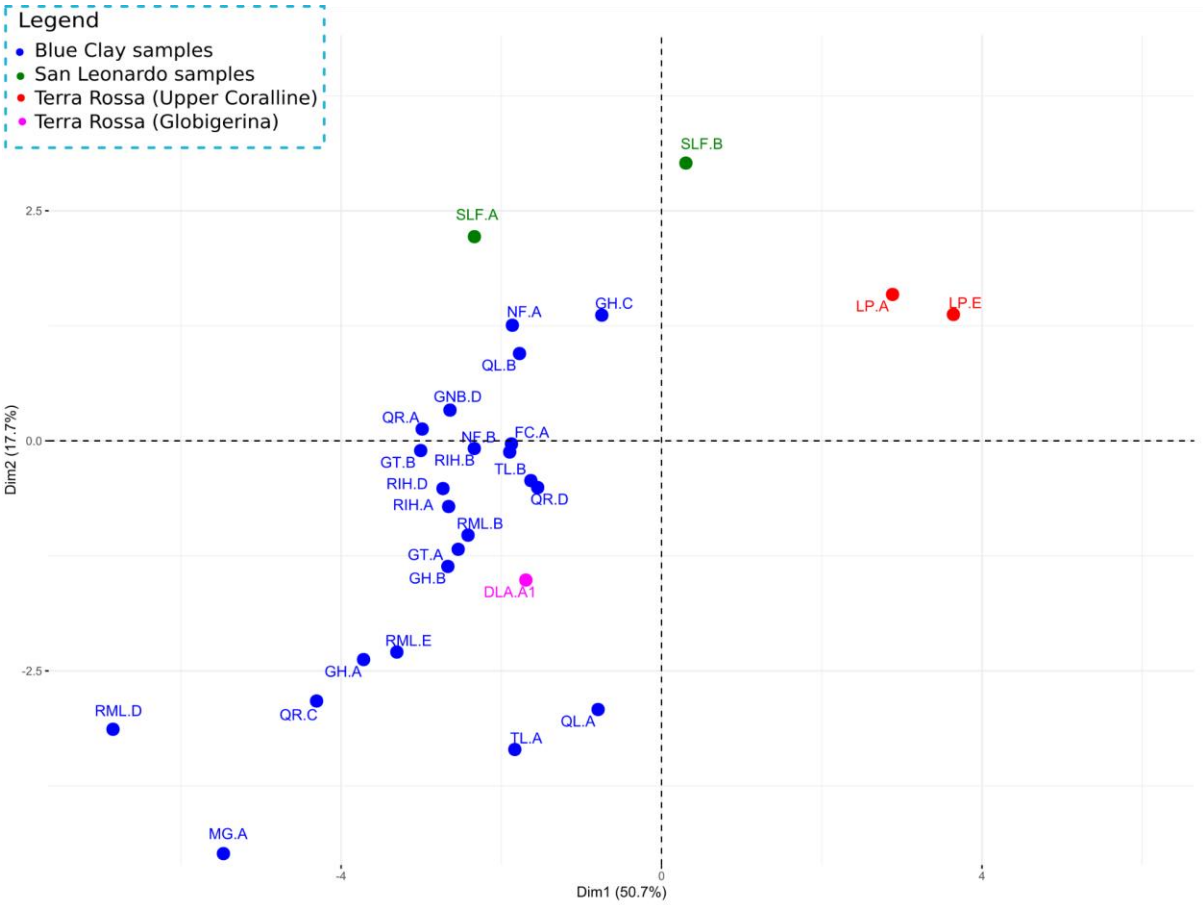

Figure S1. Biplot with only supplementary individuals (clays) plotted.

S2. Terra Rossa briquettes

Briquettes of the two samples from Ta' Lippija (LP.A and LP.E) were manufactured for petrographic analysis. The samples did not need crushing. The soil was gradually mixed with water, with weights recorded to assess *water of plasticity*. When the material was plastic enough to be shaped, it was inserted into a slab mould, pressed, taken off the mould and indented to create four briquettes (Vella *et al*. 2021; Xuereb 2021 for procedure). Two additional indents 10 cm apart were created to measure linear shrinkage. The slabs were left to dry for a week, dried in an oven at 100°C for one hour and then weighed and measured again. The briquettes were then separated, and two for each geological sample were fired in an electric furnace at 500°C and 120 mins soaking time. The heating rate was 200°C/hour. Table S2 records the metrics of both slabs before separation and firing; Figure **S3** shows briquettes after firing.

		LP.E1	LP.A1
Water of plasticity (%)		40	34
Manufacture	Weight (g) slab	64.59	62.12
	Indents (cm)	10	10
Post drying	Weight (g) slab	46.65	43.82
	Indents (cm)	8.91	8.84
Loss weight of slab (g)		17.94	18.3
Shrinkage (%)		10.9	11.6

Table S2. Data on the making and firing of Terra Rossa briquettes.

Figure S2. Photographs of fired briquettes.

S3. Validation

Repeated analyses (Table S3) were performed on sample 21 (sherd) 14 times and clay sample QL.A (Il-Qolla, Rabat)12 times to assess the reliability of the obtained results.

	QL.B, n=12			Sample 21, n=14		
	Mean (%)	σ (%)	Relative σ (%)	Mean (%)	σ (%)	Relative σ (%)
Al_2O_3	13.3	0.9	6.5	14.9	0.7	5.03
CaO	15.2	0.2	1.3	13.7	0.2	1.11
Fe_2O_3	6.75	0.09	1.31	7.3	0.09	1.23
Ga_2O_3	0.0032	0.0004	13.14	0.0024	0.0006	27.09
K_2O	2.39	0.06	2.6	2.64	0.04	1.63
Nb_2O_5	0.003	0.0009	28.85	0.0033	0.0003	7.58
Rb_2O_3	0.0156	0.0007	4.77	0.0175	0.0004	2.16
SiO_2	45.01	1.29	2.87	47.05	3.34	7.1
SrO	0.0578	0.0008	1.41	0.0572	0.001	1.69
TiO_2	0.82	0.02	2.62	0.88	0.02	2.24
Y_2O_3	0.0031	0.0008	24.2	0.005	0.0003	5.47
ZnO	0.0129	0.0005	4.14	0.0134	0.0005	3.51
ZrO_2	0.0319	0.0061	19.14	0.0486	0.0016	3.3

Table S3. repeatability of readings for the chosen variable for a sample of clay (QL.B) and a sherd (sample 21).

S4. Multivariate analysis

Table S4.1 presents the results of the PCA analysis carried out using the R package FactoMineR (Lê *et al*. 2008), including eingenvalues and percentage of variance for each principal component. The correlation between the variables and the five principal components can be found in Table S4.2. For definitions of eigenvalues and loadings, see Carlson (2017, 266).

	Eigenvalue	Percentage of variance	Cumulative percentage of variance
PC 1	**7.1029**	50.7347	50.7347
PC 2	**2.4767**	17.6908	68.4255
PC 3	**1.6702**	11.9297	80.3552
PC 4	0.9122	6.5154	86.8706
PC 5	0.7475	5.3396	92.2102
PC 6	0.3443	2.459	94.6693
PC 7	0.247	1.7646	96.4339
PC 8	0.1778	1.2703	97.7042
PC 9	0.1122	0.8017	98.5059
PC 10	0.0851	0.6078	99.1138
PC 11	0.0494	0.3525	99.4663
PC 12	0.0429	0.3064	99.7726
PC 13	0.0188	0.1341	99.9067
PC 14	0.0131	0.0933	100

Table S4.1. Results of the PCA analysis, including eigenvalues and cumulative percentage of variance.

	Dim.1	Dim.2	Dim.3	Dim.4	Dim.5
Al_2O_3	0.3253	0.5284	0.464	-0.4415	0.3138
CaO	-0.9483	0.0744	0.073	0.0679	0.2067
Fe_2O_3	0.5021	0.5513	0.3455	-0.3916	-0.2404
Ga	0.0466	0.7247	0.1387	0.5964	-0.1761
K_2O	-0.1266	0.7485	-0.5555	0.056	0.1433
Mn	0.9105	-0.1342	0.137	0.0314	-0.1194
Nb	0.8746	0.0986	0.1566	0.1408	0.279
Rb	0.2475	0.7335	-0.5004	-0.0953	0.1329
SiO_2	0.8815	0.0283	-0.3844	0.0813	-0.166
Sr	-0.9277	0.0836	0.0825	0.0094	0.2833
TiO_2	0.9579	0.0218	9e-04	-0.0758	-0.1118
Y	0.6799	-0.0572	0.4383	0.3466	0.3777
Zn	-0.5212	0.4427	0.6001	0.1553	-0.298
Zr	0.9397	-0.1717	-0.0432	0.1178	0.1883

Table S4.2. Correlation between the first five dimensions and the different variables.

S5. Datasets

Some pottery samples and clay samples were removed from the analysis, but the data is given below. Samples 47, 74, 1 and 67 were removed from the study because they were outlying samples which had not been analysed petrographically. It was, therefore, not possible to assess if the sherds were outlying because of a different fabric group or analytical error. These

are not included in the 53 samples analysed in the paper. The clay samples removed from the multivariate analysis are GNB.B, GNB.E, MX.A, MX.D, MG.B. MX.A, D and GNB.B, E.

	Major and minor oxides (%)						Trace elements (ppm)							
Sample	Al_2O_3	CaO	Fe_2O_3	K_2O	SiO_2	TiO_2	Ga	Mn	Nb	Rb	Sr	Y	Zn	Zr
1	14.72	16.75	7.43	2.93	51.62	0.91	48	596	34	176	617	47	152	425
2	13.52	12.85	7.36	2.71	59.58	0.92	23	603	21	167	466	36	110	370
4	14.62	13.11	8.02	3.08	55.36	0.94	26	622	26	169	507	39	127	349
5	13.44	3.20	7.65	1.83	68.89	1.23	20	1893	30	136	166	41	98	833
7	15.66	17.99	7.87	2.82	48.02	0.92	16	369	24	171	672	29	113	292
8	16.19	16.91	8.10	3.05	49.13	0.95	25	619	27	185	588	43	124	390
9	15.28	11.91	8.41	3.29	54.53	0.94	38	744	32	198	386	50	145	425
10	15.47	13.81	7.50	2.73	53.69	0.94	21	495	27	176	534	39	114	397
11	13.91	20.09	6.90	2.97	48.70	0.86	18	638	21	134	692	35	113	366
12	12.02	22.56	6.38	2.11	49.46	0.75	20	341	18	97	588	37	110	376
13	14.28	9.14	8.27	2.94	59.68	1.09	21	1530	28	152	374	37	106	463
15	13.19	15.60	7.36	2.54	54.76	0.92	21	957	23	126	477	37	108	421
17	15.05	13.75	7.57	2.90	54.46	0.95	28	543	27	174	537	38	124	395
18	14.56	6.05	7.84	3.07	62.42	1.14	26	863	34	133	261	42	105	532
19	14.10	11.75	7.97	3.89	56.72	0.91	28	621	22	148	351	36	143	345
21	16.26	15.05	8.02	2.90	51.77	0.96	24	640	26	176	532	43	119	395
22	14.49	18.81	7.26	2.84	49.78	0.84	19	395	22	161	582	29	111	285
23	12.51	28.30	7.22	0.98	44.15	0.75	19	405	26	68	769	40	128	245
24	14.99	27.97	7.28	1.66	36.71	0.78	22	481	17	89	702	39	166	222
25	13.48	12.03	7.37	2.76	59.94	0.94	30	596	25	161	475	40	118	369
26	17.63	17.97	7.83	2.64	46.57	0.94	23	491	26	145	673	39	118	346
27	13.64	21.45	7.65	1.85	49.29	0.85	20	432	26	90	586	39	116	266
28	11.84	20.99	7.46	2.82	50.04	0.74	26	609	20	174	494	34	138	215
30	12.78	20.70	7.65	2.86	48.53	0.95	29	423	20	155	540	30	139	239

32	15.71	3.47	8.12	3.06	63.79	1.15	26	744	33	170	187	40	105	543
33	16.03	8.92	8.99	3.55	56.16	0.98	29	477	23	210	358	30	149	270
35	12.75	4.13	7.92	2.79	67.59	1.16	21	1267	33	150	226	41	97	555
36	15.29	3.98	8.35	2.02	64.40	1.37	30	2235	35	134	198	46	138	617
37	9.66	28.23	6.84	2.83	49.32	0.84	20	447	22	148	639	34	115	273
39	14.90	3.37	8.11	1.81	66.46	1.28	21	2731	31	140	161	48	114	713
40	14.30	28.15	7.80	1.22	40.97	0.86	18	428	21	67	828	35	147	220
42	16.24	14.35	7.80	3.39	51.05	0.96	29	598	33	164	520	46	132	431
43	14.35	5.12	7.96	2.98	64.17	1.14	25	892	33	159	233	39	97	559
46	14.28	3.74	8.15	2.97	65.04	1.18	29	1205	32	155	182	41	98	555
47	15.33	15.77	8.91	3.41	49.73	0.94	34	608	36	216	522	44	150	353
48	12.88	13.30	7.66	2.77	58.60	0.93	19	604	24	158	451	38	107	403
50	12.17	20.17	6.84	2.80	52.08	0.83	26	315	19	150	537	27	130	222
52	12.90	26.14	6.77	2.22	46.48	0.86	27	434	20	69	768	30	134	307
53	13.99	3.14	7.95	2.42	69.44	1.27	19	1486	31	149	177	43	92	732
54	13.10	10.48	7.31	2.79	61.89	1.06	22	766	29	140	254	39	92	493
58	13.38	12.73	6.65	2.90	58.85	0.97	30	397	28	158	434	39	112	470
60	15.01	15.43	7.24	2.83	53.59	0.91	45	695	32	168	622	48	137	441
61	15.42	1.29	8.40	1.60	68.61	1.30	18	2211	34	138	97	47	102	890
62	14.99	8.33	8.90	3.34	58.50	0.97	27	501	21	177	315	26	134	235
64	13.92	16.66	6.86	2.78	52.04	0.91	19	320	24	167	571	32	107	358
65	13.10	18.76	6.93	2.55	52.29	0.90	20	481	21	160	858	31	109	302
66	14.33	19.21	7.20	2.54	49.31	0.87	23	397	19	146	633	25	116	271
67	15.50	24.42	7.90	0.50	43.68	0.86	18	395	21	45	893	37	120	263
68	13.02	0.86	6.65	1.36	73.80	1.32	18	2079	32	122	83	45	87	1031
69	14.10	19.89	7.09	2.71	49.50	0.81	24	407	21	153	638	27	114	267
70	15.84	2.12	9.23	1.80	65.79	1.37	32	1799	35	156	124	50	126	682
71	14.09	17.14	7.41	2.63	51.86	0.89	24	661	24	142	579	34	93	419
72	13.87	14.83	7.85	2.85	54.62	0.88	25	351	22	158	454	25	104	259
73	12.02	15.96	7.12	3.67	55.86	0.87	24	363	19	153	483	27	109	282
74	14.37	12.27	8.71	3.91	53.83	0.98	15	409	18	143	719	30	93	246
TL.B	11.50	12.42	7.77	2.41	57.56	0.88	23	258	16	169	355	22	99	247
NF.B	12.80	16.19	7.50	2.74	55.77	0.92	24	419	17	137	655	23	97	242
GH.B	13.62	22.77	7.80	2.53	46.87	0.80	20	402	20	144	615	26	101	242

FC.A	13.90	9.68	7.08	2.91	60.00	0.98	23	370	16	152	614	20	101	234
GH.A	10.24	18.98	6.21	2.27	55.64	0.71	39	466	26	93	994	43	99	341
GT.A	12.08	21.14	7.27	2.51	50.88	0.89	29	373	17	176	397	25	120	228
GT.B	14.24	16.35	7.33	2.61	50.18	0.87	14	350	31	151	443	38	78	294
MX.A	6.39	50.36	3.04	1.93	30.40	0.47	24	476	17	152	530	25	117	290
NF.A	12.69	9.74	8.35	2.81	57.97	0.86	19	415	24	151	488	31	98	292
QL.A	10.66	25.82	7.67	2.09	48.42	0.90	18	439	25	165	640	26	99	242
RIH.D	12.61	17.79	7.02	2.50	53.90	0.82	29	326	24	164	429	25	118	328
DLA.A	11.67	21.67	7.33	2.30	51.25	0.86	21	359	13	77	1458	31	76	238
QR.D	13.09	16.39	7.43	2.86	55.97	0.92	30	317	22	151	598	22	105	225
GH.C	15.52	9.87	7.56	2.84	56.20	1.04	46	420	31	113	1085	41	140	330
GNB.B	7.58	59.22	3.52	1.76	19.12	0.51	42	384	27	103	972	39	109	331
GNB.D	14.45	16.77	6.70	2.64	51.20	0.91	20	290	10	81	1097	30	94	185
GNB.F	9.78	42.77	4.57	2.07	32.37	0.60	23	415	18	147	678	23	106	257
MG.A	7.92	39.16	4.01	1.94	38.02	0.58	19	399	17	120	396	19	81	181
MX.D	6.80	48.33	3.33	1.84	31.11	0.48	24	338	24	149	601	25	108	236
QR.A	14.88	20.23	7.27	2.93	44.76	0.88	25	263	21	156	522	24	103	248
QR.C	11.62	32.58	6.39	2.43	38.50	0.84	21	361	24	149	634	27	104	249
RIH.A	12.28	18.15	6.63	2.63	52.16	0.86	22	240	18	115	942	21	119	191
RIH.B	14.35	15.34	6.57	2.80	53.90	0.93	16	339	19	138	586	24	87	247
RML.B	12.77	19.43	6.56	2.70	51.62	0.89	28	275	23	203	154	21	126	326
RML.D	12.41	33.44	4.80	1.86	38.84	0.57	31	279	21	192	281	18	121	224
RML.E	13.18	22.41	6.49	2.42	47.46	0.74	22	209	15	113	1016	24	102	183
SLF.B	16.13	5.80	8.75	3.77	59.49	1.11	28	791	28	174	124	43	104	514
SLF.A	15.00	21.87	8.34	2.66	46.00	0.96	30	993	27	179	105	44	110	498
GNB.A	11.53	36.86	4.68	1.84	36.28	0.56	27	374	23	160	549	27	117	262
LP.A	15.31	4.72	8.82	3.27	61.76	1.00	29	371	21	158	553	25	121	236
LP.E	14.42	1.27	8.84	2.92	67.00	0.98	22	391	21	166	529	24	117	239
QL.B	14.76	17.09	7.56	2.68	50.74	0.92	29	334	20	144	525	26	125	251

Table S5.1. Normalised dataset.

		Major/minor oxides (%)						Trace elements (ppm)							
HCA		Al_2O_3	CaO	Fe_2O_3	K_2O	SiO_2	TiO_2	Ga	Mn	Nb	Rb	Sr	Y	Zn	Zr
A.1	$\tilde{x}$	13.39	25.76	7.18	1.67	44.51	0.98	21	420	21	80	707	40	119	443

	σ	1.13	3.03	0.54	0.49	5.00	0.12	3	46	4	14	101	7	16	196
	RSD (%)	8.41	11.78	7.46	29.33	11.22	12.58	15	11	17	17	14	18	13	44
	x̄	13.28	19.24	7.23	2.83	50.85	0.91	23	421	21	156	604	38	120	368
	σ	1.49	3.18	0.37	0.27	2.35	0.11	4	97	2	11	95	3	17	81
B-A.2	RSD (%)	11.24	16.51	5.05	9.52	4.62	12.38	19	23	8	7	16	9	14	22
	x̄	14.82	12.83	7.80	2.95	55.67	1.02	27	672	26	166	466	38	119	423
	σ	1.34	3.41	0.58	0.45	4.91	0.18	6	328	4	21	120	6	20	177
C	RSD (%)	9.04	26.58	7.37	15.25	8.82	17.92	24	49	14	12	26	16	17	42
	x̄	14.46	4.98	8.11	2.60	64.61	0.89	25	1411	32	149	216	27	107	289
	σ	0.97	2.62	0.46	0.50	2.73	0.14	4	639	2	11	67	9	14	114
D.2	RSD (%)	6.71	52.55	5.71	19.31	4.23	16.14	18	45	8	8	31	34	13	40
D.1	x̄	14.22	1.07	7.53	1.48	71.21	0.73	18	2145	33	130	90	31	107	294
	x̄	12.81	19.30	7.02	2.58	51.14	0.93	24	369	21	151	551	30	108	353
	σ	1.98	7.52	1.03	0.38	6.20	0.16	6	84	4	21	176	9	14	207
Blue Clay	RSD (%)	15.46	38.96	14.64	14.57	12.12	17.32	25	23	18	14	32	29	13	59
Terra Rossa	x̄	14.87	3.00	8.83	3.10	64.38	0.98	29	892	27	176	114	26	108	285

Table S5.2. Descriptive statistics (mean, standard deviation and relative standard deviation) per HCA cluster (not accounting for mismatches) on the normalised dataset. Groups with only two samples have only the mean.

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