

Supplementary Material

Table S1 - Mineralogical composition from the Alleron area (after [29,39,40]).

Sample	Meter	Smectite	Saponite	Montmorillonite	Vermiculite	Chlorite/Clinchlore	Mixed phases	Illite	lite/muscovite	Kaolinite	Phyllosilicates	Quartz	K-feldspars	Plagioclases	Heavy Minerals	Calcite	Dolomite	Reference
M-21A - Allerona	10.00	0			0	19	8	15		27	69	11	2	5		11	2	[38]
M-22C - Castelviscardo -Le Fornaci	1.50	0			3	17	10	13		21	64	11	0	4		19	3	[38]
M-22A - Castelviscardo -Le Fornaci	3.00	0			0	14	11	14		16	55	13	2	6		22	0	[38]
M-22B - Castelviscardo -Le Fornaci	5.00	0			0	10	10	19		23	62	12	3	5		18	0	[38]
Allerona 2	27.00					30.5			21. 5		52	22.2		13.6		12.2		[78]
Allerona 2	13.00					40.8			22. 7		63.5	13.3		11.5		10.3	1.5	[78]
Montemoro 2	9.00		1.4			29.9			19. 2		50.5	14.3		13.2		12.6	9.5 0	[78]
Montemoro 2	1.00					36.7			19. 0		55.7	14.0		11.3		16.3	2.7	[78]
Montemoro 1	2.00					32.3			22. 5		54.8	15.2		13.6		11.2	5.2	[78]
Bargiano (Cololites)																	72- 81	[28]
Bargiano (Clay)																<15		[28]

Table S2: detail of acquisition parameters used for the GPR dataset of this study.

PROFILE NAME	ANTENNA FREQUENCY (MHz)	TIME RANGE (ns)	TOT N° SAMPLES	SAMPLING TIME	N° TRACES	DISTANCE (m)	TRACE DISTANCE
L0	300	100	512	0.195	483	24.15	0.05
L1	500	100	512	0.195	1318	26.36	0.02
L2	500	100	512	0.195	687	13.74	0.02
L3	500	100	512	0.195	577	11.54	0.02
L4	500	100	512	0.195	1253	25.06	0.02
L5	500	100	512	0.195	649	12.98	0.02
L6	500	100	512	0.195	2002	40.04	0.02
L7	300	100	512	0.195	798	39.90	0.05
L8	300	100	512	0.195	522	26.10	0.05
L9	300	100	512	0.195	649	32.45	0.05
L10	300	100	512	0.195	515	25.75	0.05
L11	300	100	512	0.195	252	12.60	0.05
L12	300	100	512	0.195	256	12.80	0.05
L13	300	100	512	0.195	422	21.10	0.05
L14	300	100	512	0.195	347	17.35	0.05
L15	300	100	512	0.195	626	31.30	0.05
L16	300	100	512	0.195	657	32.85	0.05
L17	300	100	512	0.195	671	33.55	0.05
L18	300	100	512	0.195	433	21.65	0.05
L19	300	100	512	0.195	474	23.70	0.05
L20	300	100	512	0.195	453	22.65	0.05
L21	300	100	512	0.195	414	20.70	0.05
L22	300	100	512	0.195	216	10.80	0.05
L23	300	100	512	0.195	262	13.10	0.05
L24	300	100	512	0.195	512	25.60	0.05
L25	300	100	512	0.195	468	23.40	0.05
L26	300	100	512	0.195	472	23.60	0.05
L27	300	100	512	0.195	459	22.95	0.05
L28	300	100	512	0.195	367	18.35	0.05
L29	300	100	512	0.195	321	16.05	0.05

Figure S1 - Geotechnical classification (Skempton's Diagram) of deposits from Alleron area (including Bargiano site, modified after [40]), showing main presence of low activity clay in the clay fraction.

