

Supplementary data

Table S1. Results from the continuous extraction. From left to right: Pit codes (Fig. 1) and depth, AlkExSi fractions obtained ordered by Si/Al ratio ($\text{Si/Al} > 5$ and $\text{Si/Al} < 5$). The amount of AlkExSi (AlkExSi, mg g^{-1} of sample), the reactivity (k , min^{-1}) and the Si/Al ratio (Si/Al) are shown for biogenic and non-biogenic fractions (see Eq. (1)). Missing values indicate the absence of additional fractions according to the curve model.

Code	Depth	AlkExSi1	k1	Si/Al 1	AlkExSi2	k2	Si/Al2
FGTR3	0 - 10	27.78	0.11	88.09			
	10 - 20	28.45	0.14	54.54			
	20 - 30	12.95	0.22	19.05			
	30 - 40	18.59	0.19	7.96			
	40 - 50				9.09	0.35	1.30
	55 - 65	31.34	0.14	26.28			
	75 - 85	20.75	0.21	28.55	0.25	0.31	0.01
FGUMR1	75 - 85	32.11	0.17	92.99			
FGUMR2	0 - 10	18.32	0.11	139.96			
	10 - 20				17.77	0.15	2.32
	20 - 30				11.38	0.22	1.36
	30 - 40				10.78	0.35	0.67
	40 - 50				12.20	0.36	0.62
	55 - 65				17.54	0.30	0.67
	75 - 85				22.72	0.26	0.88
	95 - 105	14.69	0.11	15.49	12.17	0.31	0.41
	130 - 140	20.65	0.24	8.49	1.03	0.30	0.05
	180 - 190				9.47	0.41	0.67
FGLMR2	0 - 10	15.00	0.10	12.38	1.09	0.16	0.11
	10 - 20	6.81	0.27	108.60			
	20 - 30				9.24	0.17	0.99
	30 - 40				0.80	0.57	0.22
	40 - 50	11.53	0.25	12.15			
	55 - 65	13.78	0.23	381.88			
	75 - 85				33.89	0.07	1.24
					13.93	0.32	0.57
	95 - 105	17.09	0.22	140.85			
	130 - 140				13.49	0.29	0.68
FGLMR3	00 - 10	14.51	0.22	1528.41			
	20 - 30				8.10	0.25	2.40
	55 - 65	20.72	0.11	10.03	9.06	0.35	0.45
	95 - 105				12.88	0.29	0.61
FGBR1	0 - 10	17.26	0.09	39.92			
	10 - 20	11.78	0.15	100.60			
	20 - 30	4.67	0.38	43.06	0.16	0.52	0.02
	30 - 40	9.25	0.26	281.92			
	40 - 50				8.66	0.39	0.55

	55 - 65				12.83	0.25	0.48
	75 - 85				13.14	0.36	0.60
	95 - 105	10.36	0.25	18.21			
FGBR2	155				3.46	0.54	0.54
-----	00 - 20				14.88	0.16	2.06
	20 - 30				11.13	0.11	4.34
FGBR3					1.30	0.64	0.31
	55 - 65	8.57	0.23	11.79	0.45	0.34	0.04
	75 - 85	19.69	0.18	20.49	0.29	0.35	0.02
	130 - 140				14.59	0.18	0.94
	0 - 10				35.75	0.16	1.03
	10 - 20	47.62	0.12	46.31			
	20 - 30				45.40	0.13	4.33
	30 - 40				43.14	0.13	2.53
FSTR2					26.06	0.18	3.76
	40 - 50				11.45	0.12	0.40
	55 - 65				44.25	0.13	1.07
	75 - 85	25.29	0.21	20.11			
	95 - 105				56.02	0.15	2.96
FSUMR1	00 - 10	18.08	0.13	6.93			
	20 - 30				24.61	0.15	2.43
	0 - 10	30.06	0.13	43.93			
	10 - 20	30.07	0.14	120.87			
FSUMR2					10.65	0.27	1.49
	20 - 30				17.40	0.13	1.96
	30 - 40				6.25	0.47	0.38
	0 - 10	16.37	0.13	536.57			
	10 - 20				4.32	0.32	1.08
	20 - 30				9.21	0.19	1.15
	30 - 40				4.76	0.43	0.58
	40 - 50				6.47	0.58	0.58
FSLMR2					10.92	0.40	0.46
	55 - 65				9.01	0.12	0.46
	75 - 85				11.71	0.50	0.45
	95 - 105	6.88	0.10	28.34	16.63	0.40	0.48
	130 - 140	35.13	0.18	14.03			
	180 - 190				20.98	0.30	0.64
	00 - 10	18.58	0.16	89.46			
	20 - 30	11.65	0.25	53.74			
FSLMR3					15.62	0.26	3.57
	55 - 65				16.92	0.36	0.66
	75 - 85						
	95 - 105	29.07	0.23	52.20			
	180 - 190				17.86	0.44	0.74
FSBR2	0 - 10	19.57	0.15	23.97			

	10 - 20	13.43	0.13	76.64			
	20 - 30	14.35	0.14	35.86			
	30 - 40	5.46	0.30	96.05			
	40 - 50	7.26	0.12	20.19	4.71	0.46	0.44
-----	55 - 65	17.83	0.09	57.64	6.22	0.54	0.42
	75 - 85	3.38	0.68	265.09			
		18.33	0.14	5.11			
	95 - 105	14.84	0.18	16.90	8.64	0.10	0.31
					2.58	0.60	0.20
	130 - 140	3.05	0.79	388.21	12.61	0.23	0.52
	180 - 190				13.04	0.31	0.75

	0 - 10				0.29	1.16	0.15
	10 - 20	19.15	0.11	12.08			
	20 - 30				28.23	0.11	1.38
					2.12	0.54	0.68
CGTR1	30 - 40	27.74	0.14	8.93			
	40 - 50	45.69	0.10	6.37	2.30	0.24	0.13
	55 - 65	41.00	0.15	5.36	0.37	0.25	0.02
	75 - 85				2.66	0.38	0.32
	95 - 105				22.35	0.23	0.78
	130 - 140	20.33	0.19	5.75	0.35	0.23	0.01

	0 - 10						
	20 - 30				22.52	0.11	2.98
CGTR2	55 - 65	65.56	0.09	14.87			
	95 - 105				25.63	0.17	0.97
	130 - 140	24.50	0.08	7.56	12.05	0.33	0.50
	180 - 190				21.59	0.24	0.72

	0 - 10	11.86	0.08	5.04			
	20 - 30	19.40	0.12	15.14			
CGMR1	40 - 50				18.04	0.20	0.71
	75 - 85				36.62	0.12	1.03
	95 - 105				34.00	0.11	2.35
					3.77	0.60	0.40

	0 - 10	0.61	237.60	5.10			
	10 - 20	0.84	0.24	106.43			
CGMR3	20 - 30				0.45	1.57	0.15
	30 - 40				3.17	0.35	0.36
	40 - 50				36.04	0.10	0.98
	55 - 65				10.38	0.27	0.56

	0 - 10						
CGBR2	20 - 30				23.03	0.12	1.50
	40 - 50				29.48	0.16	1.03
	95 - 105				72.96	0.11	1.51

CGBR3	0 - 10						

	10 - 20				15.51	0.10	1.35
					2.24	0.70	0.83
	20 - 30				5.60	0.27	0.52
	30 - 40				9.65	0.26	0.85
	40 - 50				7.87	0.26	0.59
	55 - 65				25.94	0.13	4.27
					0.46	0.17	0.02
	75 - 85	21.03	0.16	64.19			
	95 - 105				24.13	0.22	0.86
CSTR1	0 - 10	5.40	0.16	21.78	0.38	0.89	0.15
	10 - 20				2.06	0.45	0.65
CSTR3	0 - 10	9.15	0.09	186.97			
	10 - 20	10.17	0.08	128.40			
	20 - 30						
	30 - 40				1.42	0.41	0.37
	40 - 50	5.50	0.37	5.94			
	55 - 65				12.71	0.42	0.55
	75 - 85	10.76	0.41	9.60			
	95 - 105	9.87	0.17	239.81	3.95	0.77	0.97
CSMR1	0 - 10				3.51	0.26	4.66
					0.57	0.69	0.24
	10 - 20				3.25	0.25	2.46
	20 - 30	3.58	0.20	12.35			
CSMR2	0 - 10				2.15	0.35	0.86
	40 - 50				12.02	0.38	0.57
CSBR3	0 - 10	9.32	0.13	29.94	2.69	0.53	0.34
	10 - 20	5.63	0.27	12.79			
	20 - 30	8.19	0.22	42.84	0.94	0.65	0.12
	30 - 40	6.09	0.29	41.51			
	40 - 50	14.29	0.10	13.41	1.93	0.72	0.42
	55 - 65	16.91	0.32	13.16			
	75 - 85	17.89	0.34	30.91	0.42	0.39	0.02
	95 - 105	14.18	0.36	17.11			

Table S2. Bulk density (g cm^{-3}) and TRB values ($\text{cmol}_c \text{ kg}^{-1}$) of depths from selected pits. ¹Missing bulk densities. The value assigned is the bulk density average of that slope.

CODE	BD	TRB	CODE	BD	TRB	CODE	BD	TRB
FGTR3_0010	1.16	55	FSTR2_2030	0.90	28	CGTR1_7585	1.36	30
FGTR3_1020	1.00	46	FSTR2_3040	1.02	28	CGTR1_95105	1.42	28
FGTR3_2030	0.96	42	FSTR2_4050	0.90	28	CGTR1_130140	1.44	27
FGTR33_3040	1.25	42	FSTR2_5565	0.93	28	CGMR3_0010	1.44	50
FGTR3_4050	1.15	39	FSTR2_7585	0.99	30	CGMR3_1020	1.48	29
FGTR3_5565	0.92	45	FSTR2_95105	1.01	29	CGMR3_2030	1.39	28
FGTR3_7585	0.92	55	FSUMR2_0010	1.16 ¹	88	CGMR3_3040	1.43	36
FGUMR2_0010	0.89	53	FSUMR2_1020	1.16 ¹	92	CGMR3_4050	1.39	40
FGUMR2_1020	1.06	44	FSUMR2_2030	1.16 ¹	88	CGMR3_5565	1.35	38
FGUMR2_2030	1.21	44	FSUMR2_3040	1.16 ¹	93	CGBR3_0010	1.23	59
FGUMR2_3040	1.25	45	FSLMR2_0010	1.05	59	CGBR3_1020	1.25	42
FGUMR2_4050	1.22	47	FSLMR2_1020	1.14	55	CGBR3_2030	1.25	33
FGUMR2_5565	1.03	47	FSLMR2_2030	1.27	55	CGBR3_3040	1.28 ¹	38
FGUMR2_7585	1.20	44	FSLMR2_3040	1.28	54	CGBR3_4050	1.28 ¹	42
FGUMR2_95105	1.37	42	FSLMR2_4050	1.23	56	CGBR3_5565	1.28 ¹	44
FGUMR2_130140	1.38	44	FSLMR2_5565	1.16	57	CGBR3_7585	1.28 ¹	36
FGUMR2_180190	1.45	68	FSLMR2_7585	1.33	57	CGBR3_95105	1.28 ¹	34
FGLMR2_0010	0.72	61	FSLMR2_95105	1.37	57	CSTR3_0010	1.27	151
FGLMR2_1020	1.07	44	FSLMR2_130140	1.46	49	CSTR3_1020	1.24	122
FGLMR2_2030	1.19	44	FSLMR2_180190	1.38	51	CSTR3_2030	1.27	112
FGLMR2_3040	1.32	44	FSBR2_0010	1.04	44	CSTR3_3040	1.22	84
FGLMR2_4050	1.07	45	FSBR2_1020	1.12	41	CSTR3_4050	1.09	87
FGLMR2_5565	1.19	50	FSBR2_2030	1.10	40	CSTR3_5565	1.03	90
FGLMR2_7585	1.25	52	FSBR2_3040	1.36	39	CSTR3_7585	1.22	88
FGLMR2_95105	1.39	52	FSBR2_4050	1.34	43	CSTR3_95105	1.19	100
FGLMR2_130140	1.53	53	FSBR2_5565	1.33	50	CSMR1_0010	1.33	133
FGBR1_0010	0.92	42	FSBR2_7585	1.37	51	CSMR1_1020	1.20 ¹	132
FGBR1_1020	1.18	39	FSBR2_95105	1.38	53	CSMR1_2030	1.20 ¹	130
FGBR1_2030	1.25	37	FSBR2_130140	1.45	46	CSBR3_0010	1.06	88
FGBR1_3040	1.30	40	FSBR2_180190	1.54	48	CSBR3_1020	1.32	84
FGBR1_4050	1.38	42	CGTR1_0010	1.48	43	CSBR3_2030	1.32	80
FGBR1_5565	1.18	44	CGTR1_1020	1.43	34	CSBR3_3040	1.31	76
FGBR1_7585	1.31	45	CGTR1_2030	1.49	25	CSBR3_4050	1.21	73
FGBR1_95105	1.29	45	CGTR1_3040	1.32	25	CSBR3_5565	1.06	76
FSTR2_0010	0.72	37	CGTR1_4050	1.33	31	CSBR3_7585	1.18	76
FSTR2_1020	0.86	30	CGTR1_5565	1.24	32	CSBR3_95105	1.26	76

Table S3. Total element content averages and standard deviation in brackets (g kg⁻¹) for the different positions along the slopes.

			Al	Fe	Si	Ti	Ba	Ca	K	Mg	Mn	Na	P	Sr	Zr
Forest	Gentle (G)	Top (T) FGTR3	73 (16)	47 (3)	314 (21)	6.3 (0.6)	0.2 (1.0E-02)	0.9 (0.6)	5 (0.4)	3.0 (0.5)	0.5 (0.1)	1.2 (0.2)	0.4 (3.6E-02)	1.7E-02 (5.1E-03)	0.4 (2.6E-02)
(F)		Upper Middle (UM) FGUMR2	80 (19)	58 (6)	301 (23)	7.1 (0.4)	0.2 (6.2E-02)	0.7 (0.5)	6 (1.3)	2.6 (0.5)	0.7 (0.2)	1.6 (0.6)	0.5 (8.8E-02)	2.0E-02 (5.5E-03)	0.4 (3.1E-02)
		Lower Middle (LM) FGLMR2	69 (22)	47 (7)	322 (29)	6.5 (0.7)	0.3 (2.6E-02)	0.7 (1.0)	7 (0.5)	2.5 (0.8)	0.8 (0.2)	1.7 (0.3)	0.5 (5.5E-02)	2.3E-02 (7.0E-03)	0.5 (4.9E-02)
		Bottom (B) FGBR1	72 (18)	49 (5)	318 (22)	6.7 (0.4)	0.2 (1.8E-02)	0.9 (0.3)	4 (0.1)	2.8 (0.5)	0.8 (0.3)	0.8 (0.1)	0.5 (5.2E-02)	2.1E-02 (2.6E-03)	0.5 (4.5E-02)
	Steep (S)	Top (T) FSTR2	93 (12)	51 (3)	286 (10)	6.6 (0.3)	0.2 (8.2E-02)	0.4 (0.1)	3 (0.2)	2.3 (0.1)	0.3 (0.1)	0.4 (0.4)	0.5 (8.8E-02)	1.1E-02 (1.2E-03)	0.4 (2.8E-02)
		Upper Middle (UM) FSUMR2	60 (5)	47 (2)	302 (11)	6.3 (0.2)	0.3 (1.1E-02)	2.0 (0.7)	16 (1.3)	2.2 (0.1)	1.5 (0.2)	5.1 (0.5)	0.6 (9.4E-02)	3.8E-02 (4.6E-03)	0.4 (2.8E-02)
		Lower Middle (LM) FSLMR2	76 (23)	56 (4)	306 (28)	7.5 (0.9)	0.3 (1.9E-02)	1.0 (0.6)	8 (0.8)	2.4 (0.7)	0.8 (0.3)	2.2 (0.6)	0.4 (1.0E-01)	2.3E-02 (4.7E-03)	0.5 (4.1E-02)
		Bottom (B) FSBR2	66 (22)	56 (10)	321 (31)	8.2 (0.7)	0.2 (1.8E-02)	1.0 (0.2)	6 (0.5)	2.4 (0.7)	0.9 (0.3)	1.5 (0.3)	0.4 (6.0E-02)	2.3E-02 (2.6E-03)	0.5 (4.2E-02)
Cropland	Gentle (G)	Top (T) CGTR1	90 (23)	64 (3)	287 (25)	8.5 (0.4)	0.1 (4.4E-02)	0.7 (0.5)	2 (0.6)	2.3 (0.3)	0.7 (0.2)	0.5 (0.2)	0.5 (2.1E-01)	1.9E-02 (5.2E-03)	0.5 (1.3E-02)
(C)		Upper Middle (UM) CGMR3	82 (27)	65 (5)	295 (33)	8.2 (0.3)	0.1 (3.3E-02)	1.3 (0.8)	2 (0.2)	2.7 (0.6)	1.1 (0.5)	0.4 (0.2)	0.5 (1.2E-01)	1.7E-02 (2.7E-03)	0.5 (1.5E-02)
		Bottom (B) CGBR3	94 (23)	63 (6)	278 (26)	8.8 (0.5)	0.2 (6.9E-02)	1.3 (0.8)	2 (0.4)	3.2 (0.5)	1.1 (0.8)	0.4 (0.2)	0.5 (2.4E-01)	1.7E-02 (6.2E-03)	0.6 (4.3E-02)
	Steep (S)	Top (T) CSTR3	70 (17)	49 (3)	316 (19)	6.2 (0.8)	0.4 (6.9E-02)	2.3 (1.4)	18 (3.6)	3.8 (1.1)	0.8 (0.3)	3.6 (0.8)	0.4 (2.3E-01)	3.2E-02 (7.7E-03)	0.4 (3.5E-02)
		Upper Middle (UM) CSMR1	65 (2)	44 (1)	321 (2)	5.5 (0.1)	0.5 (1.7E-02)	2.6 (0.1)	26 (1.2)	3.2 (0.3)	0.8 (0.1)	5.9 (0.3)	0.5 (7.9E-02)	4.6E-02 (1.3E-03)	0.4 (1.0E-02)
		Bottom (B) CSBR3A	69 (21)	54 (1)	315 (22)	7.3 (1.2)	0.3 (3.7E-02)	1.2 (0.4)	14 (2.2)	3.0 (0.9)	1.0 (0.4)	2.8 (0.6)	0.6 (3.3E-01)	2.1E-02 (3.8E-03)	0.5 (3.3E-02)

Table S4. Granulometry (Average % (SD) of total texture) and mineralogy content (% of total minerals) for the different positions along the slope. For the mineralogy analysis only samples at 20-30 and 55-65 depths were analyzed. ¹Sample CGBR3_5565 was not analyzed due to the scarce of sample remaining. In the case of FG slope, instead of the bottom position, upper middle position was selected in order to avoid repeatability with the bottom of FS. Matrix consists on a mixture of sanidine, goethite, hematite, gibbsite, smectite, vermiculite and illite. *Values below 5% might not be reliable due to the limitations of the quantifying method.

			Granulometry			Mineralogy*				
			% loam	% sand	% clay	% quartz	% cristobalite	% halloysite	% kaolinite	% matrix
Forest	Gentle (G)	Top (T) FGTR3	70 (3)	14 (5)	15 (4)	55.1	0 - 3.2	18 - 25	14 - 16	4 - 10
(F)		Upper Middle (UM) FGUMR2	67 (5)	15 (8)	18 (4)	51 - 66	0 - 4.6	12 - 17	11 - 27	5.4 - 6
		Lower Middle (LM) FGLMR2	69 (3)	14 (4)	17 (2)					
		Bottom (B) FGBR1	73 (4)	9 (2)	18 (4)					
	Steep (S)	Top (T) FSTR2	70 (3)	13 (4)	16 (1)	54 - 66	0.6 - 3.3	15 - 26	13	3.7 - 5.4
		Upper Middle (UM) FSUMR2	68 (1)	22 (1)	10 (1)					
		Lower Middle (LM) FSLMR2	67 (3)	15 (2)	18 (2)					
		Bottom (B) FGBR2	73 (4)	9 (5)	18 (2)	63 - 79	0	6.6 - 16	0 - 15	6 - 14
Cropland	Gentle (G)	Top (T) CGTR1	64 (6)	18 (4)	18 (6)	38 - 60	4.5 - 6.4	19 - 20	7.9 - 19	8.6 - 17
(C)		Upper Middle (UM) CGMR3	60 (3)	16 (5)	25 (4)					
		Bottom (B) CGBR3	57 (4)	18 (8)	25 (5)	58 ¹	8 ¹	10 ¹	11 ¹	13 ¹
	Steep (S)	Top (T) CSTR3	61 (6)	21 (6)	17 (2)	45 - 61	1.6	4.2 - 7.5	14 - 19	19 - 27
		Upper Middle (UM) CSMR1	45 (5)	43 (7)	13 (2)					
		Bottom (B) CSBR3A	62 (2)	19 (3)	19 (2)	52 - 61	0.9	4.3 - 4.7	6.9 - 18	24 - 27