

Table S1. Grain size data of analyzed sediments into individual sampling horizons A, B and C.

Horizon A (Active Layer; 0–5 cm)							
	N	Mean	Median	Minimum	Maximum	SD ¹	CV ²
Mean grain size	45	6.85	6.83	6.57	7.24	0.15	2.26
Sorting	45	1.53	1.53	1.42	1.77	0.07	4.30
Skewness	45	−0.21	−0.22	−0.28	−0.11	0.03	−15.04
Kurtosis	45	1.03	1.04	0.89	1.11	0.04	3.77
Sand	45	6.13	6.17	2.64	8.79	1.36	22.22
Silt	45	70.63	70.99	63.33	75.54	2.78	3.94
Clay	45	23.24	22.92	16.44	33.29	3.53	15.21
Medium sand	45	0.10	0.09	0.01	0.29	0.07	68.15
Fine sand	45	1.42	1.31	0.002	3.00	0.52	36.52
Very fine sand	45	4.64	4.60	2.64	6.66	0.91	19.53
Very coarse silt	45	7.59	7.49	5.66	9.79	0.94	12.43
Coarse silt	45	13.00	12.86	10.07	16.88	1.43	10.98
Medium silt	45	22.66	22.64	17.11	26.59	1.96	8.64
Fine silt	45	27.37	27.51	24.48	29.19	1.19	4.36
Clay	45	23.24	22.92	16.44	33.29	3.53	15.21
Horizon B (9–17 cm)							
	N	Mean	Median	Minimum	Maximum	SD ¹	CV ²
Mean grain size	45	6.78	6.74	5.86	8.08	0.40	5.96
Sorting	45	1.57	1.59	1.22	1.82	0.15	9.51
Skewness	45	−0.15	−0.16	−0.25	0.05	0.08	−53.45
Kurtosis	45	0.91	0.91	0.76	1.19	0.09	10.27
Sand	45	6.10	5.91	0.21	17.50	3.44	56.33
Silt	45	69.40	69.44	47.14	78.09	5.24	7.55
Clay	45	24.50	22.37	13.74	52.65	7.17	29.29
Medium sand	45	0.07	0.06	0.003	0.22	0.05	72.33
Fine sand	45	1.10	1.02	0.06	3.38	0.67	60.79
Very fine sand	45	5.02	4.72	0.21	14.06	2.79	55.52
Very coarse silt	45	10.02	9.43	0.89	18.96	4.10	40.93
Coarse silt	45	14.42	14.85	3.84	19.67	2.97	20.59
Medium silt	45	20.16	19.45	13.40	27.89	3.10	15.38
Fine silt	45	24.81	25.45	16.88	30.25	3.30	13.29
Clay	45	24.50	22.37	13.74	52.65	7.17	29.29
Horizon C (25–32 cm)							
	N	Mean	Median	Minimum	Maximum	SD ¹	CV ²
Mean grain size	45	6.83	6.83	5.89	7.92	0.41	5.95
Sorting	45	1.49	1.49	1.06	1.77	0.17	11.05
Skewness	45	−0.13	−0.14	−0.23	0.10	0.07	−54.21
Kurtosis	45	0.93	0.97	0.78	1.11	0.10	10.48
Sand	45	5.20	4.79	0.01	14.90	3.02	58.10
Silt	45	70.75	71.30	52.34	77.74	4.91	6.93
Clay	45	24.05	23.03	14.01	47.65	6.71	27.88
Medium sand	45	0.05	0.04	0.000	0.29	0.06	114.32
Fine sand	45	0.87	0.86	0.000	2.88	0.55	63.28
Very fine sand	45	4.28	3.97	0.01	11.90	2.59	60.52
Very coarse silt	45	9.29	8.09	0.63	20.44	4.65	50.05
Coarse silt	45	14.39	14.56	3.20	22.15	3.66	25.43
Medium silt	45	21.22	21.19	15.13	28.06	2.95	13.91
Fine silt	45	25.86	26.65	15.87	33.37	3.91	15.14
Clay	45	24.05	23.03	14.01	47.65	6.71	27.88

SD ¹—standard deviation (+/− 1σ); CV ²—coefficient of variance (in %).

Table S2. Geochemical data of sampling horizons A, B and C.

Horizon A (Active Layer; 0–5 cm)									
	N	Method		Mean	Median	Minimum	Maximum	SD ¹	CV ²
Fe	10	AAS		4.01	3.78	3.44	5.45	0.64	16.03
Mn	10	AAS		0.50	0.46	0.38	0.80	0.13	25.26
Si	3	XRF		25.02	25.11	23.40	26.55	1.29	5.15
Al	3	XRF		5.30	5.46	4.96	5.47	0.24	4.50
Na	3	XRF		1.95	2.00	1.81	2.05	0.10	5.29
Mg	3	XRF	[%]	1.43	1.46	1.33	1.49	0.07	4.87
K	3	XRF		2.75	2.81	2.63	2.81	0.08	3.09
Ca	3	XRF		1.35	1.16	1.16	1.72	0.26	19.60
Ti	3	XRF		0.54	0.54	0.52	0.55	0.01	2.32
P	10	FIA		0.08	0.08	0.05	0.10	0.01	19.22
Cl	3	XRF		6.44	6.56	6.03	6.74	0.30	4.68
Cu	45	ICP-MS		363.56	360.65	225.75	455.31	38.00	10.45
Ni	45	ICP-MS		171.20	165.54	64.89	348.35	36.22	21.15
Co	45	ICP-MS		62.56	62.53	30.58	78.24	7.51	12.00
Zn	45	ICP-MS		126.52	126.11	100.63	154.33	11.15	8.81
Pb	45	ICP-MS		20.73	20.62	16.52	25.36	1.90	9.17
As	45	ICP-MS		6.22	6.20	3.33	8.14	0.87	13.92
Mo	45	ICP-MS		6.93	6.68	2.03	17.27	2.00	28.88
Ag	45	ICP-MS		0.41	0.42	0.12	0.90	0.17	40.98
Cd	45	ICP-MS		0.22	0.22	0.08	0.40	0.04	20.01
Sn	45	ICP-MS		2.72	2.76	1.94	3.06	0.26	9.59
Sb	45	ICP-MS		2.12	2.13	1.40	2.89	0.21	9.78
Tl	45	ICP-MS		1.19	1.16	0.63	2.07	0.21	17.63
Cr	45	ICP-MS		62.19	49.54	39.83	627.10	86.33	138.82
Sr	45	ICP-MS		352.86	347.09	289.10	441.03	28.45	8.06
Rb	45	ICP-MS		80.02	79.71	69.51	101.96	5.27	6.58
Ba	45	ICP-MS		9128.23	9099.33	6120.20	11729.95	1135.55	12.44
Sc	45	ICP-MS		21.51	22.00	16.20	25.56	2.28	10.60
Y	45	ICP-MS	[ppm]	54.58	53.46	39.82	69.09	6.58	12.06
La	45	ICP-MS		34.98	34.91	27.22	43.83	4.21	12.02
Ce	45	ICP-MS		62.77	61.87	53.65	76.16	6.08	9.68
Pr	45	ICP-MS		10.47	10.33	8.02	13.56	1.26	12.08
Nd	45	ICP-MS		44.77	43.86	34.07	58.78	5.32	11.88
Sm	45	ICP-MS		11.01	10.73	8.26	14.11	1.18	10.67
Eu	45	ICP-MS		2.83	2.74	2.19	3.59	0.29	10.31
Gd	45	ICP-MS		10.80	10.52	7.68	14.56	1.28	11.89
Tb	45	ICP-MS		1.68	1.61	1.21	2.24	0.20	11.65
Dy	45	ICP-MS		9.96	9.62	7.22	13.03	1.14	11.49
Ho	45	ICP-MS		1.95	1.89	1.41	2.56	0.22	11.40
Er	45	ICP-MS		5.46	5.36	3.98	7.05	0.61	11.13
Tm	45	ICP-MS		0.78	0.76	0.57	1.01	0.09	11.32
Yb	45	ICP-MS		5.13	5.03	3.74	6.71	0.59	11.53
Lu	45	ICP-MS		0.79	0.75	0.58	1.03	0.09	11.58
ΣLREE	45	ICP-MS		177.62	176.07	141.08	224.58	19.62	78.54
ΣMREE	45	ICP-MS		32.68	31.64	23.68	43.03	3.75	67.86
ΣHREE	45	ICP-MS		80.33	78.64	58.52	102.71	9.52	92.16
ΣREE	45	ICP-MS		279.46	273.55	216.51	344.28	28.88	10.33
Ce _{an}	45	ICP-MS		0.71	0.71	0.61	0.78	0.04	5.16
Eu _{an}	45	ICP-MS		1.22	1.23	1.07	1.29	0.05	4.10
Y _{SN} /Ho _{SN}	45	ICP-MS	-	1.02	1.02	0.95	1.10	0.03	2.94
LREE/HREE	45	ICP-MS		0.62	0.62	0.56	0.67	0.03	4.89
Th	45	ICP-MS	[ppm]	8.83	8.77	7.09	10.94	0.88	10.00
U	45	ICP-MS		1.44	1.43	1.18	1.80	0.15	10.59
C	10	CNS		0.66	0.61	0.54	1.01	0.13	20.49
N	10	CNS	[%]	0.12	0.12	0.11	0.13	0.01	4.38
S	10	CNS		0.51	0.50	0.43	0.63	0.06	11.85
Horizon B (10-15 cm)									
	N	Method		Mean	Median	Minimum	Maximum	SD ¹	CV ²
Fe	10	AAS		4.18	3.74	3.22	8.00	1.24	29.77
Mn	10	AAS		0.35	0.20	0.08	2.00	0.51	145.09
Si	3	XRF	[%]	26.21	26.27	22.63	29.73	2.90	11.06
Al	3	XRF		5.38	5.34	4.84	5.96	0.46	8.52

Na	3	XRF		2.14	2.17	1.66	2.59	0.38	17.77
Mg	3	XRF		1.62	1.48	1.35	2.03	0.29	18.19
K	3	XRF		2.95	2.96	2.68	3.22	0.22	7.47
Ca	3	XRF		1.17	1.15	0.94	1.43	0.20	17.11
Ti	3	XRF		0.50	0.49	0.44	0.58	0.06	11.51
P	10	FIA		0.64	0.60	0.14	1.29	0.31	48.57
Cl	3	XRF		6.21	6.19	5.30	7.15	0.76	12.16
Cu	45	ICP-MS		333.64	290.66	207.17	1047.52	170.27	51.03
Ni	45	ICP-MS		127.30	99.15	64.82	485.44	93.01	73.07
Co	45	ICP-MS		53.92	47.45	24.96	165.43	29.91	55.47
Zn	45	ICP-MS		124.46	122.49	98.75	198.53	18.75	15.06
Pb	45	ICP-MS		21.08	19.21	12.74	52.28	7.19	34.09
As	45	ICP-MS		5.03	4.35	3.26	8.05	1.40	27.83
Mo	45	ICP-MS		5.37	3.92	1.38	31.52	5.20	96.82
Ag	45	ICP-MS		0.44	0.47	0.07	0.73	0.16	35.94
Cd	45	ICP-MS		0.14	0.12	0.06	0.37	0.07	48.11
Sn	45	ICP-MS		2.82	2.86	1.79	3.39	0.30	10.78
Sb	45	ICP-MS		1.92	1.75	1.36	4.28	0.65	33.77
Tl	45	ICP-MS		0.86	0.83	0.63	1.42	0.18	20.53
Cr	45	ICP-MS		49.91	50.34	10.48	78.79	11.04	22.11
Sr	45	ICP-MS		353.18	324.12	238.90	929.89	133.71	37.86
Rb	45	ICP-MS		82.41	80.95	68.63	97.41	7.13	8.65
Ba	45	ICP-MS		8907.86	8074.90	5196.58	24045.28	3256.38	36.56
Sc	45	ICP-MS		21.77	21.42	17.96	29.68	2.45	11.27
Y	45	ICP-MS	[ppm]	56.33	48.85	36.41	144.91	21.62	38.37
La	45	ICP-MS		36.31	33.01	23.96	75.36	10.30	28.37
Ce	45	ICP-MS		62.94	60.55	47.63	79.18	8.42	13.38
Pr	45	ICP-MS		10.75	9.98	7.27	22.92	3.06	28.49
Nd	45	ICP-MS		46.11	42.05	30.77	103.94	14.12	30.62
Sm	45	ICP-MS		11.34	10.12	7.68	26.53	3.59	31.65
Eu	45	ICP-MS		2.89	2.56	1.84	6.85	0.95	32.84
Gd	45	ICP-MS		11.08	9.72	7.31	27.81	3.93	35.51
Tb	45	ICP-MS		1.72	1.52	1.16	4.22	0.59	34.10
Dy	45	ICP-MS		10.21	8.93	6.90	25.13	3.54	34.64
Ho	45	ICP-MS		2.00	1.76	1.37	4.92	0.70	35.02
Er	45	ICP-MS		5.59	4.84	3.79	13.66	1.92	34.43
Tm	45	ICP-MS		0.79	0.69	0.53	1.91	0.27	33.79
Yb	45	ICP-MS		5.19	4.59	3.55	12.40	1.72	33.17
Lu	45	ICP-MS		0.79	0.70	0.54	1.86	0.26	33.01
ΣLREE	45	ICP-MS		181.41	171.18	126.47	342.59	44.38	200.86
ΣMREE	45	ICP-MS		33.48	29.41	22.38	82.59	11.63	206.54
ΣHREE	45	ICP-MS		82.63	71.89	54.27	209.01	30.62	276.54
ΣREE	45	ICP-MS		285.82	265.44	199.99	577.36	72.70	25.43
Ce _{an}	45	ICP-MS		0.71	0.75	0.36	0.81	0.10	14.39
Eu _{an}	45	ICP-MS		1.21	1.22	1.08	1.30	0.05	4.22
Y _{SN} /Ho _{SN}	45	ICP-MS	-	1.03	1.02	0.96	1.11	0.04	3.73
LREE/HREE	45	ICP-MS		0.63	0.63	0.53	0.68	0.03	5.31
Th	45	ICP-MS		9.18	8.83	7.19	11.79	1.21	13.14
U	45	ICP-MS	[ppm]	1.42	1.38	1.06	1.85	0.20	13.79
C	10	CNS		0.48	0.42	0.30	0.72	0.15	31.07
N	10	CNS	[%]	0.09	0.10	0.07	0.11	0.01	13.26
S	10	CNS		0.50	0.49	0.37	0.70	0.10	19.02
Horizon C (25-30> cm]									
	N	Method		Mean	Median	Minimum	Maximum	SD ¹	CV ²
Fe	10	AAS		4.02	3.80	3.09	5.86	0.76	18.87
Mn	10	AAS		0.30	0.09	0.03	2.48	0.66	218.97
Si	4	XRF		21.03	20.97	19.01	23.17	1.58	7.52
Al	4	XRF		4.91	5.11	4.00	5.42	0.57	11.62
Na	4	XRF		1.95	2.07	1.43	2.23	0.31	15.74
Mg	4	XRF	[%]	1.41	1.39	1.24	1.62	0.13	9.48
K	4	XRF		1.88	1.90	1.71	2.02	0.14	7.33
Ca	4	XRF		1.57	0.85	0.58	3.99	1.40	89.40
Ti	4	XRF		0.34	0.33	0.30	0.38	0.03	8.83
P	10	FIA		0.82	0.66	0.55	1.52	0.31	37.91
Cl	4	XRF		3.92	3.81	3.05	5.01	0.85	21.65

Cu	38	ICP-MS		301.08	243.09	197.13	1172.99	166.82	55.41
Ni	38	ICP-MS		79.89	61.92	48.99	466.58	68.09	85.23
Co	38	ICP-MS		43.63	28.59	17.01	276.79	44.94	103.00
Zn	38	ICP-MS		115.73	107.68	92.75	169.71	20.16	17.42
Pb	38	ICP-MS		20.94	20.60	13.50	31.57	4.84	23.12
As	38	ICP-MS		4.61	4.15	2.15	7.78	1.56	33.76
Mo	38	ICP-MS		3.10	1.34	0.77	52.93	8.39	270.51
Ag	38	ICP-MS		0.48	0.49	0.13	1.32	0.24	49.63
Cd	38	ICP-MS		0.08	0.07	0.05	0.40	0.06	70.14
Sn	38	ICP-MS		2.83	2.86	2.00	3.53	0.32	11.46
Sb	38	ICP-MS		1.61	1.42	1.10	4.72	0.61	37.90
Tl	38	ICP-MS		0.67	0.64	0.54	0.88	0.09	13.55
Cr	38	ICP-MS		52.16	48.31	15.98	152.12	19.09	36.60
Sr	38	ICP-MS		347.97	335.49	242.25	707.03	86.64	24.90
Rb	38	ICP-MS		83.08	80.96	69.55	104.77	8.56	10.30
Ba	38	ICP-MS		8216.89	7575.52	6169.39	13645.21	1851.72	22.54
Sc	38	ICP-MS		21.44	20.29	17.43	30.59	3.05	14.24
Y	38	ICP-MS	[ppm]	56.09	50.48	36.74	126.64	18.95	33.79
La	38	ICP-MS		36.99	33.15	24.72	71.68	10.34	27.94
Ce	38	ICP-MS		65.74	61.52	47.78	90.01	11.46	17.44
Pr	38	ICP-MS		11.04	9.57	7.37	23.26	3.39	30.67
Nd	38	ICP-MS		47.26	40.96	31.32	105.28	15.37	32.51
Sm	38	ICP-MS		11.56	10.08	8.06	25.63	3.65	31.61
Eu	38	ICP-MS		2.94	2.58	2.03	6.58	0.96	32.77
Gd	38	ICP-MS		11.28	9.66	7.75	26.61	3.88	34.39
Tb	38	ICP-MS		1.75	1.51	1.19	3.96	0.59	33.51
Dy	38	ICP-MS		10.31	9.01	7.17	23.34	3.43	33.28
Ho	38	ICP-MS		2.01	1.78	1.40	4.57	0.67	33.25
Er	38	ICP-MS		5.62	4.96	3.86	12.40	1.83	32.65
Tm	38	ICP-MS		0.80	0.71	0.55	1.73	0.26	32.31
Yb	38	ICP-MS		5.23	4.61	3.61	11.08	1.68	32.05
Lu	38	ICP-MS		0.80	0.70	0.54	1.67	0.26	32.03
ΣLREE	38	ICP-MS		186.81	162.69	129.02	349.05	49.05	207.32
ΣMREE	38	ICP-MS		33.91	28.78	23.40	77.45	11.36	199.85
ΣHREE	38	ICP-MS		82.61	71.81	55.07	185.38	27.66	262.88
ΣREE	38	ICP-MS		290.86	259.75	203.77	544.07	76.50	26.30
Ce _{an}	38	ICP-MS		0.72	0.74	0.37	0.80	0.08	11.25
Eu _{an}	38	ICP-MS		1.21	1.21	1.10	1.29	0.04	3.47
Y _{SN} /Ho _{SN}	38	ICP-MS	-	1.02	1.03	0.94	1.09	0.04	3.45
LREE/HREE	38	ICP-MS		0.64	0.64	0.56	0.69	0.03	4.56
Th	38	ICP-MS	[ppm]	9.17	8.96	7.04	12.29	1.37	14.93
U	38	ICP-MS		1.41	1.36	1.10	1.93	0.22	15.53
C	10	CNS		0.65	0.42	0.21	2.12	0.56	85.81
N	10	CNS	[%]	0.09	0.09	0.05	0.12	0.02	21.70
S	10	CNS		0.47	0.46	0.33	0.57	0.06	13.32

SD ¹—standard deviation (+/- 1σ); CV ²—coefficient of variance (in %).

Table S3. The SEM-EDX geochemical data of selected mineral components.

Sedimentary Samples (N = 4)					Feldspar (N = 4)				Apatite (N = 6)				Barite (N = 2)		Micronodules (N = 16)			
	Mean	Minimum	Maximum	Std. dev.	Mean	Minimum	Maximum	Std. dev.	Mean	Minimum	Maximum	Std. dev.	Mean	Mean	Minimum	Maximum	Std. dev.	
Fe	4.7	4.4	4.9	0.2	2.5	2.5	2.5	-	0.5	0.3	0.8	0.3	0.5	13.5	7.5	19.4	6.0	
Mn	0.3	0.1	0.3	0.1	0.2	0.2	0.2	-	0.4	0.4	0.4	-	-	50.8	25.9	82.8	14.2	
Ti	0.35	0.3	0.4	0.05	0.3	0.3	0.3	-	0.4	0.3	0.5	0.1	-	0.4	0.0	1.0	0.3	
Cr	0.8	0.8	0.8	-	0.2	0.2	0.2	-	1.6	1.6	1.6	-	-	-	-	-	-	
Ni	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2	0.2	2.4	0.8	
Cu	-	-	-	-	0.3	0.3	0.3	-	3.0	0.2	5.0	1.8	-	1.8	0.5	3.3	1.0	
Zn	-	-	-	-	-	-	-	-	1.0	0.8	1.2	0.2	-	0.9	0.1	1.6	0.7	
Mo	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.1	0.5	0.2	
Sc	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.1	0.1	-	
Si	20.6	19.6	21.3	0.6	19.6	17.5	21.6	2.1	2.0	0.2	4.9	1.8	1.3	5.5	1.8	11.8	2.3	
Al	[%]	8.7	8.0	9.0	0.4	9.7	7.3	12.0	2.4	4.9	0.5	8.7	2.8	-	3.3	0.6	6.1	1.6
Na		3.2	3.0	3.4	0.2	3.0	0.5	5.4	2.5	1.4	0.9	2.1	0.5	-	0.9	0.3	2.1	0.5
Mg		2.4	2.2	2.5	0.1	1.3	1.3	1.3	-	0.4	0.2	0.7	0.2	-	1.5	0.5	2.6	0.8
Ca		0.4	0.4	0.4	-	6.7	3.8	9.5	2.9	22.0	15.5	29.3	4.8	0.1	1.7	0.3	4.7	1.5
K		1.9	1.8	2.0	0.1	0.6	0.6	0.6	-	0.25	0.2	0.3	0.05	0.1	1.0	0.4	2.2	0.5
Sr		-	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-
Ba		0.65	0.6	0.7	0.05	-	-	-	-	-	-	-	-	46.5	1.1	0.5	2.7	0.6
P	-	-	-	-	1.5	1.5	1.5	-	10.8	9.0	13.9	1.8	-	0.1	0.1	0.2	0.1	
S	-	-	-	-	0.1	0.1	0.1	-	0.5	0.4	0.6	0.1	12.9	0.2	0.0	0.4	0.1	
Cl	1.75	1.5	2.0	0.25	0.1	0.1	0.1	-	2.1	0.3	3.1	0.9	-	0.2	0.0	1.2	0.3	
F	-	-	-	-	-	-	-	-	2.3	1.5	3.2	0.8	-	1.3	1.1	1.4	0.2	
O	52.6	51.2	56.2	2.1	54.3	54.2	54.4	0.1	46.5	39.4	50.9	4.2	34.5	26.4	4.3	51.4	13.2	

[illegible][illegible]

[illegible]

[illegible]

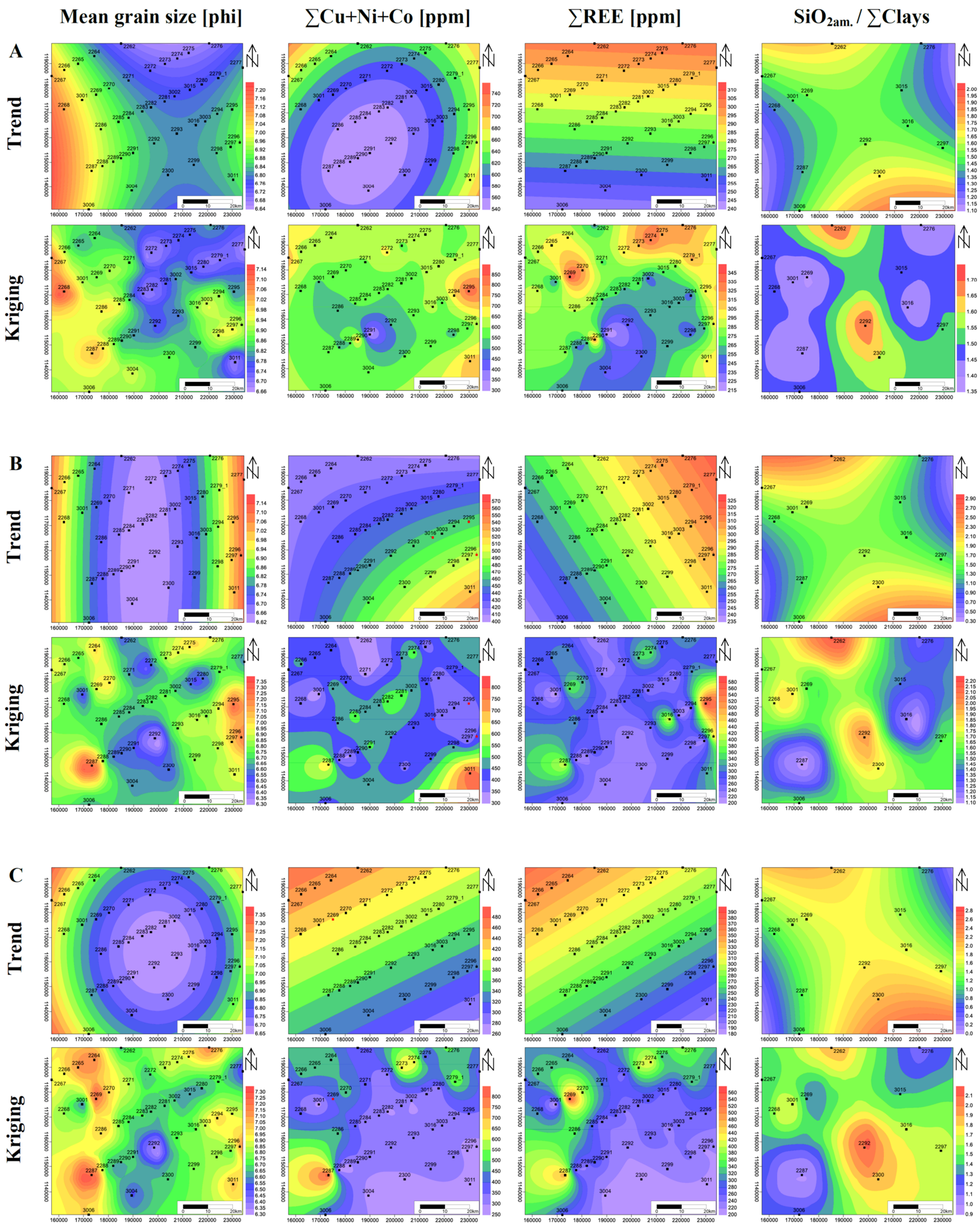


Figure S2. Simplified maps of selected lithological parameters of individual horizons A, B and C. Trend maps indicate the mean directions of minimal and maximal spatial variability. Kriging maps indicate detrended data of selected variables. Red points indicate anomalous values removed during mapping.