

Ambio

Electronic Supplementary Material

This supplementary material has not been peer reviewed.

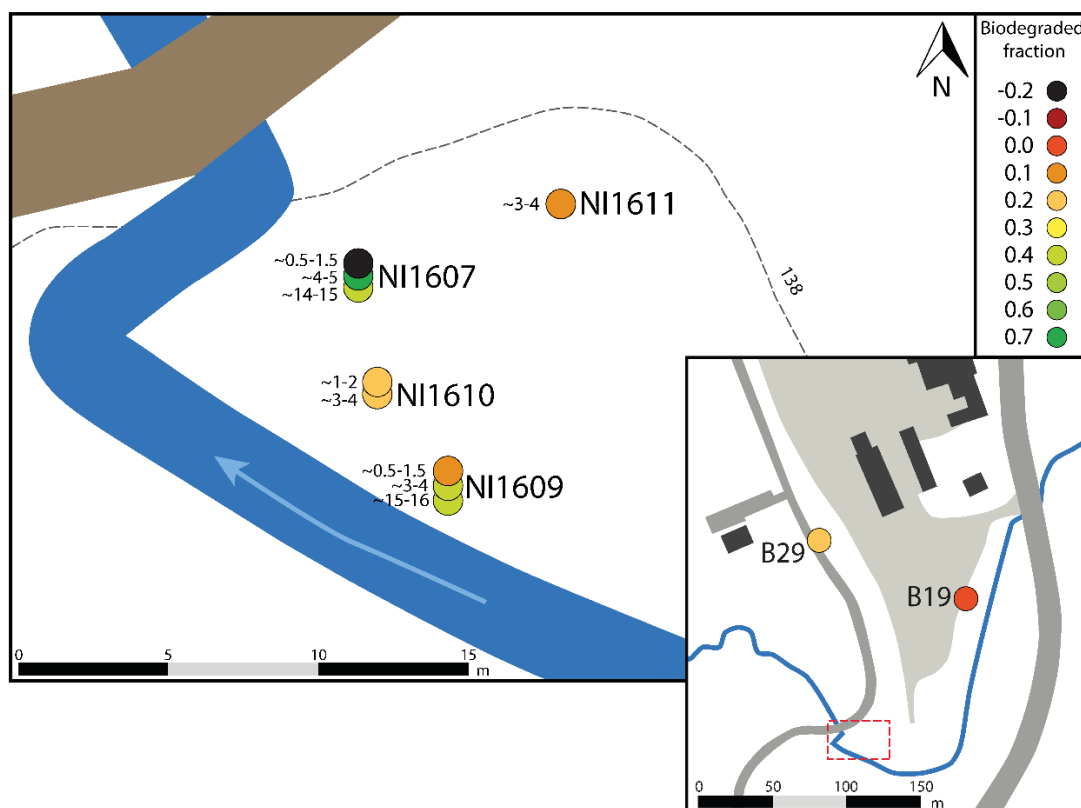
Title: **Characterizing natural degradation of tetrachloroethene (PCE) using a multidisciplinary approach**

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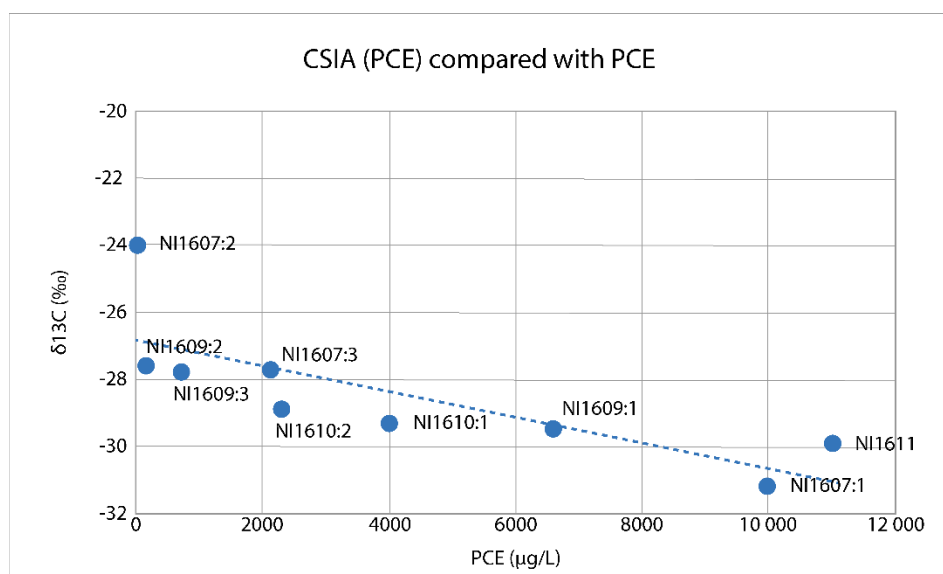
Appendix Tab. S1. All data including field parameters, chemical analysis, filtered volume for microbial samples, and Compound-Specific Isotope Analysis. Metals marked with asterisk (*) are acid digested.

Well		NI1610:1	NI1610:2	NI1611	NI1609:1	NI1609:2	NI1609:3	NI1607:1	NI1607:2	NI1607:3	B29	B19
FIELD PARAMETERS												
Temp (water)	°C	3.7	4.1	4.8	2.9	4.1	6.1	4	4.6	5.9	7.3	5.7
Baro	mb	1016	1016	1014	1006	1001	996	977	980	990	990	991
Oxidation-Redox Potential	mV	-82.8	-120.8	-5.7	-75.5	-126.5	-229.2	45.1	-115.3	-177.9	101.4	52.3
pH		6.56	6.6	6.5	6.67	7.19	8.5	6.54	7.85	8.23	6.48	6.86
pHmV		2.2	0.3	5.8	0.8	-27.2	-97.7	8.4	-64.3	-84.2	13.2	-7.6
Dissolved O	% sat	0	0.1	0	55.2	78.6	0	50.9	60.7	0.4	70.6	41.2
Dissolved Oxygen	mg/L	0	0.01	0	7.42	10.17	0	6.46	7.57	0.05	8.34	5.07
Electrical Conductivity	µS/cm	350	359	296	391	449	763	338	602	220	277	340
Resistivity	(Ohms,cm)	4807	4629	5494	4424	3703	2049	4926	2717	7142	5434	4651
Total Dissolved Solids	mg/L	227	233	192	254	291	495	219	391	143	180	221
Salinity	ppt	0.11	0.11	0.09	0.12	0.14	0.32	0.11	0.25	0.07	0.09	0.11
LAB ANALYSIS												
Physical & chemical properties												
Alkalinity, HCO ₃	mg/L	120	130	89	130	150	130	93	120	74	58	98
Colour	mg/L Pt	50	70	10	40	20	10	10	30	5	<5	10
Hardness. German degrees	°dH	5.7	6.1	4.6	6.4	7.1	5.9	4.7	4.3	3.6	3.1	8.6
Conductivity 25°C	mS/m	24.8	24.8	21.1	27.9	28.9	64	23	44.5	17.6	22.2	22.7
pH at 20°C		6.7	6.7	6.7	6.8	7	8.2	6.6	7.8	8	6.7	8
Turbidity FNU	FNU	9.4	11	23	64	79	970	38	4.1	230	0.33	590
Anions												
Bromide	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Fluoride	mg/L	0.2	0.2	0.24	0.27	0.33	0.61	0.22	0.58	0.51	0.19	0.63
Chloride	mg/L	8.5	7.6	12	9.5	8.4	55	15	41	10	25	20
Chloride	µg/L	8500	7600	12000	9500	8400	55000	15000	41000	10000	25000	20000
Sulphate	mg/L	5	4.4	6.5	7.9	1.7	100	8.5	51	2	8.8	6.8
Nutrients												
Ammonium	mg/L	0.22	0.28	0.12	0.21	<0.02	0.28	0.1	0.17	<0.02	<0.02	<0.02
Ammoniacal nitrogen	mg/L	0.17	0.22	0.095	0.16	<0.25	0.22	0.08	0.13	<0.25	<0.01	<0.25
Nitrate	mg/L	0.62	<0.3	1.3	2.5	<0.3	<0.3	2.1	<0.3	<1.1	8	<1.1
Nitrate nitrogen	mg/L	0.14	<0.01	0.29	0.56	<0.01	<0.01	0.47	0.04	<0.25	1.8	<0.25
Nitrate + nitrite nitrogen	mg/L	0.15	<0.01	0.3	0.56	<0.01	<0.01	0.47	0.037	<0.25	1.8	<0.25
Nitrite nitrogen	mg/L	0.0081	<0.001	0.012	<0.045	<0.001	<0.001	<0.045	<0.001	<0.001	<0.001	<0.001
Phosphate phosphorus	mg/L	<0.01	0.016	<0.01	<0.01	<0.2	0.18	0.012	0.075	0.13	0.011	<0.2
Metals in water (method: ICP/AES)												
Iron*	mg/L	3.2	5.1	2.3	5.9	16	1.8	1.6	1.3	5.6	0.78	86
Potassium*	mg/L	2.6	2.7	2.9	4.2	4.7	5.1	3.2	4	6.5	3	27
Silicon*	mg/L	6.9	7.1	11	12	11	15	10	7.9	27	8.9	87
Magnesium*	mg/L	8.3	8.3	7.8	9.4	9.8	9	7.7	7	6.8	4.8	27

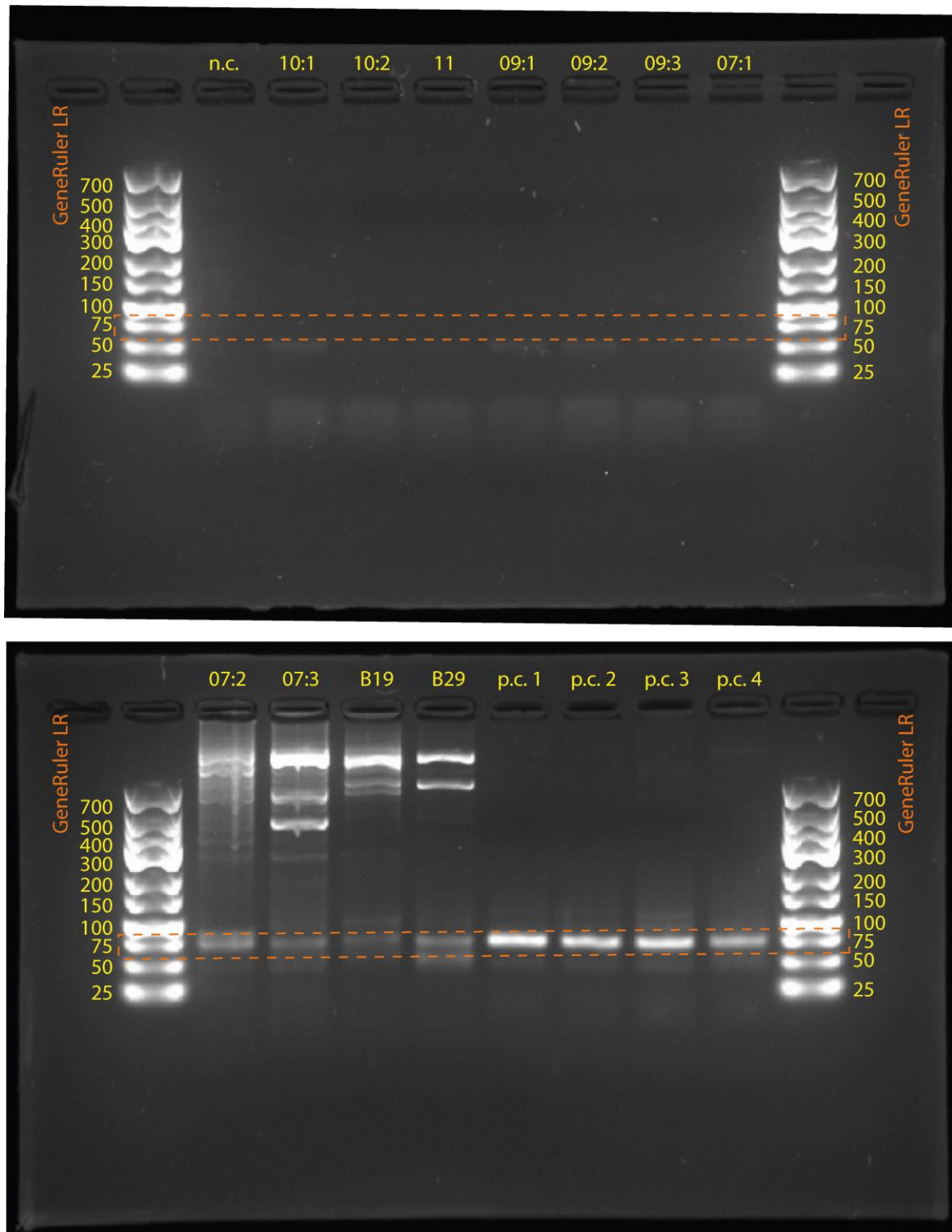
Sodium *	mg/L	7	6.6	8.5	10	8.8	88	11	59	9.1	20	12
Aluminium	mg/L	0.12	0.1	0.34	0.45	0.38	0.67	0.48	0.09	1.1	0.16	16
Iron	mg/L	2.9	5	0.58	4.9	16	1.1	0.68	1.2	1.9	0.29	32
Calcium	mg/L	28	30	21	31	35	28	22	20	16	15	37
Potassium	mg/L	2.4	2.5	2.6	3.2	4.2	4.1	2.5	3.5	4.2	2.5	9.6
Silicon	mg/L	6.7	7	7.1	10	12	15	7.1	8.1	14	5.5	35
Copper	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.04
Magnesium	mg/L	8.1	8.5	7.3	9.2	9.7	8.6	7.1	6.5	5.8	4.5	15
Manganese	mg/L	0.46	0.57	0.44	0.44	1.6	0.25	0.39	0.72	0.38	<0.02	1.1
Sodium	mg/L	7	6.9	8.2	10	8.8	87	11	57	7.8	20	8.1
Metals in water (method: ICP/MS)												
Boron*	µg/L	<30	<30	<30	<30	<30	59	<150	32	<150	<30	<30
Copper*	µg/L	0.76	<0.5	3	1.3	<0.5	0.53	1.7	<0.5	3.4	2	47
Manganese*	µg/L	470	560	470	470	1700	280	380	700	420	16	2100
Boron	µg/L	15	16	15	23	16	58	14	35	4.5	20	11
Organic summary methods												
DOC	mg/L	5.6	5.8	4.1	4.4	4.5	1.6	3.5	4.1	2.7	1.5	18
Chemical Oxygen Demand COD-Mn	mg/L	4.2	4.2	2.4	3.4	4.8	1.1	2	3.1	1.4	<1	4.3
TOC	mg/L	5.8	6	4.1	5.1	6.6	1.8	3.7	4.2	3	1.4	21
Halogenic solvents												
1.1.1-trichloroethane	µg/L	<5.0	<5.0	<10	<10	<1.0	<1.0	<10	<5.0	<5.0	<0.1	<100
1.1.2-trichlorethane	µg/L	<5.0	<5.0	<10	<10	<1.0	<1.0	<10	<5.0	<5.0	<0.1	440
1.1-dichlorethane	µg/L	<5.0	<5.0	<10	<10	<1.0	<1.0	<10	<5.0	<5.0	<0.1	<100
1.1-dichlorethene	µg/L	<5.0	<5.0	<10	<10	<1.0	<1.0	<10	<5.0	<5.0	<0.1	140
1.2-dichlorethane	µg/L	<5.0	<5.0	<10	<10	<1.0	<1.0	<10	<5.0	<5.0	<0.1	190
1.2-dichloropropane	µg/L	<5.0	<5.0	<10	<10	<1.0	<1.0	<10	<5.0	<5.0	<0.2	<100
cis-1.2-dichloretheen	µg/L	230	240	51	310	890	470	140	1100	820	<0.1	290
dichloromethane	µg/L	<25	<25	<50	<50	<5.0	<5.0	<50	<25	<25	<0.5	<500
tetrachloroethene	µg/L	4000	2300	11000	6600	160	720	10000	29	2100	39	220000
tetrachloromethane	µg/L	<5.0	<5.0	<10	<10	<1.0	<1.0	<10	<5.0	<5.0	<0.1	<100
trans-1.2-dichlorethen	µg/L	<5.0	<5.0	<10	<10	2.1	2.8	<10	<5.0	<5.0	<0.1	<100
trichloroethene	µg/L	350	450	220	320	64	930	280	180	1900	0.32	1800
trichloromethane	µg/L	<5.0	<5.0	<10	<10	<1.0	<1.0	<10	<5.0	<5.0	<0.1	<100
vinyl chloride	µg/L	<10	<10	<20	<20	2	<2	<20	33	<10	<0.2	<200
monochlorobenzene	µg/L	<5.0	<5.0	<10	<10	<1.0	<1.0	<10	<5.0	<5.0	<0.2	<100
dichlorobenzene	µg/L	<0.6	<0.6	<0.6	<0.6	0.9	<0.6	2.1	<0.6	<0.6	<0.6	<0.6
MICROBIOLOGY												
Filtered volume	mL	250	750	750	750	500	500	500	1750	500	1000	575
Copies per mL filtered water		183	1551	611	3168	602	63	237	1647	530	6	206
CSIA (¹³ C/ ¹² C)												
PCE	δ ‰	-29.3	-28.9	-29.9	-29.5	-27.6	-27.8	-31.2	-24.0	-27.7	-29.3	-30.3
TCE	δ ‰	-32.9	-32.1	-33.7	-30.7	-29.4	-28.9	-33.2	-25.0	-31.5	n.d	-27.6
cis-DCE	δ ‰	-33.3	-33	-34.7	-30.9	-28.6	-30.7	-31.8	-27.6	-26.9	n.d	-35.3
trans-DCE	δ ‰	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d	n.d	n.d.
VC	δ ‰	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d	n.d	-21.2



Appendix Fig. S1. Biodegradation via CSIA results of carbon. The numbers to the left correlates to the filter screen's depth, in meters below surface. Gray area marks hard surfaces, mostly macadam.



Appendix Fig. S2. Comparison between CSIA ($\delta^{13}\text{C}$ ‰) for PCE and PCE ($\mu\text{g/L}$) shows an indication of coincide, with the exception of NI1607:2 as an outlier.



Appendix Fig. S3. Appendix Fig. S3 Gel of qPCR product (BAV1). NB! "NI16" are deleted due to space, n.c. = negative control, p.c. = positive controls in dilution serial. For the first gel are there no amplicons of the right size (71 bp), marked as an orange dashed line; however, something smaller is amplified, that is not primers dimers since they are beneath. The amplicons in a too small size can also be seen in the second gel. At the second gel are thin bands of amplicons visualized (dashed square) even thou the machine did not found amplicons of the samples. Brightest in the NI1607:2 where one out of four test showed amplification. Here are also other products amplified at ranges outside the ladder.