

## Supplementary Materials

### Nitrate

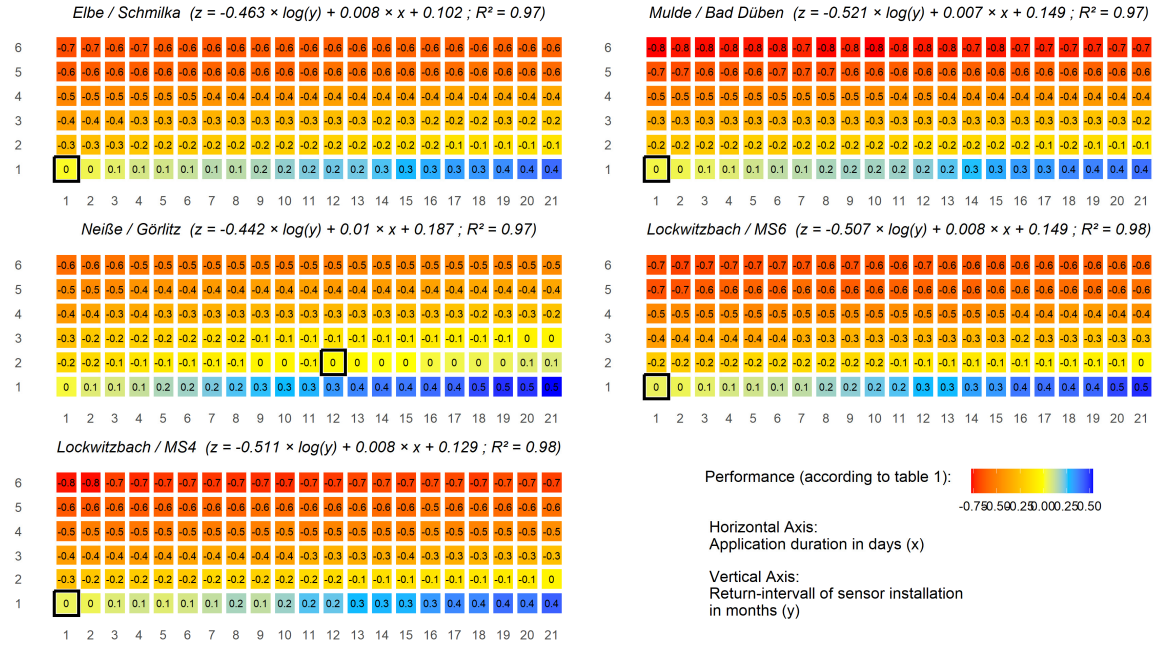


Figure S1: Performance between STOM and grab sampling at weekend and 9 am to 5 pm for nitrogen-nitrate

### Chloride

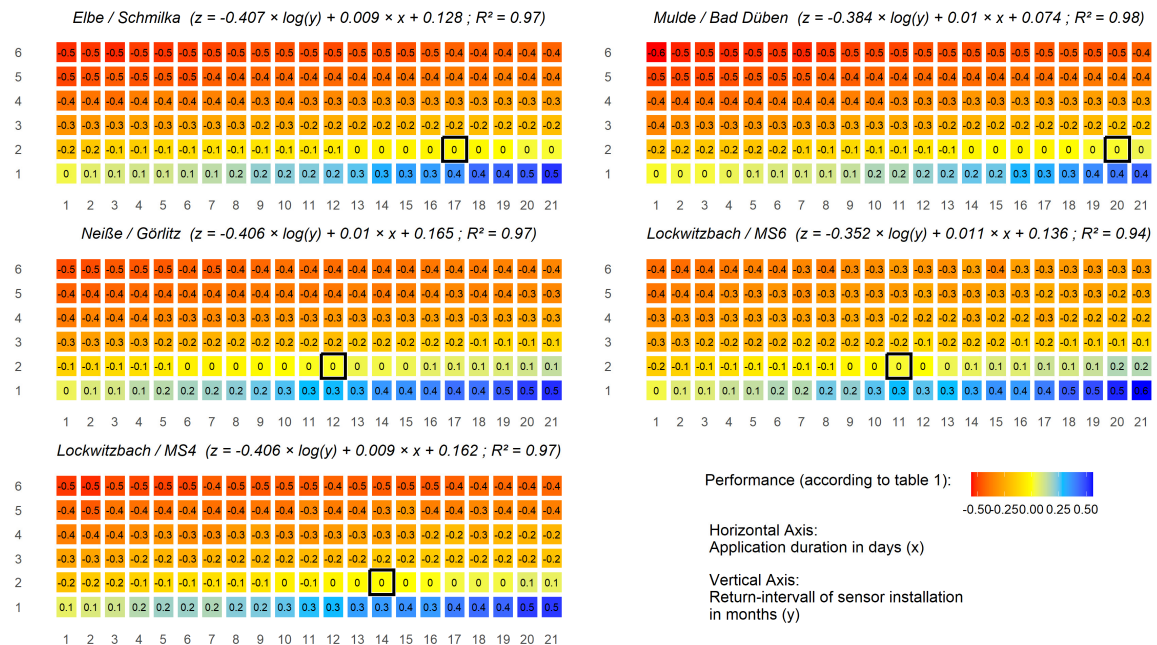
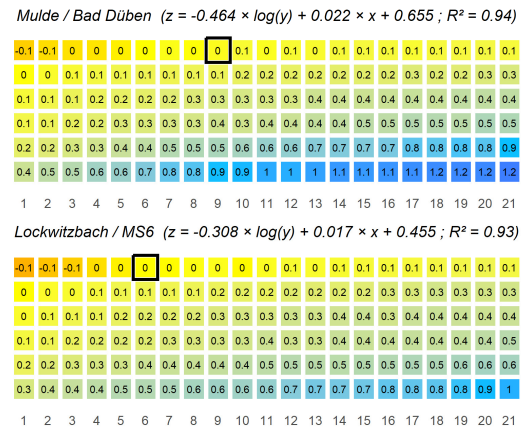
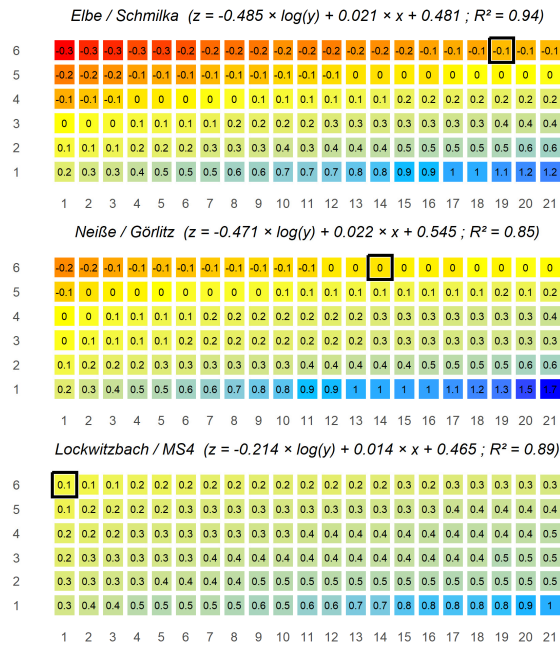


Figure S2: Performance between STOM and grab sampling at weekend and 9 am to 5 pm for chloride

## Oxygen



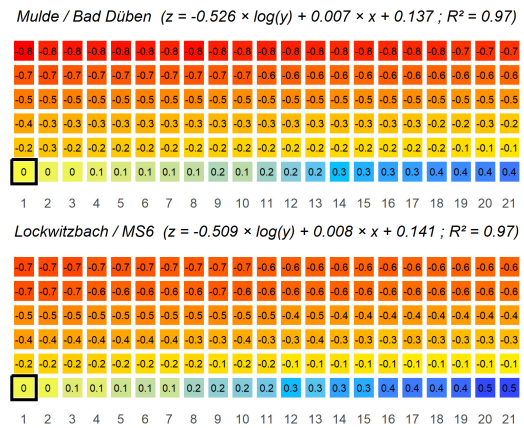
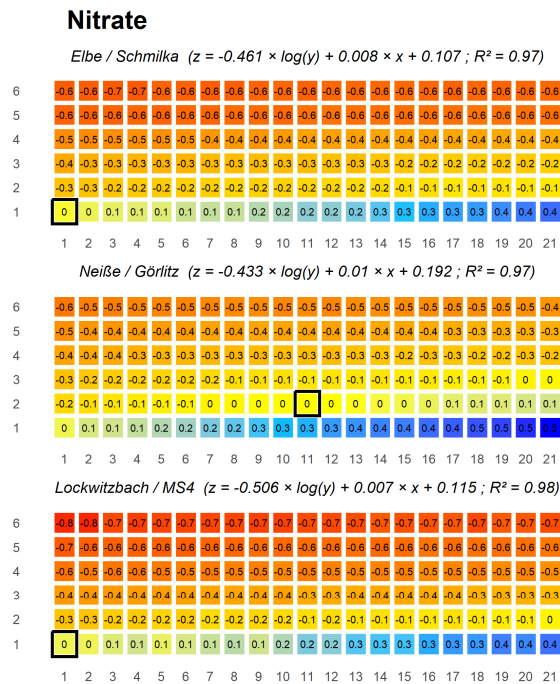
Performance (according to table 1):

Horizontal Axis:  
Application duration in days (x)

Vertical Axis:  
Return-interval of sensor installation  
in months (y)

Figure S3: Performance between STOM and grab sampling at weekend and 9 am to 5 pm for dissolved oxygen

Grab sampling during the whole day (0-24h):



Performance (according to table 1):

Horizontal Axis:  
Application duration in days (x)

Vertical Axis:  
Return-interval of sensor installation  
in months (y)

Figure S4: Performance between STOM and Grab sampling during the whole day (0-24h) for nitrate nitrogen

## Chloride

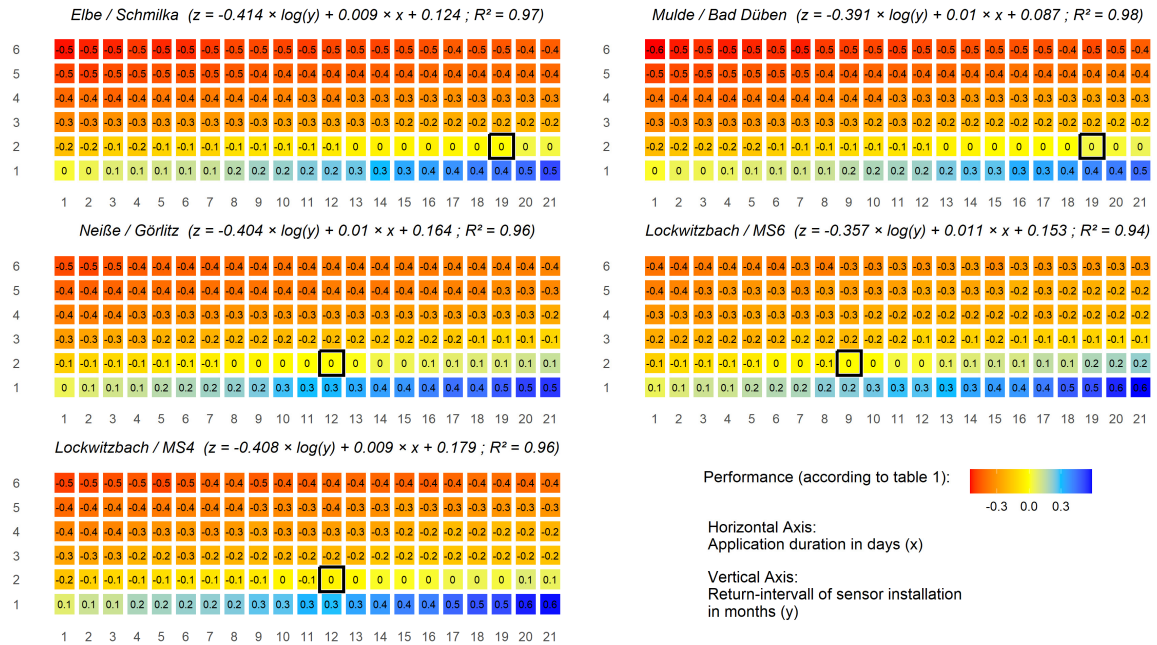


Figure S5: Performance between STOM and Grab sampling during the whole day (0-24h) for chloride

## Oxygen

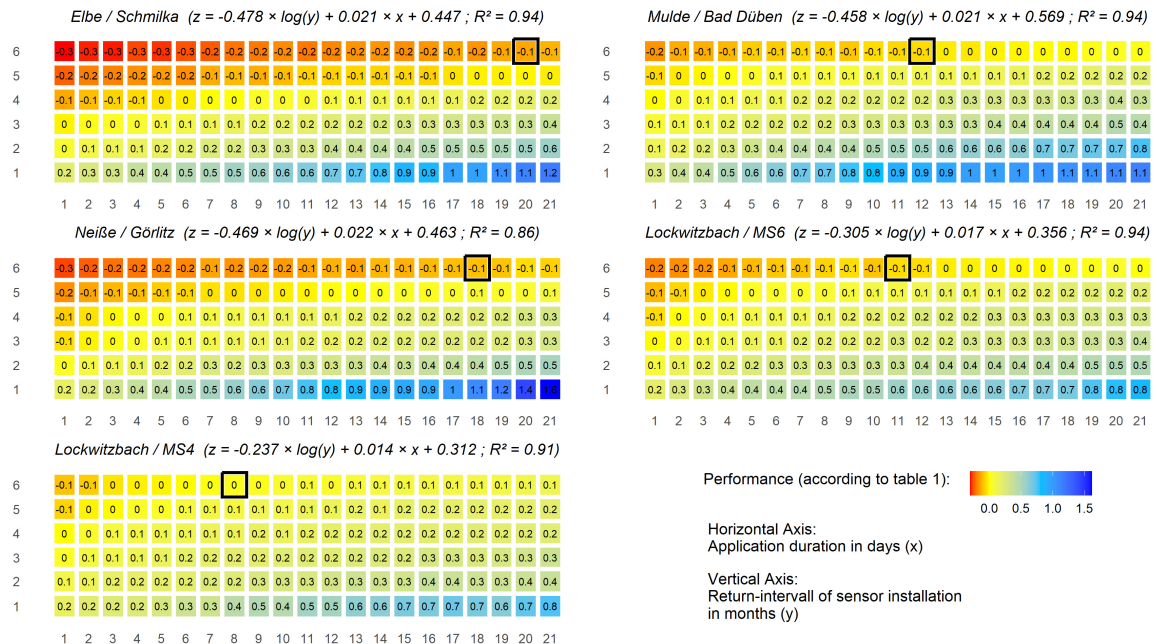


Figure S6: Performance between STOM and Grab sampling during the whole day (0-24h) for dissolved oxygen

## Nitrate

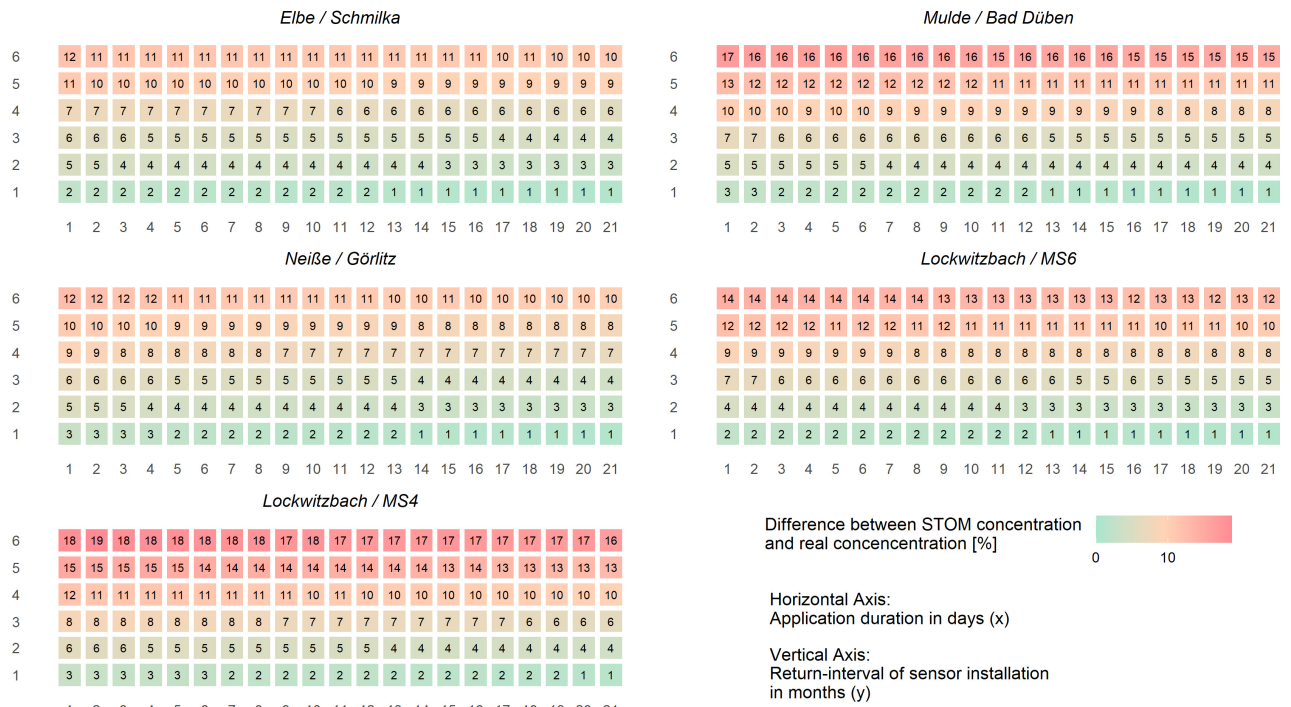


Figure S7: Difference between STOM concentration and real concentration for nitrogen-nitrate

## Chloride

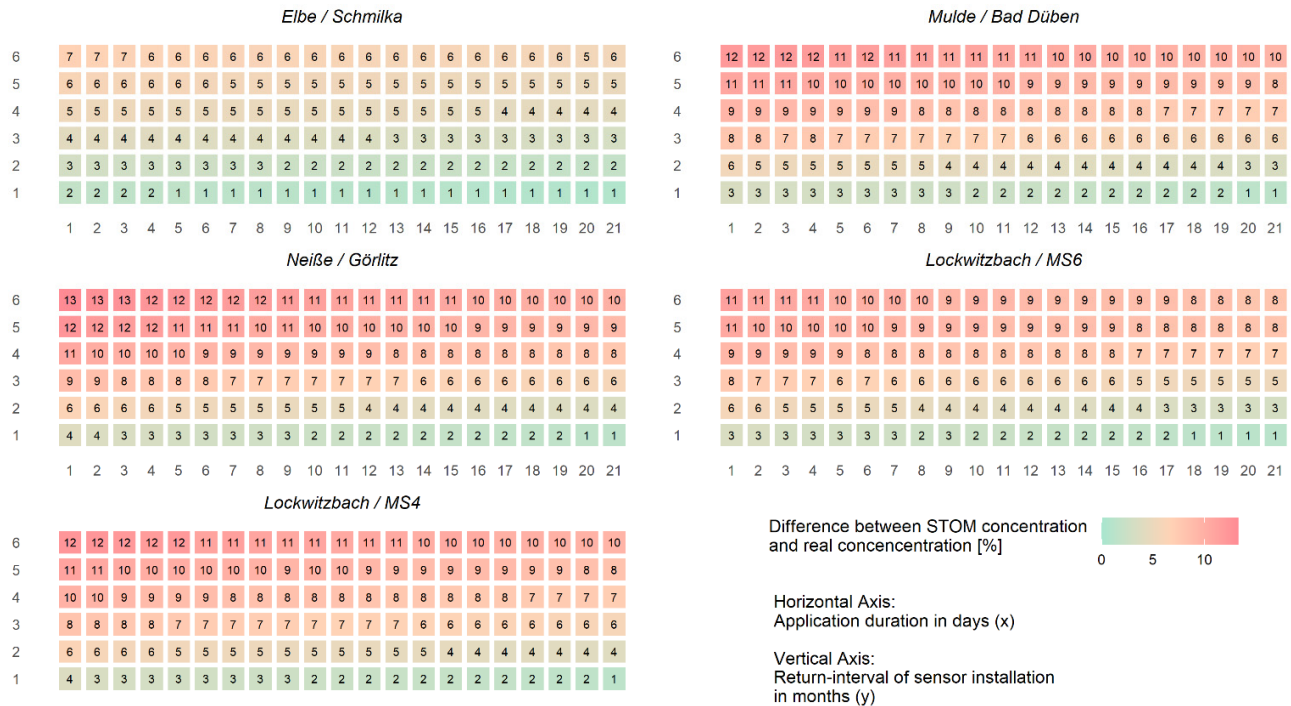


Figure S8: Difference between STOM concentration and real concentration for chloride



## Oxygen

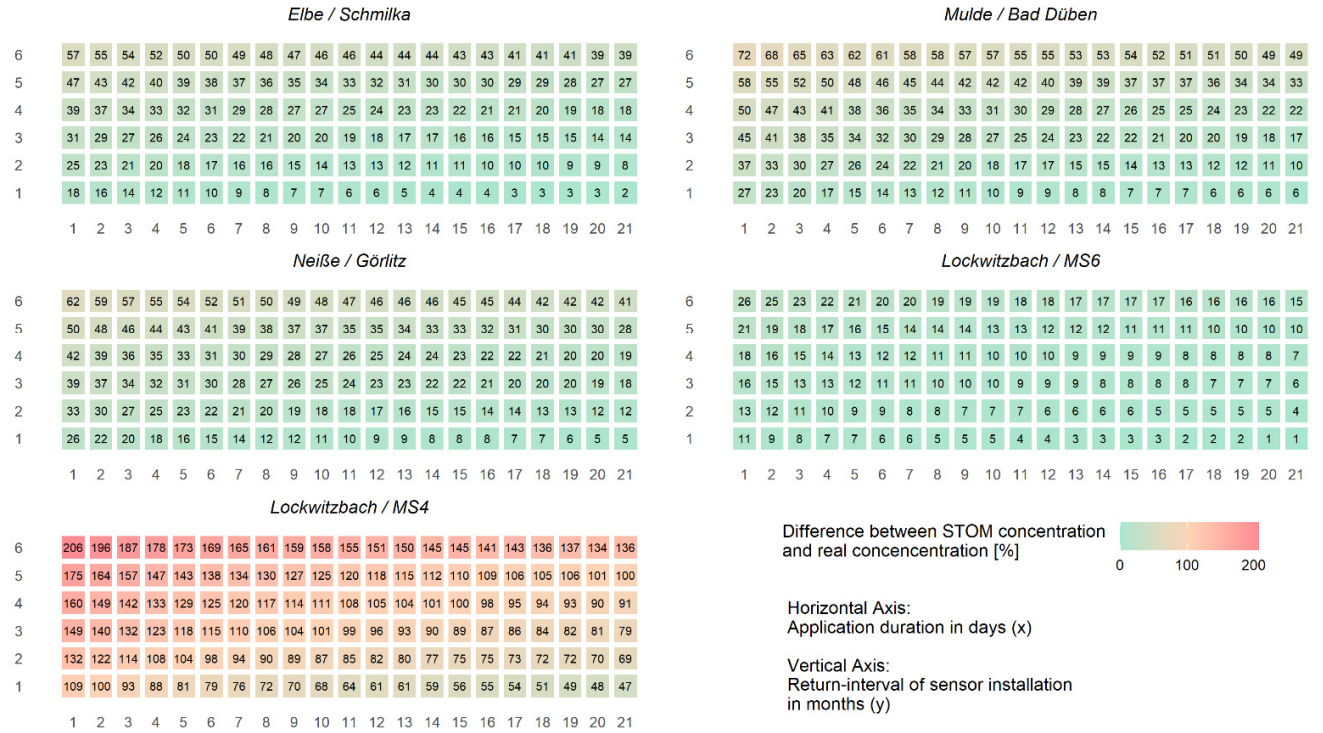


Figure S9: Difference between STOM concentration and real concentration for oxygen

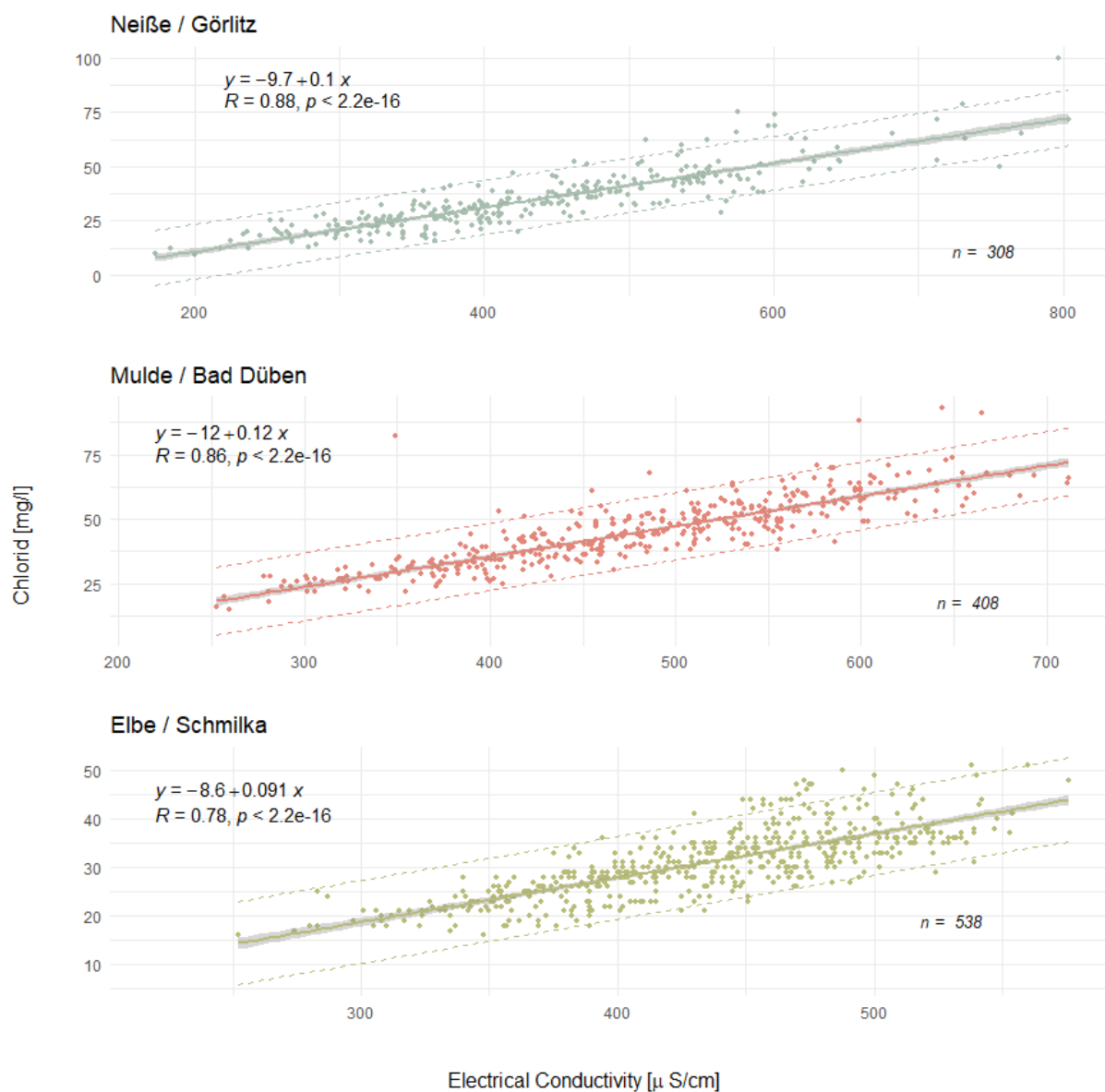


Figure S10: Linear relation between electrical conductivity and chloride concentration at Mule / Bad Döben, Lausitzer Neiße / Görlitz and Elbe / Schmilka. Shaded area: 95%-confidence interval, dashed lines: Prediction interval

Table S1: Result of 500 simulation runs of grab sampling according to OGeV rules with standard deviation. Sampling frequency were varied between once to every month to two times per year.

	Grab sampling every month			Grab sampling every fourth month		
	Nitrate-Nitrogen [mg/l]	Chloride [mg/l]	Dissolved Oxygen [mg/l]	Nitrate-Nitrogen [mg/l]	Chloride [mg/l]	Dissolved Oxygen [mg/l]
Mulde / Bad Döben	$4.2 \pm 0.1$	$41 \pm 1.7$	$11.1 \pm 0.3$	$4.2 \pm 0.5$	$40.9 \pm 4.7$	$11.1 \pm 0.8$
Elbe / Schmilka	$3.3 \pm 0.1$	$30.2 \pm 0.7$	$10.4 \pm 0.3$	$3.3 \pm 0.3$	$30.2 \pm 2.1$	$10.4 \pm 1$

Neiße / Görlitz	2.8 ± 0.1	35.3 ± 1.8	10.5 ± 0.2	2.7 ± 0.3	35.3 ± 4.8	10.5 ± 0.7
Lockwitzbach /MS6	7 ± 0.2	43 ± 2.2	11.2 ± 0.2	7 ± 0.8	42.9 ± 5.5	11.1 ± 0.7
Lockwitzbach /MS4	6.3 ± 0.3	41.9 ± 2.2	12.6 ± 0.5	6.4 ± 1	42 ± 5.9	12.5 ± 1.1
Grab sampling every second month			Grab sampling every fifth month			
	Nitrate-Nitrogen [mg/l]	Chloride [mg/l]	Dissolved Oxygen [mg/l]	Nitrate-Nitrogen [mg/l]	Chloride [mg/l]	Dissolved Oxygen [mg/l]
Mulde / Bad Düben	4.2 ± 0.3	40.9 ± 2.9	11.1 ± 0.5	4.2 ± 0.6	40.9 ± 5.5	11 ± 1.1
Elbe / Schmilka	3.3 ± 0.2	30.2 ± 1.2	10.4 ± 0.5	3.4 ± 0.4	30.3 ± 2.4	10.4 ± 1.2
Neiße / Görlitz	2.8 ± 0.2	35.3 ± 2.9	10.5 ± 0.4	2.7 ± 0.3	35.5 ± 5.6	10.5 ± 0.9
Lockwitzbach /MS6	7 ± 0.4	43.1 ± 3.5	11.2 ± 0.4	7 ± 0.9	42.6 ± 6.9	11.1 ± 0.8
Lockwitzbach /MS4	6.3 ± 0.5	41.9 ± 3.7	12.6 ± 0.8	6.3 ± 1.1	41.5 ± 6.6	12.5 ± 1.4
Grab sampling every third month			Grab sampling every sixth month			
	Nitrate-Nitrogen [mg/l]	Chloride [mg/l]	Dissolved Oxygen [mg/l]	Nitrate-Nitrogen [mg/l]	Chloride [mg/l]	Dissolved Oxygen [mg/l]
Mulde / Bad Düben	4.2 ± 0.4	41 ± 4	11.1 ± 0.7	4.2 ± 0.9	40.9 ± 6.4	11.1 ± 1.2
Elbe / Schmilka	3.3 ± 0.2	30.2 ± 1.7	10.4 ± 0.7	3.3 ± 0.5	30.2 ± 2.6	10.4 ± 1.4
Neiße / Görlitz	2.8 ± 0.2	35.3 ± 3.9	10.5 ± 0.6	2.7 ± 0.4	35.3 ± 6	10.5 ± 1.4
Lockwitzbach /MS6	7 ± 0.6	42.9 ± 4.5	11.1 ± 0.6	7 ± 1.2	42.8 ± 6.7	11.1 ± 1.1
Lockwitzbach /MS4	6.4 ± 0.7	41.8 ± 4.7	12.5 ± 1.1	6.4 ± 1.5	41.9 ± 7.9	12.5 ± 1.6

Table S2: Monitoring costs for STOM in Euro per year

	Return interval in months						
	1	2	3	4	5	6	
Application duration in days	1	8011	5077	4099	3610	3316	3121
	2	8011	5077	4099	3610	3316	3121
	3	8011	5077	4099	3610	3316	3121
	4	8011	5077	4099	3610	3316	3121
	5	8011	5077	4099	3610	3316	3121
	6	8011	5077	4099	3610	3316	3121
	7	8011	5077	4099	3610	3316	3121
	8	8011	5077	4099	3610	3316	3121
	9	10154	5077	4099	3610	3316	3121
	10	10154	5077	4099	3610	3316	3121
	11	10154	5077	4099	3610	3316	3121
	12	10154	5077	4099	3610	3316	3121
	13	10154	5077	4099	3610	3316	3121
	14	10154	5077	4099	3610	3316	3121
	15	12297	5077	4099	3610	3316	3121
	16	12297	5077	4099	3610	3316	3121
	17	12297	5077	4099	3610	3316	3121
	18	12297	5077	4099	3610	3316	3121

19	12297	5077	4099	3610	3316	3121
20	12297	5077	4099	3610	3316	3121
21	14439	5077	4099	3610	3316	3121