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Spatial and temporal dynamics of suspended particles and *E. coli* in a complex surface-water and karst groundwater system as a basis for an adapted water protection scheme, Northern Vietnam

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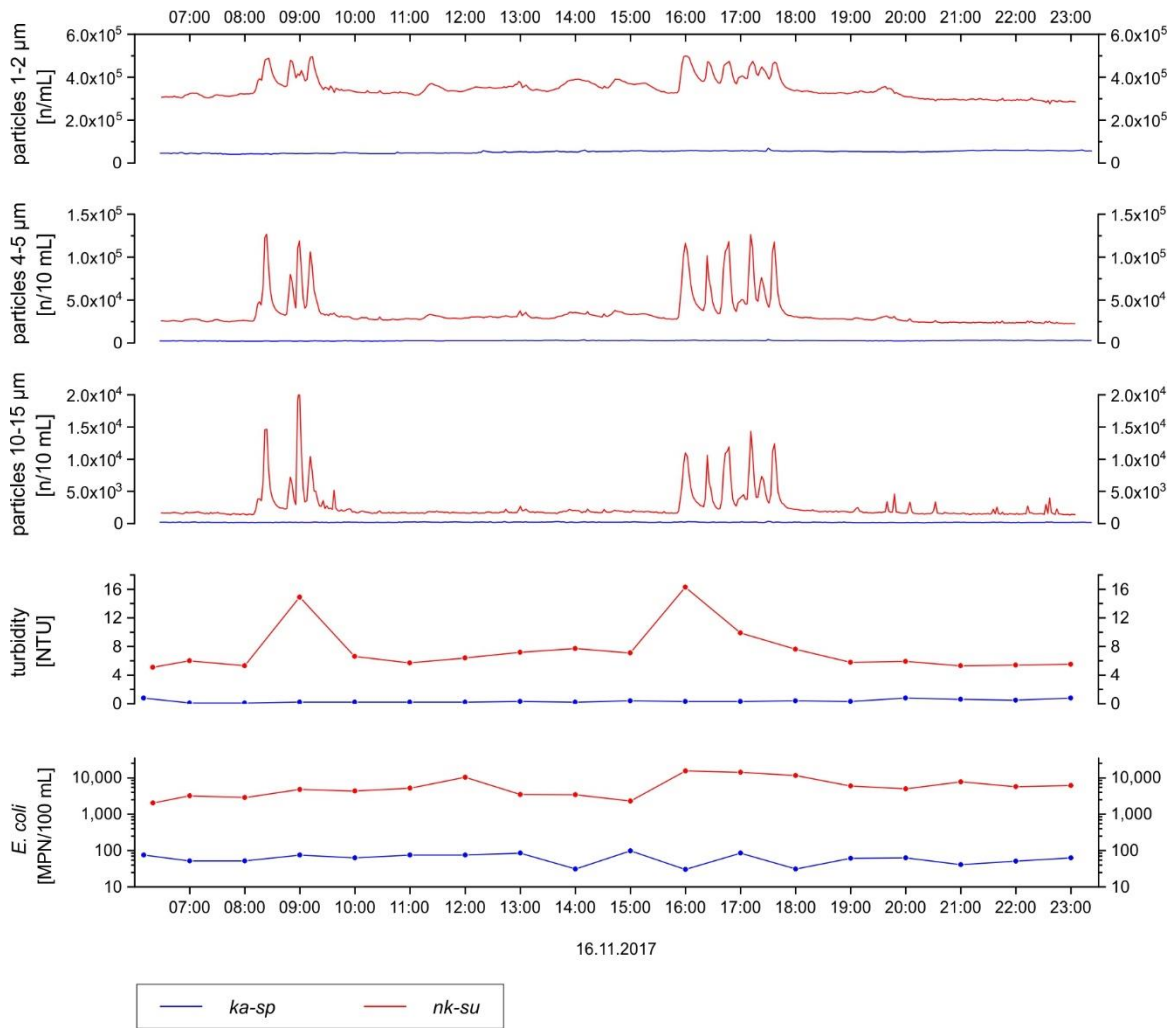


Fig S-1: Measurement series 1 at the surface stream nk-su (red) and the karst spring ka-sp (blue) on November 16th 2017 at constant hydraulic conditions, showing the concentration of three different particle-size classes (1-2 μm , 4-5 μm , 10-15 μm , turbidity, and *E. coli* concentration. Constant discharge at nk-su: 50 L/s, at ka-sp: 80 L/s.

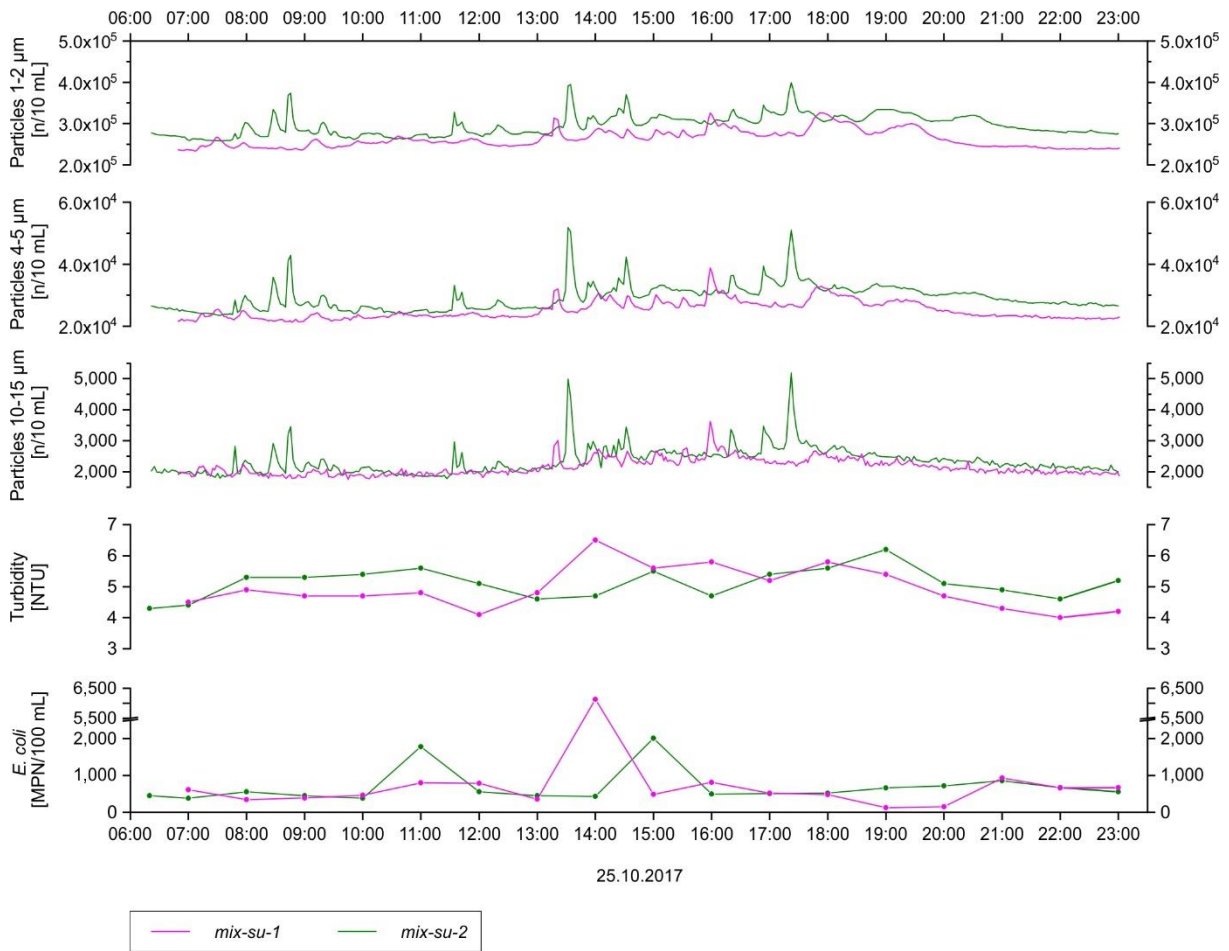


Fig S-2: Measurement series 2 at sampling site mix-su-1 (pink) and mix-su-2 (green) on October 25th 2017 at constant hydraulic conditions, showing the concentration of three different particle-size classes (1-2 μm , 4-5 μm , 10-15 μm), turbidity, and *E. coli* concentration. Constant discharge at mix-su-1: 550 L/s; at mix-su-2: 750 L/s.

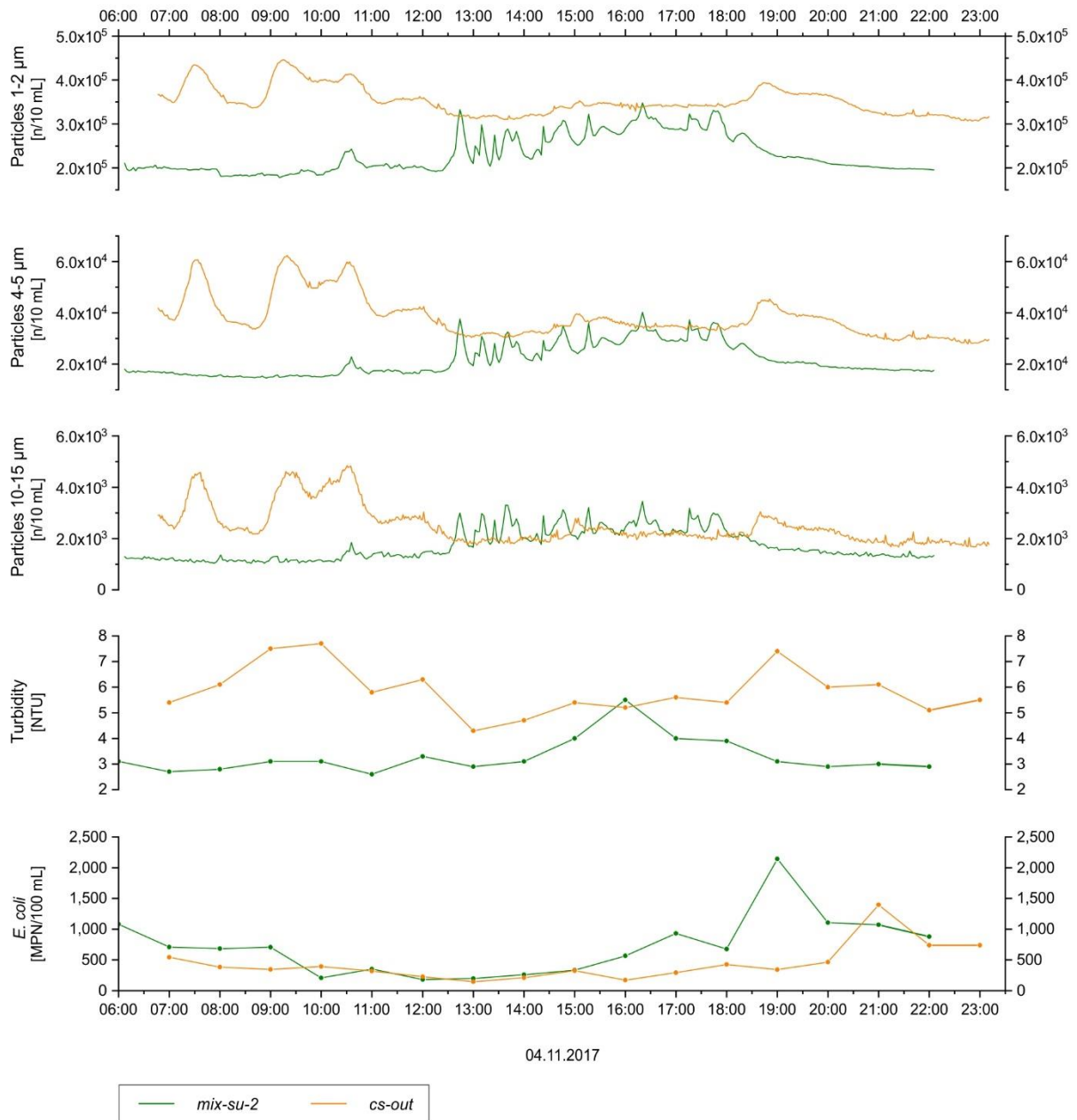


Fig S-3: Measurement series 3 at sampling site mix-su-2 (green) and cs-out (orange) on November 4th 2017 at constant hydraulic conditions, showing the concentration of three different particle-size classes (1-2 μm , 4-5 μm , 10-15 μm), turbidity, and *E. coli* concentration. Constant discharge at mix-su-2: 460 L/s, at cs-out: 640 L/s.

		MEASUREMENT SERIES 1		MEASUREMENT SERIES 2		MEASUREMENT SERIES 3	
		<i>ka-sp</i>	<i>nk-su</i>	<i>mix-su-1</i>	<i>mix-su-2</i>	<i>mix-su-2</i>	<i>cs-out</i>
particles 1-2 µm	n	380	500	420	378	366	623
	min [n/10 mL]	4.02*10 ⁴	2.76*10 ⁵	2.34*10 ⁵	2.59*10 ⁵	1.78*10 ⁵	3.07*10 ⁵
	max [n/10 mL]	6.93*10 ⁴	4.98*10 ⁵	3.26*10 ⁵	3.99*10 ⁵	3.48*10 ⁵	4.46*10 ⁵
	mean [n/10 mL]	5.14*10 ⁴	3.47*10 ⁵	2.63*10 ⁵	2.96*10 ⁵	2.30*10 ⁵	3.52*10 ⁵
	initial value [n/10 mL]	4.52*10 ⁴	3.07*10 ⁵	2.37*10 ⁵	2.78*10 ⁵	2.11*10 ⁵	3.67*10 ⁵
	last value [n/10 mL]	5.57*10 ⁴	2.86*10 ⁵	2.41*10 ⁵	2.76*10 ⁵	1.96*10 ⁵	3.17*10 ⁵
	S.D.	5.64*10 ³	4.66*10 ⁴	2.09*10 ⁴	2.52*10 ⁴	4.28*10 ⁴	3.20*10 ⁴
	<i>p</i>	<i>< 0.001</i>		<i>< 0.001</i>		<i>< 0.001</i>	
	<i>λ</i>	<i>< 0.001</i>		<i>< 0.001</i>		<i>< 0.001</i>	
particles 4-5 µm	n	380	500	420	378	366	623
	min [n/10 mL]	1.93*10 ³	2.23*10 ⁴	2.13*10 ⁴	2.35*10 ⁴	1.46*10 ⁴	2.79*10 ⁴
	max [n/10 mL]	4.09*10 ³	1.27*10 ⁵	3.88*10 ⁴	5.19*10 ⁴	4.03*10 ⁴	6.24*10 ⁴
	mean [n/10 mL]	2.59*10 ³	3.48*10 ⁴	2.51*10 ⁴	2.91*10 ⁴	2.15*10 ⁴	3.81*10 ⁴
	initial value [n/10 mL]	2.30*10 ³	2.59*10 ⁴	2.16*10 ⁴	2.65*10 ⁴	1.81*10 ⁴	4.19*10 ⁴
	last value [n/10 mL]	2.81*10 ³	2.26*10 ⁴	2.29*10 ⁴	2.65*10 ⁴	1.75*10 ⁴	2.96*10 ⁴
	S.D.	3.24*10 ²	1.83*10 ⁴	2.89*10 ³	4.19*10 ³	6.17*10 ³	8.06*10 ³
	<i>p</i>	<i>< 0.001</i>		<i>< 0.001</i>		<i>< 0.001</i>	
	<i>λ</i>	<i>< 0.001</i>		<i>< 0.001</i>		<i>< 0.001</i>	
particles 10-15 µm	n	380	500	420	378	366	623
	min [n/10 mL]	1.17*10 ²	1.31*10 ³	1.75*10 ³	1.77*10 ³	1.04*10 ³	1.67*10 ³
	max [n/10 mL]	3.38*10 ²	2.13*10 ⁴	3.63*10 ³	5.19*10 ³	3.45*10 ³	4.84*10 ³
	mean [n/10 mL]	1.91*10 ²	2.56*10 ³	2.15*10 ³	2.34*10 ⁴	1.71*10 ³	2.50*10 ³
	initial value [n/10 mL]	1.91*10 ²	1.65*10 ³	1.91*10 ³	2.03*10 ³	1.30*10 ³	2.90*10 ³
	last value [n/10 mL]	1.77*10 ²	1.40*10 ³	1.87*10 ³	1.99*10 ³	1.34*10 ³	1.76*10 ³
	S.D.	3.40*10 ¹	2.33*10 ³	2.63*10 ²	4.26*10 ²	5.90*10 ²	7.55*10 ²
	<i>p</i>	<i>< 0.001</i>		<i>< 0.001</i>		<i>< 0.001</i>	
	<i>λ</i>	<i>< 0.001</i>		<i>< 0.001</i>		<i>< 0.001</i>	
turbidity	n	18	18	17	18	17	17
	min [NTU]	0.1	5.1	4.0	4.3	2.6	4.3
	max [NTU]	0.8	16.3	6.5	6.2	5.5	7.7
	mean [NTU]	0.4	7.4	5.0	5.1	3.3	5.9
	initial value [NTU]	0.8	5.1	4.5	4.3	3.1	5.4
	last value [NTU]	0.8	5.5	0	5.2	2.9	5.5
	S.D.	0.2	3.2	0.7	0.5	0.7	0.9
	<i>p</i>	<i>< 0.001</i>		0.420		<i>< 0.001</i>	
	<i>λ</i>	<i>0.001</i>		0.193		0.238	
<i>E. coli</i>	n	18	18	17	18	17	17
	min [MPN/100 mL]	30	2044	127	379	183	146
	max [MPN/100 mL]	97	15402	6131	2014	2143	1396
	mean [MPN/100 mL]	61	6332	866	691	711	439
	initial value [MPN/100 mL]	75	2044	613	448	1081	545
	last value [MPN/100 mL]	63	6160	670	554	880	738
	S.D.	19	4020	1334	445	475	290
	<i>p</i>	<i>< 0.001</i>		0.611		0.060	
	<i>λ</i>	<i>< 0.001</i>		0.263		0.136	

Table S-1: Summary statistics for particles (1-2 µm; 4-5 µm; 10-15 µm), turbidity, and *E. coli* for measurement series 1, 2, and 3. *n*, number of samples; *S.D.*, standard deviation; *p*, significance after LSD; *λ*, significant differences for variance after Levene's test. Significant differences (*p* < 0.05) are in italics.

rs p n	1-2 μm	4-5 μm	10 - 15 μm	turbidity	<i>E. coli</i>
1-2 μm		0.83 <i>< 0.001</i> 380	0.05 0.858 380	0.35 0.158 18	0.32 0.196 18
4-5 μm	0.98 <i>< 0.001</i> 500		0.26 0.297 380	0.32 0.198 18	0.08 0.752 18
10 - 15 μm	0.94 <i>< 0.001</i> 500	0.91 <i>< 0.001</i> 500		0.29 0.240 18	0.11 0.675 18
turbidity	0.94 <i>< 0.001</i> 18	0.90 <i>< 0.001</i> 18	0.94 <i>< 0.001</i> 18		0.14 0.584 18
<i>E. coli</i>	0.15 0.565 18	0.12 0.627 18	0.23 0.354 18	0.29 0.245 18	

Table S-2: Spearman's rank correlation r_s with significance p and the number of measurements n for measurement series 1 at ka-sp (white) and nk-su (grey). Significant correlations ($p < 0.05$) are in italics.

rs p n	1-2 μm	4-5 μm	10 - 15 μm	turbidity	<i>E. coli</i>
1-2 μm		0.97 <i>< 0.001</i> 378	0.92 <i>< 0.001</i> 378	0.35 0.151 17	0.23 0.365 17
4-5 μm	0.93 <i>< 0.001</i> 420		0.94 <i>< 0.001</i> 378	0.36 0.138 17	0.17 0.489 17
10 - 15 μm	0.83 <i>< 0.001</i> 420	0.93 <i>< 0.001</i> 420		0.27 0.273 17	0.03 0.916 17
turbidity	0.84 <i>< 0.001</i> 17	0.82 <i>< 0.001</i> 17	0.83 <i>< 0.001</i> 17		0.40 0.096 17
<i>E. coli</i>	0.01 0.970 17	0.02 0.926 17	0.07 0.801 17	-0.08 0.764 17	

Table S-3: Spearman's rank correlation r_s with significance p and the number of measurements n for measurement series 2 at mix-su-1 (grey) and mix-su-2 (white). Significant correlations ($p < 0.05$) are in italics.

rs p n	1-2 μm	4-5 μm	10 - 15 μm	turbidity	<i>E. coli</i>
1-2 μm		0.94 <i>< 0.001</i> 623	0.90 <i>< 0.001</i> 623	0.80 <i>< 0.001</i> 17	0.01 0.996 17
4-5 μm	0.96 <i>< 0.001</i> 366		0.96 <i>< 0.001</i> 623	0.73 <i>0.001</i> 17	-0.24 0.345 17
10 - 15 μm	0.85 <i>< 0.001</i> 366	0.94 <i>< 0.001</i> 366		0.70 0.002 17	-0.17 0.525 17
turbidity	0.68 <i>0.003</i> 17	0.64 <i>0.006</i> 17	0.60 <i>0.010</i> 17		0.24 0.346 17
<i>E. coli</i>	0.06 0.830 17	0.05 0.837 17	-0.10 0.694 17	-0.15 0.561 17	

Table S-4: Spearman's rank correlation r_s with significance p and the number of measurements n for measurement series 3 at mix-su-1 (grey) and cs-out (white). Significant correlations ($p < 0.05$) are in italics.