

Contributions of Catchment and In-Stream Processes to Suspended Sediment Transport in a Dominantly Groundwater-Fed Catchment

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Table S1. Sensitivity analysis of the sediment transport model

Parameter	Adjustment factor [-]	Rural contribution [%]	NSE for entire SS, NSE _e [-]		NSE for SS \geq 30 mg L ⁻¹ , NSE _h [-]	
			Calibration	Validation	Calibration	Validation
M_{max}	-90%	7.0	0.21	0.09	-0.23	-0.39
	-70%	5.7	0.31	0.20	-0.05	-0.22
	-50%	4.9	0.38	0.27	0.10	-0.08
	-30%	4.2	0.43	0.32	0.22	0.03
	-10%	3.7	0.45	0.33	0.31	0.11
	+30%	3.0	0.43	0.25	0.42	0.17
	+50%	2.8	0.38	0.17	0.43	0.15
	+100%	2.3	0.14	-0.16	0.33	-0.01
	+200%	1.7	-0.79	-1.36	-0.37	-0.90
	+300%	1.3	-2.32	-3.29	-1.75	-2.50
K_w	-90%	6.9	0.22	0.10	-0.21	-0.38
	-70%	5.6	0.32	0.22	-0.02	-0.19
	-50%	4.8	0.40	0.29	0.13	-0.04
	-30%	4.2	0.44	0.33	0.24	0.06
	-10%	3.7	0.46	0.33	0.32	0.12
	+30%	3.1	0.43	0.25	0.41	0.14
	+50%	2.8	0.39	0.17	0.42	0.11
	+100%	2.4	0.23	-0.11	0.39	-0.05
	+200%	1.9	-0.26	-0.93	0.12	-0.63
	+300%	1.7	-0.86	-1.74	-0.23	-0.96
C_h	-90%	0.4	0.50	0.32	0.34	0.13
	-70%	1.1	0.49	0.32	0.34	0.13
	-50%	1.8	0.49	0.32	0.34	0.13
	-30%	2.5	0.48	0.32	0.35	0.13
	-10%	3.2	0.47	0.32	0.35	0.14
	+30%	4.5	0.43	0.32	0.35	0.14
	+50%	5.2	0.40	0.32	0.35	0.14
	+100%	6.7	0.33	0.31	0.36	0.14
	+200%	9.6	0.10	0.30	0.36	0.14
	+300%	12.3	-0.20	0.29	0.36	0.14
τ_c	-90%	9.7	0.29	0.30	0.36	0.15
	-70%	7.8	0.35	0.31	0.36	0.15
	-50%	6.3	0.40	0.32	0.35	0.14
	-30%	5.0	0.43	0.32	0.35	0.14
	-10%	4.0	0.45	0.32	0.35	0.14
	+30%	2.5	0.47	0.32	0.35	0.13
	+50%	1.9	0.48	0.32	0.35	0.13
	+100%	1.1	0.49	0.32	0.34	0.13
	+200%	0.3	0.50	0.32	0.34	0.13
	+300%	0.1	0.50	0.32	0.34	0.13
Base case	0%	3.5	0.46	0.32	0.35	0.14

* The calibrated parameter-set is used as the base case.

Table S2. The PAH concentrations (the sum of 15 PAHs) on different particles in the Ammer catchment.

Symbol	Description	Value (mg kg ⁻¹)	Remarks
c_u	PAH concentration on urban particles	8.1	(Gocht et al., 2005)
c_r	PAH concentration on rural particles	1	based on measurements
c_{bf}	PAH concentration on baseflow particles	1	assuming the same as rural particles
c_{bd}	PAH concentration on river bed particles	8.1	assuming the same as urban particles
c_{bk}	PAH concentration on river bank particles	0	regarded as clean particles
$c_{p,ss}$	Average PAH concentration on suspended particles at the gauge	5.8	(Schwientek et al., 2013)

5 **Sediment source diagnosis based on the end-member-mixing analysis of sediment-bound PAHs.**

$$f_u + f_r + f_{bf} + f_{bd} + f_{bk} = 1, \text{ assuming } f_{bk}=0.06 \text{ from the model simulation} \quad (S1)$$

$$c_u f_u + c_r f_r + c_{bf} f_{bf} + c_{bd} f_{bd} + c_{bk} f_{bk} = c_{p,ss} \quad (S2)$$

Because $c_u=c_{bd}$, $c_r=c_{bf}$, then we can get

$$c_u(f_u + f_{bd}) + c_r(f_r + f_{bf}) = 5.8 \quad (S3)$$

10 $f_u + f_{bd} = 0.68 \quad (S4)$

$$f_r + f_{bf} = 0.26 \quad (S5)$$

$$f_{bf} = \frac{\sum_{Q_i \leq 1} Q_i c_{ss,i}}{\sum Q_i c_{ss,i}} = 0.23 \quad (S6)$$

$$f_r = 0.03 \quad (S7)$$

in which, f_u , f_r , f_{bf} , f_{bd} , and f_{bk} are the annual contribution fractions of urban, rural, baseflow, bed erosion, and bank
15 erosion particles, respectively. Q_i and $c_{ss,i}$ are the i-th measured discharge and suspended sediment concentration.

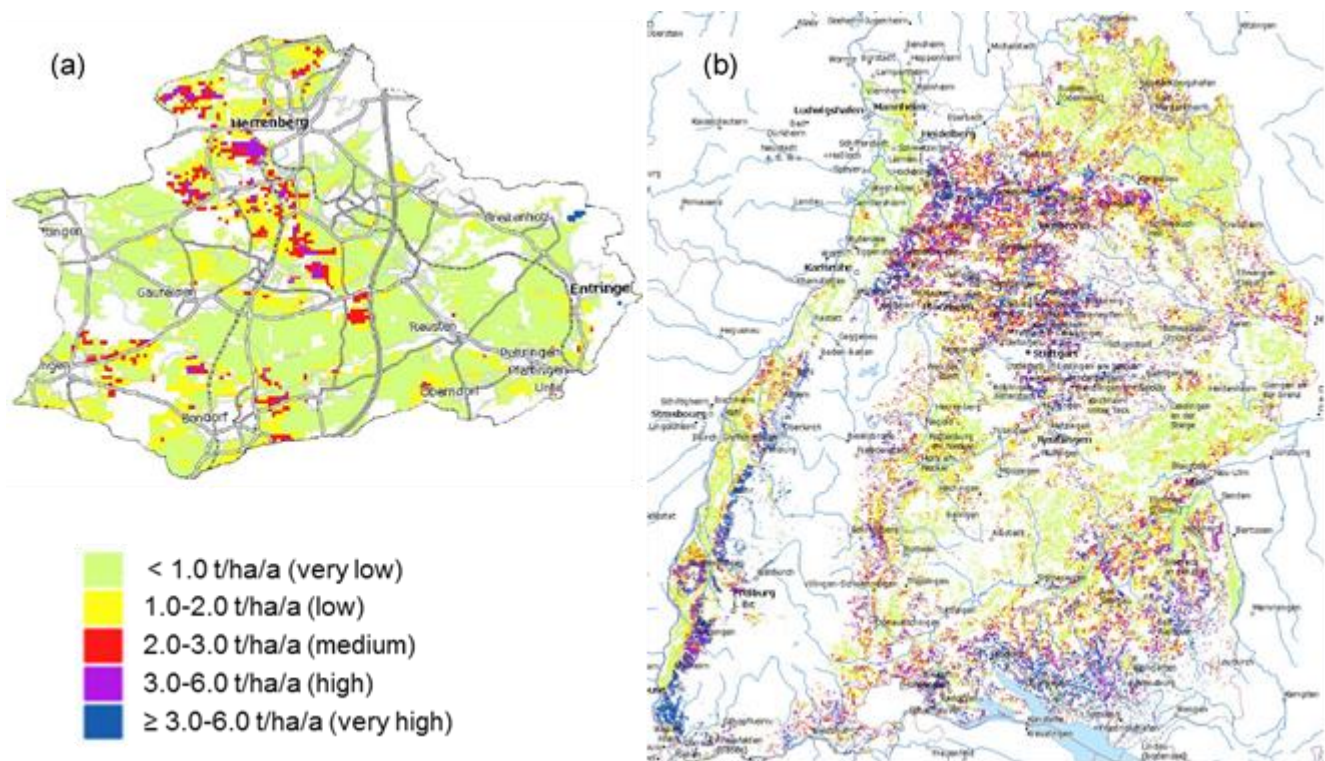


Figure S1. Soil erosion maps of the Ammer catchment (a) and the state of Baden-Württemberg (b). The white color in the maps represents forest. The original information can be found in <http://maps.lgrb-bw.de/>.

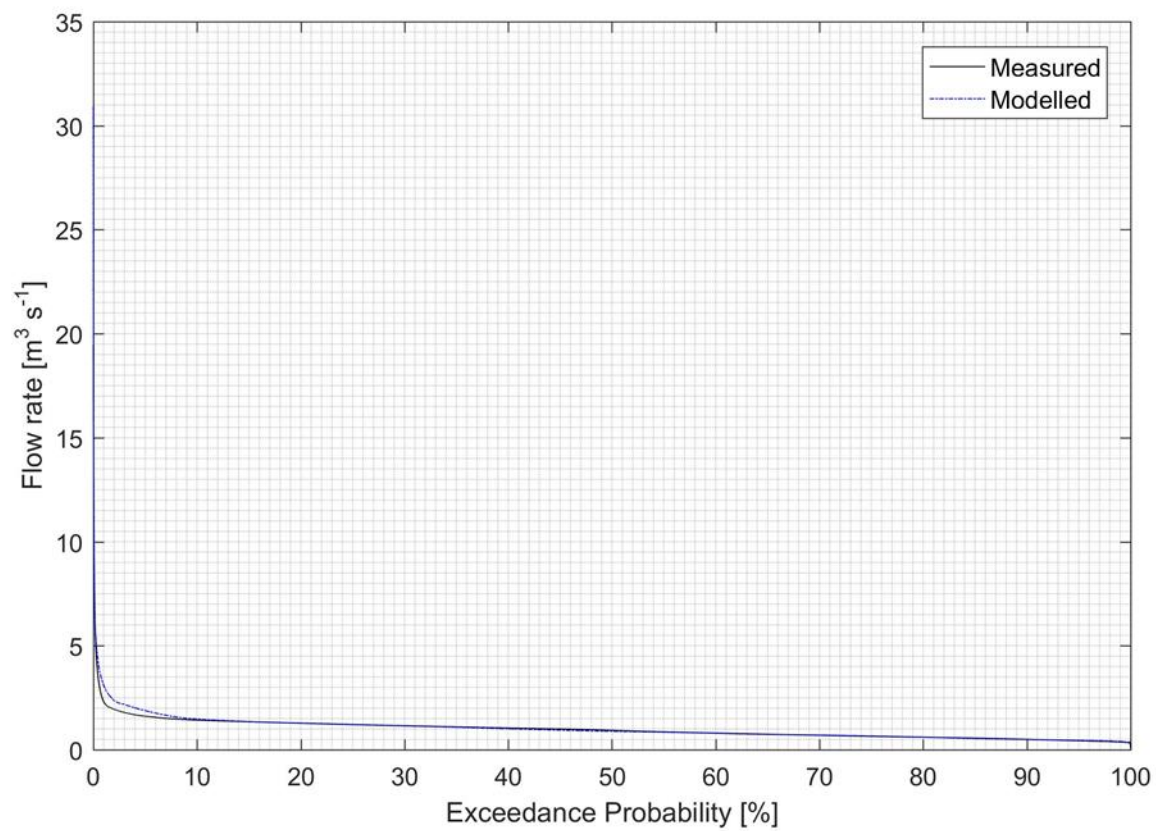


Figure S2. Flow duration curves of measured and modelled discharge of the Ammer River for year 2014-2016.

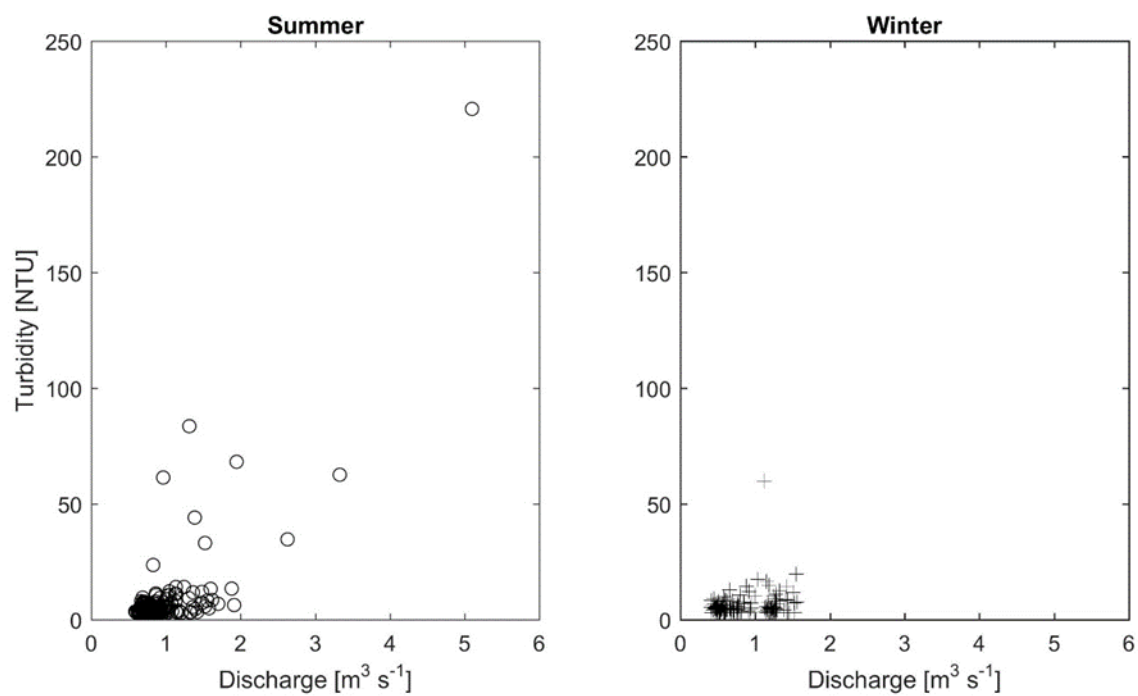


Figure S3. Relationships between measured turbidity and discharge for summer season (Left) and winter season (Right).

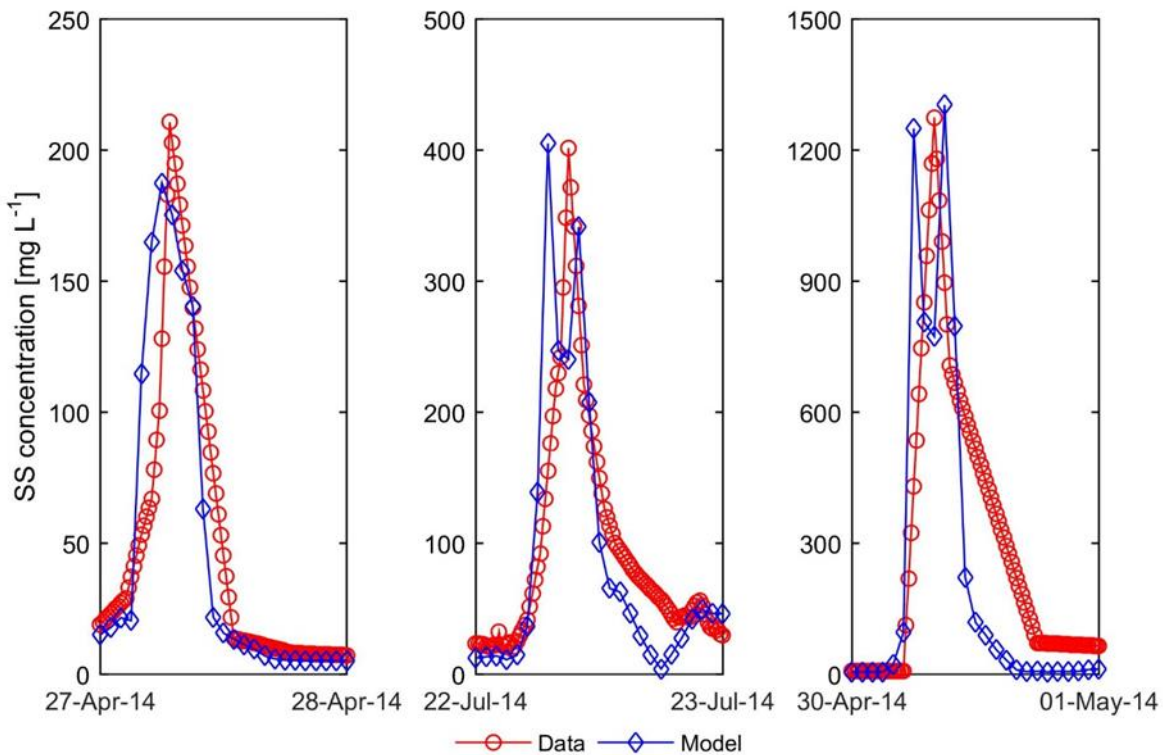


Figure S4. Measured and modelled suspended sediment concentrations for different events (the event becomes bigger from left to right of the figure).

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Reference

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- 10 Schwientek, M., Rugner, H., Beckingham, B., Kuch, B., and Grathwohl, P.: Integrated monitoring of particle associated transport of PAHs in contrasting catchments, Environ Pollut, 172, 155-162, 10.1016/j.envpol.2012.09.004, 2013.