Supplementary Materials for

The effect of stream discharge on hyporheic exchange

Brian Babak Mojarrad, Andrea Betterle, Tanu Singh, Carolina Olid and Anders Wörman

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Introduction

This supplementary materials contains the study domain characteristics which were used in our analysis but not found in the main paper, drainage area to every 50 meters of the stream (Fig. S1), depth decaying hydraulic conductivity function using measured values from Morén et al. 2017 (Fig. S2), and mean value of hyporehic zone depth under various flow condition (Fig. S3).

Furthermore, the document includes correlation between discharge and mean water depth using five flow data (Table S1), and estimated mean water depth for different flow condition (Table S2).

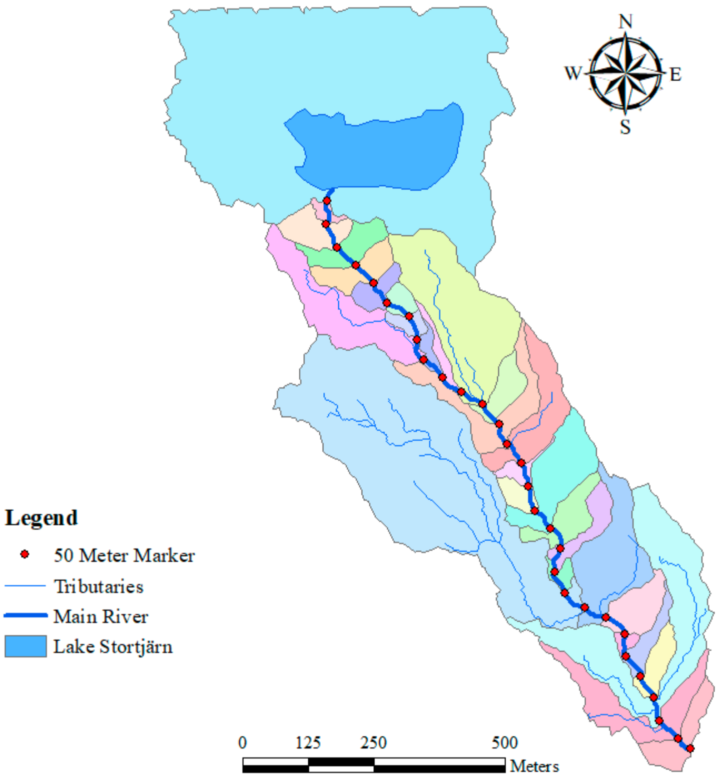

Figure S1. Map showing the draining area every 50 meter along the main river of the subcatchment, as well the main river (dark blue color), tributaries (light blue color), the lake Stortjärn (solid light blue region), and 50 meter distance markers (red dots) from upstream.

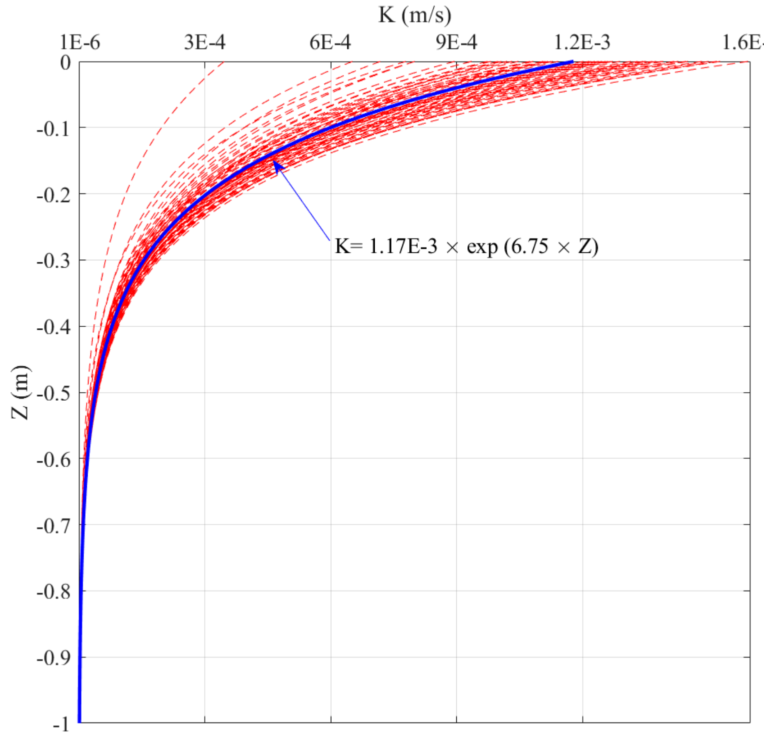

Figure S2. Hydraulic conductivity decay function along the depth. Red color dashed lines represent the measured values from Morén et al. (2017), and blue color solid line is the mean exponential function for all the measured data.

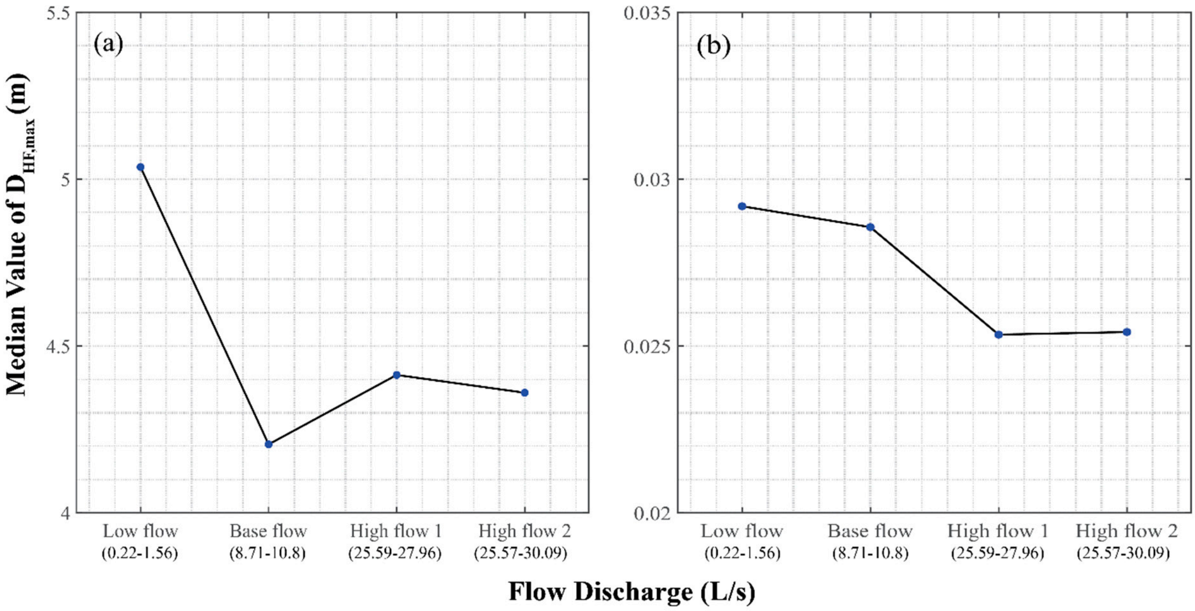

Figure S3. Mean value of hyporehic zone depth under various flow condition assuming: (**a**) constant intrinsic permeability ($K = 10^{-9}$ [m²]) for the entire subsurface region and (**b**) decaying intrinsic permeability (starting from $K(Z = 0) = 10^{-9}$ [m²] at the surface–subsurface water interface and decaying exponentially to $K(Z = -1) = 10^{-12}$ [m²] down to a depth of 1 m). In the case of vertically varying permeability, a constant permeability ($K = 10^{-12}$) was used for depths larger than 1 m.

Table S1. Correlation between discharge and mean water depth using five flow data for every 50 meter distance from upstream along the main river

Distance from upstream [m]	Correlation function	R^2	Drainage area [m2]	Distance from upstream [m]	Correlation function	R^2	Drainage area [m2]
0	$Q = 0.1864 \times h^{1.658}$	0.9421	234445.7	700	$Q = 0.0035 \times h^{2.662}$	0.2974	373439.2
50	$Q = 0.1866 \times h^{1.658}$	0.9568	236030.7	750	$Q = 0.002 \times h^{3.124}$	0.9648	375921
100	$Q = 0.5928 \times h^{1.319}$	0.8726	243262.3	800	$Q =1.032 \times h^{1.145}$	0.98	379197.4
150	$Q = 1E-6 \times h^{5.136}$	0.8589	250838.1	850	$Q = 1.29E-4 \times h^{4.221}$	0.8781	396899.4
200	$Q = 0.0155 \times h^{2.193}$	0.3293	258334.2	900	$Q =5.52E-4 \times h^{4.107}$	0.5793	405144.5
250	$Q = 4.35E-4\times h^{3.387}$	0.9844	262731.3	950	$Q = 4.24E-3 \times h^{2.94}$	0.9975	411321.6
300	$Q = 0.0243 \times h^{2.208}$	0.82	265497.2	1000	$Q = 2.29E-18 \times h^{13.08}$	0.3203	413346.9
350	$Q = 0.4983 \times h^{1.432}$	0.8404	267926	1050	$Q = 0.241 \times h^{1.636}$	0.9895	535590.8
400	$Q = 0.1593 \times h^{1.784}$	0.8743	291324.1	1100	$Q = 0.6612 \times h^{1.518}$	0.9553	558354.6
450	$Q = 0.0365 \times h^{2.186}$	0.9803	293516.2	1150	$Q = 0.3135 \times h^{2.032}$	0.9998	567112.5
500	$Q = 0.0078 \times h^{2.921}$	0.9994	296213.5	1200	$Q = 0.0245 \times h^{2.373}$	0.9733	568491.9
550	$Q = 6.63E-10 \times h^{-6.91}$	0.6568	337040	1250	$Q = 5.99E-5 \times h^{4.097}$	0.9904	573211.1
600	$Q = 0.0445 \times h^{1.926}$	0.9551	343055.2	1300	$Q = 1.72E-14 \times h^{10.1}$	0.9854	578673.2
650	$Q = 0.0767 \times h^{1.922}$	0.9797	357882.2	1437	$Q = 6.06E-15 \times h^{10.4}$	0.9843	648703.1

Table S2. Estimated mean water depth for different flow condition every 50 meter from upstream

Distance from Upstream [m]	Mean Water Depth [cm]			
	Base flow	Low flow	High flow 1	High flow 2
0	0.102	0.011	0.195	0.195
50	0.102	0.011	0.195	0.195
100	0.077	0.005	0.174	0.174
150	0.225	0.115	0.277	0.277
200	0.181	0.039	0.294	0.295
250	0.187	0.070	0.256	0.257
300	0.145	0.032	0.235	0.235
350	0.075	0.008	0.157	0.158
400	0.096	0.017	0.174	0.175
450	0.124	0.030	0.202	0.203
500	0.112	0.039	0.161	0.161
550	0.221	0.257	0.209	0.209
600	0.160	0.038	0.274	0.277
650	0.122	0.030	0.208	0.211
700	0.194	0.072	0.286	0.289

750	0.150	0.065	0.208	0.210
800	0.069	0.007	0.170	0.174
850	0.142	0.078	0.181	0.183
900	0.108	0.058	0.138	0.139
950	0.138	0.059	0.196	0.198
1000	0.265	0.219	0.287	0.288
1050	0.099	0.027	0.180	0.186
1100	0.061	0.015	0.116	0.121
1150	0.056	0.020	0.090	0.093
1200	0.128	0.053	0.193	0.198
1250	0.190	0.115	0.241	0.245
1300	0.291	0.237	0.320	0.322
1473	0.293	0.243	0.321	0.323