

Supplement of Hydrol. Earth Syst. Sci., 23, 125–138, 2019
<https://doi.org/10.5194/hess-23-125-2019-supplement>
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Supplement of

Understanding variability in root zone storage capacity in boreal regions

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1 Background on study catchments

Tables S1 and S2 give an overview of available vegetation and climate characteristics of the study catchments.

Table S1: Vegetation and land use characteristics of study catchments

ID	Catchment name	Size (km ²)	Pine RBM (10 kg/ha)	Spruce RBM (10 kg/ha)	Decid RBM (10 kg/ha)	Total RBM (10 kg/ha)	Forest (%)	Conifer (%)	Broad-leaved (%)	Agriculture (%)	Drained peat-land (%)	Pris-tine peat-land (%)	Leaf cover (%)	Tree height (dm)
7	Rudbäcken1	1.42	532	470	313	1636	90	53	4	0	8	4	50	152
11	Hovi	0.12	0	2	1	2	0	0	0	97	0	0	12	52
12	Ali-Knuuttila	0.25	127	225	201	666	40	18	6	48	0	0	61	141
13	Yli-Knuuttila	0.07	152	355	833	1569	90	11	29	0	0	0	59	118
14	Teeressuonoja	0.69	262	556	579	1802	88	30	13	0	1	11	59	146
15	Kylmänoja	4.04	293	416	265	1271	65	36	6	19	8	1	58	159
17	Koppelonoja	7.81	164	467	280	1271	65	33	5	23	6	1	59	157
18	Löyttynoja	8.2	259	363	349	1209	75	38	5	17	14	2	53	135
21	Löytäneenoja	5.64	94	132	111	409	26	13	1	63	2	1	50	132
22	Savijoki	15.4	371	346	146	1017	55	37	1	39	3	1	54	154
31	Paunulampuro	1.5	472	885	444	2037	98	66	1	0	10	3	58	167
32	Siukolampuro	1.86	138	280	184	800	89	58	2	0	42	14	53	116
33	Katajaluoma	11.2	692	232	144	1155	92	66	0	3	34	4	41	140
41	Niittyjoki	29.7	150	235	192	835	44	24	3	25	5	1	56	156
42	Ravijoki	56.9	475	329	179	1199	77	51	4	13	13	4	54	148
43	Latusuonoja	5.34	521	480	216	1499	81	60	2	15	12	0	60	166
44	Huhtisuonoja	5.03	926	225	283	1663	96	80	0	0	43	2	55	164
45	Juonistonoja	13	308	401	324	1454	81	42	5	11	22	1	57	148

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Table S1 – Continued from previous page

ID	Catchment name	Size (km ²)	Pine RBM (10 kg/ha)	Spruce RBM (10 kg/ha)	Decid RBM (10 kg/ha)	Total RBM (10 kg/ha)	Forest (%)	Conifer (%)	Broad-leaved (%)	Agriculture (%)	Drained peat-land (%)	Pris-tine peat-land (%)	Leaf cover (%)	Tree height (dm)
51	Kesselinpuro	21.7	491	443	311	1639	94	59	2	1	34	2	56	150
52	Kuokkalanoja	2.67	396	527	300	1634	82	51	6	5	9	1	60	163
53	Mustapuro	11.2	518	216	220	1199	86	55	3	8	32	2	52	136
54	Murtopuro	4.94	565	370	369	1517	94	47	1	0	44	10	53	137
55	Liuhapuro	1.65	536	920	248	1962	97	75	0	0	23	31	56	153
56	Suopuro	1.13	392	219	132	886	64	50	0	0	23	45	35	127
57	Välipuro	0.86	599	376	166	1333	83	75	0	0	15	40	49	139
58	Kivipuro	0.54	672	457	309	1613	100	83	0	0	12	20	54	140
59	Koivupuro	1.18	402	144	185	847	81	53	0	0	33	19	38	104
61	Korpijoki	122	382	220	321	1143	81	43	5	11	34	3	52	128
62	Kohisevanpuro	10.65	449	476	321	1604	88	53	4	1	22	4	54	153
71	Ruunapuro	5.39	399	335	269	1281	76	48	5	17	12	2	51	148
72	Heinäjoki	9.4	378	592	295	1684	88	58	3	3	14	2	56	156
81	Haapajyrä	6.09	146	74	98	356	37	18	2	55	11	0	45	104
82	Kainastonluoma	79.2	342	165	177	858	65	35	2	24	18	3	47	121
83	Kaidesluoma	45.5	524	84	140	846	75	54	1	10	26	2	42	126
84	Norrskogsdiket	11.6	227	138	141	667	47	29	1	34	9	13	50	120
85	Sulvanjoki	26.85	383	324	280	1302	75	48	2	20	10	1	57	140

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Table S1 – Continued from previous page

ID	Catchment name	Size (km ²)	Pine RBM (10 kg/ha)	Spruce RBM (10 kg/ha)	Decid RBM (10 kg/ha)	Total RBM (10 kg/ha)	Forest (%)	Conifer (%)	Broad-leaved (%)	Agriculture (%)	Drained peat-land (%)	Pris-tine peat-land (%)	Leaf cover (%)	Tree height (dm)
91	Tuuraoja	23.5	394	128	194	844	65	39	1	23	35	9	53	127
92	Tuuoja	20.5	415	235	315	1178	82	48	4	5	32	1	52	132
93	Pahkaoja	23.3	417	65	122	700	71	50	0	2	31	16	36	106
94	Kuikkisenoja	8.05	383	215	240	975	66	36	3	25	13	3	57	120
101	Huopakinoja	19.7	421	174	322	1110	78	40	4	14	26	3	55	131
102	Vääräjoki	19.3	305	153	75	670	73	51	0	0	8	35	30	100
103	Myllypuro	9.86	546	221	221	1181	91	61	0	0	27	5	46	120
104	Murronoja	4.38	509	89	227	968	92	57	1	0	59	10	45	114
105	Koppamäenoja	6.15	504	76	116	791	82	52	1	0	32	25	38	107
106	Kaukolanpuro	4.84	656	120	233	1138	91	63	1	0	49	2	46	126
111	Kuusivaaran-puro	27.6	361	131	149	745	89	50	0	0	29	7	35	94
112	Lismanoja	2.77	214	66	91	463	58	43	0	0	17	8	25	90
113	Korintteenoja	6.13	575	239	284	1111	92	75	0	3	5	7	39	124
114	Vähä-Askanjoki	16.4	464	79	55	709	88	67	0	0	6	21	32	101
116	Myllyoja	28.5	362	79	99	649	83	50	1	0	8	10	27	104
117	Iittovuoma	11.6	0	0	18	19	17	0	17	0	0	12	4	22
118	Kirnuoja	6.79	307	301	218	1020	78	25	3	0	14	21	46	101

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Table S1 – Continued from previous page

ID	Catchment name	Size (km ²)	Pine RBM (10 kg/ha)	Spruce RBM (10 kg/ha)	Decid RBM (10 kg/ha)	Total RBM (10 kg/ha)	Forest (%)	Conifer (%)	Broad-leaved (%)	Agriculture (%)	Drained peat-land (%)	Pris-tine peat-land (%)	Leaf cover (%)	Tree height (dm)
119	Ylijoki	56.27	191	101	101	480	72	39	1	1	36	19	26	80
120	Kotioja	18.11	243	154	106	600	79	48	1	1	31	18	29	83
121	Laanioja	13.62	203	28	38	314	68	57	0	0	0	5	17	79
200	Valkea-Kotinen	0.34	467	1656	226	2495	86	86	0	0	4	16	63	213
201	Iso Hietajärvi	4.64	706	63	58	903	66	58	0	0	1	40	51	158
202	Pieni Hietajärvi	0.67	751	39	68	930	69	58	0	0	2	45	44	143
501	Kauheanpuro	1.76	432	269	210	1132	79	51	1	0	18	33	48	126
502	Korsukorvenpuro	0.72	429	229	120	1007	73	60	0	0	7	47	42	130
503	Kangasvaaranpuro	0.56	561	862	245	1930	98	78	2	0	3	6	56	161
504	Kangaslammenpuro	0.3	535	880	436	2026	100	78	0	0	3	6	58	156
505	Porkkasalonpuro	0.72	742	854	233	1954	100	90	0	0	12	6	56	161

Table S2: Climate characteristics of study catchments

ID	Catchment name	Mean annual temperature (°C)	Mean annual precipitation (mm yr ⁻¹)	Max annual S_{SWE} (mm)	P/E_P (-)	Snow-off (day of the year)
7	RudbäckenI	5	682	79	1.49	110
11	Hovi	4.8	652	79	1.42	113
12	Ali-Knuuttila	4.8	652	79	1.42	113
13	Yli-Knuuttila	4.8	652	79	1.42	113
14	Teeressuonoja	4.8	652	79	1.42	113
15	Kylmänoja	4.8	652	79	1.42	113
17	Koppelonoja	4	616	65	1.41	108
18	Löyttynoja	4	614	65	1.44	108
21	Löytäneenoja	4.5	566	73	1.09	111
22	Savijoki	4.9	664	73	1.28	111
31	Paunulanpuro	3.8	624	117	1.5	117
32	Siukolanpuro	3.8	624	117	1.5	117
33	Katajaluoma	3.9	678	73	1.61	111
41	Niittyjoki	4.4	646	96	1.38	111
42	Ravijoki	4.4	695	99	1.47	113.5
43	Latosuonoja	3.8	623	107	1.49	117
44	Huhtisuonoja	3.8	623	107	1.49	117
45	Juonistonoja	3.4	584	97	1.43	118
51	Kesselinpuro	2.9	605	132	1.32	121
52	Kuokkalanoja	2.8	645	132	1.42	121
53	Mustapuro	2.7	620	132	1.36	121

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ID	Catchment name	Mean annual temperature (°C)	Mean annual precipitation (mm yr ⁻¹)	Max annual S_{SWE} (mm)	$PIEP$ (-)	Snow-off (day of the year)
54	Murtopuro	1.7	658	196	1.74	127.5
55	Liuhapuro	2	624	196	1.63	127.5
56	Suopuro	1.8	642	196	1.71	127.5
57	Välipuro	1.8	642	196	1.71	127.5
58	Kivipuro	1.8	642	196	1.71	127.5
59	Koivupuro	1.8	642	196	1.71	127.5
61	Korpijoki	2.4	574	172	1.25	125
62	Kohisevanpuro	3	593	121	1.23	120
71	Ruunapuro	3.1	605	119	1.25	120
72	Heinäjoki	3.5	659	141	1.28	121.5
81	Haapajyrä	3.7	533	78	1	114
82	Kainastonluoma	3.7	547	78	1.05	114
83	Kaidesluoma	3.1	545	78	1.03	114
84	Norrskogsdiket	4	572	75	1.13	111
85	Sulvanjoki	3.9	535	78	1.06	114
91	Tuuraoja	2.8	478	93	1.02	117
92	Tujuoja	2.5	533	112	1.09	117.5
93	Pahkaoja	2.6	575	109	1.15	118
94	Kuikkisenoja	3.3	512	109	1.08	118
101	Huopakinoja	2.5	514	93	1.23	117
102	Vääräjoki	0	581	194	2.02	138
103	Myllypuro	1.3	600	179	1.96	133

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Table S2 – Continued from previous page

ID	Catchment name	Mean annual temperature (°C)	Mean annual precipitation (mm yr ⁻¹)	Max annual S_{SWE} (mm)	PIE_P (-)	Snow-off (day of the year)
104	Murronoja	1.9	607	172	1.33	125
105	Koppamäenoja	1.9	607	172	1.33	125
106	Kaukolanpuro	1.9	607	172	1.33	125
111	Kuusivaaranpuro	0	498	163	1.76	137
112	Lismanoja	-0.6	541	176	1.59	139
113	Korintteenoja	0.4	552	177	1.65	133
114	Vähä-Askanjoki	0.1	546	163	1.93	137
116	Myllyoja	-0.6	550	219	1.62	144
117	Iittovuoma	-2.2	434	154	2.42	140
118	Kirnuoja	2	494	157	1.3	128
119	Ylijoki	0.7	614	185	1.83	135.5
120	Kotioja	0.7	614	185	1.83	135.5
121	Laanioja	-1.2	541	207	1.95	147
200	Valkea-Kotinen	3.7	632	65	1.32	108
201	Iso Hietajärvi	2	652	175	1.31	130
202	Pieni Hietajärvi	2	652	175	1.31	130
501	Kauheanpuro	1.8	642	196	1.71	127.5
502	Korsukorvenpuro	1.8	642	196	1.71	127.5
503	Kangasvaaranpuro	1.8	640	196	1.68	127.5
504	Kangaslammenpuro	1.8	640	196	1.68	127.5
505	Porkkasalonpuro	1.8	653	196	1.72	127.5

Table S3. Summary of principal component analysis (PCA). The highest loads for each characteristic are shown in bold.

	PC1	PC2
Eigenvalue	8.20	4.68
% Explained	34	20
Cumulative % explained	34	54
Forest	-0.364	-0.825
Conifer	-0.516	-0.866
Broadleaved	0.350	0.169
Peatland	-0.727	0.253
Agriculture	0.796	0.509
Precipitation	0.254	-0.944
Summer precipitation	0.021	-0.865
max S_{SWE}	-1.168	-0.156
P/E_p	-0.923	-0.068
Longitude	-0.771	-0.643
Latitude	-1.086	0.544
Leaf cover	0.025	-0.974
Pine RBM	0.227	0.563
Spruce RBM	0.365	0.433
Decidious RBM	0.294	0.534
Total RBM	0.298	0.525
Tree height	0.528	-0.961
Drained peat	-0.198	-0.029
Pristine peat	-0.751	-0.232
Timing max S_{SWE}	-1.221	0.071
snow-off	-1.206	0.237
mean annual temperature	1.186	-0.349
Tdemand	0.857	-0.495
Gap $S_{SWE} E_p$	-1.100	-0.041

2 Background on correlations between catchment characteristics

2.1 Principal component analysis

Table S3 shows the explained variance of the first two principal components, together with the loadings of all used catchment characteristics on these two principal components.

5 2.2 Correlation matrix

Figure S1 shows the correlations between S_r and the various catchment characteristics. From this figure it follows that the strongest positive correlation was found between S_r and the mean annual temperature and the strongest negative correlation was found for S_r and the (timing of) maximum S_{SWE} . Further, it can be seen that a strong correlation exists between the different vegetation characteristics and between the different climate variables. In addition, the different land covers (except for drained peatlands) also show a significant correlation with the climate variables.

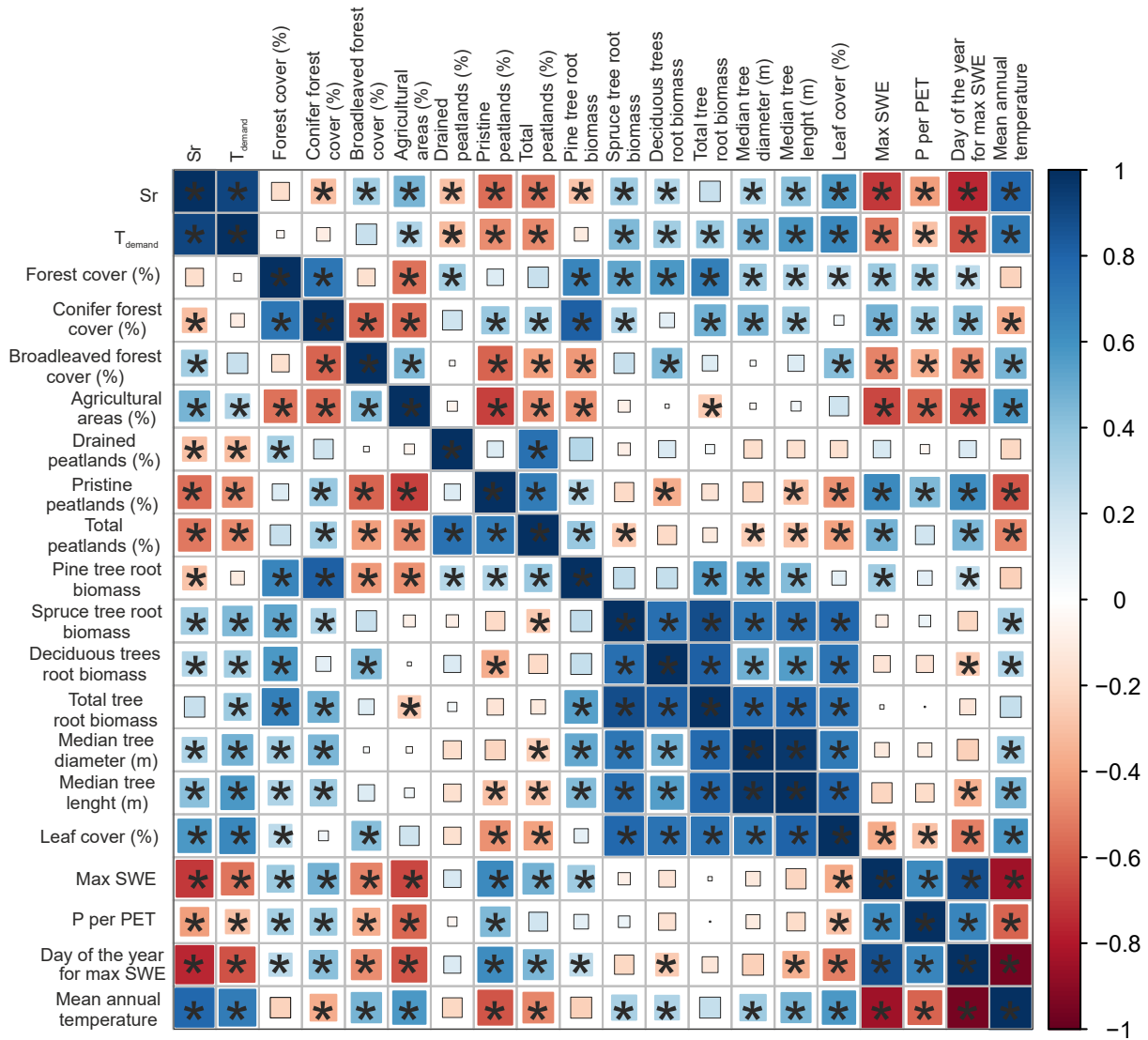


Figure S1. Correlation matrix for calculated root zone storage capacity (20 year return period), calculated transpiration demands (used in the S_r calculation) and catchment characteristics. The sizes of the boxes indicate the p-values; the asterisks indicates a significant correlation ($p < 0.05$).