Hydrology and Earth System Sciences

Supplementary Information for

Trends in hydroclimate extremes: How changes in winter conditions affect seasonal baseflow and storage

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Table S1 Extreme Climate indices used in the analysis of 30 years of climate data from 1992-2022 showing the significant indices during the winter and summer

Extreme Climate Indices	Unit	Winter	Summer
TA	o C		
Tmin	o C	r^2=0.51 p<0.01	
Tmax	o C		
Intensity			
Min Tmax	o C		
Min Tmin	o C		
Max Tmax	o C		r^2=0.48 p<0.01
Max Tmin	o C		
Diurnal temperature range	o C	r^2=0.44 p<0.01	
AFDD <0	o C	r^2=0.5 p<0.01	
Freeze thaw days (Tmax >0 Tmin <0)	Days		
Duration			
Growing season length	Days	r^2=0.32 p=0.08	
Cold spell duration indicator	Days	r^2=0.34 p=0.06	
Warm spell duration indicator	Days		
Frequency			
Cool days	%Days		
Cool nights	%Days	r^2=-0.42 p=0.02	
Warm days	%Days		r^2=0.33 p=0.07
Warm nights	%Days		r^2=0.33 p=0.17
Frost days	Days	r^2=-0.47 p<0.01	
Icing days	Days		
Precipitation			
Intensity			
Max 1-day precipitation	mm		
Max 5-day precipitation	mm		
Simple daily intensity index	mm		
Contribution from very wet days	mm		
Contribution from wet days	mm		
Duration			
Consecutive wet days	Days		
Consecutive dry days	Days		
Frequency			
Heavy precipitation days	Days		
Very heavy precipitation days	Days		
Total snow days	Days	r^2=-0.55 p<0.01	
Runoff			
Winter Qmin	Mm day^{-1}		
Spring Qmin	Mm day^{-1}		
Summer Qmin	Mm day^{-1}		

Table S2 Average annual temperature (T), Total precipitation (P mm yr^{-1}) and Total runoff (Q mm yr^{-1}) from the Krycklan catchment showing variability using standard deviation (std) and annual average minimum (Tmin) and maximum (Tmax) temperatures.

Year	T	P	Q	Std T	Std P	Std Q	Tmin	Tmax
1982	1.6	1018.5	387.6	8.7	39.5	1.4		
1983	1.5	603.1	328.7	9.1	40.9	1.5		
1984	1.8	600.9	317.8	9.2	24.2	1.6		
1985	-1.5	718.2	258.6	12.2	33.8	1.3		
1986	0.9	685.3	353.5	10.1	45.9	1.8		
1987	-0.5	681.2	360.8	10.1	27.3	1.9		
1988	0.9	588	371.5	9.7	63.7	1.5		
1989	3	553.5	398.1	7.8	36.3	2.2		
1990	2.2	634.7	282.7	7.4	24.4	1.7		
1991	1.9	536.8	305.5	8.5	27.6	1.3	-2.9	6
1992	2.3	648.8	273.5	7.8	29.8	1.0	-2.8	6.5
1993	1.6	710.6	260.0	7.5	29.7	1.2	-3.3	5.8
1994	1.2	446.1	427.3	9.8	41	1.8	-4.1	6
1995	1.9	549.5	267.7	8.6	55.5	1.7	-3.2	6.2
1996	1.2	553.3	297.1	9.3	9.1	2.0	-4	5.9
1997	2.5	513.7	130.6	8.9	40.4	0.5	-2.7	6.9
1998	1.5	846.8	216.8	8.4	44.6	1.6	-3.1	5.6
1999	2.2	549.1	507.5	9.2	33.4	2.0	-2.8	7
2000	3.3	827.5	253.2	7.7	39.8	1.3	-1.7	7.7
2001	1.8	824.9	588.9	9.5	38.7	1.8	-3.4	6.6
2002	2.5	470	534.3	10.1	28.7	2.2	-3.2	7.4
2003	2.5	597.4	225.5	9.4	18.3	1.2	-3.1	7.7
2004	2.2	643.5	246.5	8.5	27.2	1.1	-2.8	6.7
2005	2.9	581.2	346.1	8.4	19.7	1.2	-2.4	7.6
2006	3.1	628.1	248.7	9.3	25.3	0.8	-2	7.7
2007	2.8	562.5	291.0	8.7	18.9	1.2	-2.6	7.5
2008	2.9	658.6	259.3	7.1	29.7	0.8	-2	7
2009	2.1	665.7	345.4	9.3	27.5	1.6	-2.4	6.3
2010	0.6	612.5	327.0	11	27.6	1.4	-4.2	4.8
2011	3.6	645.6	285.9	9.2	19.8	1.3	-1.2	7.8
2012	2	828.9	263.3	8.5	44.8	0.9	-2.7	5.4
2013	3.2	647.2	483.8	9	23.8	1.7	-1	8.6
2014	3.7	583.5	293.1	8.3	16.7	1.2	-0.8	7.7
2015	3.6	680.4	278.0	7.1	28.4	0.9	-0.7	7.8
2016	2.6	609.9	325.2	8.9	26.7	1.2	-2.1	7.1
2017	2.3	731.6	262.9	7.7	27.4	1.2	-2.1	6.7
2018	2.9	543.7	304.5	10.1	35.2	1.3	-2.4	7.9
2019	2.3	616.7	241.8	8.9	28	1.5	-2.6	7.2
2020	4.1	794.9	234.6	7.3	32.6	1.3	-0.5	8.8
2021	2.2	764.8	392.9	9.7	34.7	1.5	-2.5	6.9
2022	3.2	639.3	429.8	8.6	15	1.5	-1.7	8

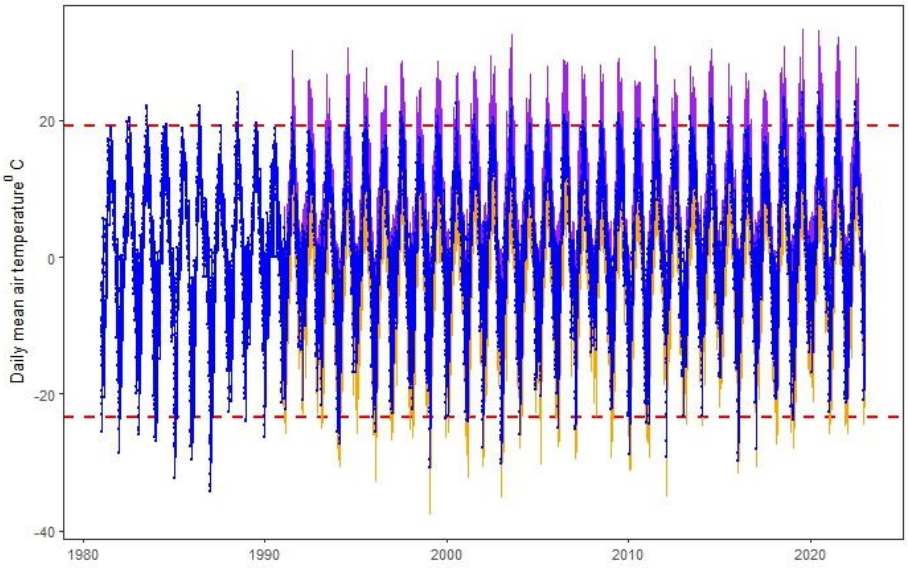

Figure S1 Variability in average daily temperature (blue), average minimum temperature (orange), and average maximum temperature (purple) in the data set from C7 Krycklan catchment from 1982 to 2022

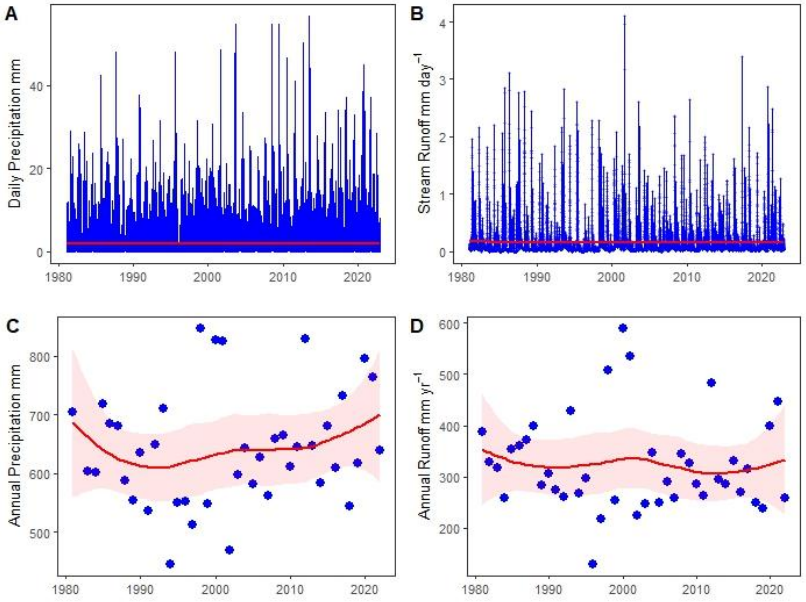

Figure S2 Variability in daily precipitation (A) and runoff (B) and the variability in annual values for precipitation (C) and runoff (D) in the Svartberget catchment

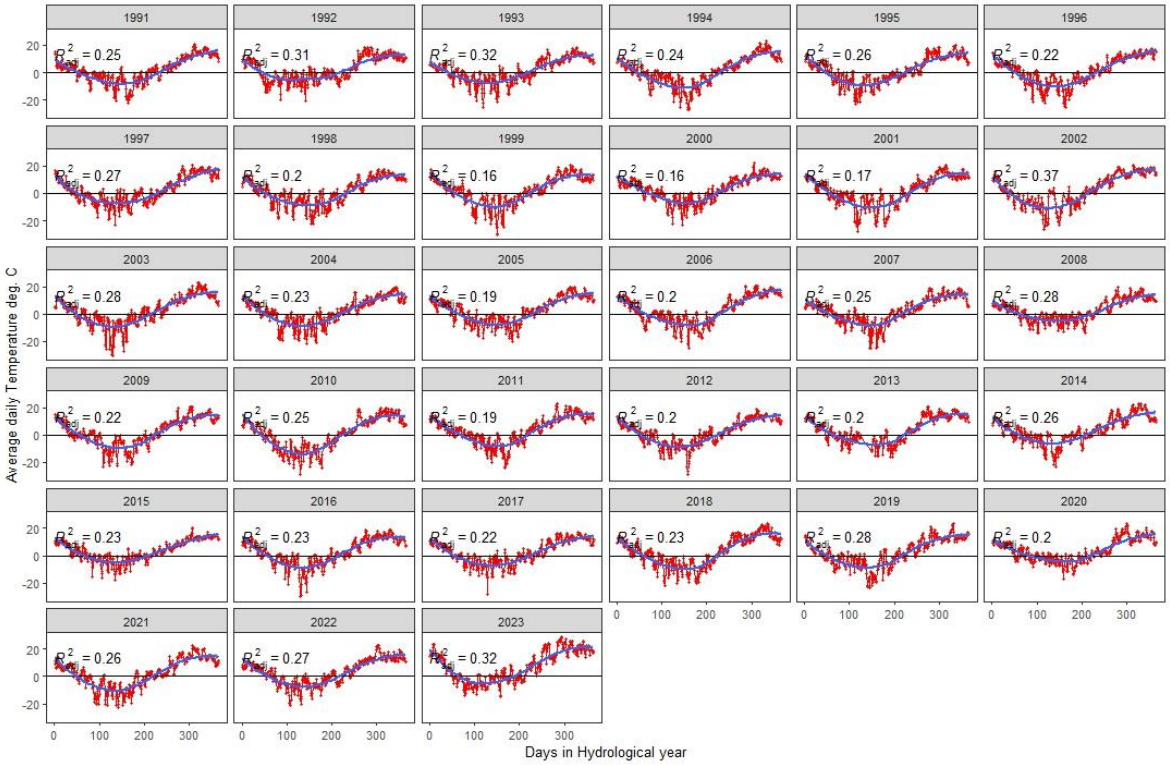

Figure S3 Annual air temperature showing the isolation of the winter period using the consecutive days below zero threshold.

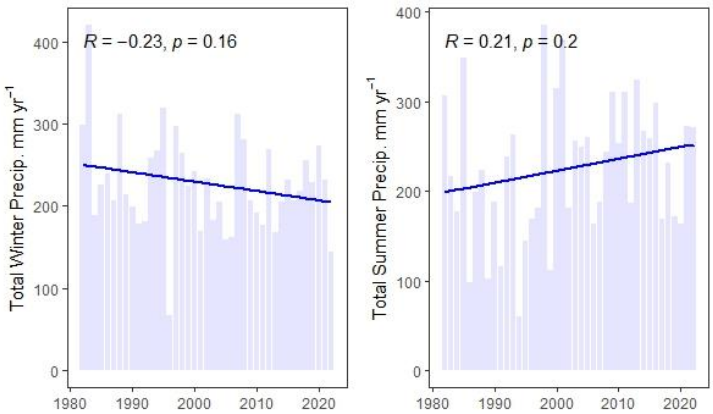

Figure S4 Trends in winter and summer precipitation across the seasons from 1982-2022

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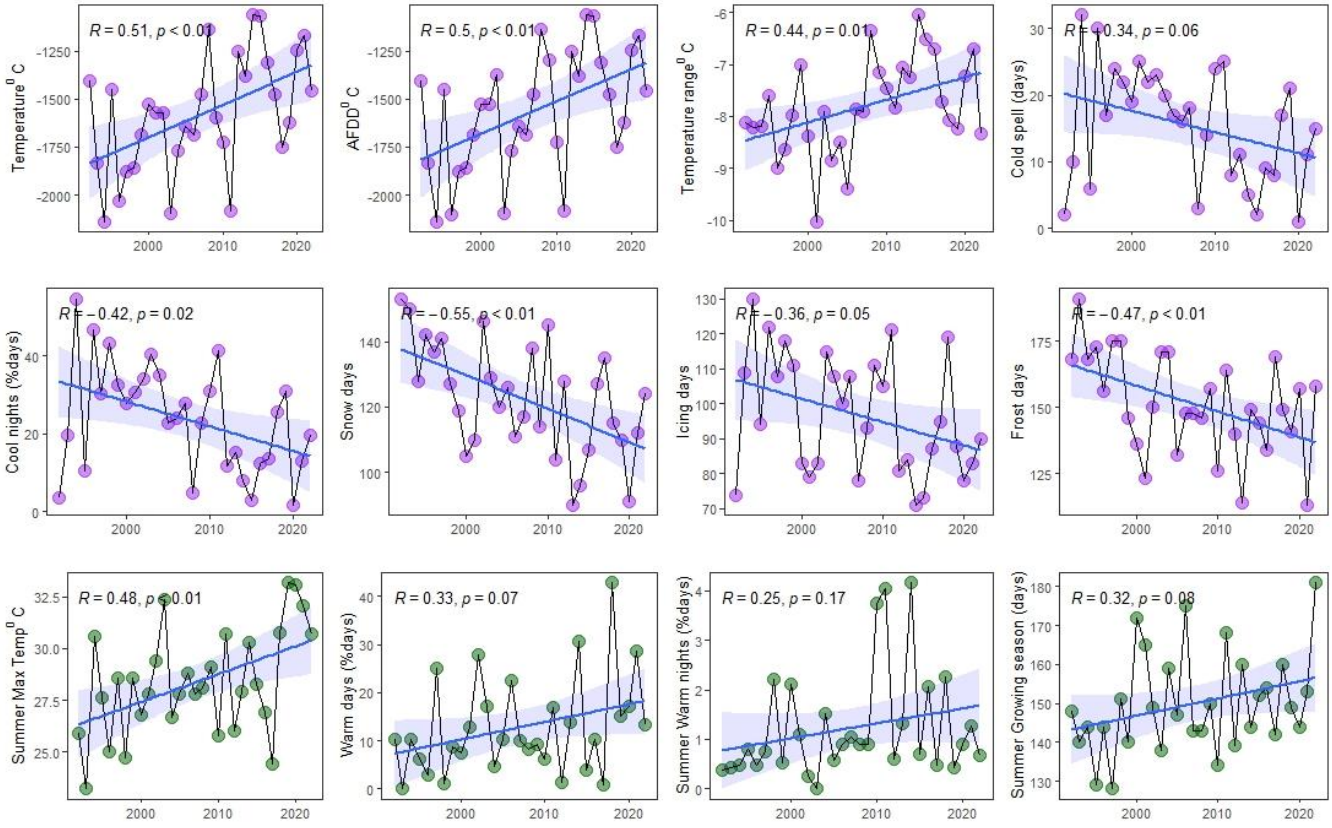

Figure S5 The extreme climate indices during the winter (purple) and summer (green) that showed significant trends over the 30 years from 1992-2022

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