Table S1: Ranges of parameter values. For parameters not listed default values implemented in *brook90r* [59] were used.

Parameter	Value	Unit	Description
alb	0.14 - 0.18	-	Albedo of soil/vegetation surface without snow
albsn	0.14 - 0.23	-	Albedo of soil/vegetation surface with snow
alfa	2.852 - 100	m^{-1}	Parameter alpha (Mualem van Genuchten parameterization)
betaroot	0.94 - 0.97	-	Shape parameter for rootlength density depth distribution
bypar	0	-	Switch to allow (1) or prevent (0) bypass flow in deeper layers
cintrs	0.15 - 0.5	mm	Maximum interception storage of rain per unit SAI
cintss	0.6 - 2	mm	Maximum interception storage of snow per unit SAI
dtimax	0.01	d	Maximum iteration time step
frintlai	0.06 - 0.09	-	Intercepted fraction of rain per unit LAI
frintsai	0.06 - 0.12	-	Intercepted fraction of rain per unit SAI
fsintlai	0.04 - 0.08	-	Intercepted fraction of snow per unit LAI
fsintsai	0.04 - 0.08	-	Intercepted fraction of snow per unit SAI
glmax	0.0045	$m\ s^{-1}$	Maximum leaf vapor conductance when stomata are fully open
gravel	0 - 0.1		Ratio between mass of gravel and total dry soil mass
gsc	1	d^{-1}	Rate constant for ground water discharge
gsp	1	-	Seep fraction of groundwater discharge
height	20.8 - 25.4	m	Plant height
ilayer	19 - 24	-	Number of layers from top to which infiltration is distributed
infexp	0.2 - 1	-	Shape parameter for distribution of infiltration in first ILayer
ksat	323.4 - 67665	$mm\ d^{-1}$	Hydraulic conductivity at saturation
lwidth	0.004 - 0.06	m	Average leaf width
maxlai	3.7 - 5.9	-	Maximum projected leaf area index
npar	1.1528 - 2.0196	.	Shape parameter n (Mualem van Genuchten parameterization)
qffc	0.05	-	Quickflow fraction of infiltrating water at field capacity
qfpar	2	-	Quickflow shape parameter
qlayer	20 - 25	-	Number of layers which are considered for generation of surface or source area flow
rhotp	2 - 2.5	-	Ratio of total leaf area to projected area
rssa	500	$s\ m^{-1}$	Soil evaporation resistance at field capacity
sai	0.5 - 1.3	-	Stem area index
thr	0 - 0.18	--	Residual water content (Mualem van Genuchten parameterization)
ths	0.3847 - 0.8683	--	Water content at saturation (Mualem van Genuchten parameterization)
tort	0.5	-	Tortuosity parameter for hydraulic conductivity
winlaifrac	0 - 0.4	-	Minimum LAI as a fraction of maxlai

Table S2: Two-sided hypothesis-test statistics (t-test) for pairwise comparison of periods 1961-1990, 1991-2019 and 2071-2100 of the scenarios. Upper values = confidence limits of difference, lower value = *p-value*, degrees of freedom were 1217

Pair	T [°C]	P [mm]	CWB [mm]	ET [mm]	Tr [mm]	S [mm]	SW200 [mm]	TI [d]
1961-1990 - 1991-2019	[-1.2;-0.8] <.0001	[-54.6;4.5] 0.15	[-28;49.1] 0.971	[-38.8;-12.2] <.0001	[-30.2;-13.8] <.0001	[-0.7;1.6] 0.89	[-3.4;5.5] 0.987	[-17.4;18.3] 1
ECE/RCA26 - ECE/RCA85	[-3.6;-2.2] <.0001	[-91.3;41.8] 0.897	[-33.8;136.5] 0.518	[-87.1;32.4] 0.782	[-55.1;13.8] 0.525	[-7.6;10.5] 0.998	[-90.8;102.8] 1	[-74.9;85.3] 1
ECE/RCA26 - MPI/REMO26	[-0.6;0.8] 0.996	[-76.1;57] 0.999	[-93.1;77.3] 1	[-44.8;74.7] 0.98	[-23.3;45.6] 0.94	[-10.6;7.5] 0.996	[-103.7;89.9] 1	[-118.2;41.9] 0.751
ECE/RCA26 - MPI/REMO85	[-2.6;-1.2] <.0001	[-153.5;-20.4] 0.003	[-158.8;11.5] 0.135	[-75.6;43.9] 0.975	[-35.5;33.4] 1	[-12.3;5.8] 0.907	[-110.9;82.7] 0.998	[-148.5;11.6] 0.143
ECE/RCA26 - 1961-1990	[1;2.4] <.0001	[-21.7;111.4] 0.387	[-169.2;1.2] 0.056	[-41.6;78] 0.954	[-22.7;46.2] 0.927	[-7.7;10.4] 0.998	[-90.2;103.4] 1	[-51.3;108.8] 0.91
ECE/RCA26 - 1991-2019	[0;1.4] 0.04	[-46.8;86.5] 0.958	[-158.8;11.9] 0.138	[-67.1;52.5] 0.999	[-44.7;24.2] 0.957	[-7.3;10.8] 0.993	[-89.2;104.5] 1	[-50.9;109.3] 0.904
ECE/RCA85 - MPI/REMO26	[2.3;3.7] <.0001	[-51.4;81.7] 0.987	[-144.4;25.9] 0.351	[-17.5;102.1] 0.332	[-2.6;66.2] 0.089	[-12;6.1] 0.935	[-109.7;83.9] 0.999	[-123.4;36.7] 0.635
ECE/RCA85 - MPI/REMO85	[0.3;1.7] 0.001	[-128.8;4.3] 0.082	[-210.2;-39.8] <.0001	[-48.3;71.3] 0.994	[-14.8;54.1] 0.581	[-13.7;4.3] 0.675	[-116.9;76.7] 0.992	[-153.7;6.4] 0.092
ECE/RCA85 - 1961-1990	[3.9;5.3] <.0001	[3.1;136.2] 0.034	[-220.5;-50.2] <.0001	[-14.2;105.4] 0.25	[-2.1;66.8] 0.079	[-9.1;9] 1	[-96.2;97.5] 1	[-56.5;103.6] 0.96
ECE/RCA85 - 1991-2019	[2.9;4.3] <.0001	[-22.1;111.2] 0.398	[-210.1;-39.5] <.0001	[-39.7;79.9] 0.931	[-24.1;44.8] 0.956	[-8.7;9.4] 1	[-95.1;98.5] 1	[-56.1;104.1] 0.957
MPI/REMO26 - MPI/REMO85	[-2.7;-1.3] <.0001	[-144;-10.9] 0.012	[-150.9;19.5] 0.237	[-90.6;29] 0.684	[-46.6;22.2] 0.915	[-10.7;7.3] 0.995	[-104;89.6] 1	[-110.4;49.7] 0.889
MPI/REMO26 - 1961-1990	[0.9;2.3] <.0001	[-12.1;121] 0.181	[-161.3;9.1] 0.111	[-56.5;63.1] 1	[-33.9;35] 1	[-6.1;11.9] 0.942	[-83.3;110.3] 0.999	[-13.2;146.9] 0.163
MPI/REMO26 - 1991-2019	[-0.1;1.3] 0.147	[-37.3;96] 0.808	[-150.9;19.8] 0.242	[-82;37.6] 0.897	[-55.9;13] 0.48	[-5.7;12.4] 0.9	[-82.3;111.4] 0.998	[-12.8;147.4] 0.157
MPI/REMO85 - 1961-1990	[2.9;4.3] <.0001	[65.3;198.4] <.0001	[-95.6;74.8] 0.999	[-25.7;93.9] 0.581	[-21.7;47.2] 0.898	[-4.4;13.7] 0.692	[-76.1;117.5] 0.99	[17.1;177.3] 0.007
MPI/REMO85 - 1991-2019	[1.9;3.3] <.0001	[40.1;173.4] <.0001	[-85.1;85.5] 1	[-51.2;68.4] 0.999	[-43.7;25.2] 0.973	[-4;14.1] 0.603	[-75.1;118.6] 0.988	[17.6;177.8] 0.007

Table S3: Two-sided hypothesis-test statistics (t-test) for significance of slope (estimate) within the scenarios, Stderr = Standard error, degrees of freedom were 2893

Variable	Scenario	Estimate	Stderr	Probt	p-Value
T [°C]	ECE/RCA26	0.0065	0.0012	5.31	<.0001
	ECE/RCA85	0.0472	0.0012	38.66	<.0001
	MPI/REMO26	0.0060	0.0012	4.9	<.0001
	MPI/REMO85	0.0376	0.0012	30.84	<.0001
	1961-2019	0.0344	0.0023	14.97	<.0001
P [mm]	ECE/RCA26	-0.00012	0.00026	-0.46	0.643
	ECE/RCA85	0.00009	0.00026	0.34	0.736
	MPI/REMO26	0.00007	0.00026	0.26	0.794
	MPI/REMO85	0.00140	0.00026	5.45	<.0001
	1961-2019	0.00082	0.00048	1.7	0.089
CWB [mm]	ECE/RCA26	-0.21	0.21	-0.99	0.324
	ECE/RCA85	-1.43	0.21	-6.75	<.0001
	MPI/REMO26	-0.39	0.21	-1.85	0.064
	MPI/REMO85	0.29	0.21	1.35	0.177
	1961-2019	-0.68	0.40	-1.71	0.087
ET [mm]	ECE/RCA26	0.00040	0.00015	2.67	0.008
	ECE/RCA85	0.00067	0.00015	4.46	<.0001
	MPI/REMO26	-0.00017	0.00015	-1.15	0.251
	MPI/REMO85	0.00066	0.00015	4.4	<.0001
	1961-2019	0.00104	0.00028	3.71	<.0001
Tr [mm]	ECE/RCA26	0.00055	0.00015	3.77	<.0001
	ECE/RCA85	0.00103	0.00015	7.04	<.0001
	MPI/REMO26	-0.00024	0.00015	-1.67	0.095
	MPI/REMO85	0.00038	0.00015	2.6	0.009
	1961-2019	0.00186	0.00028	6.75	<.0001
SW200 [mm]	ECE/RCA26	-0.00026	0.00017	-1.55	0.121
	ECE/RCA85	-0.00097	0.00017	-5.73	<.0001
	MPI/REMO26	-0.00005	0.00017	-0.3	0.765
	MPI/REMO85	0.00020	0.00017	1.17	0.243
	1961-2019	-0.00023	0.00032	-0.7	0.482
S [mm]	ECE/RCA26	-0.24	0.10	-2.27	0.023
	ECE/RCA85	-0.31	0.10	-2.94	0.003
	MPI/REMO26	0.00	0.10	0	0.997
	MPI/REMO85	0.58	0.10	5.56	<.0001
	1961-2019	0.03	0.20	0.16	0.877
TI [d]	ECE/RCA26	-0.0019	0.0013	-1.44	0.149
	ECE/RCA85	0.0151	0.0013	11.88	<.0001
	MPI/REMO26	0.0002	0.0014	0.14	0.891
	MPI/REMO85	0.0044	0.0013	3.34	0.001
	1961-2019	0.0048	0.0022	2.23	0.026

Table S4: Two-sided test statistics (F-test) for pairwise comparison for difference of slopes. Upper value = F-value, lower value = *p-value*, degrees of freedom were 2893.

Pair	T [°C]	P [mm]	CWB [mm]	ET [mm]	Tr [mm]	S [mm]	SW200 [mm]	TI [d]
ECE/RCA26 - 1961-2019	115.33	2.96	1.1	4.09	17.6	0.01	1.45	7.04
	<.0001	*0.085*	*0.295*	*0.043*	*<.0001*	*0.917*	*0.229*	*0.008*
ECE/RCA26 - ECE/RCA85	556.42	0.32	16.58	1.61	5.37	8.73	0.22	86.88
	<.0001	*0.571*	*<.0001*	*0.205*	*0.021*	*0.003*	*0.636*	*<.0001*
ECE/RCA26 - MPI/REMO26	0.08	0.26	0.38	7.28	14.77	0.78	2.6	1.19
	0.774	*0.608*	*0.54*	*0.007*	*<.0001*	*0.377*	*0.107*	*0.276*
ECE/RCA26 - MPI/REMO85	325.97	17.48	2.73	1.5	0.68	3.69	30.65	11.45
	<.0001	*<.0001*	*0.099*	*0.221*	*0.41*	*0.055*	*<.0001*	*0.001*
ECE/RCA85 - 1961-2019	24.01	1.81	2.73	1.4	7.07	4.26	2.3	16.65
	<.0001	*0.179*	*0.099*	*0.237*	*0.008*	*0.039*	*0.129*	*<.0001*
ECE/RCA85 - MPI/REMO26	570.04	0	11.96	15.73	37.97	14.74	4.35	63.03
	<.0001	*0.957*	*0.001*	*<.0001*	*<.0001*	*<.0001*	*0.037*	*<.0001*
ECE/RCA85 - MPI/REMO85	30.62	13.07	32.76	0	9.87	23.78	36.12	34.53
	<.0001	*<.0001*	*<.0001*	*0.964*	*0.002*	*<.0001*	*<.0001*	*<.0001*
MPI/REMO26 - 1961-2019	119.45	1.91	0.41	14.53	45.48	0.23	0.02	3.26
	<.0001	*0.167*	*0.521*	*<.0001*	*<.0001*	*0.63*	*0.893*	*0.071*
MPI/REMO26 - MPI/REMO85	336.42	13.46	5.13	15.38	9.12	1.08	15.41	4.83
	<.0001	*<.0001*	*0.024*	*<.0001*	*0.003*	*0.299*	*<.0001*	*0.028*
MPI/REMO85 - 1961-2019	1.51	1.1	4.59	1.47	22.49	1.37	6.09	0.03
	0.218	*0.293*	*0.032*	*0.226*	*<.0001*	*0.242*	*0.014*	*0.855*

Table S5: Two-sided hypothesis-test statistics (t-test) for significance of intercept of random effect (site) within the historical time series, Err = prediction error, degrees of freedom were 2893.

Variable	Site	Estimate	Err	Probt	p-Value
T [°C]	1101	0.47	0.19	2.46	0.014
	1202	-0.48	0.19	-2.48	0.013
	1203	-0.28	0.19	-1.45	0.148
	1204	0.01	0.19	0.03	0.972
	1205	-0.50	0.19	-2.59	0.01
	1302	0.52	0.19	2.69	0.007
	1303	0.26	0.19	1.34	0.181
P [mm]	1101	-0.023	0.028	-0.82	0.412
	1202	0.048	0.028	1.7	0.088
	1203	-0.001	0.028	-0.05	0.961
	1204	-0.011	0.028	-0.41	0.682
	1205	0.017	0.028	0.6	0.55
	1302	0.005	0.028	0.17	0.866
	1303	-0.034	0.028	-1.19	0.234
CWB [mm]	1101	-49.2	24.1	-2.04	0.041
	1202	68.3	24.1	2.83	0.005
	1203	3.9	24.1	0.16	0.872
	1204	-26.5	24.1	-1.1	0.271
	1205	44.7	24.1	1.85	0.064
	1302	-21.1	24.1	-0.88	0.38
	1303	-20.0	24.1	-0.83	0.408
ET [mm]	1101	0.028	0.033	0.83	0.407
	1202	0.082	0.033	2.46	0.014
	1203	-0.039	0.033	-1.17	0.244
	1204	-0.047	0.033	-1.42	0.157
	1205	-0.023	0.033	-0.68	0.494
	1302	-0.124	0.033	-3.71	<.0001
	1303	0.123	0.033	3.68	<.0001
Tr [mm]	1101	0.065	0.030	2.15	0.031
	1202	-0.011	0.030	-0.35	0.724
	1203	-0.018	0.030	-0.58	0.562
	1204	-0.067	0.030	-2.2	0.028
	1205	-0.084	0.030	-2.77	0.006
	1302	-0.020	0.030	-0.65	0.513
	1303	0.134	0.030	4.41	<.0001
SW200 [mm]	1101	-0.30	0.14	-2.11	0.035
	1202	0.56	0.14	3.9	<.0001
	1203	0.45	0.14	3.11	0.002
	1204	-0.13	0.14	-0.88	0.38
	1205	-0.39	0.14	-2.7	0.007
	1302	0.26	0.14	1.78	0.075
	1303	-0.45	0.14	-3.11	0.002
S [mm]	1101	-28.23	17.89	-1.58	0.115
	1202	-3.25	17.89	-0.18	0.856
	1203	18.40	17.89	1.03	0.304
	1204	20.69	17.89	1.16	0.248
	1205	22.49	17.89	1.26	0.209
	1302	51.93	17.89	2.9	0.004
	1303	-82.02	17.89	-4.58	<.0001
TI [d]	1101	0.25	0.22	1.12	0.261
	1202	0.57	0.22	2.6	0.009
	1203	-0.51	0.23	-2.2	0.028
	1204	-0.71	0.23	-3.03	0.002
	1205	0.49	0.22	2.2	0.028
	1302	0.16	0.22	0.72	0.47
	1303	-0.20	0.23	-0.89	0.374