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Supplement of

Future water temperature of rivers in Switzerland under climate change investigated with physics-based models

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Supplement

S1 Measurement stations details

In this section, details about hydrological gauging stations and automatic meteorological stations are presented (Tables S1 and S2, respectively). In addition, maps detailing each catchment (watershed and stream network, see Section S3, along with the locations of meteorological and hydrological stations) are presented in Figure S1.

Table S1. Details about gauging stations used in this study.

ID	Name	Elevation (m)	Easting (m)	Northing (m)	Discharge	Temperature	Provider
2034	Broye - Payerne, Caserne d'aviation	441	561660	187320	x	x	FOEN
2106	Birs - Münchenstein, Hofmatt	268	613570	263080	x	x	FOEN
2109	Lütschine - Gsteig	585	633130	168200	x	x	FOEN
2202	Ergolz - Liestal	305	622270	259750	x		FOEN
2269	Lonza - Blatten	1520	629130	140910	x	x	FOEN
2327	Dischmabach - Davos, Kriegsmatte	1668	786220	183370		x	FOEN
2355	Landwasser - Davos, Frauenkirch	1487	779640	181200	x		FOEN
2414	Rietholzbach - Mosnang, Rietholz	682	718840	248440	x	x	FOEN
2462	Inn - S-Chanf	1645	795800	165910	x	x	FOEN
2634	Kleine Emme - Emmen	430	663700	213630	x	x	FOEN
A024	Suze - Péry, Vigier Ciment	586	585610	225610	x	x	AWA
A017	Kander - Frutigen	777	616540	158320	x	x	AWA
ER1	Ergolz - Frenkendorf	275	621200	263420		x	Holdinger AG
ZH523	Eulach - Wülflingen	410	694120	262820	x	x	AWEL

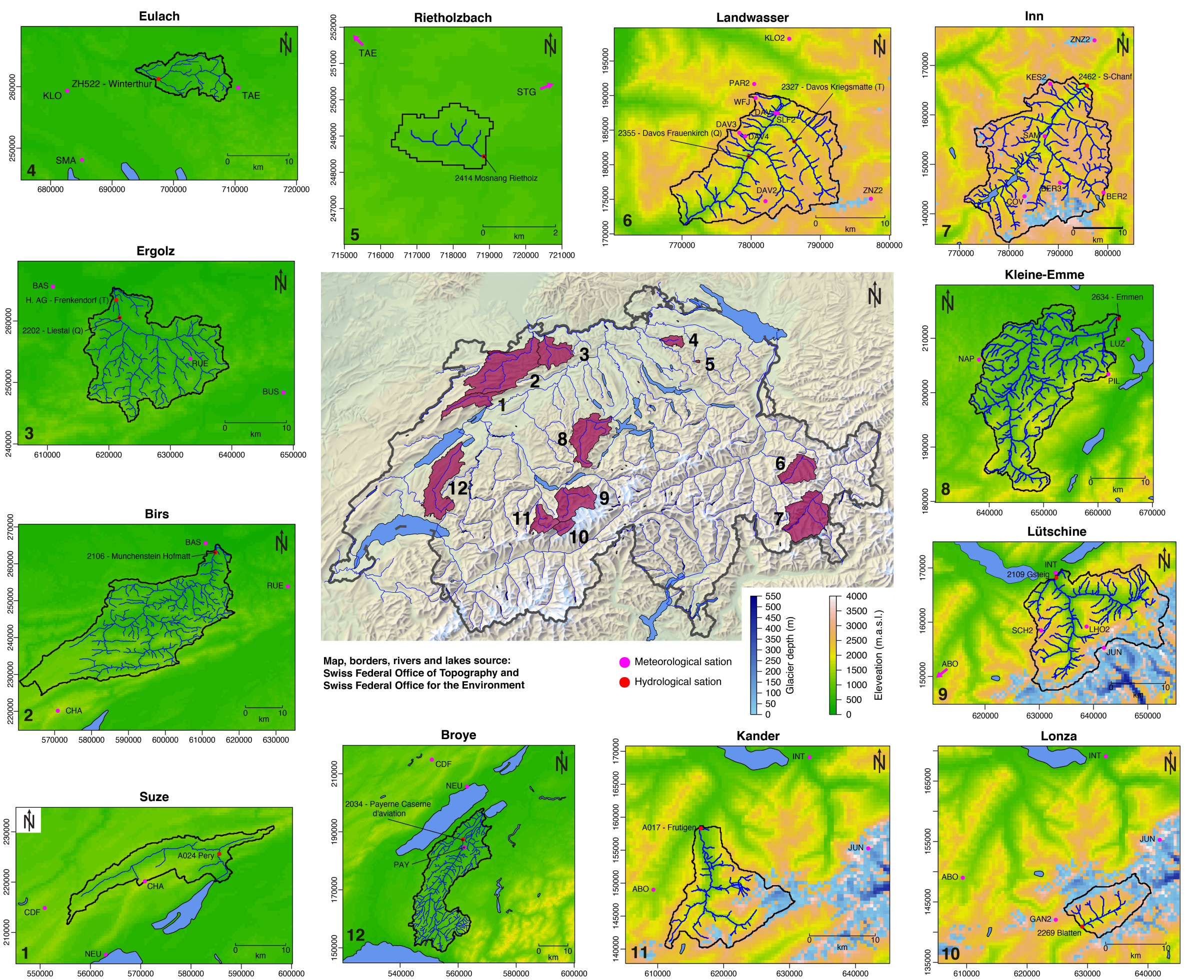

Figure S1. Catchment details showing position of meteorological and hydrological measurements stations, elevation, and glacier thickness for all studied catchments. Source: Swisstopo, FOEN (Swiss Federal Office for the Environment, 2013, 2020), and Zekollari et al. (2019).

Table S2. Details about meteorological stations used in this study.

ID	Name	Elevation (m)	Easting (m)	Northing (m)	TA	PSUM	RH	VW	ISWR	Provider
ABO	Adelboden	1327	609350	149001	x	x	x	x	x	MCH
BAS	Basel / Binningen	316	610911	265601	x	x	x	x	x	MCH
BER2	Bernina:Motta Bianco	2447	799121	144312		x	x	x		IMIS
BER3	Bernina:Puoz Pass	2625	790343	146291	x		x	x		IMIS
CDF	La Chaux-de-Fonds	1017	550919	214861	x	x	x	x	x	MCH
CHA	Chasseral	1599	570847	220158	x	x	x		x	MCH
COV	Piz Corvatsch	3302	783151	143522	x	x	x	x	x	MCH
DAV	Davos	1594	783514	187458	x	x	x	x	x	MCH
DAV2	Davos:Bärentälli	2558	782062	174726	x	x	x	x		IMIS
DAV3	Davos:Hanengretji	2455	778292	184616	x	x	x	x		IMIS
DAV4	Davos:Frauentobel	2330	779125	184125	x	x	x	x		IMIS
GAN2	Gandegg:Schneestation	2710	624748	142041	x	x	x			IMIS
INT	Interlaken	577	633019	169093	x	x	x	x	x	MCH
JUN	Jungfraujoch	3580	641930	155275	x		x		x	MCH
KES2	Kesch:Porta d'Es-cha	2727	788351	166289	x	x		x		IMIS
KLO	Zürich / Kloten	426	682710	259339	x	x	x	x	x	MCH
KLO2	Klosters:Madrisa	2147	785499	198213	x	x	x	x		IMIS
LHO2	Lauberhorn:Russisprung	2150	638715	159182		x		x		IMIS
LUZ	Luzern	454	665540	209848	x	x	x	x	x	MCH
NAP	Napf	1404	638133	206079	x	x	x		x	MCH
NEU	Neuchâtel	485	563087	205560	x	x	x	x	x	MCH
PAR2	Parsenn:Kreuzweg	2290	780436	191675	x	x	x	x		IMIS
PAY	Payerne	490	562127	184612	x	x	x	x	x	MCH
PIL	Pilatus	2106	661910	203410					x	MCH
RUE	Rünenberg	611	633246	253846	x	x	x	x	x	MCH
SAM	Samedan	1709	787250	155685	x	x	x	x	x	MCH
SCH2	Schilthorn:Schneestation	2332	630363	158481	x	x	x	x		IMIS
SLF2	SLF:Fluelastrasse	1563	783879	187447	x		x	x		IMIS
SMA	Zürich / Fluntern	556	685117	248066	x	x	x	x	x	MCH
STG	St. Gallen	776	747865	254588	x	x	x	x	x	MCH
TAE	Aadorf / Tänikon	539	710515	259821	x	x	x	x	x	MCH
VIS	Visp	639	631149	128020	x	x	x	x	x	MCH
WFJ	Weissfluhjoch	2691	780615	189634	x	x	x	x	x	MCH
ZNZ2	Zernez:Puelschezza	2677	797312	175078	x	x	x	x		IMIS

Table S3. Translation between CORINE land cover (CLC) and Alpine3D land cover classes combined with the grouping of the classes (see Table 1 in the main text). Only CLC classes relevant to this study are shown.

CLC name	CLC number	A3D name	A3D number	Table 1 grouping
Continuous urban fabric	111	Settlement	10200	Rock
Discontinuous urban fabric	112	Settlement	10200	Rock
Industrial or commercial units	121	Settlement	10200	Rock
Road and rail networks and associated land	122	Settlement	10200	Rock
Airports	124	Settlement	10200	Rock
Mineral extraction sites	131	Rock	11500	Rock
Dump sites	132	Settlement	10200	Rock
Construction sites	133	Settlement	10200	Rock
Green urban areas	141	Sub-alpine meadow	12400	Field
Sport and leisure facilities	142	Settlement	10200	Field
Non-irrigated arable land	211	Sub-alpine meadow	12400	Field
Permanently irrigated land	212	Sub-alpine meadow	12400	Field
Vineyards	221	Pasture	10700	Field
Fruit trees and berry plantations	222	Pasture	10700	Field
Pastures	231	Pasture	10700	Field
Annual crops associated with permanent crops	241	Pasture	10700	Field
Complex cultivation patterns	242	Pasture	10700	Field
Land principally occupied by agriculture, with significant areas of natural vegetation	243	Pasture	10700	Field
Agro-forestry areas	244	Mixed forest	10500	Forest
Broad-leaved forest	311	Mixed forest	10500	Forest
Coniferous forest	312	Coniferous forest	10300	Forest
Mixed forest	313	Mixed forest	10500	Forest
Natural grasslands	321	Sub-alpine meadow	12400	Field
Moors and heathland	322	Bare soil vegetation	12600	Field
Sclerophyllous vegetation	323	Mixed forest	10500	Forest
Transitional woodland-shrub	324	Mixed forest	10500	Forest
Bare rocks	332	Rock	11500	Rock
Sparsely vegetated areas	333	Bare soil vegetation	12600	Field
Glaciers and perpetual snow	335	Bare ice	11400	Glacier
Inland marshes	411	Wetland	12200	Field
Peat bogs	412	Wetland	12200	Field
Water courses	511	Water	10100	Rock
Water bodies	512	Water	10100	Rock

S2 Land cover classes

Table S3 presents the translation used between CORINE land cover classes (European Environment Agency, 2013) and the classes available in the Alpine3D model. The table also indicates the grouping of the soil classes shown in Table 1 in the main text. Rock and built pixels are treated the same way in Alpine3D, they are both in the "rock" class. Note that the files defining the properties of soil and vegetation for each class are provided along with this article.

S3 Catchment and stream network delineation

Streamflow requires for each river a separation into individual reaches and the sub-watersheds associated with each reaches. In addition, only tow reaches are allowed to merge at each node of the network.

The datasets provided by the FOEN (Swiss Federal Office for the Environment, 2013, 2020) do not fulfill the above requirements. The software TauDEM (Tarboton, 1997) is thus used in order to compute from the digital elevation model (DEM) the stream network and the associated watershed and sub-watersheds. A wrapper has been developed around TauDEM to force it to reproduce the stream network given as input. Here, only a brief description is provided, for more details see Michel (2021). First, the stream network files (Swiss Federal Office for the Environment, 2013, 2020) are modified manually in order to be compliant with the requirement mentioned above. Nodes with triple reach intersection are modified (one reach is moved a bit upstream or downstream in order to have two subsequent nodes). Reach split (when one upstream reach is split into two downstream reaches, which are presents in channelized area) are removed. The DEM is then dug along the stream network (using the GDAL toolkit). The Strahler order is used (higher order means deeper digging) to ensure water flow in the downhill direction. In the next step, the following TauDEM tools are applied (filenames are not shown, see TauDEM documentation for more details):

```
PitRemove -z  -fel
D8FlowDir -p  -sd8  -fel
AreaD8 -p -ad8
PeukerDouglas -fel  -ss
AreaD8 -p  -o  -ad8  -wg
```

At this point, a grid of network skeleton, showing for each pixel the sum of contributing area, is obtained. This grid is filtered to remove contributions below a defined threshold in order to limit the creation of too small reaches. Then, a first version of the network is obtained using the corrected skeleton grid as source grid in:

```
Streamnet -fel -p -ad8 -src  -ord -tree -coord -net -w -o
```

SQL commands are used on the network shapefile obtained to remove upstream reaches smaller than a given threshold. The corrected network grid is then used as a new skeleton grid for a second pass in the `Streamnet` function. All conversions required are performed with GDAL. Finally, awk and bash are used to check that the output files fulfill all requirements. Another script in python is used to crop the DEM, landuse, and watershed grids to the correct dimensions based on TauDEM output. All scripts are provided along with this article.

Figure S2 shows the stream network and watershed delineation obtained from this method compared to the data provided by the FOEN. A very good agreement is obtained, showing the robustness of this method.

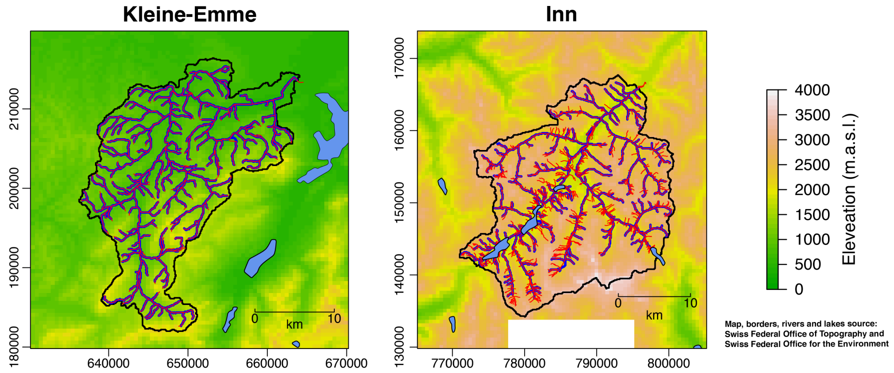

Figure S2. Stream network and watershed delineation (in blue) obtained from the method developed, compared to the data provided by the FOEN (in red, see Swiss Federal Office for the Environment, 2013, 2020).

S4 Sensitivity analysis of calibration period length

Alpine3D (A3D) is run for the Broye and Lonza catchments for the period 2003-2018. Then, StreamFlow (SF) is calibrated using once the period 2003-2008, and then using the period 2013-2018. Finally, SF is run with these two sets of parameters, and with the parameters obtained using the calibration period 2012-2014 as mentioned in the main article, to assess the impact of the calibration period length on the model performances. Results are shown in Figure S3 and in Table S4. The validation performance is computed over the periods which were not used for calibration. For the Lonza catchment, there are no significant differences in the RMSE obtained for water temperature. For the Broye catchment, the RMSE is reduced when calibrating over longer time periods. However, this difference is not visible in the temperature. Since the application of different calibration period lengths was found to be of little importance, and to reduce the computational time needed for calibration, it has been decided to use the calibration and validation periods given in the main article, i.e. 2012-2014 and 2015-2018, which is considered justified. Note that calibration and validation periods used are similar or longer than those used in previous studies using SF (Gallice et al., 2015; Brauchli et al., 2017; Griessinger et al., 2019).

Table S4. Performance of StreamFlow simulations during the calibration period with different periods used for the calibration for the Broye and the Lonza catchments (top) and performance over the whole period (validation) with the corresponding calibration parameters (bottom).

	Calibration					
Catchment	**2012-2014**		**2003-2008**		**2013-2018**	
	KGE (-)	**RMSE (°C)**	**KGE (-)**	**RMSE (°C)**	**KGE (-)**	**RMSE (°C)**
Broye	0.75	1.04	0.70	1.14	0.76	1.06
Loza	0.92	0.88	0.91	0.98	0.92	0.95
	Validation					
Catchment	**KGE (-)**	**RMSE (°C)**	**KGE (-)**	**RMSE (°C)**	**KGE (-)**	**RMSE (°C)**
Broye	0.65	1.21	0.71	0.92	0.76	0.91
Loza	0.82	1.08	0.87	1.07	0.88	1.02

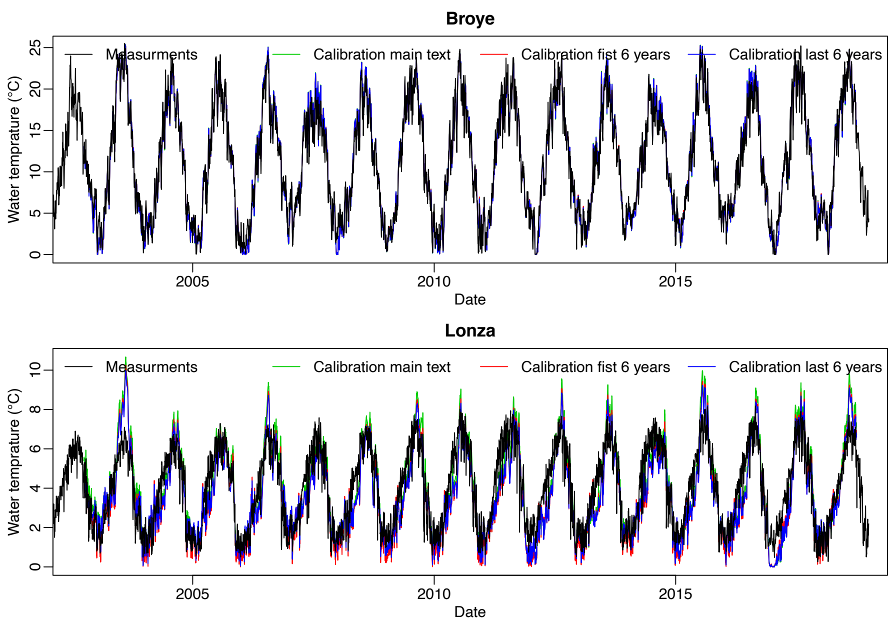

Figure S3. Broye and Lonza catchments.

S5 Inter-comparison of StreamFlow model setups

In this section we show the performance of SF over the calibration period using 2 different spatial resolutions (100 m and 500 m), 4 different water routing schemes, and 3 different methods to compute the water temperature in the ground before its discharge into the river.

Table S5. Performance of SF during the calibration period with different water routing schemes.

Catchment	Lumped Direct		Lumped Discretized		MC Direct	
	KGE (-)	RMSE (°C)	KGE (-)	RMSE (°C)	KGE (-)	RMSE (°C)
Birs	0.80	1.23	0.82	4.89	0.83	1.28
Broye	0.70	1.04	0.70	5.70	0.69	1.14
Ergolz	0.99	0.90	0.89	4.42	0.89	0.90
Eulach	0.72	0.89	0.71	5.19	0.72	0.95
Inn	0.92	0.80	0.92	8.67	0.92	0.78
Kander	0.82	0.71	0.82	11.33	0.81	0.72
Lonza	0.86	0.88	0.84	9.15	0.82	0.81
Suze	0.83	2.24	0.81	8.66	0.83	2.20

The computation time of the discretized routing approach is many orders of magnitude higher than for the lumped approach. As a consequence, this is tested only on a few catchments which are indicated in Table S5. Furthermore, the combined discretized and Muskingum-Cunge (MC) approach is so slow that it failed to finish the temperature calibration in the 24 h allowed as maximum run time on the CSCS supercomputer. Therefore, this combination could not be considered.

Table S5 shows the KGE and RMSE values obtained over the calibration and validation periods with the 3 retained water routing schemes at 500 m resolution for the selected catchments. Note that these simulations were run in an early phase of this study with a different set of meteorological stations, and consequently the results in the table might differ from the final calibration results shown in the main article (Section 4.1). The results for water temperature shown in Table S5 are the best results obtained across the 3 temperature schemes and 5 soil depths used for each individual catchment and routing scheme. The results for discharge are not improved using the discretized scheme, and with this mode the water temperature computed is completely wrong. The discrete approach is thus discarded for the rest of the analysis.

Table S5 also serves for assessing the difference between the lumped direct routing and the lumped MC approaches. We notice that the performances are very similar for the two routing schemes. Since the direct routing is significantly faster than the MC approach, the lumped direct routing is retained for this work.

Calibration performances at 100 m and 500 m resolution (using lumped direct routing) are inter-compared in Table S6. There is no clear difference between the results based on the two resolutions. The resolution of 100 m is chosen to ensure consistency among catchments since only the 100 m resolution is available for the Rietholzbach catchment (because A3D is run at 100 m resolution for this small catchment).

Finally, simulations for all catchments are run at 100 m resolution with the lumped direct routing scheme and with the 3 different methods available to compute the water temperature in the ground before discharge into the river. Results are shown in Figures S4 and S5 for four catchments and performance metrics are shown in Table S7 for all catchments. For all 3 approaches, the model is calibrated using soil depths between 0.5 and 3 meters, at intervals of 0.5 m. The soil depth leading to the best results is retained. The temperature calibration being computationally intensive, an iterative approach is used, i.e., only some depths are tested and additional depths are added if necessary, explaining why different depths are shown in the Figure S4 and S5. Figure S4 shows details for the calibration period for two non-Alpine catchments, and Figure S5 for two Alpine

Table S6. Performance of SF during the calibration period with different spatial resolutions.

Catchment	Lumped Direct @ 100m		Lumped direct @ 500m	
	KGE (-)	RMSE ($^\circ$C)	KGE (-)	RMSE ($^\circ$C)
Birs	0.83	1.26	0.80	1.23
Broye	0.68	1.12	0.70	1.04
Ergolz	0.87	1.07	0.99	0.90
Eulach	0.75	1.03	0.72	0.89
Inn	0.93	0.79	0.92	0.80
Kander	0.82	0.66	0.82	0.71
Loza	0.81	0.76	0.86	0.88
Suze	0.79	2.18	0.83	2.24

catchments. From these figures we see 1) that the difference resulting from the choice of the soil depths is almost negligible for the HSPF approach (the choice of a specific soil depth for the soil temperature to be used has an impact of only 0.1 °C on the water temperature RMSE when using the HSPF scheme.), and 2) that the HSPF approach is performing better. For the interpretation of the plots it is crucial to note that all results come from a separate calibration. So, if most of the difference seen can be attributed to the chosen soil depth, part of the difference can also be due to the calibration, and this ratio is hard to quantify.

Although not being the best preforming in all catchments, the HSPF scheme is the most consistent across catchments. The two other schemes lead to large errors in certain catchments, in particular in the Alpine ones. Contrary to over-estimating the summer temperature as in the HSPF scheme (see Sections 4.1 and 5.1 in the main text and Section S9), the two other approaches tend to overestimate winter water temperature and underestimate the summer temperature. Note that in the HSPF scheme, the soil temperature has a lower impact than in the two other schemes (soil temperature is only needed for heat conduction between water and river bed).

Table S7. Performance of SF during the calibration period with different sub-watershed temperature schemes. Energy balance calculation follows the approach of Comola et al. (2015), HSPF the approach of Bicknell et al. (1997), and soil temperature is computed by simply using soil temperature averaged over the sub-watershed for groundwater temperature.

Catchment	**Energy balance RMSE (°C)**	**HSPF RMSE (°C)**	**Soil temperature RMSE (°C)**
Birs	1.13	1.01	1.13
Broye	1.01	0.91	1.01
Ergolz	0.93	1.25	1.27
Eulach	0.91	1.15	1.04
Inn	0.91	1.02	0.92
Kander	1.06	0.69	1.05
Kleine Emme	1.88	1.08	1.79
Landwasser	1.35	0.91	1.33
Lonza	0.77	0.89	0.75
Lütschine	2.08	1.34	2.14
Rietholzbach	1.87	1.50	1.84
Suze	2.79	1.68	2.81

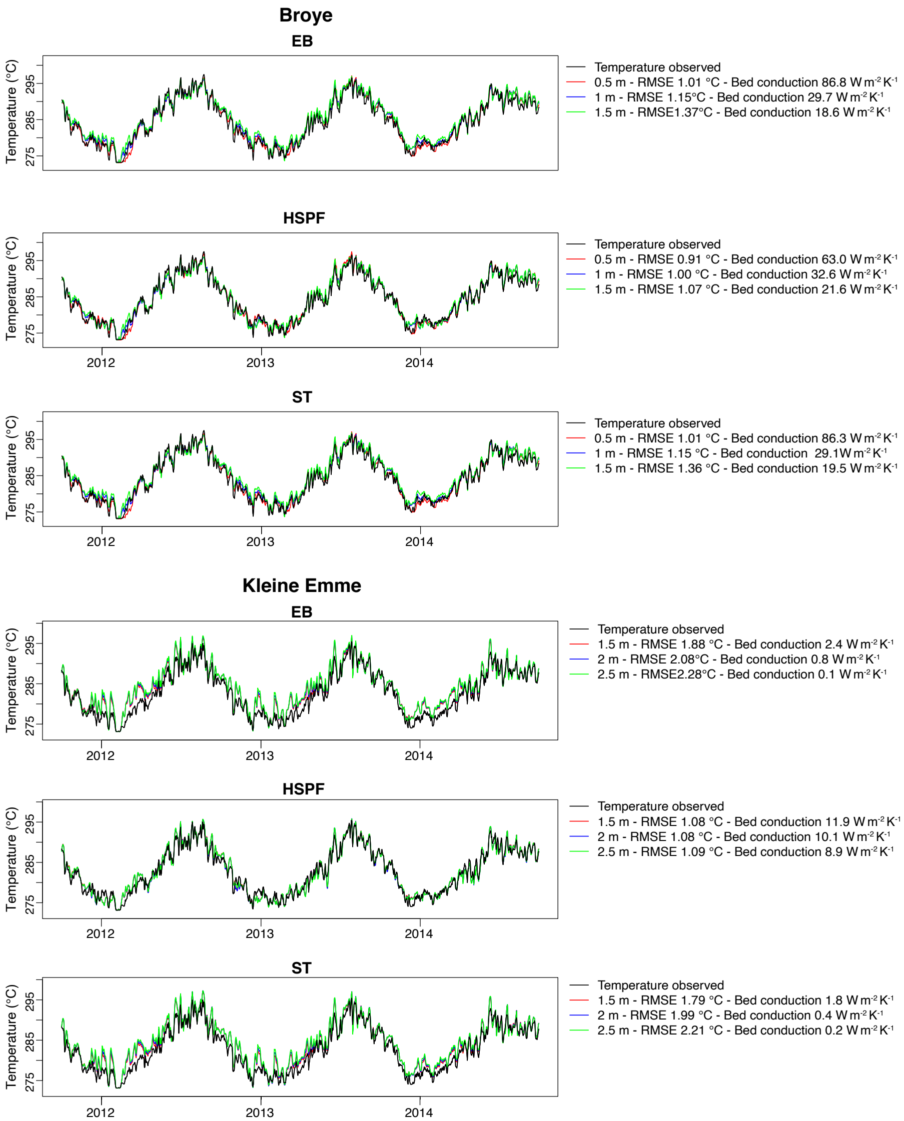

Figure S4. Details of the water temperature calibration phase with different soil depths used for the soil temperature. Calibration for the Broye catchment (top) and the Kleine Emme catchment (bottom), both located on the lowlands. The three approaches available to compute the water temperature in the soil are used: 1) the energy balance formulation (EB, Comola et al., 2015), 2) the HSPF formulation (Bicknell et al., 1997), and 3) the soil temperature approach (ST, Gallice et al., 2016). The root mean square error (RMSE) and the calibrated value obtained for the river-streambed heat transfer coefficient are indicated in the legend.

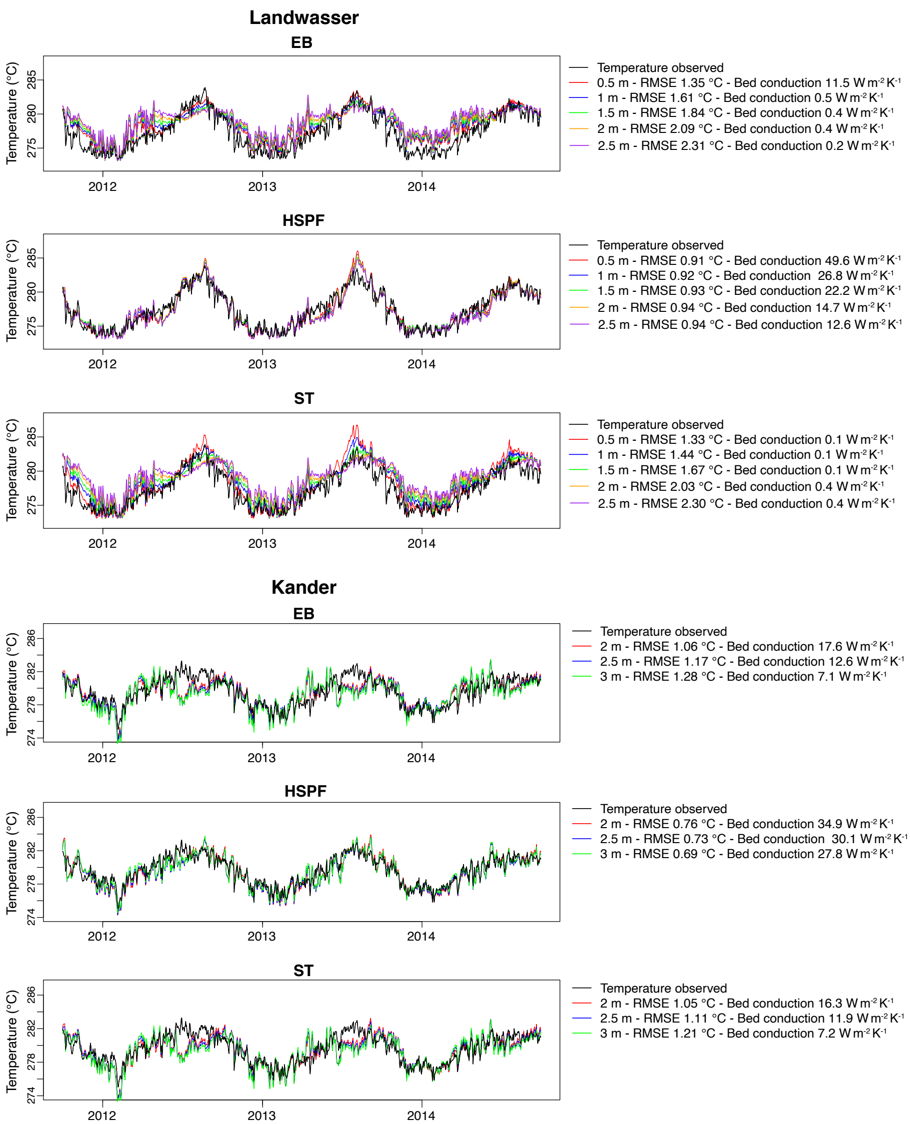

Figure S5. Details of the water temperature calibration phase with different soil depths used for the soil temperature. Calibration for the Landwasser catchment (top) and the Kander catchment (bottom), both located on the Swiss Alps. The three approaches available to compute the water temperature in the soil are used: 1) the energy balance formulation (EB, Comola et al., 2015), 2) the HSPF formulation (Bicknell et al., 1997), and 3) the soil temperature approach (ST, Gallice et al., 2016). The root mean square error (RMSE) and the calibrated value obtained for the river-streambed heat transfer coefficient are indicated in the legend.

S6 Specific data and plots for calibration and validation

In this section, we present first the values obtained for each calibrated parameter (Table S8); see main article (Sections 3.4 and 4.1) and Gallice et al. (2016) for more details about the calibrated parameters. Then, two plots per catchment are shown, presenting the obtained time series during calibration and validation periods and the distribution of errors (Figures S8 to S29). Figures are split between catchments located on the Swiss Plateau (Section S6.1) and on the Alpine region (Section S6.2). Finally, the snow depth modelled at the position of the measurement stations is shown in Figures S30 to S33 for Alpine catchments (Section S6.3). Note that the measurement stations' real elevation might differ quite significantly from the pixel elevation, leading to difference in snow depth. Both elevations are indicated in the figures. In addition, comparing pixel values to station values always comes with some uncertainty.

Table S8. Final calibration parameters of SF retained.

Catchment	PSUM lapse rate (%/m)	Soil depth for temp. (m)	Max. infiltration rate (mm/day)	Upper res. τ (day)	Lower res. τ (day)	Frac. lost water (-)	HSPF smoothing (s)	HSPF offset (K/s)	Bed heat trans. coeff (W/m^{2}K)
Birs	2.00E-02	3.0	2.87E+00	2.39E+00	6.67E+02	2.75E-01	-2.33E+00	1.15E-07	2.99E+01
Broye	2.00E-02	0.5	5.05E-01	3.31E+00	7.35E+02	5.70E-02	-2.99E+00	1.21E-07	6.30E+01
Ergolz	2.00E-02	2.5	5.01E+00	1.71E+00	6.08E+02	1.56E-01	-1.16E+00	4.76E-06	5.63E+01
Eulach	1.00E-02	3.0	6.96E+00	1.81E+00	1.46E+03	3.20E-01	+9.79E-01	4.62E-06	3.85E+01
Inn	5.00E-02	3.0	2.11E+01	3.83E+00	8.32E+02	6.91E-02	-2.22E+00	1.49E-06	2.78E+01
Kander	2.00E-02	0.5	5.17E+00	6.69E+00	5.10E+02	8.85E-02	-2.96E-01	9.76E-07	2.15E+01
Kleine Emme	5.00E-02	2.5	1.23E+01	1.07E+00	5.72E+02	1.19E-01	-2.91E+00	1.22E-06	1.01E+01
Landwasser	5.00E-02	1.0	1.17E+01	5.97E+00	1.01E+02	7.57E-02	-2.47E+00	9.16E-07	2.68E+01
Lonza	5.00E-02	0.5	1.70E+00	4.90E+00	6.35E+02	1.35E-01	-7.52E-01	7.49E-07	7.27E+01
Lütschine	3.00E-02	1.0	4.48E+00	1.79E+00	1.66E+02	3.20E-02	-2.35E+00	1.05E-07	1.06E+00
Rietholzbach	5.00E-02	1.5	5.29E+00	1.85E+00	6.26E+02	5.57E-03	-2.47E+00	1.33E-06	4.55E+01
Suze	2.00E-02	4.5	4.58E+00	2.58E+00	1.26E+02	1.19E-01	-2.50E+00	1.09E-07	3.67E+01

S6.1 Swiss Plateau

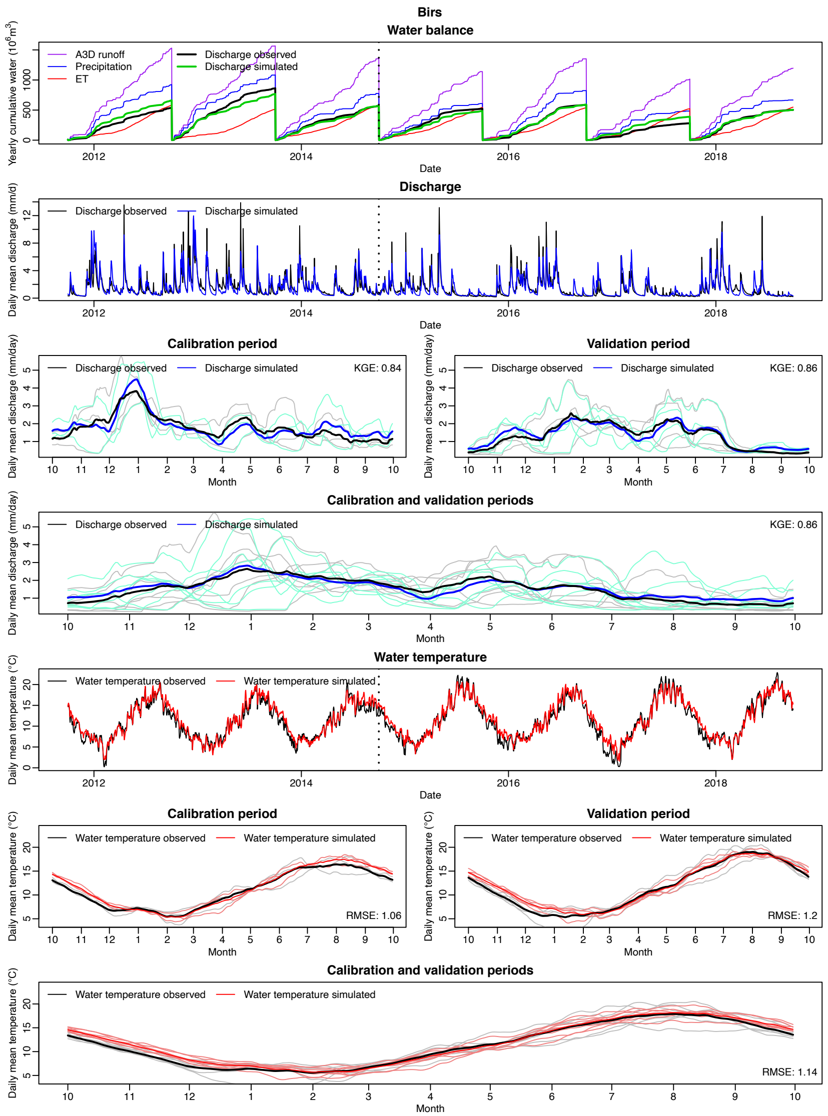

Figure S6. Calibration and validation results for the Birs catchment. Row 1: Cumulative sums of the various components of the hydrological water balance over the hydrological year. Row 2: Observed and simulated discharge. The vertical dashed line indicates the limit between the calibration period (left) and the validation period (right). Row 3: Sum for each day of the year of the measured and simulated discharge over the calibration period (left) and validation period (right). Thin light lines represent the individual years. The KGE over the period is indicated in the top right corner. Row 4: Same as Row 3 but for the calibration and validation periods. Rows 5-7: Same as Rows 2-4, but for water temperature. The RMSE over teh period is indicated in the bottom right corner.

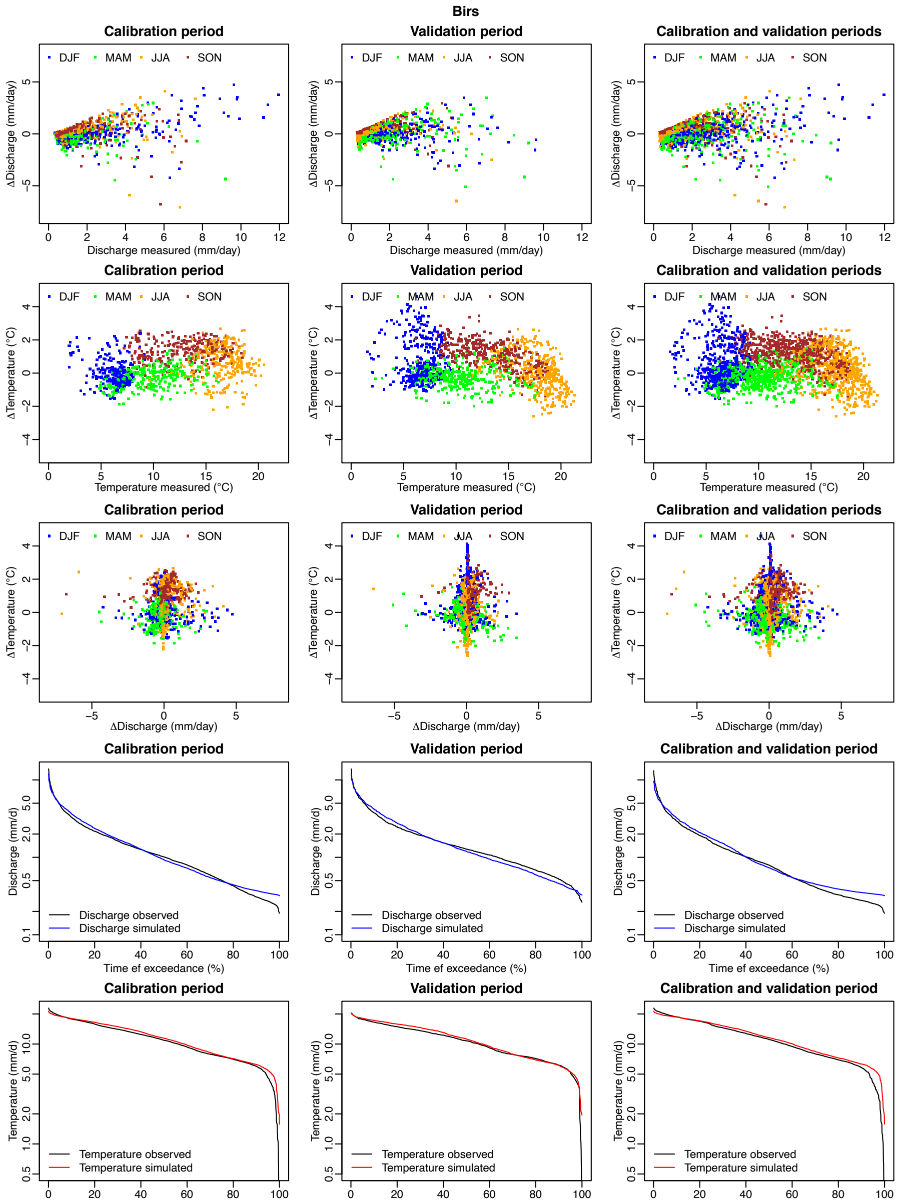

Figure S7. Errors during the calibration and validation periods for the Birs catchment. Left column: Calibration period. Center column: Validation period. Right column: Calibration and validation periods. Row 1: Discharge error versus raw discharge value (colors indicate seasons). Row 2: Water temperature error plotted against raw water temperature value (colors indicate seasons). Row 3: Water temperature error versus relative discharge errors (colors indicate seasons). Row 4: Flow duration curve for discharge. Row 5: Flow duration curve for water temperature.

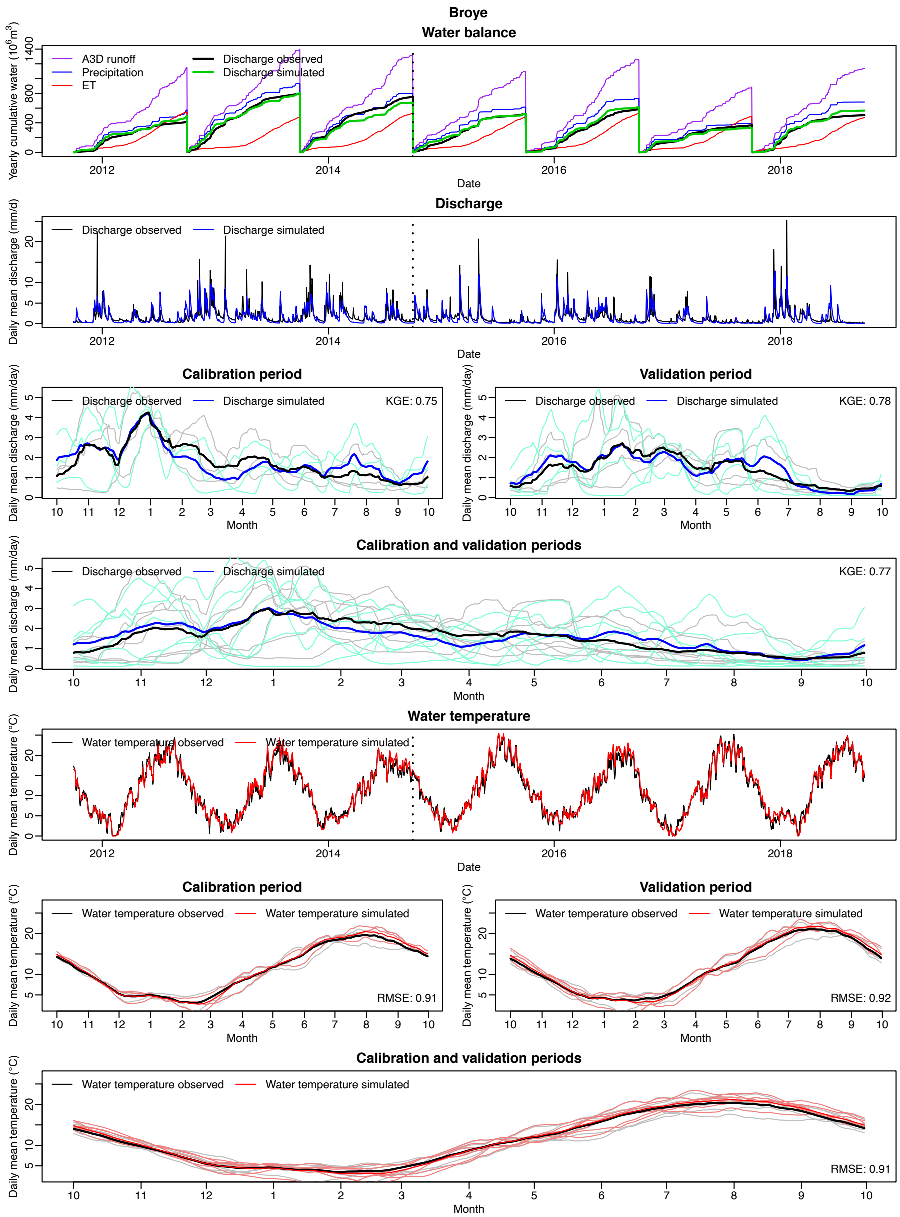

Figure S8. Calibration and validation results for the Broye catchment (located on the Swiss Plateau). Row 1: Cumulative sums of the various components of the hydrological water balance over the hydrological year. Row 2: Observed and simulated discharge. The vertical dashed line indicates the limit between the calibration period (left) and the validation period (right). Row 3: Sum for each day of the year of the measured and simulated discharge over the calibration period (left) and validation period (right). Thin light lines represent the individual years. The KGE over the period is indicated in the top right corner. Row 4: Same as Row 3 but for the calibration and validation periods. Rows 5-7: Same as Rows 2-4, but for water temperature. The RMSE over teh period is indicated in the bottom right corner.

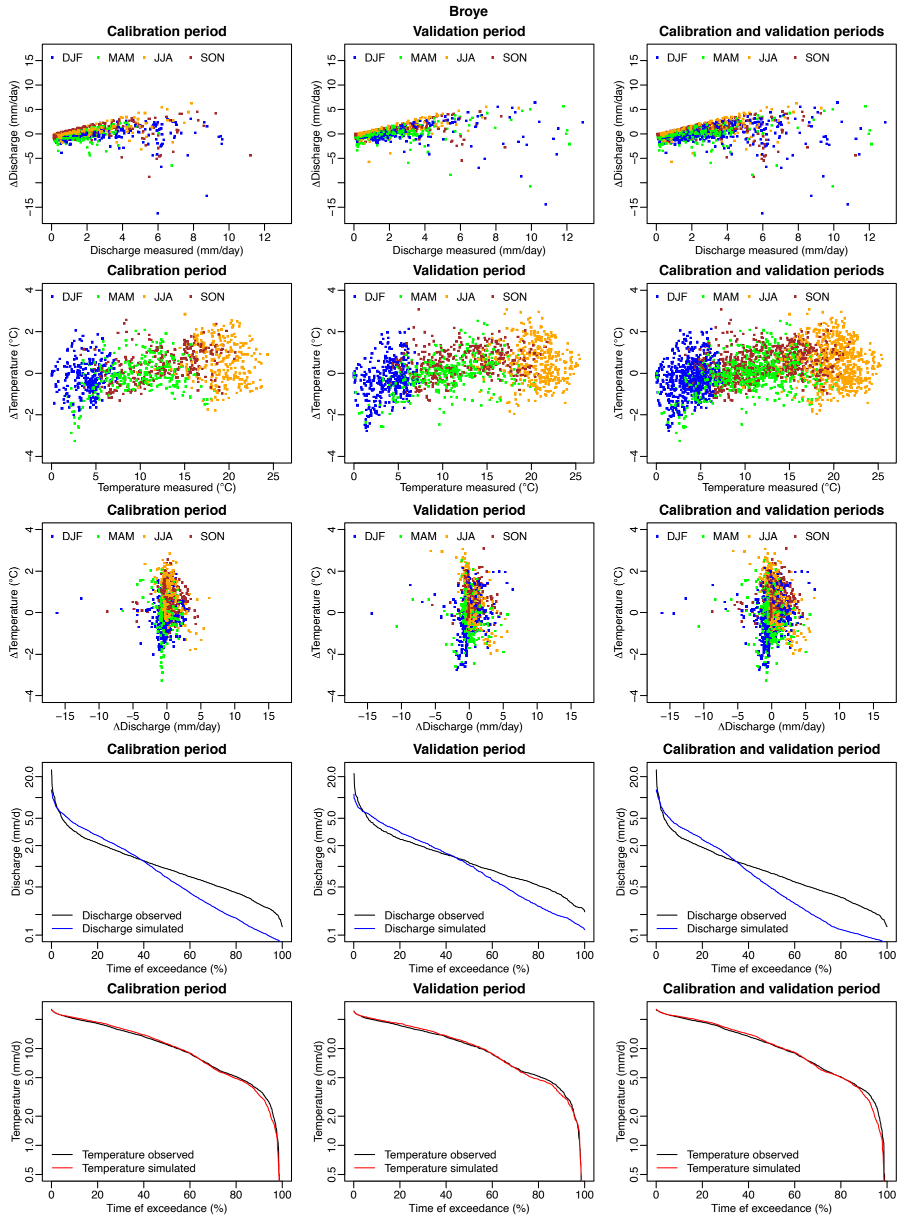

Figure S9. Errors during the calibration and validation periods for the Broye catchment (located on the Swiss Plateau). Left column: Calibration period. Center column: Validation period. Right column: Calibration and validation periods. Row 1: Discharge error versus raw discharge value (colors indicate seasons). Row 2: Water temperature error versus raw water temperature value (colors indicate seasons). Row 3: Water temperature error plotted against relative discharge errors (colors indicate seasons). Row 4: Flow duration curve for discharge. Row 5: Flow duration curve for water temperature.

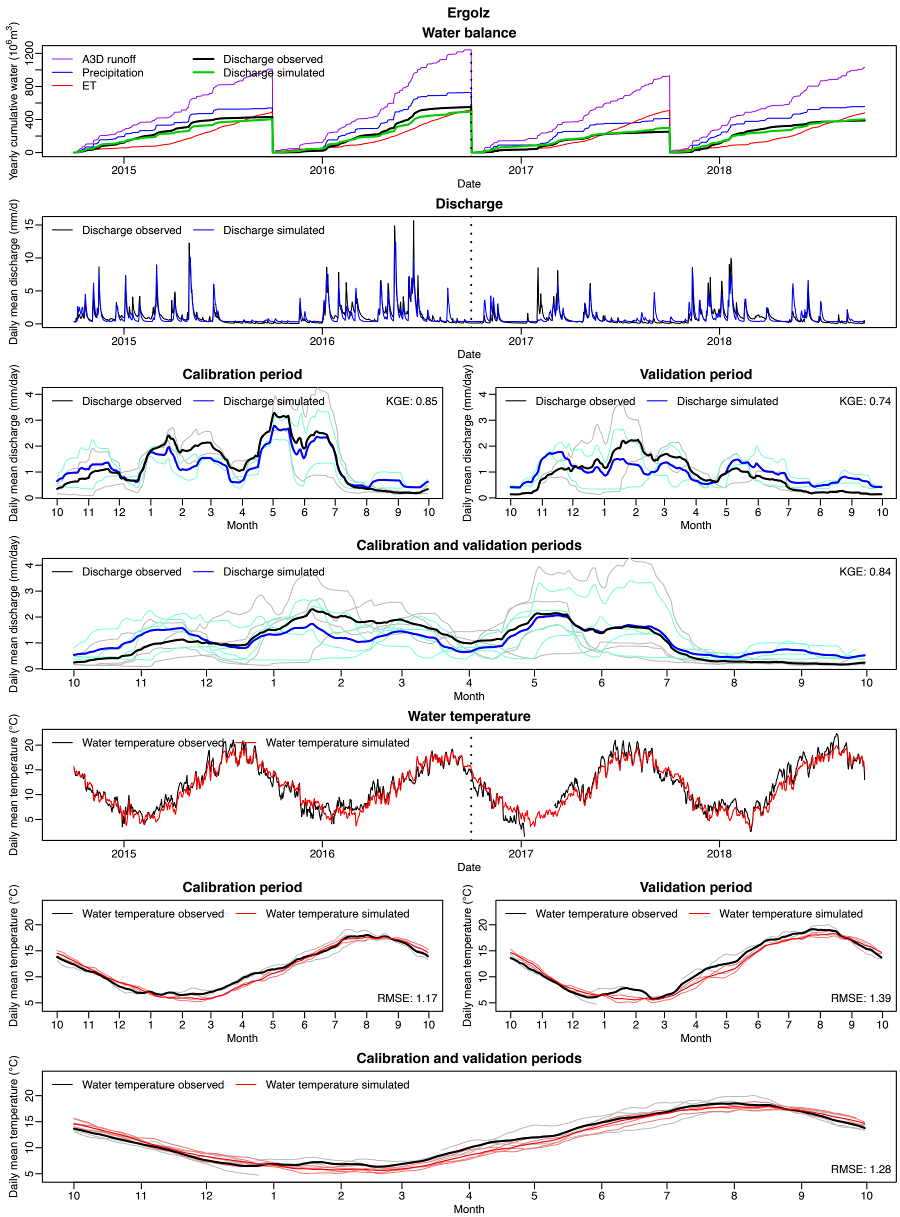

Figure S10. Calibration and validation results for the Ergolz catchment (located on the Swiss Plateau). Row 1: Cumulative sums of the various components of the hydrological water balance over the hydrological year. Row 2: Observed and simulated discharge. The vertical dashed line indicates the limit between the calibration period (left) and the validation period (right). Row 3: Sum for each day of the year of the measured and simulated discharge over the calibration period (left) and validation period (right). Thin light lines represent the individual years. The KGE over the period is indicated in the top right corner. Row 4: Same as Row 3 but for the calibration and validation periods. Rows 5-7: Same as Rows 2-4, but for water temperature. The RMSE over teh period is indicated in the bottom right corner.

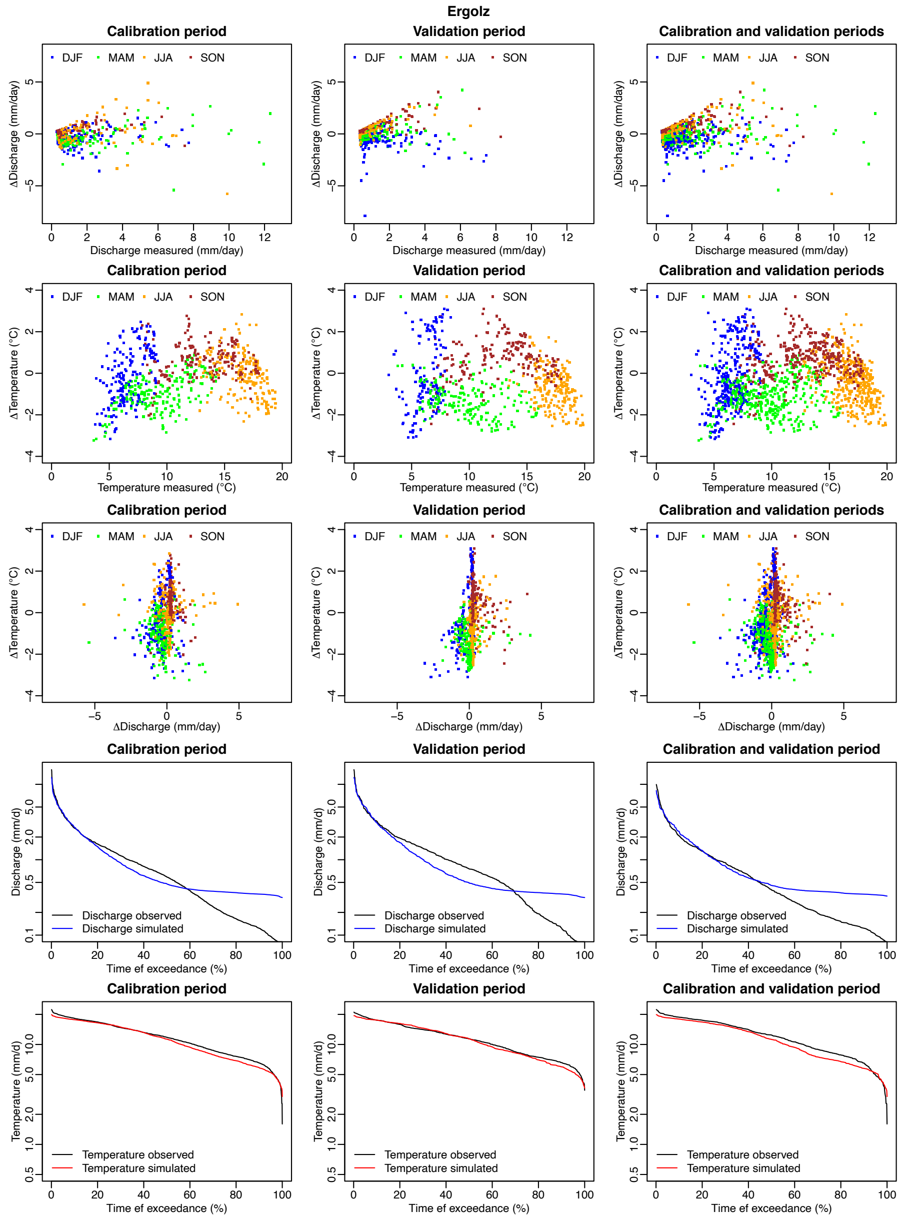

Figure S11. Errors during the calibration and validation periods for the Ergolz catchment (located on the Swiss Plateau). Left column: Calibration period. Center column: Validation period. Right column: Calibration and validation periods. Row 1: Discharge error versus raw discharge value (colors indicate seasons). Row 2: Water temperature error versus raw water temperature value (colors indicate seasons). Row 3: Water temperature error plotted against relative discharge errors (colors indicate seasons). Row 4: Flow duration curve for discharge. Row 5: Flow duration curve for water temperature.

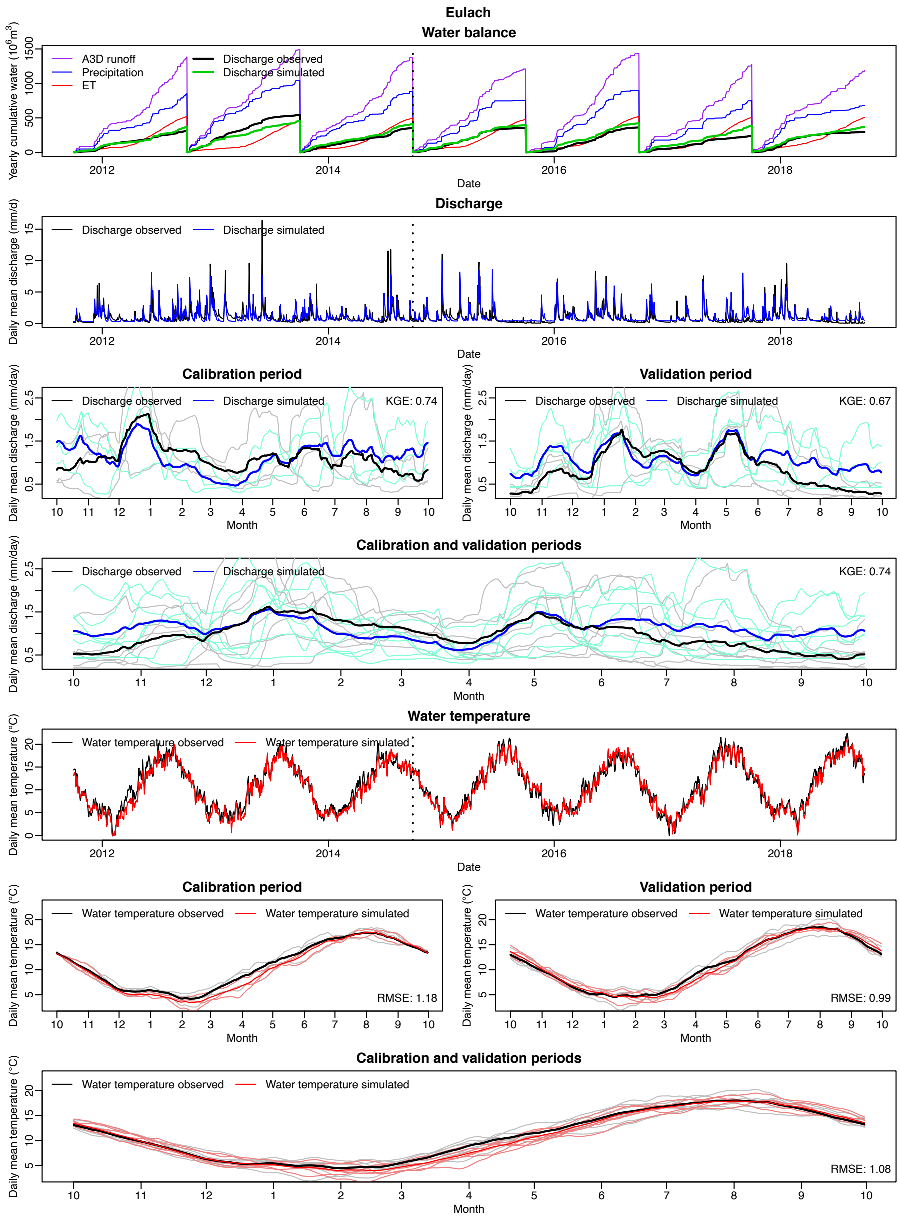

Figure S12. Calibration and validation results for the Eulach catchment (located on the Swiss Plateau). Row 1: Cumulative sums of the various components of the hydrological water balance over the hydrological year. Row 2: Observed and simulated discharge. The vertical dashed line indicates the limit between the calibration period (left) and the validation period (right). Row 3: Sum for each day of the year of the measured and simulated discharge over the calibration period (left) and validation period (right). Thin light lines represent the individual years. The KGE over the period is indicated in the top right corner. Row 4: Same as Row 3 but for the calibration and validation periods. Rows 5-7: Same as Rows 2-4, but for water temperature. The RMSE over teh period is indicated in the bottom right corner.

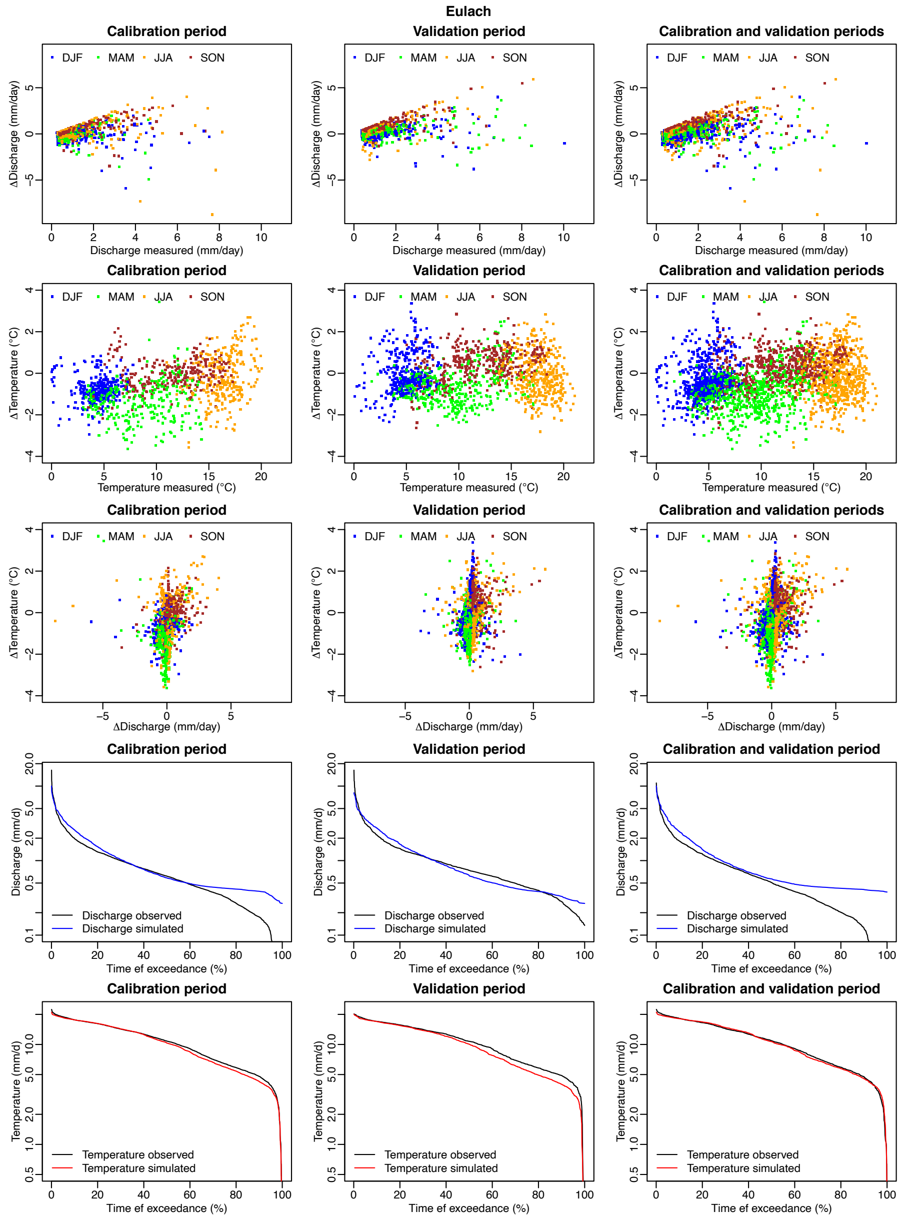

Figure S13. Errors during the calibration and validation periods for the Eulach catchment (located on the Swiss Plateau). Left column: Calibration period. Center column: Validation period. Right column: Calibration and validation periods. Row 1: Discharge error versus raw discharge value (colors indicate seasons). Row 2: Water temperature error versus raw water temperature value (colors indicate seasons). Row 3: Water temperature error plotted against relative discharge errors (colors indicate seasons). Row 4: Flow duration curve for discharge. Row 5: Flow duration curve for water temperature.

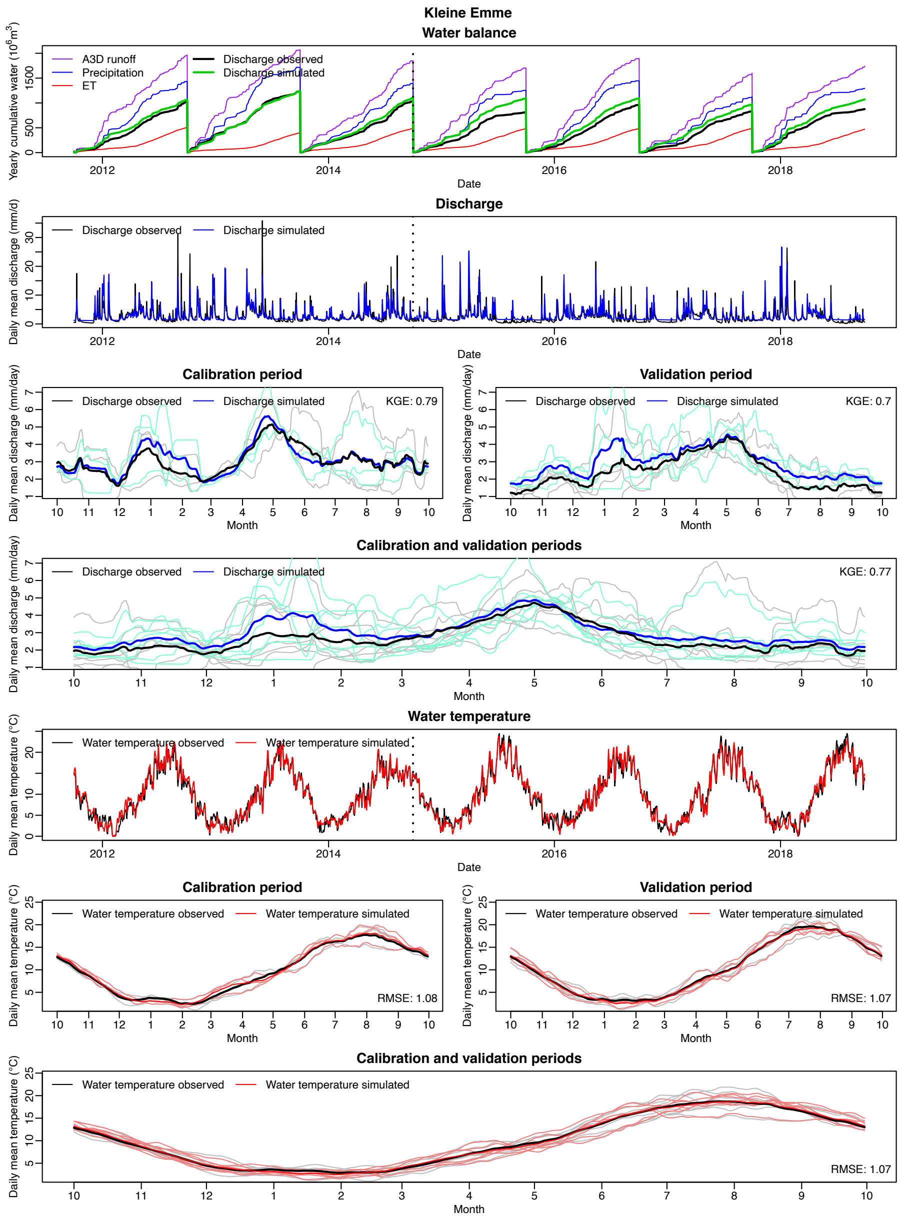

Figure S14. Calibration and validation results for the Kleine Emme catchment (located on the Swiss Plateau). Row 1: Cumulative sums of the various components of the hydrological water balance over the hydrological year. Row 2: Observed and simulated discharge. The vertical dashed line indicates the limit between the calibration period (left) and the validation period (right). Row 3: Sum for each day of the year of the measured and simulated discharge over the calibration period (left) and validation period (right). Thin light lines represent the individual years. The KGE over the period is indicated in the top right corner. Row 4: Same as Row 3 but for the calibration and validation periods. Rows 5-7: Same as Rows 2-4, but for water temperature. The RMSE over teh period is indicated in the bottom right corner.

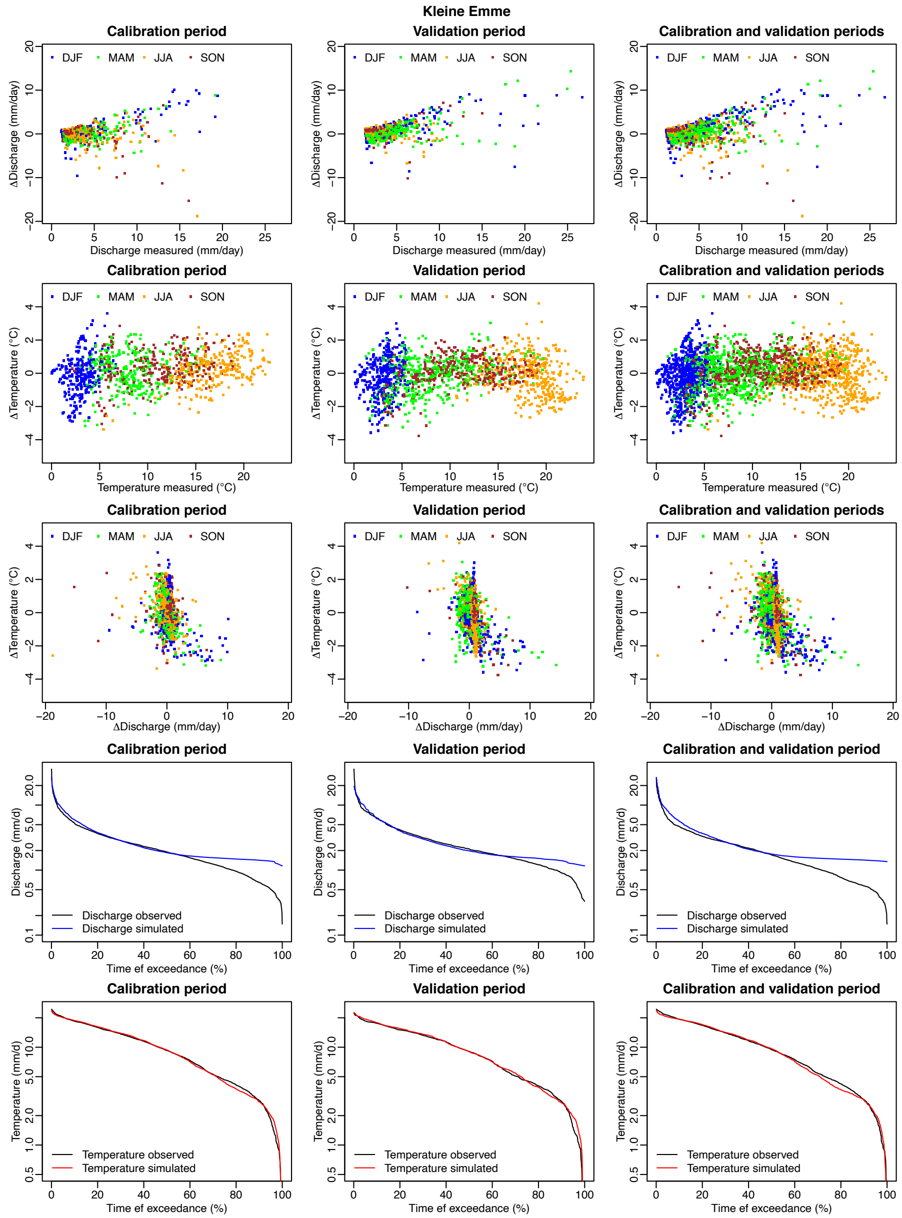

Figure S15. Errors during the calibration and validation periods for the Kleine Emme catchment (located on the Swiss Plateau). Left column: Calibration period. Center column: Validation period. Right column: Calibration and validation periods. Row 1: Discharge error versus raw discharge value (colors indicate seasons). Row 2: Water temperature error versus raw water temperature value (colors indicate seasons). Row 3: Water temperature error plotted against relative discharge errors (colors indicate seasons). Row 4: Flow duration curve for discharge. Row 5: Flow duration curve for water temperature.

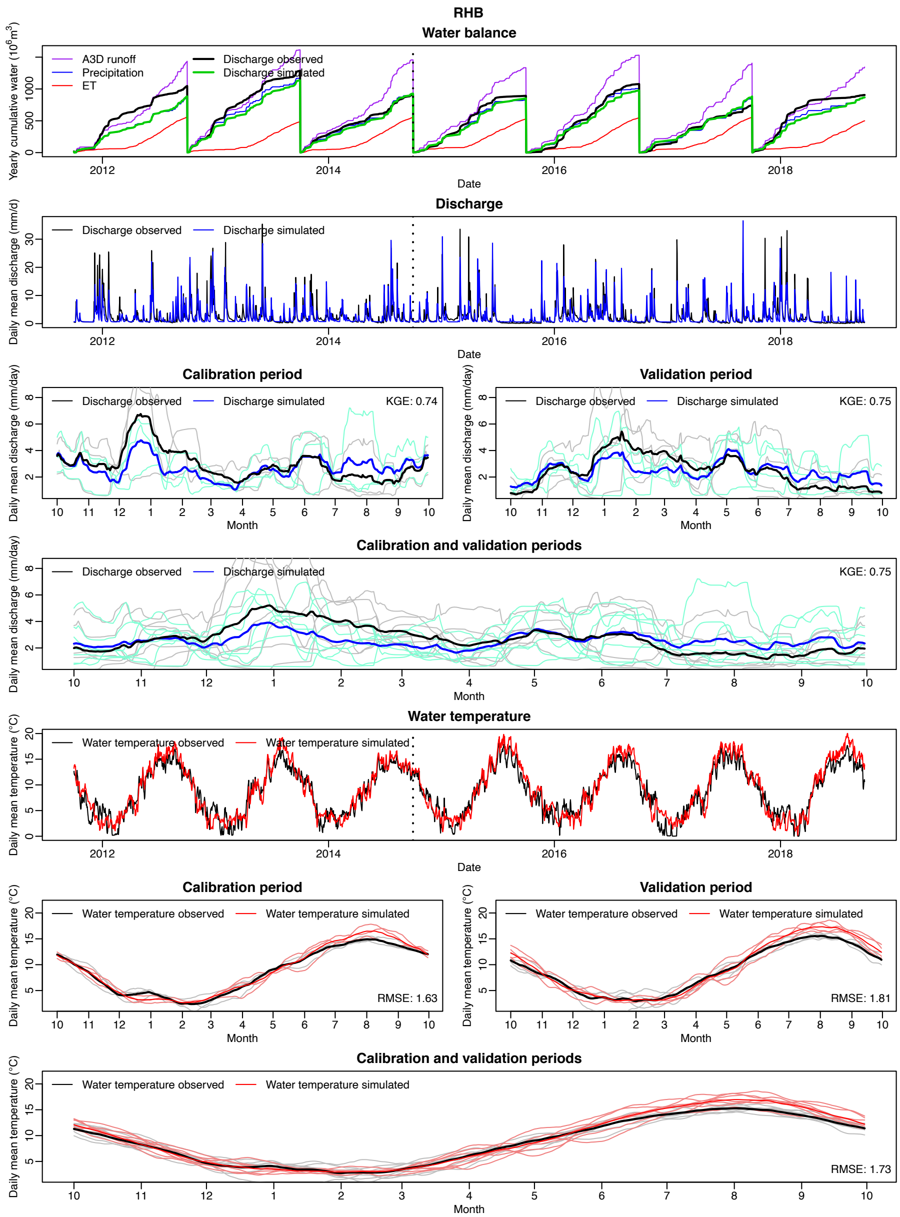

Figure S16. Calibration and validation results for the Rietholzbach catchment (located on the Swiss Plateau). Row 1: Cumulative sums of the various components of the hydrological water balance over the hydrological year. Row 2: Observed and simulated discharge. The vertical dashed line indicates the limit between the calibration period (left) and the validation period (right). Row 3: Sum for each day of the year of the measured and simulated discharge over the calibration period (left) and validation period (right). Thin light lines represent the individual years. The KGE over the period is indicated in the top right corner. Row 4: Same as Row 3 but for the calibration and validation periods. Rows 5-7: Same as Rows 2-4, but for water temperature. The RMSE over teh period is indicated in the bottom right corner.

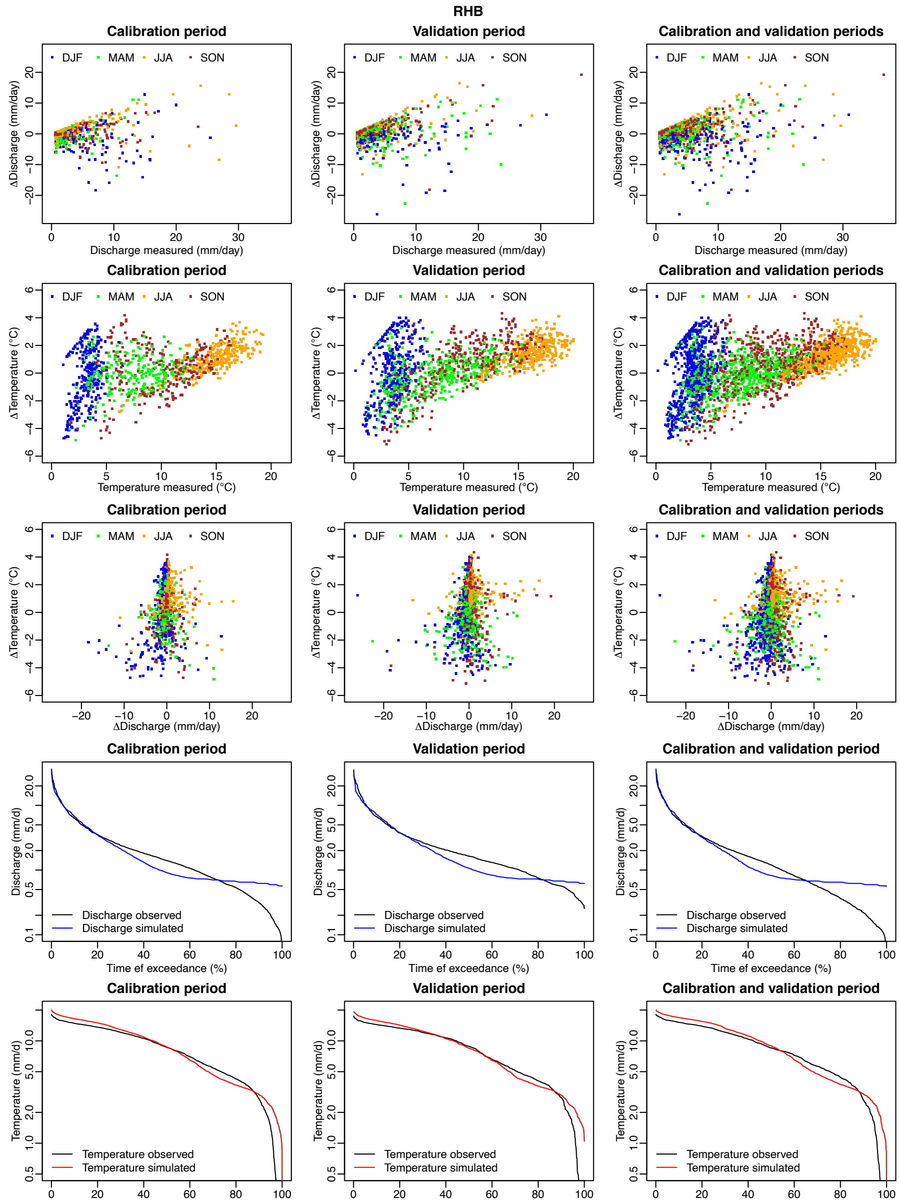

Figure S17. Errors during the calibration and validation periods for the Rietholzbach catchment (located on the Swiss Plateau). Left column: Calibration period. Center column: Validation period. Right column: Calibration and validation periods. Row 1: Discharge error versus raw discharge value (colors indicate seasons). Row 2: Water temperature error versus raw water temperature value (colors indicate seasons). Row 3: Water temperature error plotted against relative discharge errors (colors indicate seasons). Row 4: Flow duration curve for discharge. Row 5: Flow duration curve for water temperature.

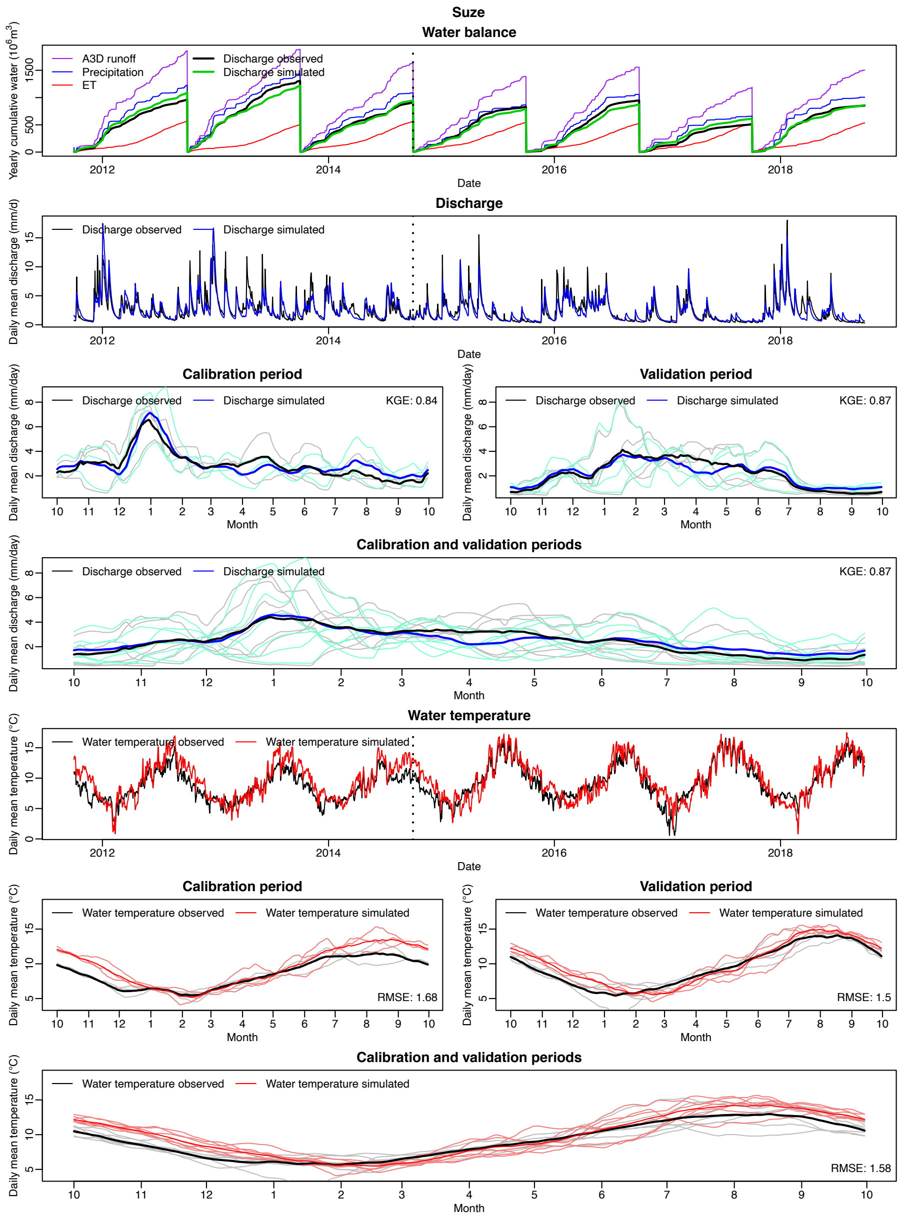

Figure S18. Calibration and validation results for the Suze catchment (located on the Swiss Plateau). Row 1: Cumulative sums of the various components of the hydrological water balance over the hydrological year. Row 2: Observed and simulated discharge. The vertical dashed line indicates the limit between the calibration period (left) and the validation period (right). Row 3: Mean for each day of the year of the measured and simulated discharge with a circular 30 days moving average applied. Left is the calibration period and right the validation period. Thin light lines represent the individual years. The KGE over the period is indicated in the top right corner. Row 4: Same as Row 3 but for the calibration and validation periods. Rows 5-7: Same as Rows 2-4, but for water temperature. The RMSE over teh period is indicated in the bottom right corner.

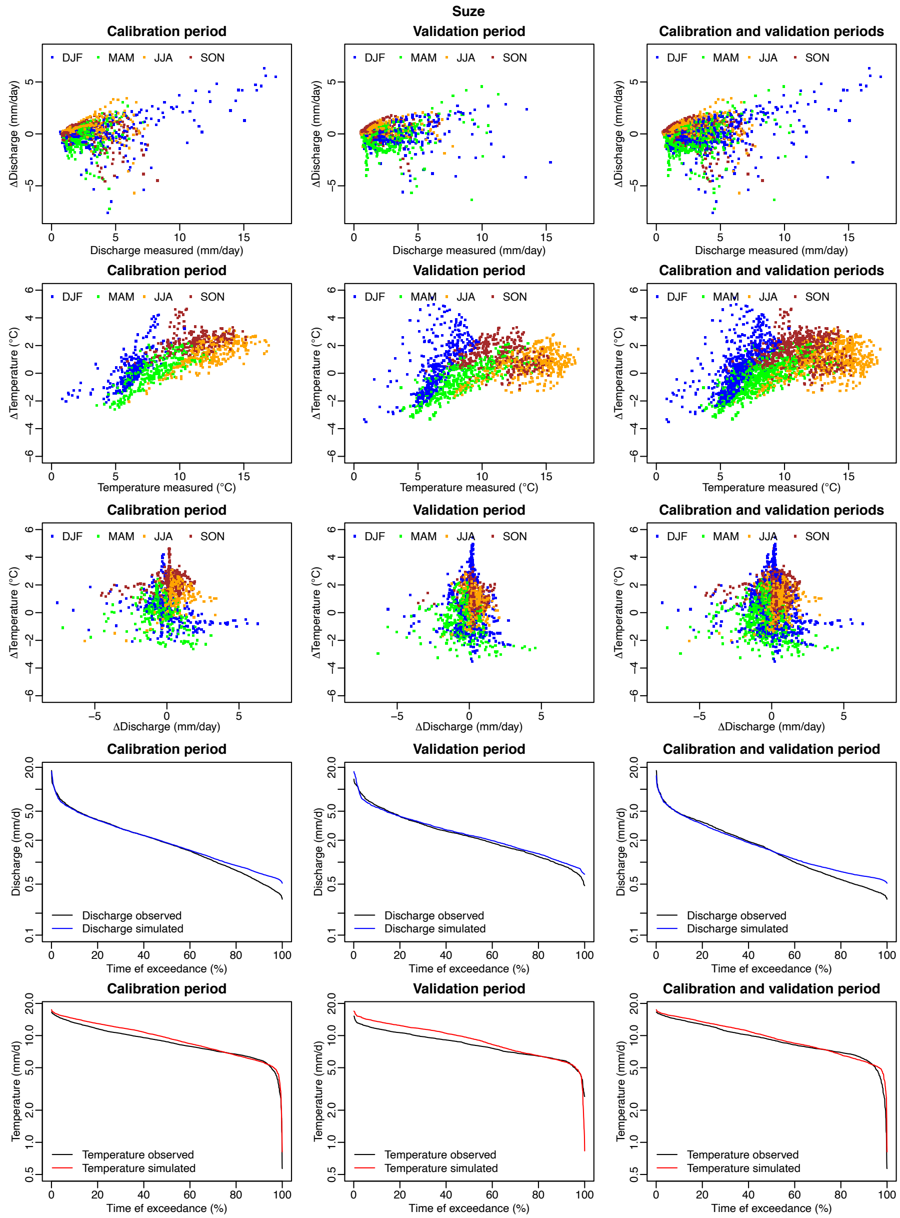

Figure S19. Errors during the calibration and validation periods for the Suze catchment (located on the Swiss Plateau). Left column: Calibration period. Center column: Validation period. Right column: Calibration and validation periods. Row 1: Discharge error versus raw discharge value (colors indicate seasons). Row 2: Water temperature error versus raw water temperature value (colors indicate seasons). Row 3: Water temperature error plotted against relative discharge errors (colors indicate seasons). Row 4: Flow duration curve for discharge. Row 5: Flow duration curve for water temperature.

S6.2 Alpine

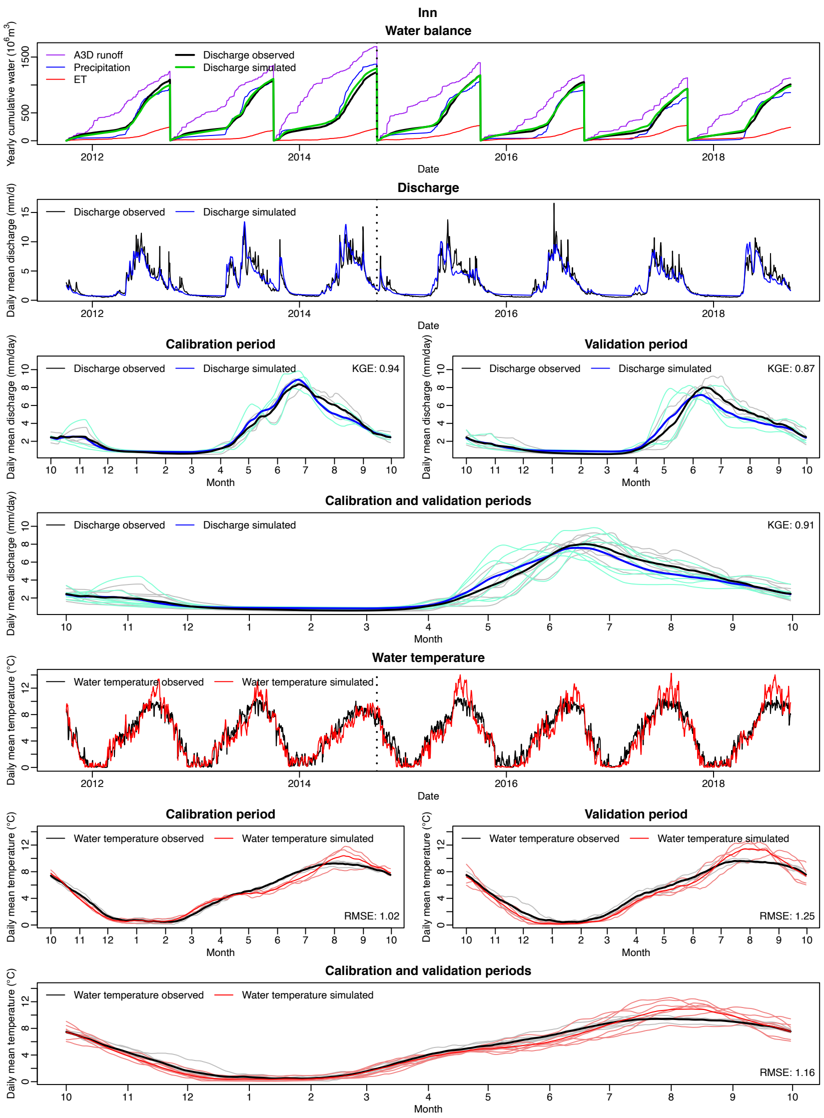

Figure S20. Calibration and validation results for the Inn catchment (located on the Alpine region). Row 1: Cumulative sums of the various components of the hydrological water balance over the hydrological year. Row 2: Observed and simulated discharge. The vertical dashed line indicates the limit between the calibration period (left) and the validation period (right). Row 3: Sum for each day of the year of the measured and simulated discharge over the calibration period (left) and validation period (right). Thin light lines represent the individual years. The KGE over the period is indicated in the top right corner. Row 4: Same as Row 3 but for the calibration and validation periods. Rows 5-7: Same as Rows 2-4, but for water temperature. The RMSE over teh period is indicated in the bottom right corner.

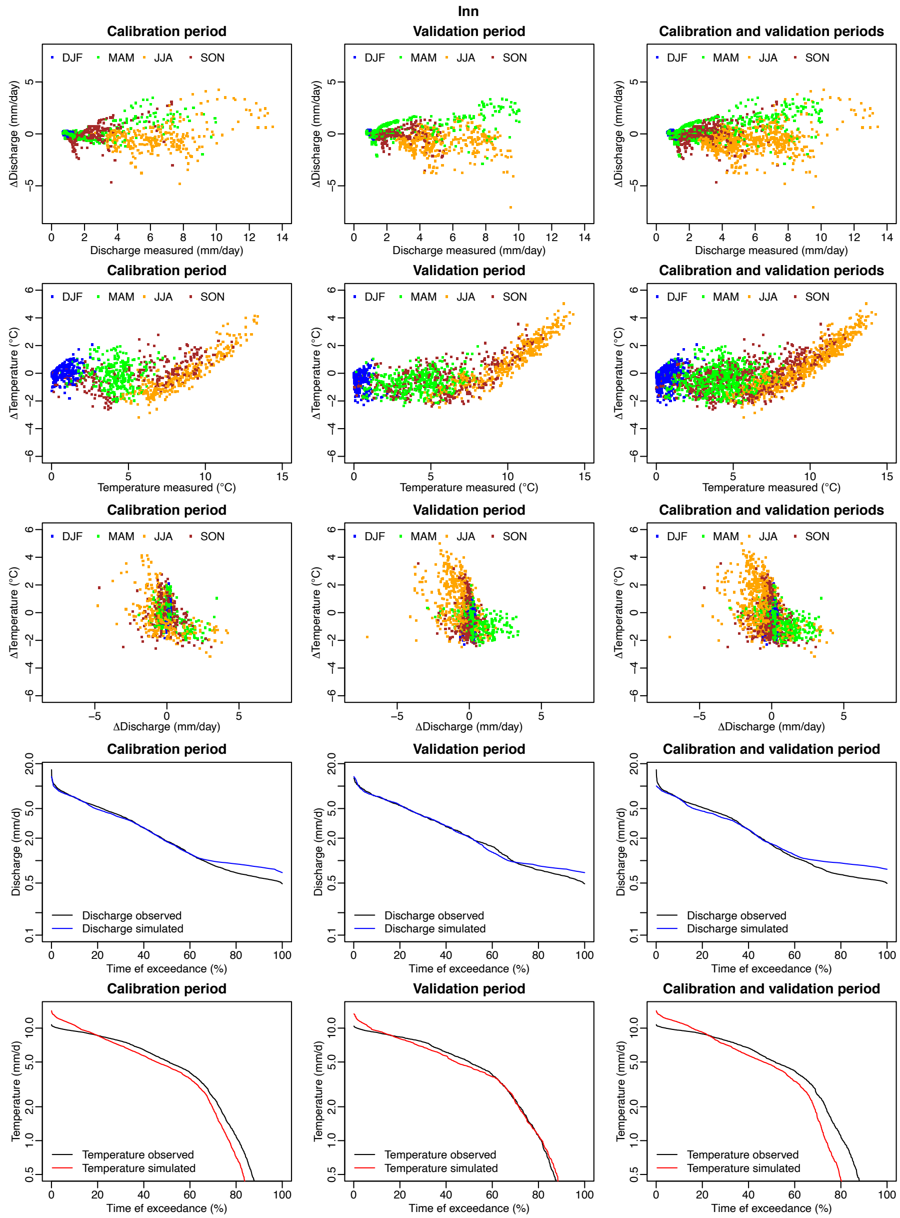

Figure S21. Errors during the calibration and validation periods for the Inn catchment (located on the Alpine region). Left column: Calibration period. Center column: Validation period. Right column: Calibration and validation periods. Row 1: Discharge error versus raw discharge value (colors indicate seasons). Row 2: Water temperature error versus raw water temperature value (colors indicate seasons). Row 3: Water temperature error plotted against relative discharge errors (colors indicate seasons). Row 4: Flow duration curve for discharge. Row 5: Flow duration curve for water temperature.

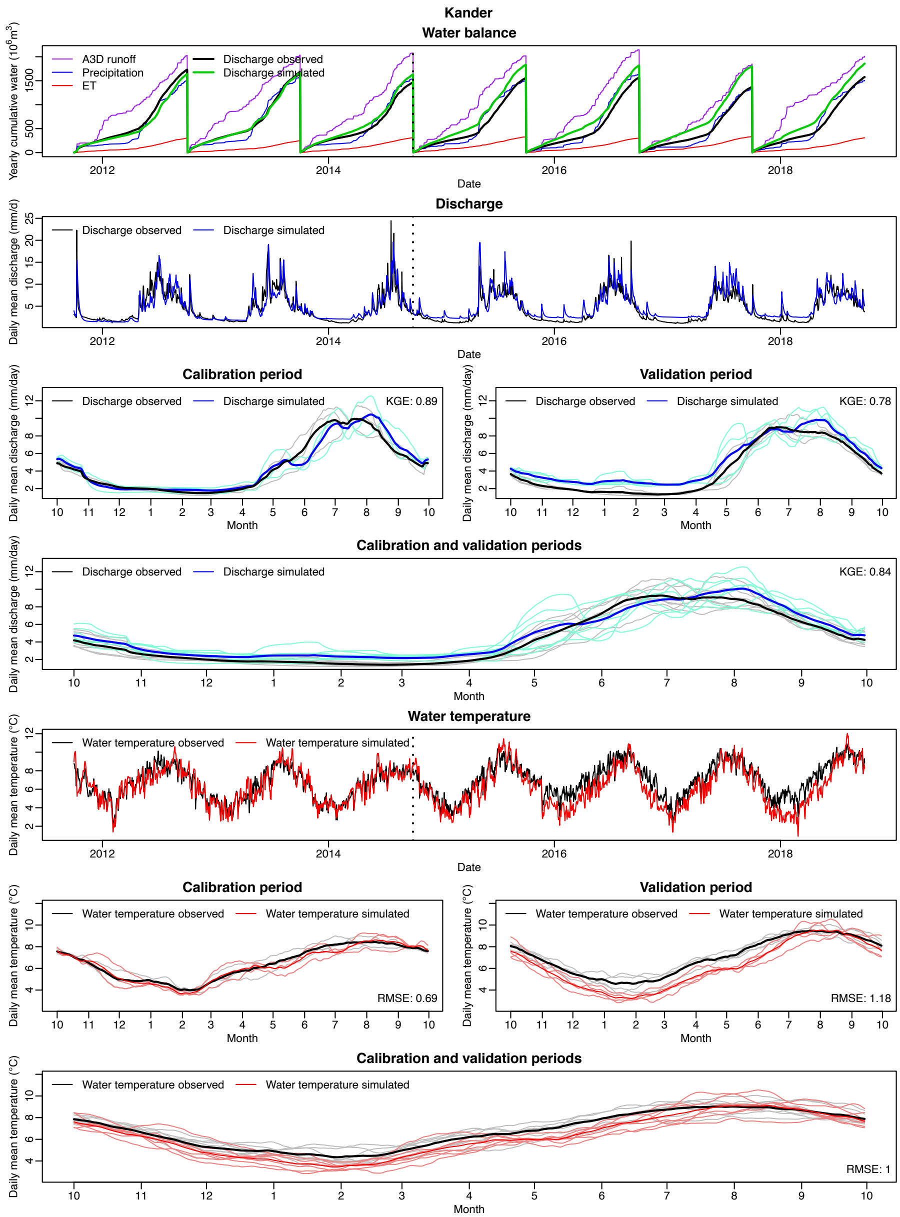

Figure S22. Calibration and validation results for the Kander catchment (located on the Alpine region). Row 1: Cumulative sums of the various components of the hydrological water balance over the hydrological year. Row 2: Observed and simulated discharge. The vertical dashed line indicates the limit between the calibration period (left) and the validation period (right). Row 3: Sum for each day of the year of the measured and simulated discharge over the calibration period (left) and validation period (right). Thin light lines represent the individual years. The KGE over the period is indicated in the top right corner. Row 4: Same as Row 3 but for the calibration and validation periods. Rows 5-7: Same as Rows 2-4, but for water temperature. The RMSE over teh period is indicated in the bottom right corner.

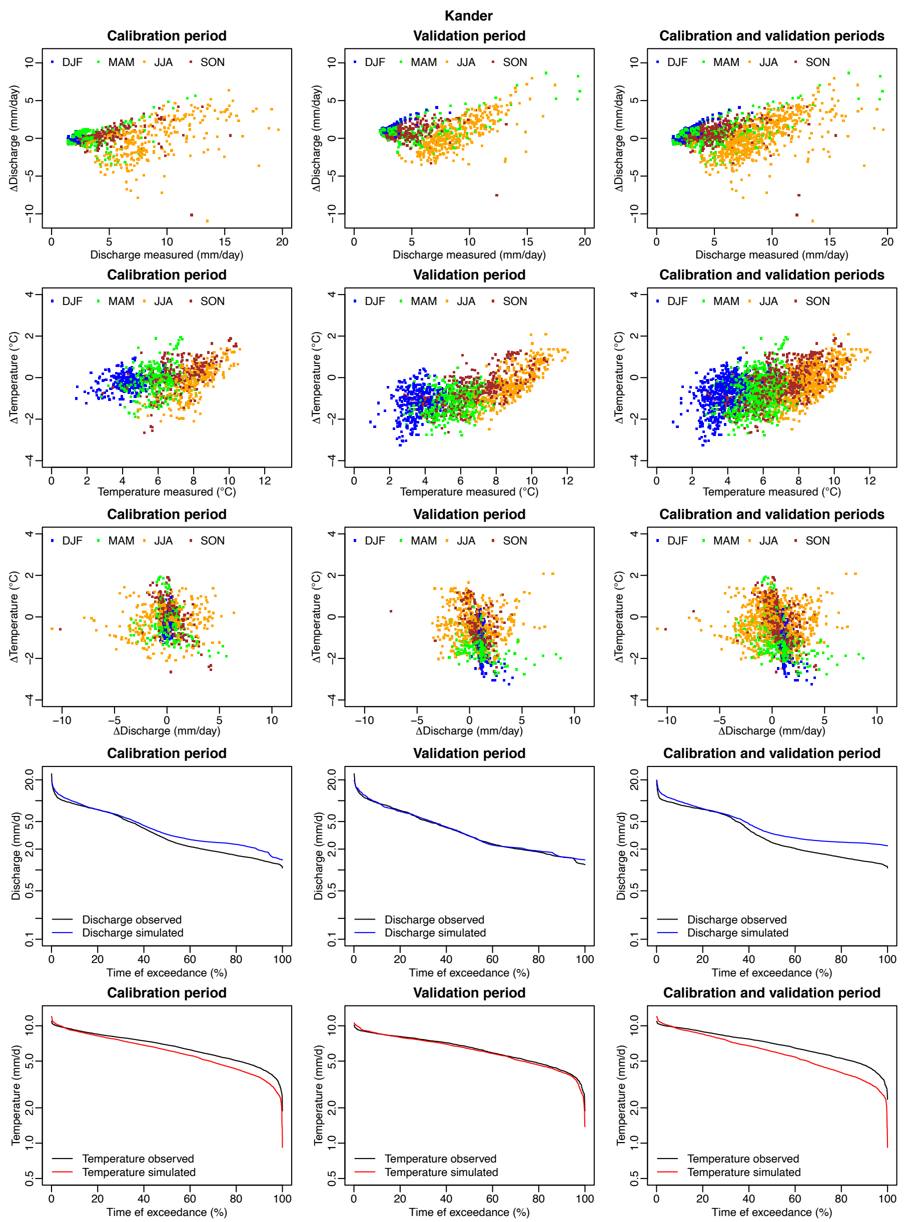

Figure S23. Errors during the calibration and validation periods for the Kander catchment (located on the Alpine region). Left column: Calibration period. Center column: Validation period. Right column: Calibration and validation periods. Row 1: Discharge error versus raw discharge value (colors indicate seasons). Row 2: Water temperature error versus raw water temperature value (colors indicate seasons). Row 3: Water temperature error plotted against relative discharge errors (colors indicate seasons). Row 4: Flow duration curve for discharge. Row 5: Flow duration curve for water temperature.

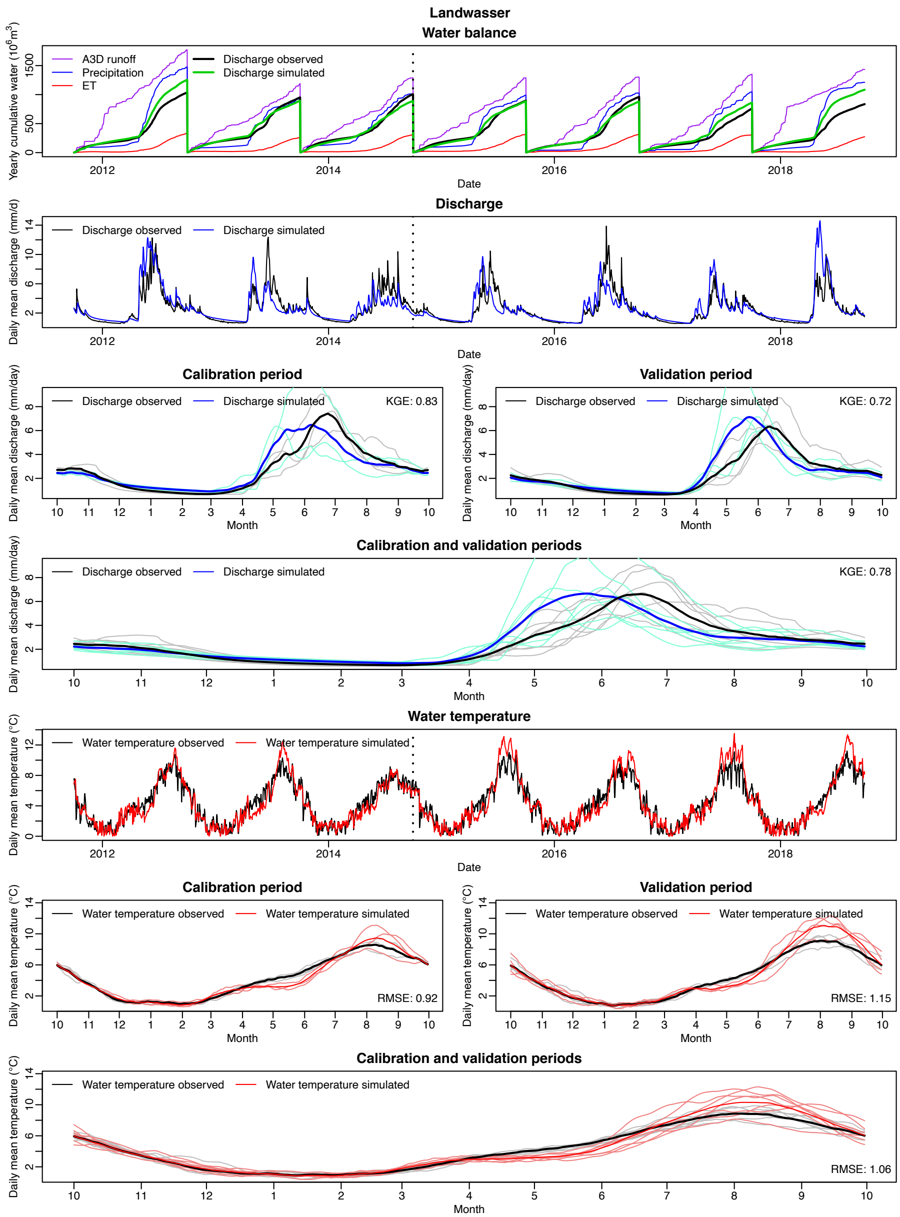

Figure S24. Calibration and validation results for the Landwassser catchment (located on the Alpine region). Row 1: Cumulative sums of the various components of the hydrological water balance over the hydrological year. Row 2: Observed and simulated discharge. The vertical dashed line indicates the limit between the calibration period (left) and the validation period (right). Row 3: Sum for each day of the year of the measured and simulated discharge over the calibration period (left) and validation period (right). Thin light lines represent the individual years. The KGE over the period is indicated in the top right corner. Row 4: Same as Row 3 but for the calibration and validation periods. Rows 5-7: Same as Rows 2-4, but for water temperature. The RMSE over teh period is indicated in the bottom right corner.

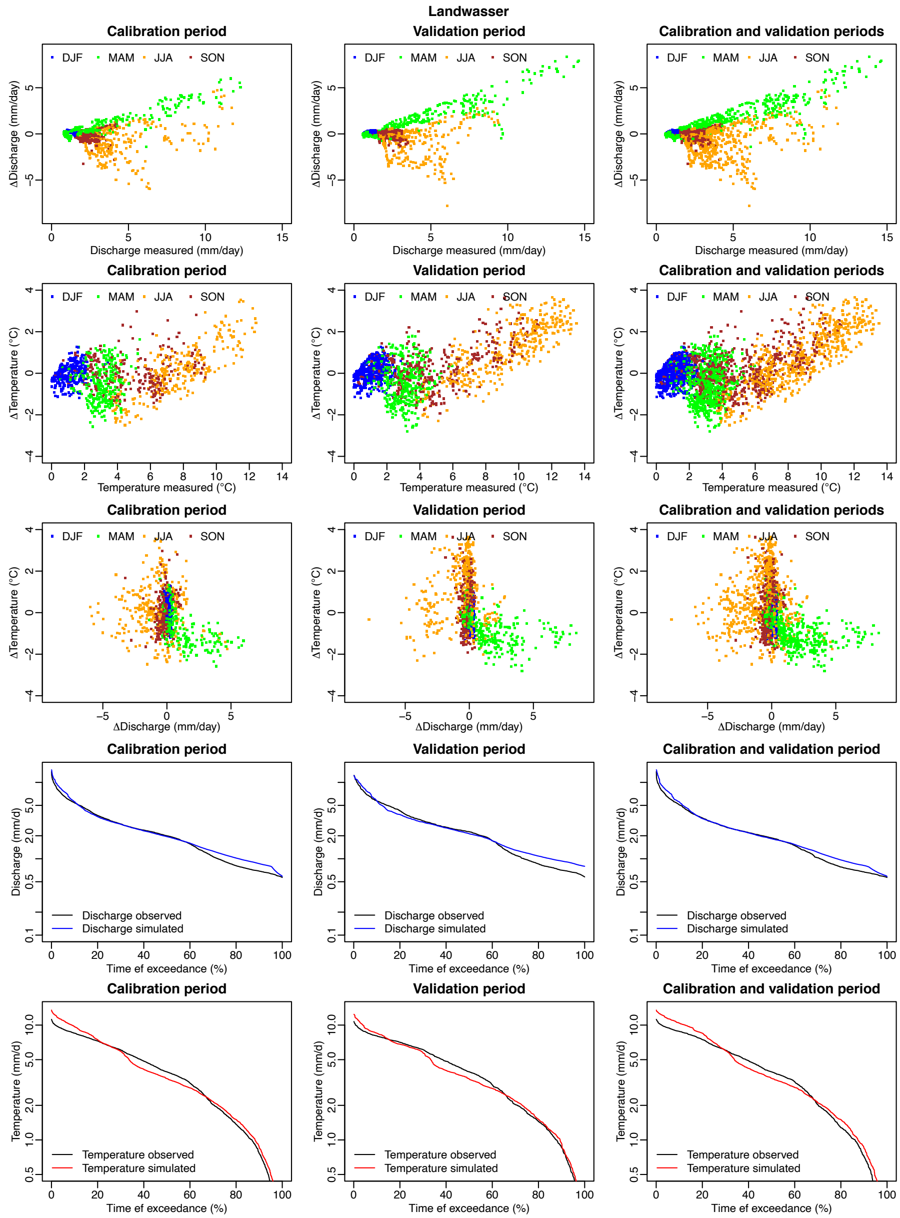

Figure S25. Errors during the calibration and validation periods for the Landwasser catchment (located on the Alpine region). Left column: Calibration period. Center column: Validation period. Right column: Calibration and validation periods. Row 1: Discharge error versus raw discharge value (colors indicate seasons). Row 2: Water temperature error versus raw water temperature value (colors indicate seasons). Row 3: Water temperature error plotted against relative discharge errors (colors indicate seasons). Row 4: Flow duration curve for discharge. Row 5: Flow duration curve for water temperature.

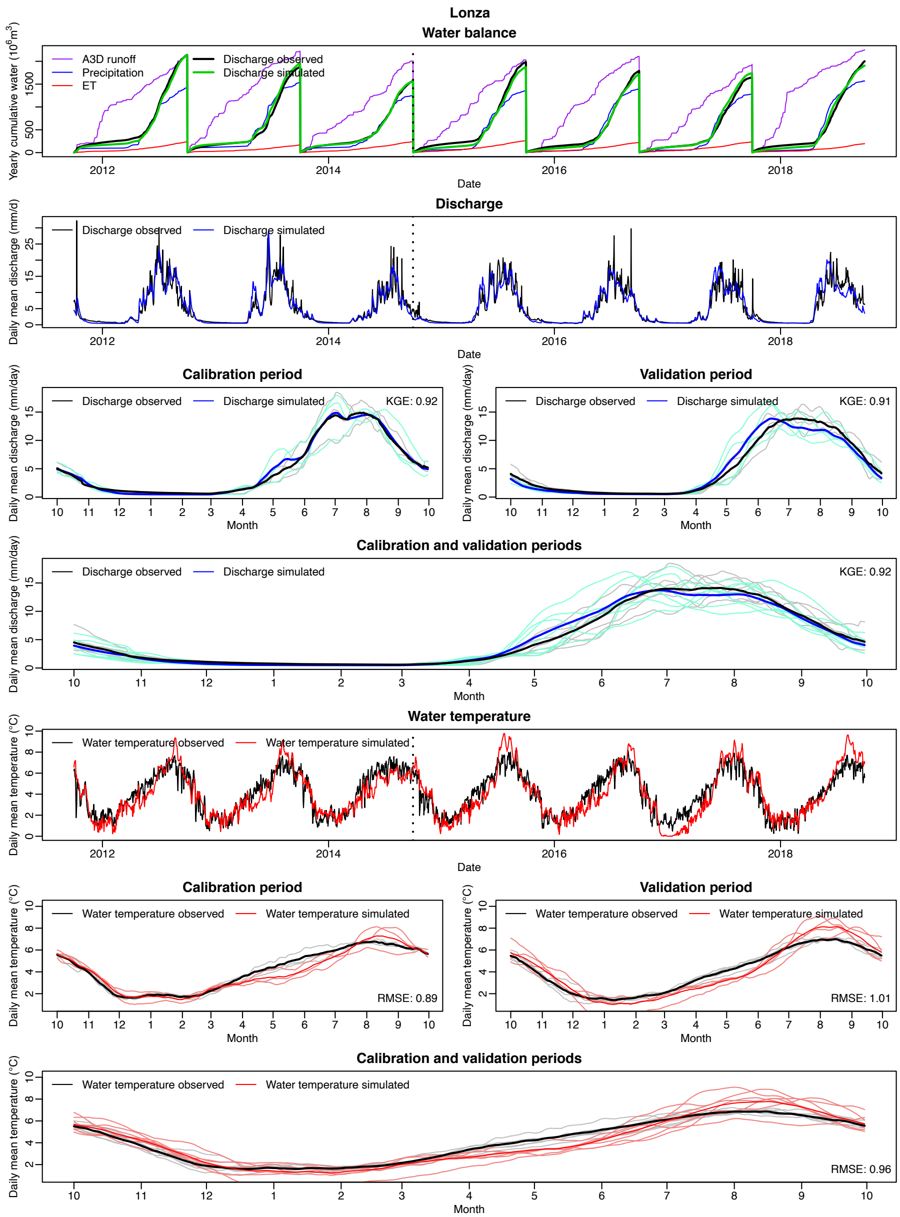

Figure S26. Calibration and validation results for the Lonza catchment (located on the Alpine region). Row 1: Cumulative sums of the various components of the hydrological water balance over the hydrological year. Row 2: Observed and simulated discharge. The vertical dashed line indicates the limit between the calibration period (left) and the validation period (right). Row 3: Sum for each day of the year of the measured and simulated discharge over the calibration period (left) and validation period (right). Thin light lines represent the individual years. The KGE over the period is indicated in the top right corner. Row 4: Same as Row 3 but for the calibration and validation periods. Rows 5-7: Same as Rows 2-4, but for water temperature. The RMSE over teh period is indicated in the bottom right corner.

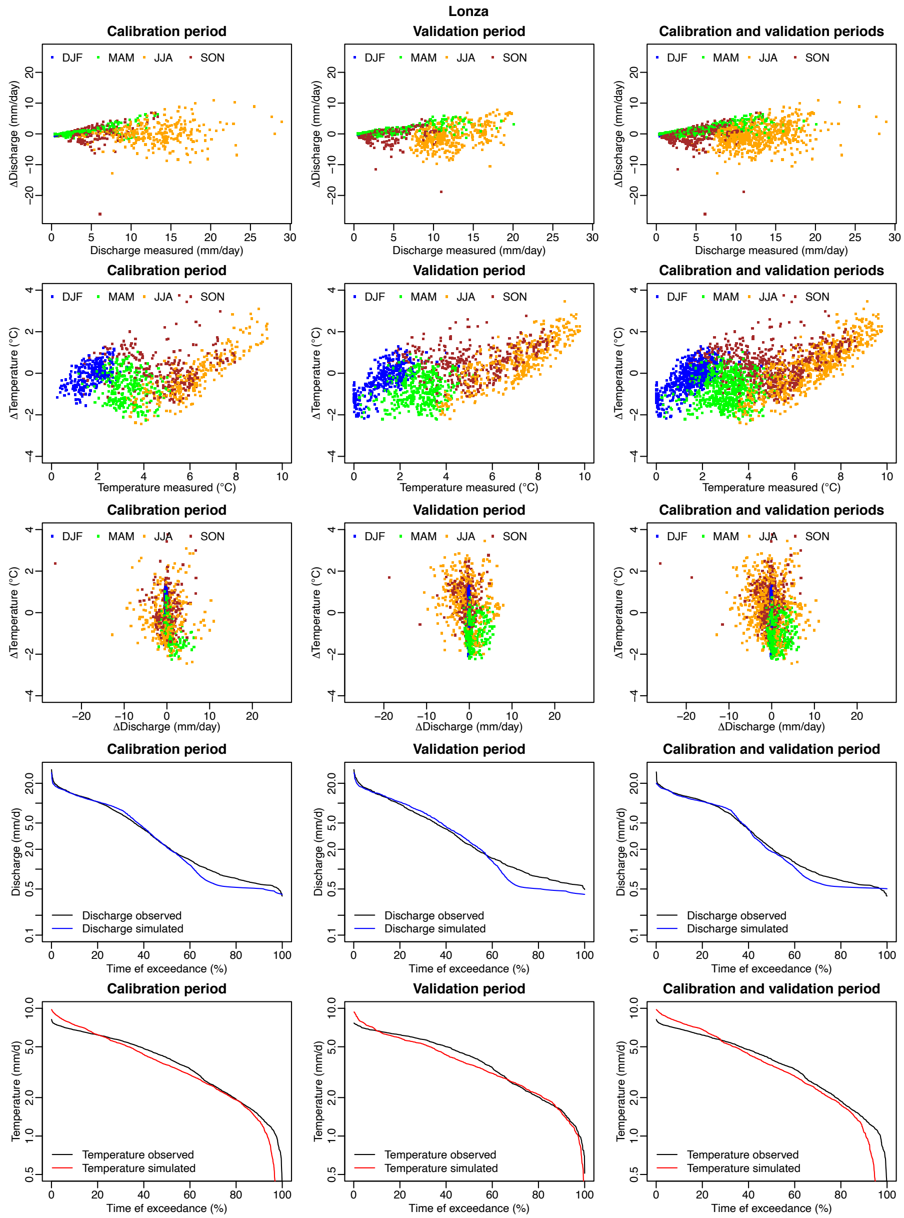

Figure S27. Errors during the calibration and validation periods for the Lonza catchment (located on the Alpine region). Left column: Calibration period. Center column: Validation period. Right column: Calibration and validation periods. Row 1: Discharge error versus raw discharge value (colors indicate seasons). Row 2: Water temperature error versus raw water temperature value (colors indicate seasons). Row 3: Water temperature error plotted against relative discharge errors (colors indicate seasons). Row 4: Flow duration curve for discharge. Row 5: Flow duration curve for water temperature.

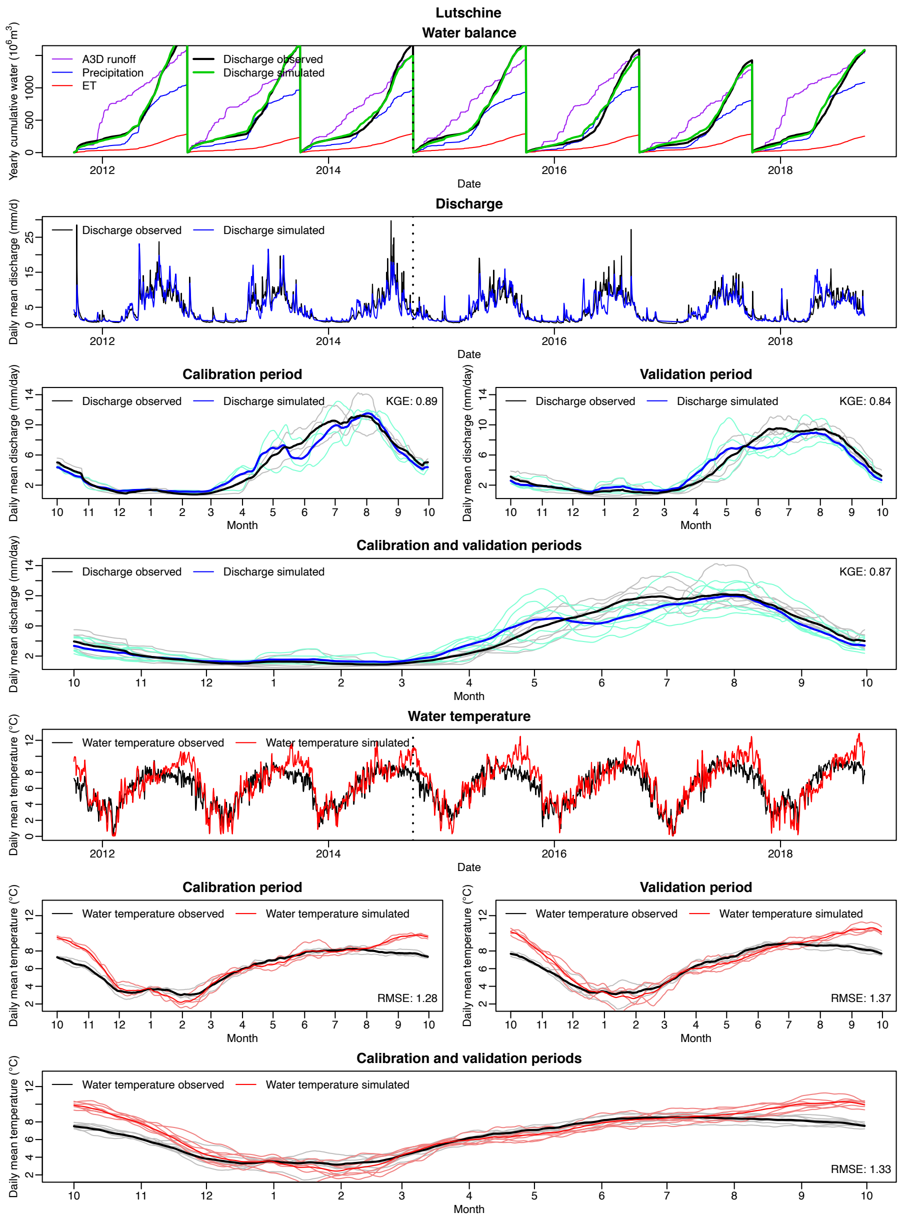

Figure S28. Calibration and validation results for the Lütschine catchment (located on the Alpine region). Row 1: Cumulative sums of the various components of the hydrological water balance over the hydrological year. Row 2: Observed and simulated discharge. The vertical dashed line indicates the limit between the calibration period (left) and the validation period (right). Row 3: Sum for each day of the year of the measured and simulated discharge over the calibration period (left) and validation period (right). Thin light lines represent the individual years. The KGE over the period is indicated in the top right corner. Row 4: Same as Row 3 but for the calibration and validation periods. Rows 5-7: Same as Rows 2-4, but for water temperature. The RMSE over teh period is indicated in the bottom right corner.

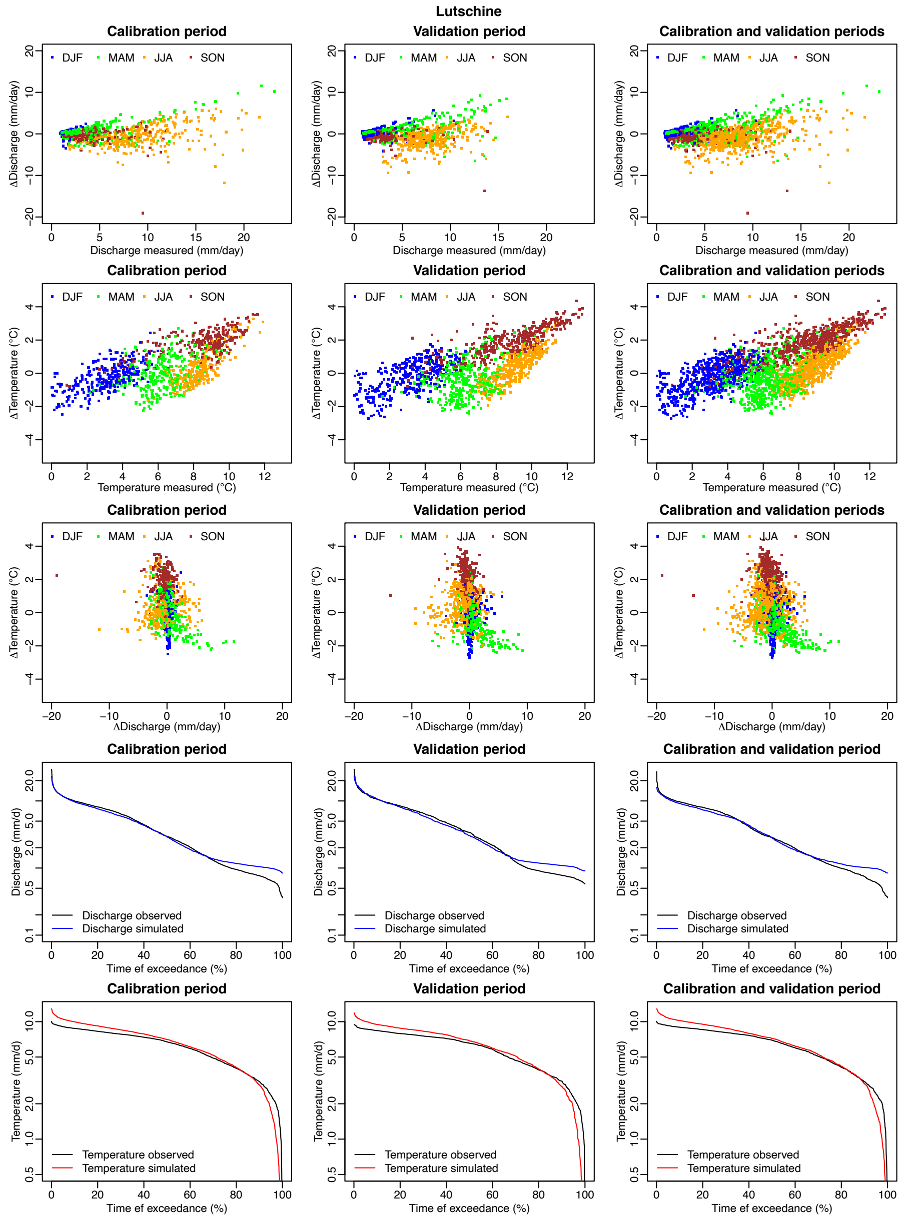

Figure S29. Errors during the calibration and validation periods for the Lütschine catchment (located on the Alpine region). Left column: Calibration period. Center column: Validation period. Right column: Calibration and validation periods. Row 1: Discharge error versus raw discharge value (colors indicate seasons). Row 2: Water temperature error versus raw water temperature value (colors indicate seasons). Row 3: Water temperature error plotted against relative discharge errors (colors indicate seasons). Row 4: Flow duration curve for discharge. Row 5: Flow duration curve for water temperature.

S6.3 Snow height

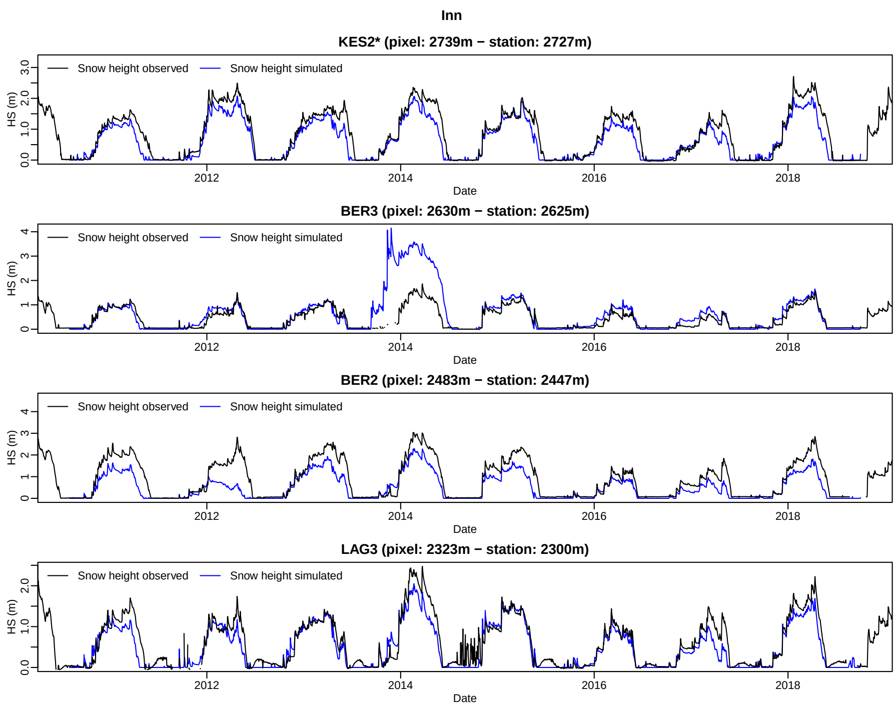

Figure S30. Snow depth measurements and simulated by A3D at the location of the measurement stations in the Inn catchment. Stations marked with an asterisk are used as forcing stations in A3D. The mean elevation of the pixel containing the station in A3D and the real elevation of the station are given in the title.

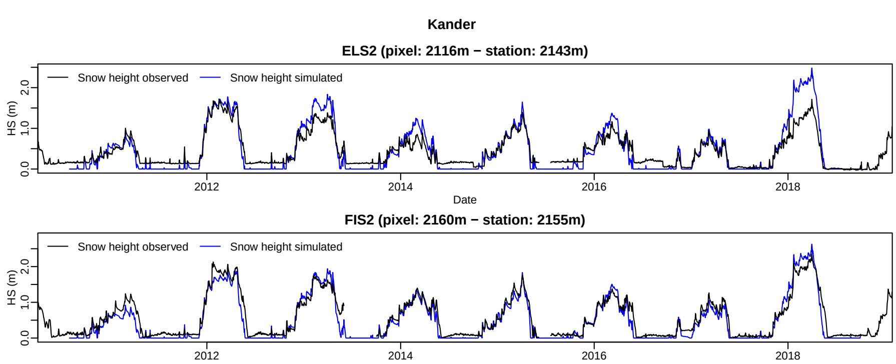

Figure S31. Snow depth measurements and simulated by A3D at the location of the measurement stations in the Kander catchment. Stations marked with an asterisk are used as forcing stations in A3D. The mean elevation of the pixel containing the station in A3D and the real elevation of the station are given in the title.

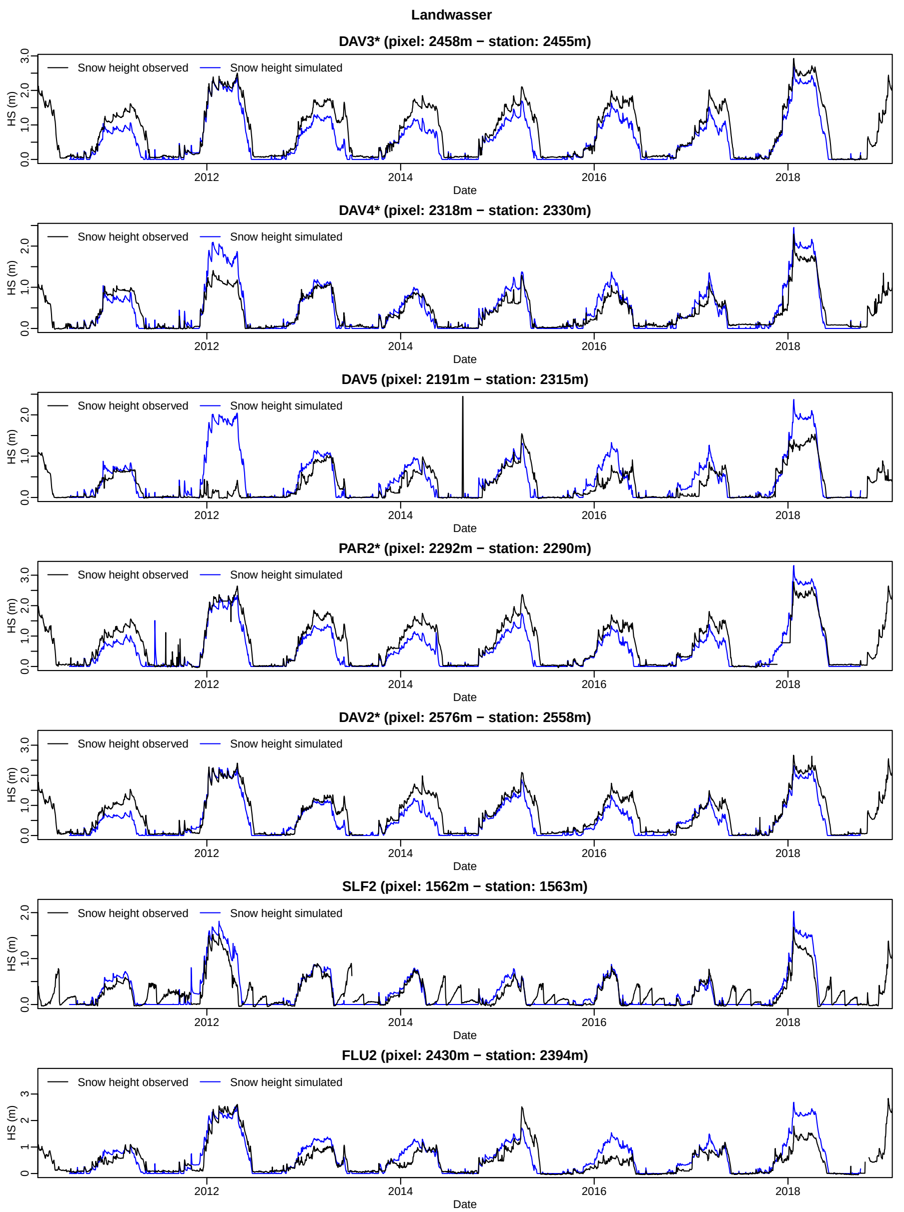

Figure S32. Snow depth measurements and simulated by A3D at the location of the measurement stations in the Landwasser catchment. Stations marked with an asterisk are used as forcing stations in A3D. The mean elevation of the pixel containing the station in A3D and the real elevation of the station are given in the title.

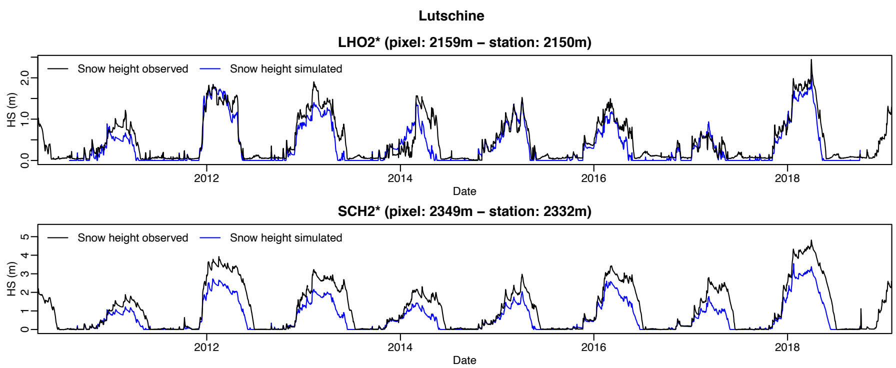

Figure S33. Snow depth measurements and simulated by A3D at the location of the measurement stations in the Lütschine catchment. Stations marked with an asterisk are used as forcing stations in A3D. The mean elevation of the pixel containing the station in A3D and the real elevation of the station are given in the title.

S7 Using 10 years versus 30 years time periods

To assess the impact of working with time series downscaled using only one decade of data instead of 30 years, we ran the models with climate change scenarios with both versions of the time series for the Broye and the Kleine Emme catchments. The models are run both for the periods 1980-2010 and 1990-2000, and for the periods 2070-2100 and 2080-2090 with the 21 selected climate change scenarios, using either time series downscaled over 10 or 30 years period. Delta, i.e. the difference between two time periods for a given variable, is computed between the future and past periods for water temperature and discharge using (a) the 10 years time series, (b) the 30 years time series, and (c) only 10 years in the middle of the 30 years time series, with forcing data downscaled over the 30 years period (Figures S34 and S35).

There are some obvious differences between the 3 runs introduced by the natural variability in the time series. There is also more spread in the delta values between scenarios when time series downscaled over only ten years are used, which is expected since time series downscaled over shorter periods are more prone to reflect model internal variability. However, the deltas obtained are very similar (Figures S34 and S35). Indeed, the median values of the deltas obtained with 10 years time series consistently lie within the range of deltas obtained using longer time series. This suggests that no significant and systematic error is introduced when using the shorter time series. The main impact is an increase of the uncertainty in the results, due to the increased range of internal variability of the CC scenarios.

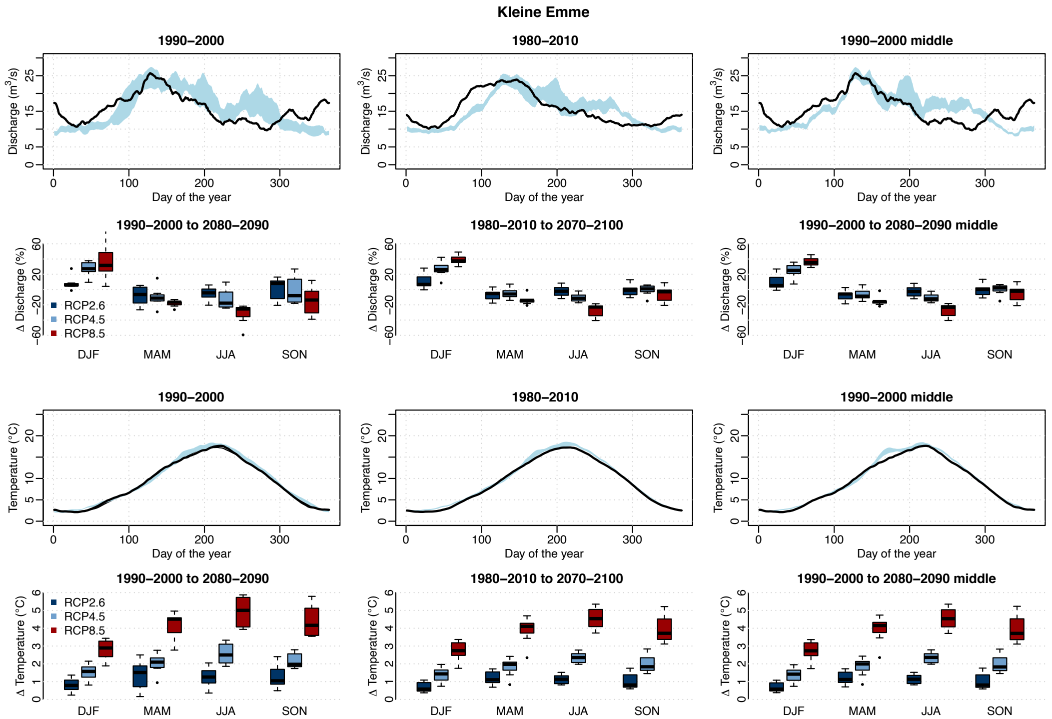

Figure S34. Impact of the version of the downscaled time series applied to the Kleine Emme catchment (located on the Swiss Plateau). Left: time series downscaled over 10 years periods and running the model over 10 years. Middle: time series downscaled over 30 years periods and running the model over 30 years. Right: time series downscaled over 30 years and running the model for the 10 years in the middle of the period. Row 1: Mean discharge over historical periods (1990-2000 or 1980-2010) for all 21 CC scenarios compared to measurements over the same period. Row 2: Change in mean discharge between end of the century periods (2080-2090 or 2070-2100) and historical periods grouped by RCP. Rows 3-4: Same as first two rows but for water temperature. For boxplots, boxes represent the first and third quartiles of the data, whiskers extend to points up to 1.5 time the box range (i.e. up to 1.5 time the first to third quartiles distance) and extra outliers are represented as dots.

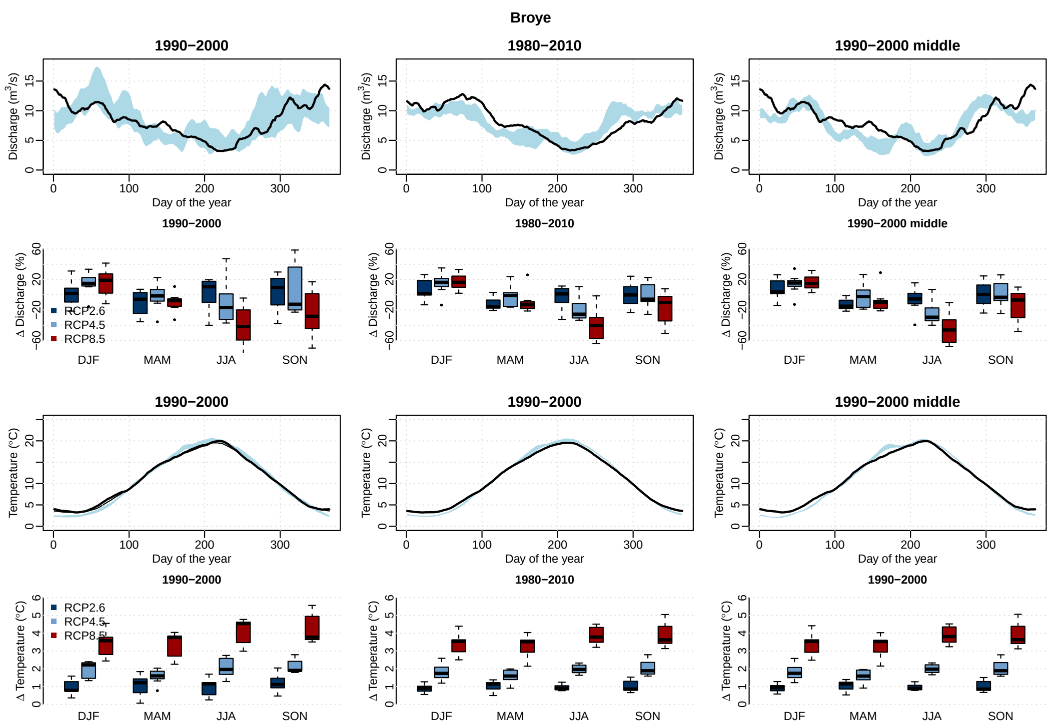

Figure S35. Impact of the version of the downscaled time series applied to the Broye catchment (located on the Swiss Plateau). Left: time series downscaled over 10 years periods and running the model over 10 years. Middle: time series downscaled over 30 years periods and running the model over 30 years. Right: time series downscaled over 30 years and running the model for the 10 years in the middle of the period. Row 1: Discharge over historical periods (1990-2000 or 1980-2010) for all 21 CC scenarios compared to measurements over the same period. Row 2: Change in discharge between end of the century periods (2080-2090 or 2070-2100) and historical periods grouped by RCP. Rows 3-4: Same as first two rows but for water temperature.

S8 Validation of climate change scenarios

The models are run with all 21 CC scenarios over the period 2005-2015, and the discharge and water temperature obtained are compared to measurements over these periods. The model results are not expected to closely match the measurements at short timescale since CC scenarios are only supposed to represent the climatology of the considered period. The purpose of this verification is to check whether the entire modeling chain (from CC scenarios to hydrological model) gives results which are, for the annual cycle, coherent with the measurements. The model outputs are thus compared to measurements in terms of annual cycle. The analysis is performed over all catchments (except for the Ergolz where not enough historical data are available) and results are shown in Figures S36 to S44. Figures are split between catchments located on the Swiss Plateau (Section S8.1) and on the Alpine region (Section S8.2).

For the Plateau catchments, the pattern of difference in temperature is similar to the error observed for the model validation phase (compare e.g. Figures S6 and S36). For discharge, most of the difference between observed and modelled discharge is due to the difference in precipitation from CC simulations compared to measurements.

For the Alpine catchments, the overestimation of summer temperature is still present. In addition, the forcing CC models lead to over- or underestimation of the total discharge in Alpine catchments, depending on the catchment, but only to a limited extent. This is expected since the used CC scenarios show lower performances in Alpine areas than for Swiss Plateau areas for precipitation (Warscher et al., 2019). Overall, it is confirmed that the output of Alpine3D and StreamFlow, when forced with CC scenarios, is coherent with historical time series.

S8.1 Swiss Plateau

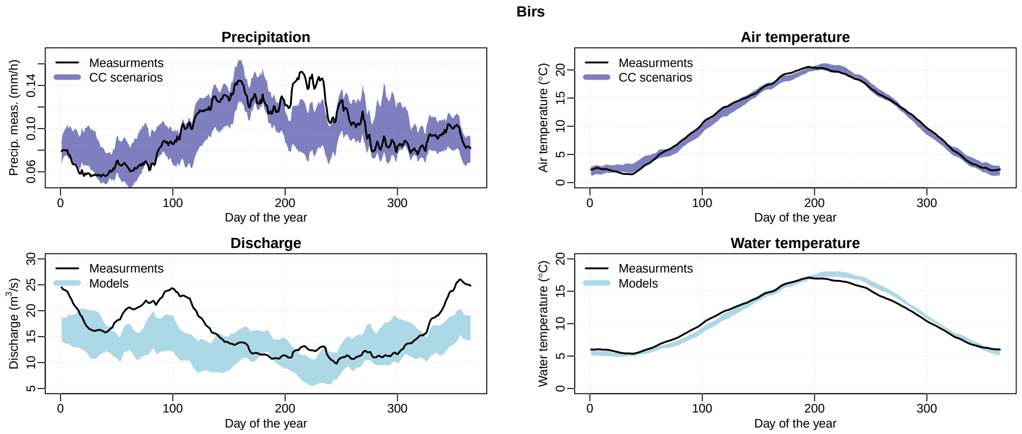

Figure S36. Comparison between model runs forced with CC scenarios (all 21 CC scenarios) and measurements for the period 2005-2015 in the Birs catchment (located on the Swiss Plateau). Measurements from the MeteoSwiss station BAS are used (see Table S2). Top left: Measured precipitation and mean precipitation over the catchment from CC scenarios. Top right: Measured air temperature and mean air temperature over the catchment from CC scenarios. Bottom left: Measured and modelled discharge. Bottom right: Measured and modelled water temperature.

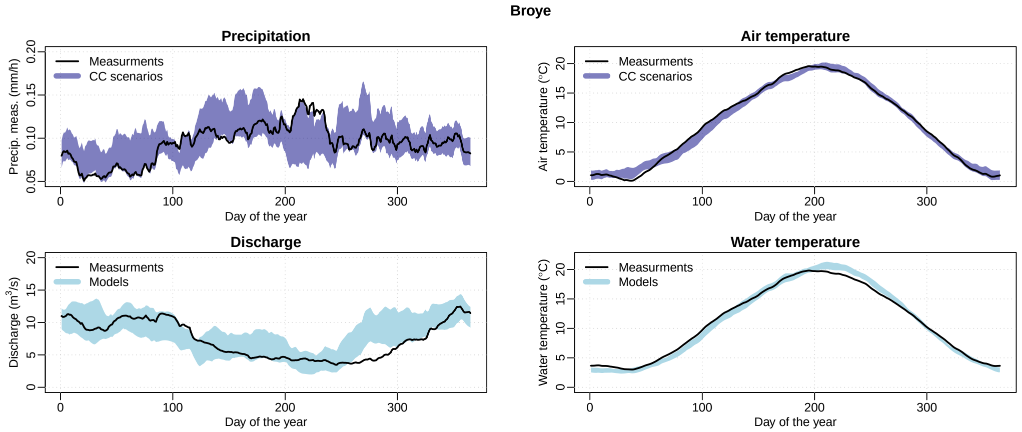

Figure S37. Comparison between model runs forced with climate change scenarios (all 21 climate change scenarios) and measurements for the period 2005-2015 in the Broye catchment (located on the Swiss Plateau). Measurements from the MeteoSwiss station PAY are used (see Table S2). Top left: Measured precipitation and mean precipitation over the catchment from climate change scenarios. Top right: Measured air temperature and mean air temperature over the catchment from climate change scenarios. Bottom left: Measured and modelled discharge. Bottom right: Measured and modelled water temperature.

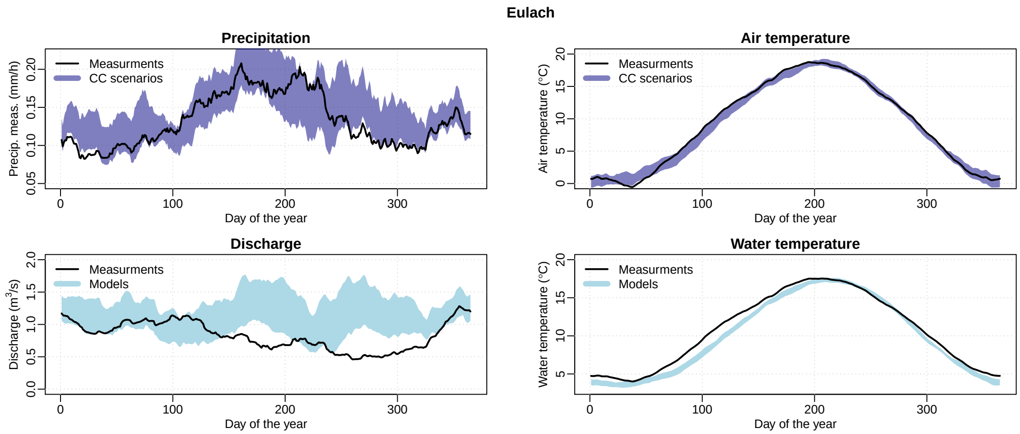

Figure S38. Comparison between model runs forced with climate change scenarios (all 21 climate change scenarios) and measurements for the period 2005-2015 in the Eulach catchment (located on the Swiss Plateau). Measurements from the MeteoSwiss station TAE are used (see Table S2). Top left: Measured precipitation and mean precipitation over the catchment from climate change scenarios. Top right: Measured air temperature and mean air temperature over the catchment from climate change scenarios. Bottom left: Measured and modelled discharge. Bottom right: Measured and modelled water temperature.

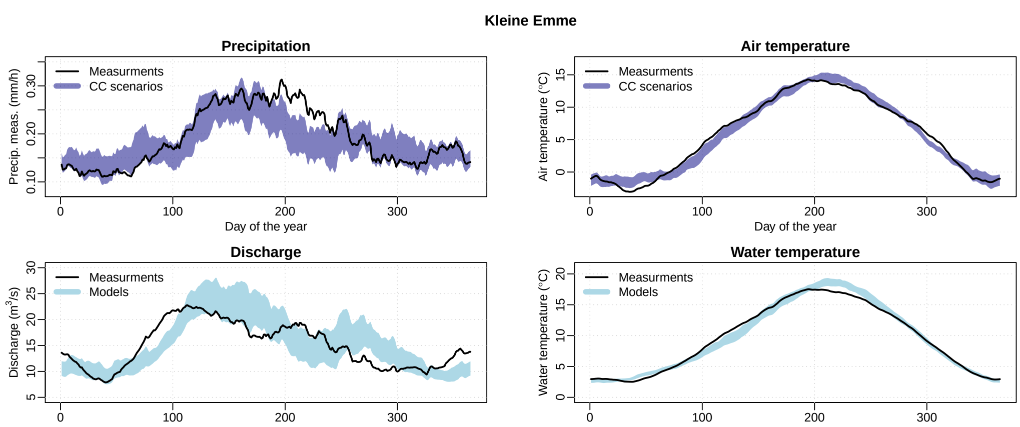

Figure S39. Comparison between model runs forced with climate change scenarios (all 21 climate change scenarios) and measurements for the period 2005-2015 in the Kleine Emme catchment (located on the Swiss Plateau). Measurements from the MeteoSwiss station NAP are used (see Table S2). Top left: Measured precipitation and mean precipitation over the catchment from climate change scenarios. Top right: Measured air temperature and mean air temperature over the catchment from climate change scenarios. Bottom left: Measured and modelled discharge. Bottom right: Measured and modelled water temperature.

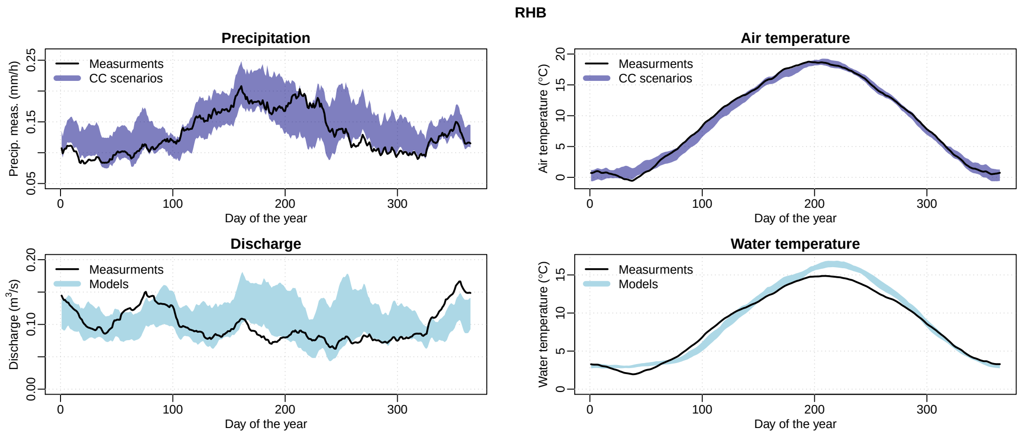

Figure S40. Comparison between model runs forced with climate change scenarios (all 21 climate change scenarios) and measurements for the period 2005-2015 in the Rietholzbach catchment (located on the Swiss Plateau). Measurements from the MeteoSwiss station TAE are used (see Table S2). Top left: Measured precipitation and mean precipitation over the catchment from climate change scenarios. Top right: Measured air temperature and mean air temperature over the catchment from climate change scenarios. Bottom left: Measured and modelled discharge. Bottom right: Measured and modelled water temperature.

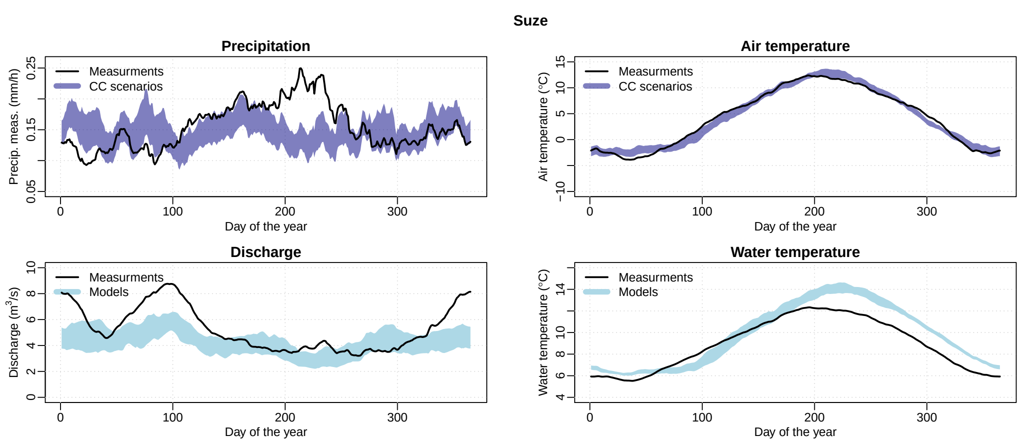

Figure S41. Comparison between model runs forced with climate change scenarios (all 21 climate change scenarios) and measurements for the period 2005-2015 in the Suze catchment (located on the Swiss Plateau). Measurements from the MeteoSwiss station CHA are used (see Table S2). Top left: Measured precipitation and mean precipitation over the catchment from climate change scenarios. Top right: Measured air temperature and mean air temperature over the catchment from climate change scenarios. Bottom left: Measured and modelled discharge. Bottom right: Measured and modelled water temperature.

S8.2 Alpine

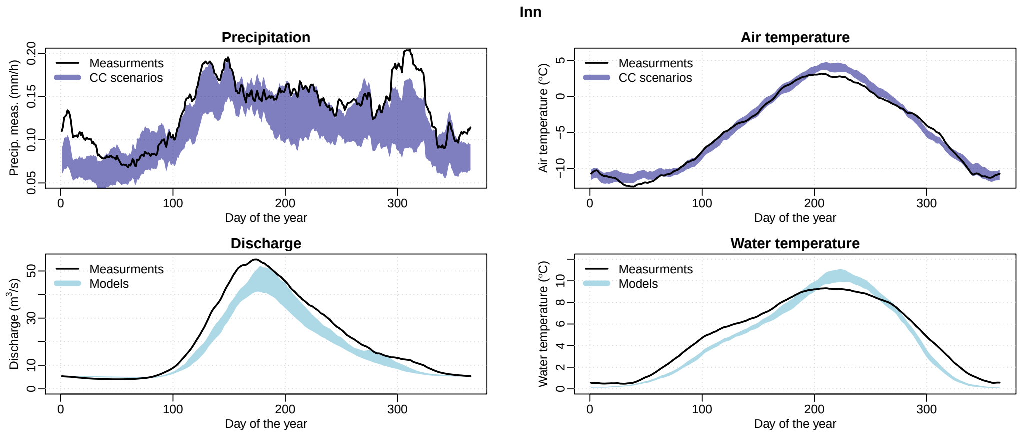

Figure S42. Comparison between model runs forced with climate change scenarios (all 21 climate change scenarios) and measurements for the period 2005-2015 in the Inn catchment (located on the Alpine region). Measurements from the MeteoSwiss station COV are used (see Table S2). Top left: Measured precipitation and mean precipitation over the catchment from climate change scenarios. Top right: Measured air temperature and mean air temperature over the catchment from climate change scenarios. Bottom left: Measured and modelled discharge. Bottom right: Measured and modelled water temperature.

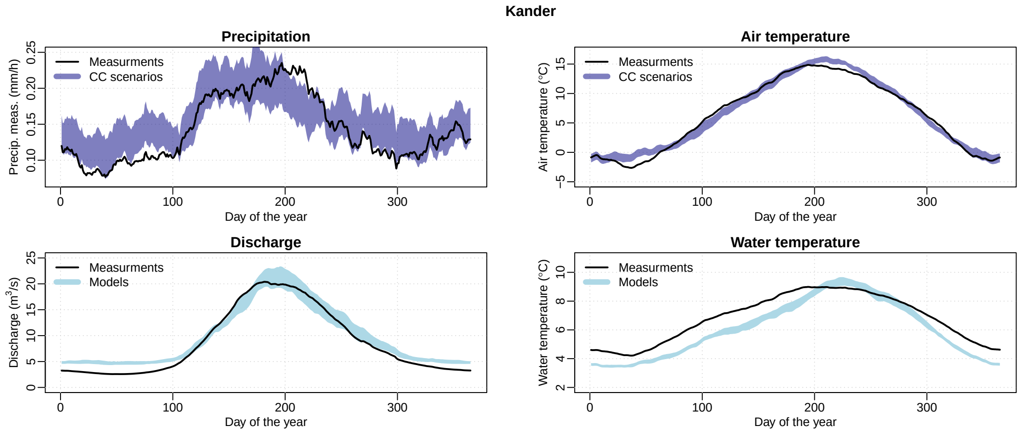

Figure S43. Comparison between model runs forced with climate change scenarios (all 21 climate change scenarios) and measurements for the period 2005-2015 in the Kander catchment (located on the Alpine region). Measurements from the MeteoSwiss station ABO are used (see Table S2). Top left: Measured precipitation and mean precipitation over the catchment from climate change scenarios. Top right: Measured air temperature and mean air temperature over the catchment from climate change scenarios. Bottom left: Measured and modelled discharge. Bottom right: Measured and modelled water temperature.

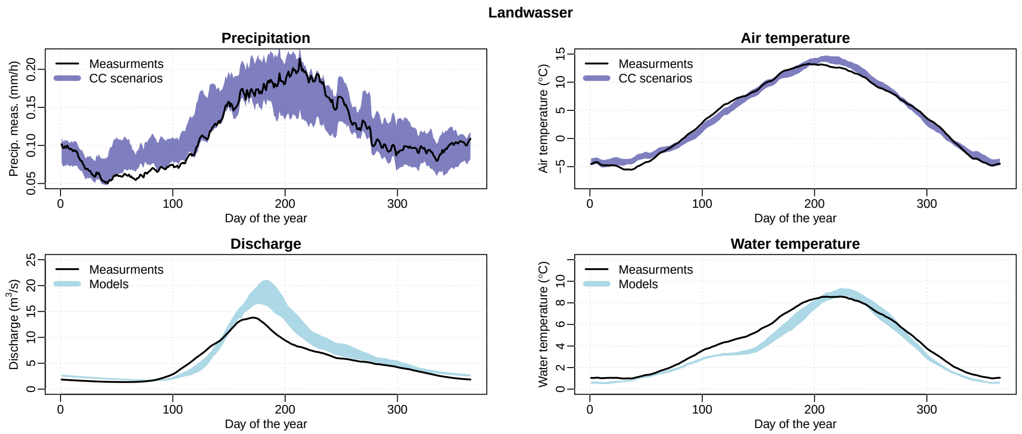

Figure S44. Comparison between model runs forced with climate change scenarios (all 21 climate change scenarios) and measurements for the period 2005-2015 in the Landwasser catchment (located on the Alpine region). Measurements from the MeteoSwiss station DAV are used (see Table S2). Top left: Measured precipitation and mean precipitation over the catchment from climate change scenarios. Top right: Measured air temperature and mean air temperature over the catchment from climate change scenarios. Bottom left: Measured and modelled discharge. Bottom right: Measured and modelled water temperature.

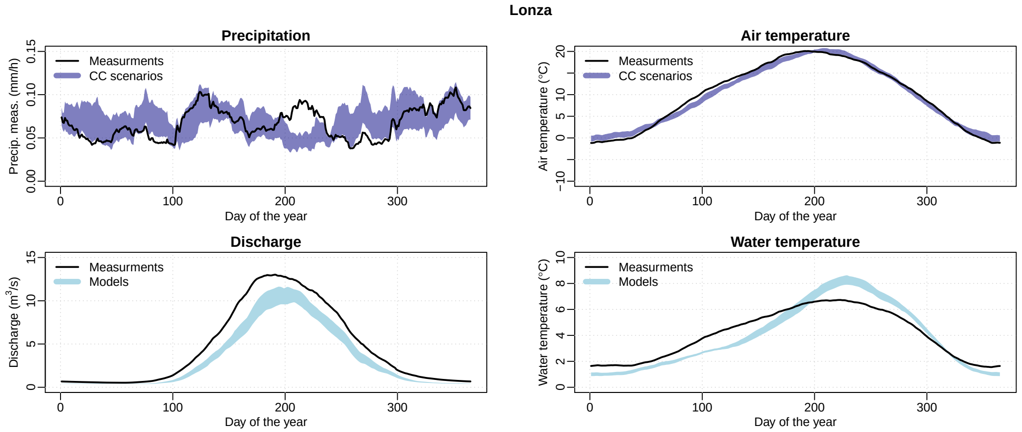

Figure S45. Comparison between model runs forced with climate change scenarios (all 21 climate change scenarios) and measurements for the period 2005-2015 in the Lonza catchment (located on the Alpine region). Measurements from the MeteoSwiss station VIS are used (see Table S2). Top left: Measured precipitation and mean precipitation over the catchment from climate change scenarios. Top right: Measured air temperature and mean air temperature over the catchment from climate change scenarios. Bottom left: Measured and modelled discharge. Bottom right: Measured and modelled water temperature.

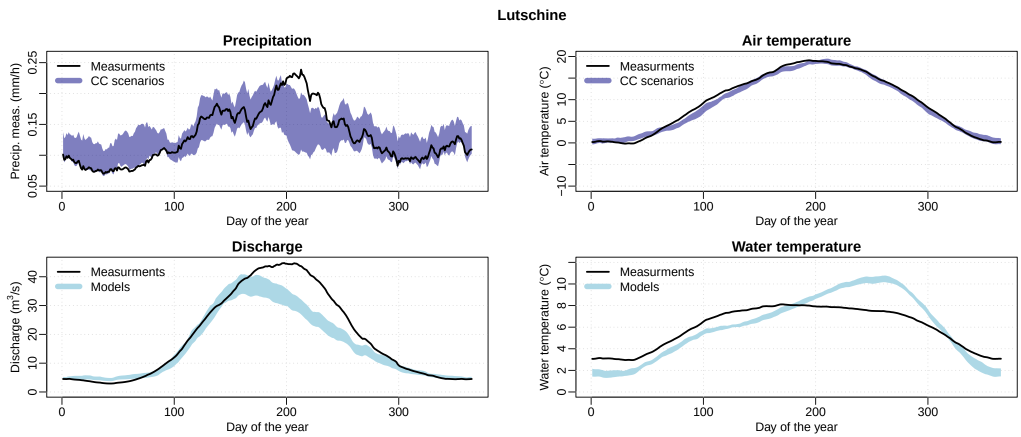

Figure S46. Comparison between model runs forced with climate change scenarios (all 21 climate change scenarios) and measurements for the period 2005-2015 in the Lutschine catchment (located on the Alpine region). Measurements from the MeteoSwiss station INT are used (see Table S2). Top left: Measured precipitation and mean precipitation over the catchment from climate change scenarios. Top right: Measured air temperature and mean air temperature over the catchment from climate change scenarios. Bottom left: Measured and modelled discharge. Bottom right: Measured and modelled water temperature.

S9 Additional discussion and validation plots for Alpine catchments

An overestimation of the water temperature is observed, but only in Alpine catchments and only for some years (see Sections 4.1 and 5.1). This allows to already exclude some candidates as cause for potential error (e.g., programming errors in the model source code or general bias in the energy balance). The fact that the problem with summer temperature overestimation occurs only in Alpine catchments, regardless of a known or unknown interaction with groundwater (e.g., the Landwasser, see Epting et al. (2021)) and not on the lowland areas, again regardless of any groundwater interaction, shows that groundwater interaction is not a likely explanation to the problem of stream temperature overestimation during summer.

The inclusion of riparian vegetation in the models is discussed in Section 5.1 and 5.3. In summary, only the shading from the CORINE land use is accounted for, not the small scale vegetation. For Alpine rivers, which are usually smaller than those of the lowlands, not considering the local riparian vegetation shading may have a stronger impact on stream temperature than on the lowlands. However, for example for the very small catchment of the Rietholzbach on the lowlands, explicit consideration of riparian vegetation would also be important. Figures S47 and S48 show ortho-images of the lowland Rietholzbach catchment and of the Alpine Lonza catchment, and Figure S49 shows a plot of the water temperature during the calibration and validation phases of the model for both catchments.

From the ortho-images, we see that riparian vegetation is more present in the Rietholzbach catchment. However, Figure S49 shows that in this catchment the model does not produce the sudden water temperature overestimation simulated in the Lonza catchment. These results suggest that the lack of riparian vegetation shading is not responsible for the overestimation observed in Alpine catchments. However, in the Rietholzbach catchment there is indeed a slight overestimation of the water temperature during summer and fall (but all over the period and not as peaky as in the Alpine catchments) which could be attributed to the lack of vegetation shading.

Topography and its treatment are discussed in Section 3.2 of the main text. For completeness, we show in Figure S50 the same ortho-image for the Lonza catchment as in Figure S48, but adding also the DEM used in Alpine3D to compute the shading. Despite the coarse resolution of the DEM, we see from the figure that the topography is still reasonably well represented to allow for a correct shading on the main reaches of the river (for the large-scale topography).

In order to push further the question of the radiation impact (and the potential errors arising from topographic and riparian vegetation shading), we made another run of the model for the Landwasser catchment with the artificial situation of zero incoming shortwave radiation. The results are shown in Figure S51. Note that StreamFlow has not been re-calibrated for this run, but that it uses the same calibration parameters as the other runs performed for the Landwasser catchment. The goal here is to assess the model sensitivity only to radiation and to see whether the high-water temperature peaks observed in summer disappear when incoming solar radiation is removed.

As expected, there is a general bias toward colder temperature when removing solar radiation. A first look at Figure S51 could suggest that the summer overshoot might be corrected by removing radiation, but when considering the summer 2014 we see that we have now a negative bias in relatively cold summers. The second panel of Figure S51 is more informative. Here we see that most of the time the model error in the summer (black line) is not at all correlated with the temperature difference we see between model runs with and without radiation (red line). This suggests again that radiation issues are not the main driver of this error.

To understand the origin of the summer overestimation, we now discuss the Inn river in more detail as an example. Figure S52 presents the different energy fluxes at the outlet reach of the Inn river and highlights four events of critical water temperature overestimation. Additional plots for other catchments and upstream reaches are shown in Figures S53 to S58. For upstream reaches, the reach number is given in the figure caption and this reach can then be identified with the textfiles and shapefiles provided along with the paper. Note that the oscillations observed on the last row of the plots of upstream reaches are caused when dividing by discharge which may be close to zero during winter time.

While all the the warm events shown in the figures correspond also to high soil temperature, there is no noticeable increase of the heat flux from the soil (panel h in Figure S52). Also, only the first event is directly related to an influx of energy from water originating from the surrounding catchment (panel i in Figure S52). In contrast, all four events are clearly correlated with a large amount of energy arriving from upstream reaches, suggesting that the issue is not caused by the local fluxes at the outlet, but rather by processes occurring upstream. Analysis of fluxes at two reaches situated upstream close to sources (Figures S53 and S54) shows that each of these events is related to high air temperature, but has a different origin. The first event is caused by warm water infiltration from the ground. The second event is caused by a combination of warm water infiltration, large downward latent heat fluxes (condensation) as well as sensible heat fluxes (convective heating of the water surface), and a large conductive heat flux from the streambed. The third event is caused by a sudden increase of solar radiation (after a cloudy period) and a sudden increase in conductive energy flux from the streambed. Finally, the last event is related to very low discharge condition and thus higher sensitivity to the acting fluxes. This analysis suggests that the small upstream reaches are too sensitive to variations in the forcing, causing too high temperature in the upper part of the catchment, which then gets advected downstream. Similar conclusions are obtained when looking at the Kander and Lonza catchments.

This too high sensitivity of the upstream reaches is explained by the absence of a cooling process in the HSPF scheme. To show this, the HSPF solver has been rewritten in R outside of the model and has been run over the Landwasser catchment using the mean air temperature over the catchment (computed from the grid output of Alpine3D). The results are shown in Figure S59. We clearly see that the peaks of high-water temperature in the river in summer correspond to peaks in the temperature of the HSPF outflow. Snow and glacier melt (likely also melting permafrost) and groundwater interaction are the main candidates after having excluded many other hypotheses (see Section 5.1 in the main text).

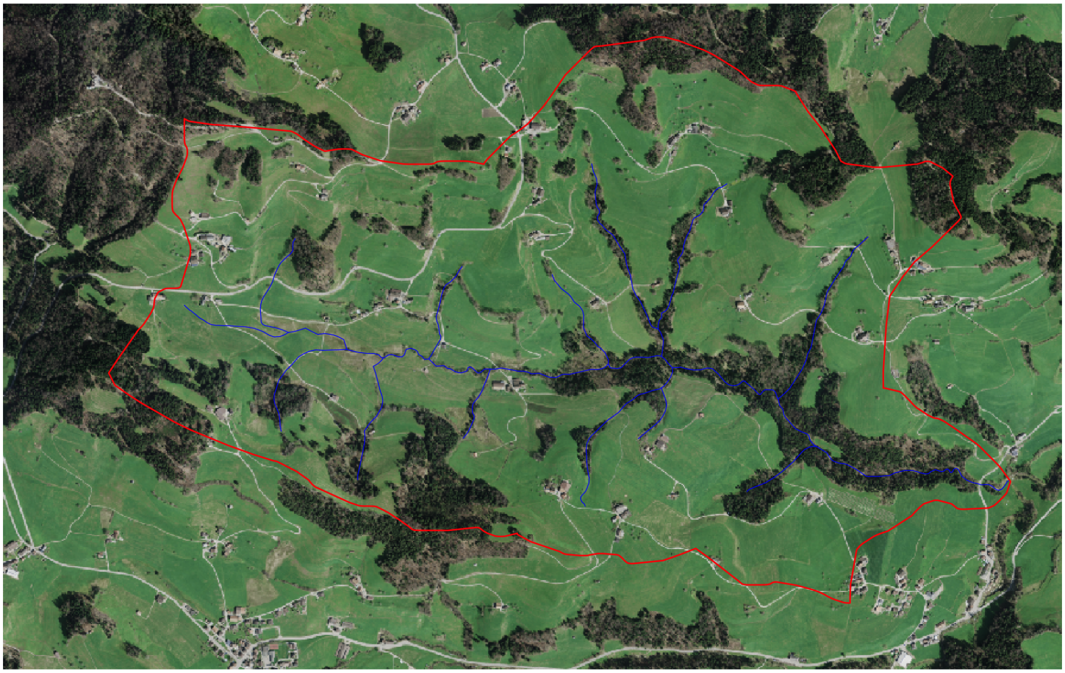

Figure S47. Aerial image of the Rietholzbach catchment. Catchment delineation is shown in red and river course blue. Source: Swisstopo

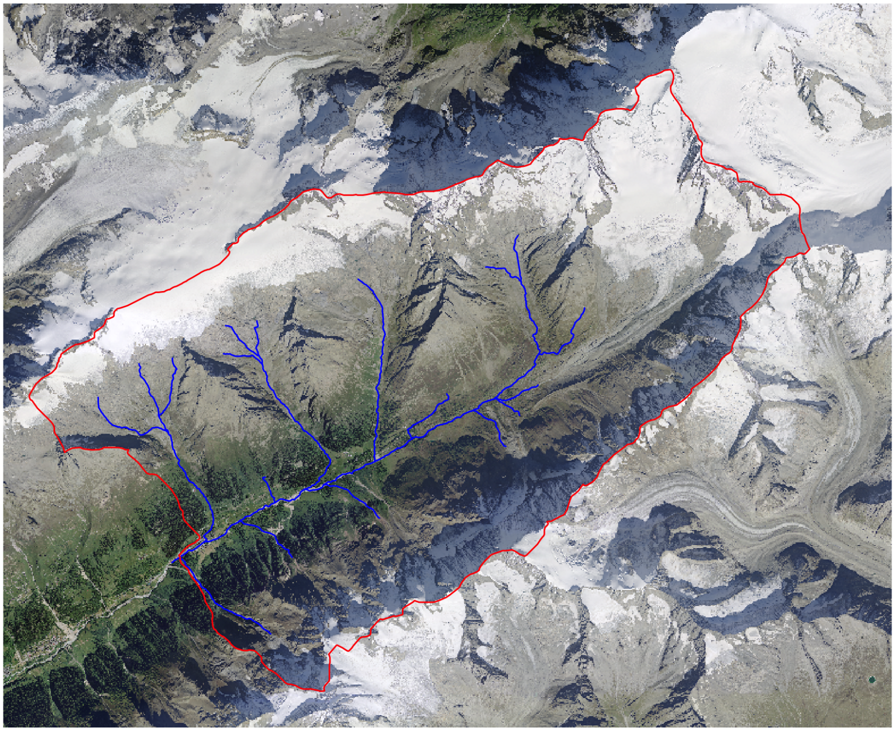

Figure S48. Aerial image of the Lonza catchment. Catchment delineation is shown in red and river course blue. Source: Swisstopo

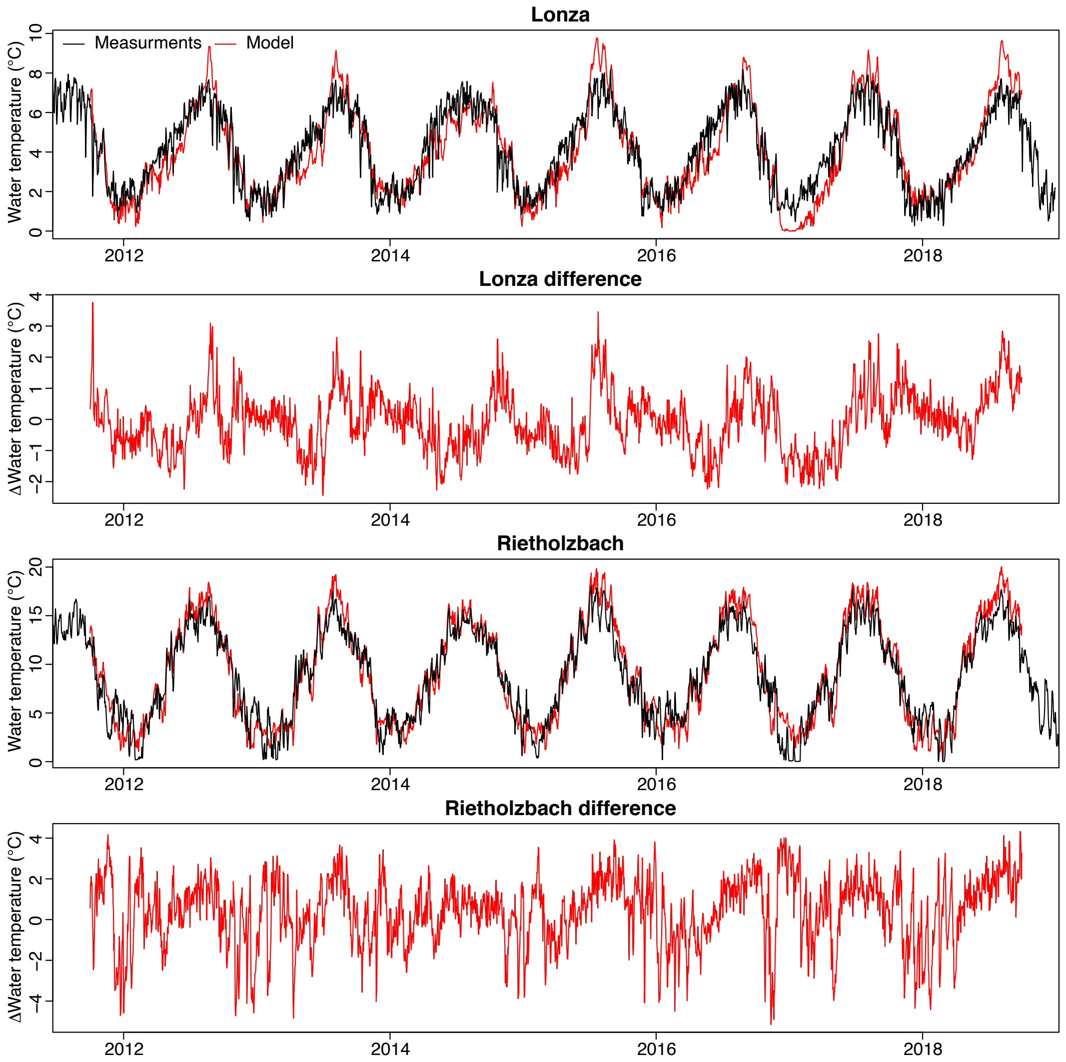

Figure S49. Top two panels: Measured (black) and simulated (red) water temperature for the Alpine Lonza catchment (first plot) and difference between the measured and simulated water temperature (second plot). Bottom two panels: Same as top, but for the lowland Rietholzbach catchment.

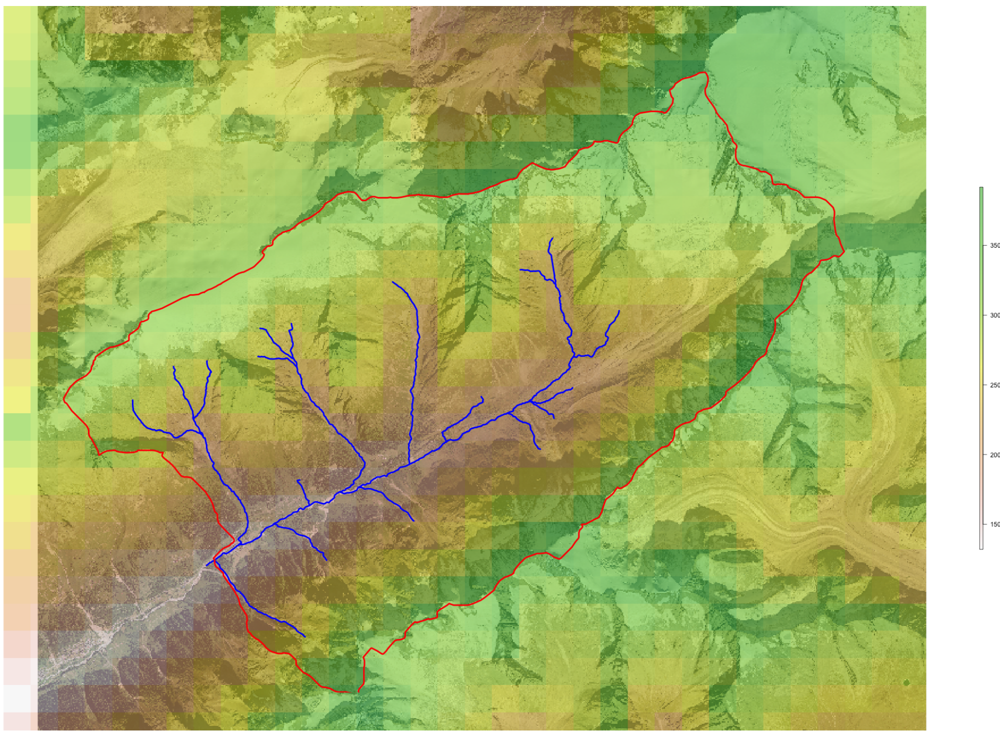

Figure S50. Aerial image of the Lonza catchment. Catchment delineation is shown in red, river course blue, and the DEM used in Alpine3D is shown on top. Source: Swisstopo

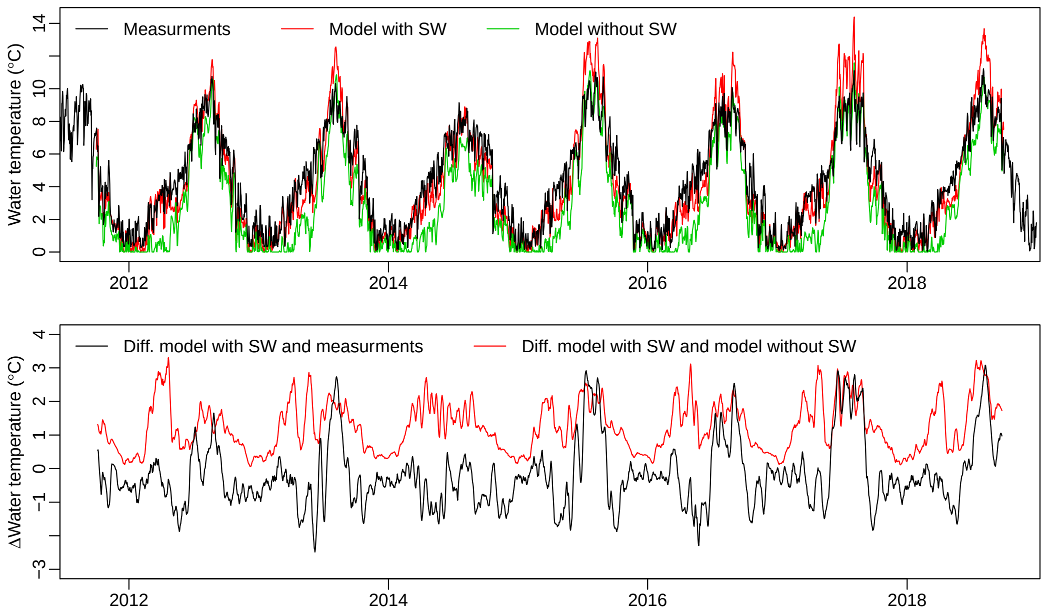

Figure S51. Top: Measured (black) and simulated water temperature (red with shortwave radiation, green without shortwave radiation) for the Alpine Lonza catchment. Bottom: Difference between measured and modelled (with shortwave radiation) water temperature (black), and difference between water temperature modelled with and without shortwave radiation (red).

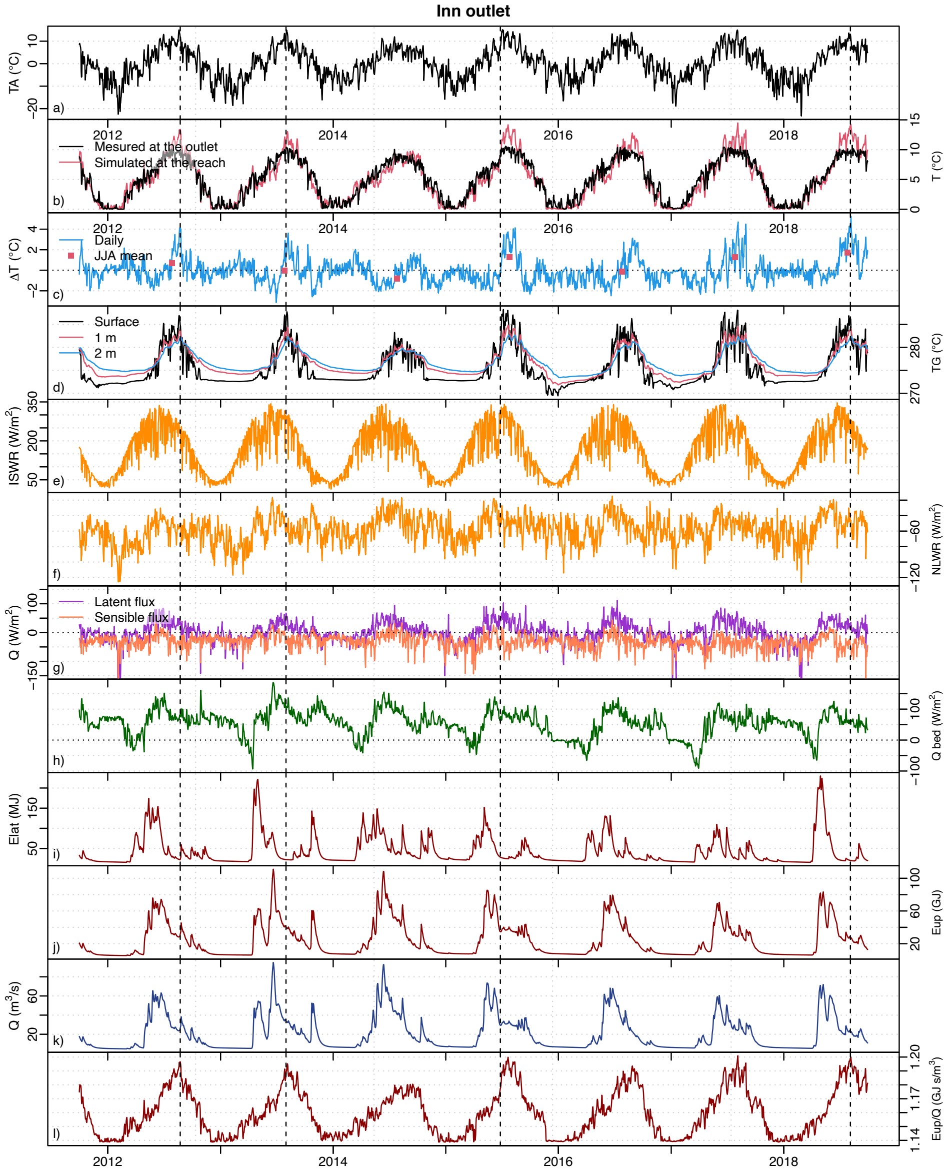

Figure S52. Energy fluxes and other relevant variables at the outlet reach of the Inn catchment (daily values). The vertical dashed lines mark some warm events discussed in the text. a) Air temperature, b) measured water temperature (black) and simulated water temperature (red) at the outlet, c) difference between simulated and measured water temperature (blue line), and mean over the difference over the summer season (red squares), d) temperature of the soil surface and at 1 m and 2 m depth, e) incoming shortwave radiation, f) net longwave radiation, g) latent heat flux (purple) and sensible heat flux (orange), h) conductive heat flux between the bed and the river, i) energy advected by water from the soil reservoirs, j) energy advected from upstream reaches, k) discharge, l) energy advected from upstream reaches normalized by discharge. In all cases, a positive sign means energy gain for the river.

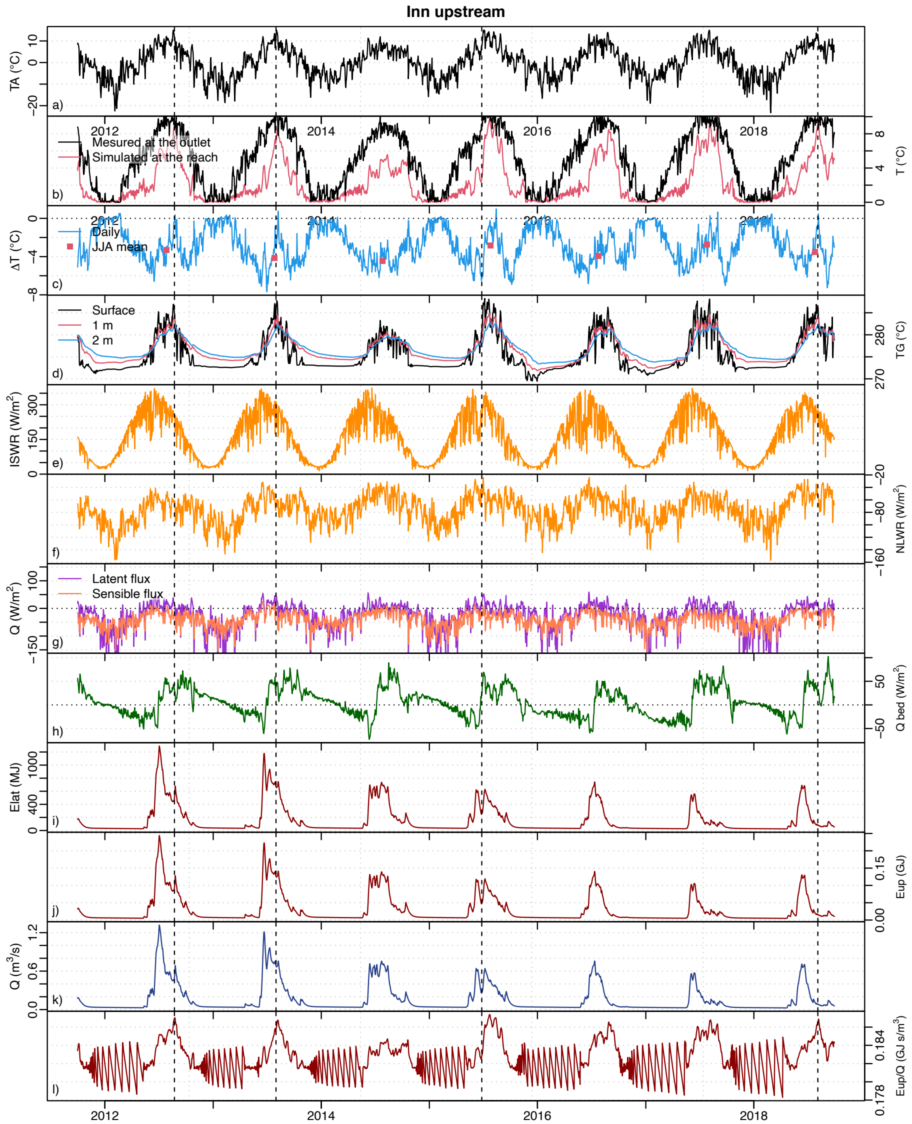

Figure S53. Energy fluxes and other relevant variables at the upstream reach 157 of the Inn catchment (daily values). The vertical dashed lines mark some warm events discussed in the main article (Section 4.1.2). a) Air temperature, b) measured water temperature at the reach (black) and simulated water temperature at the outlet (red), c) difference between simulated and measured water temperature (blue line), and mean over the difference over the summer season (red squares), d) temperature of the soil surface and at 1 m and 2 m depth, e) incoming shortwave radiation, f) net longwave radiation, g) latent heat flux (purple) and sensible heat flux (orange), positive means energy gain for the river, h) conductive heat flux between the bed and the river, positive means energy gain for the river, i) energy advected by water from the soil reservoirs, j) energy advected from upstream reaches, k) discharge, l) energy advected from upstream reaches normalized by discharge.

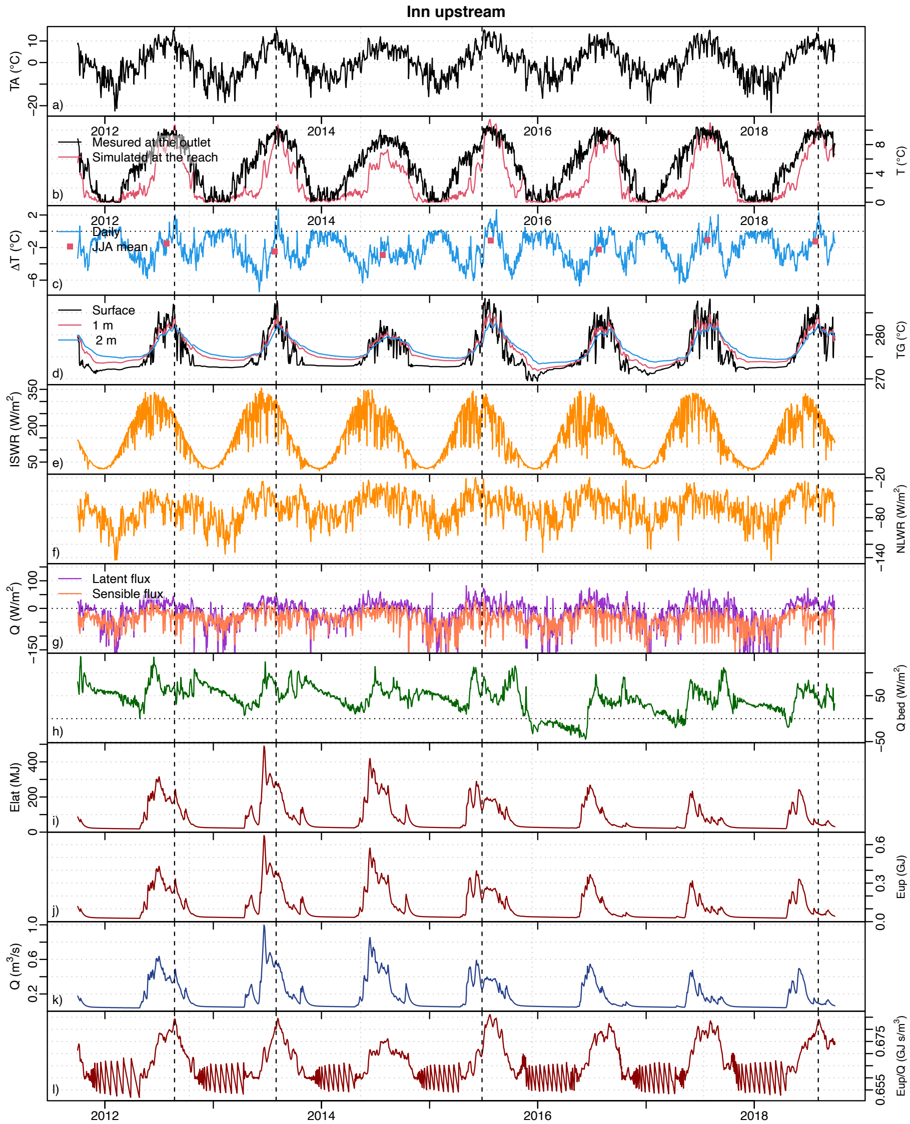

Figure S54. Energy fluxes and other relevant variables at the upstream reach 262 of the Inn catchment (daily values). The vertical dashed lines mark some warm events discussed in the main article (Section 4.1.2). a) Air temperature, b) measured water temperature at the reach (black) and simulated water temperature at the outlet (red), c) difference between simulated and measured water temperature (blue line), and mean over the difference over the summer season (red squares), d) temperature of the soil surface and at 1 m and 2 m depth, e) incoming shortwave radiation, f) net longwave radiation, g) latent heat flux (purple) and sensible heat flux (orange), positive means energy gain for the river, h) conductive heat flux between the bed and the river, positive means energy gain for the river, i) energy advected by water from the soil reservoirs, j) energy advected from upstream reaches, k) discharge, l) energy advected from upstream reaches normalized by discharge.

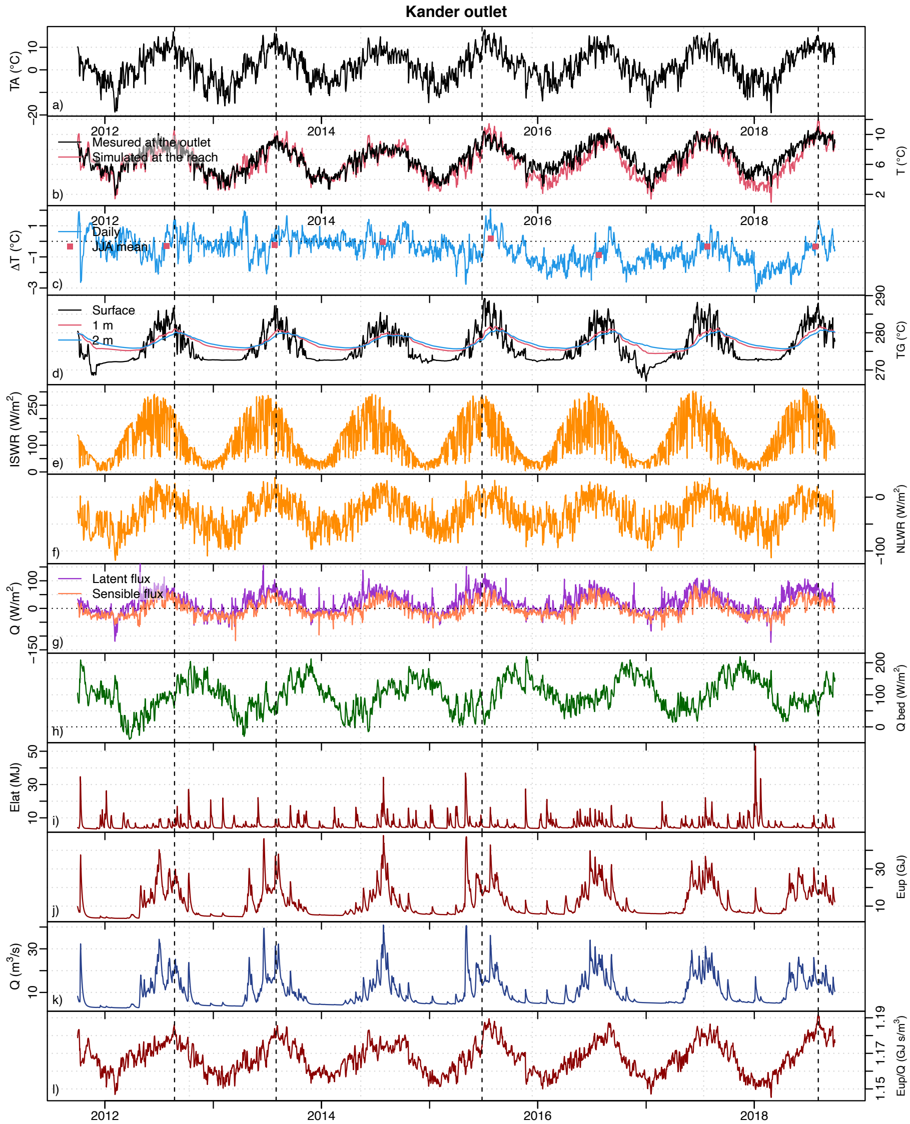

Figure S55. Energy fluxes and other relevant variables at the outlet reach of the Kander catchment (daily values). The vertical dashed lines mark some warm events discussed in the main article (Section 4.1.2). a) Air temperature, b) measured water temperature (black) and simulated water temperature (red) both at the outlet, c) difference between simulated and measured water temperature (blue line), and mean over the difference over the summer season (red squares), d) temperature of the soil surface and at 1 m and 2 m depth, e) incoming shortwave radiation, f) net longwave radiation, g) latent heat flux (purple) and sensible heat flux (orange), positive means energy gain for the river, h) conductive heat flux between the bed and the river, positive means energy gain for the river, i) energy advected by water from the soil reservoirs, j) energy advected from upstream reaches, k) discharge, l) energy advected from upstream reaches normalized by discharge.

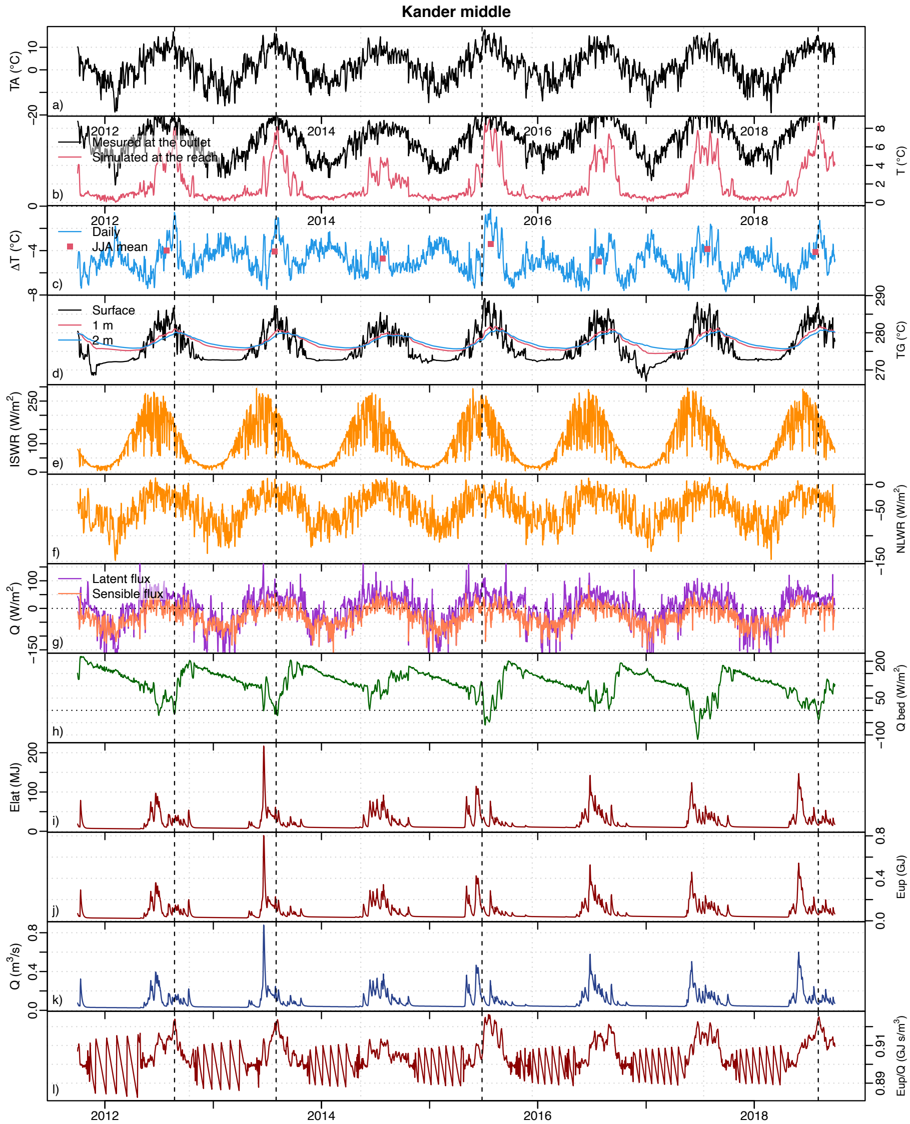

Figure S56. Energy fluxes and other relevant variables at the upstream reach 4 of the Kander catchment (daily values). The vertical dashed lines mark some warm events discussed in the main article (Section 4.1.2). a) Air temperature, b) measured water temperature at the reach (black) and simulated water temperature at the outlet (red), c) difference between simulated and measured water temperature (blue line), and mean over the difference over the summer season (red squares), d) temperature of the soil surface and at 1 m and 2 m depth, e) incoming shortwave radiation, f) net longwave radiation, g) latent heat flux (purple) and sensible heat flux (orange), positive means energy gain for the river, h) conductive heat flux between the bed and the river, positive means energy gain for the river, i) energy advected by water from the soil reservoirs, j) energy advected from upstream reaches, k) discharge, l) energy advected from upstream reaches normalized by discharge.

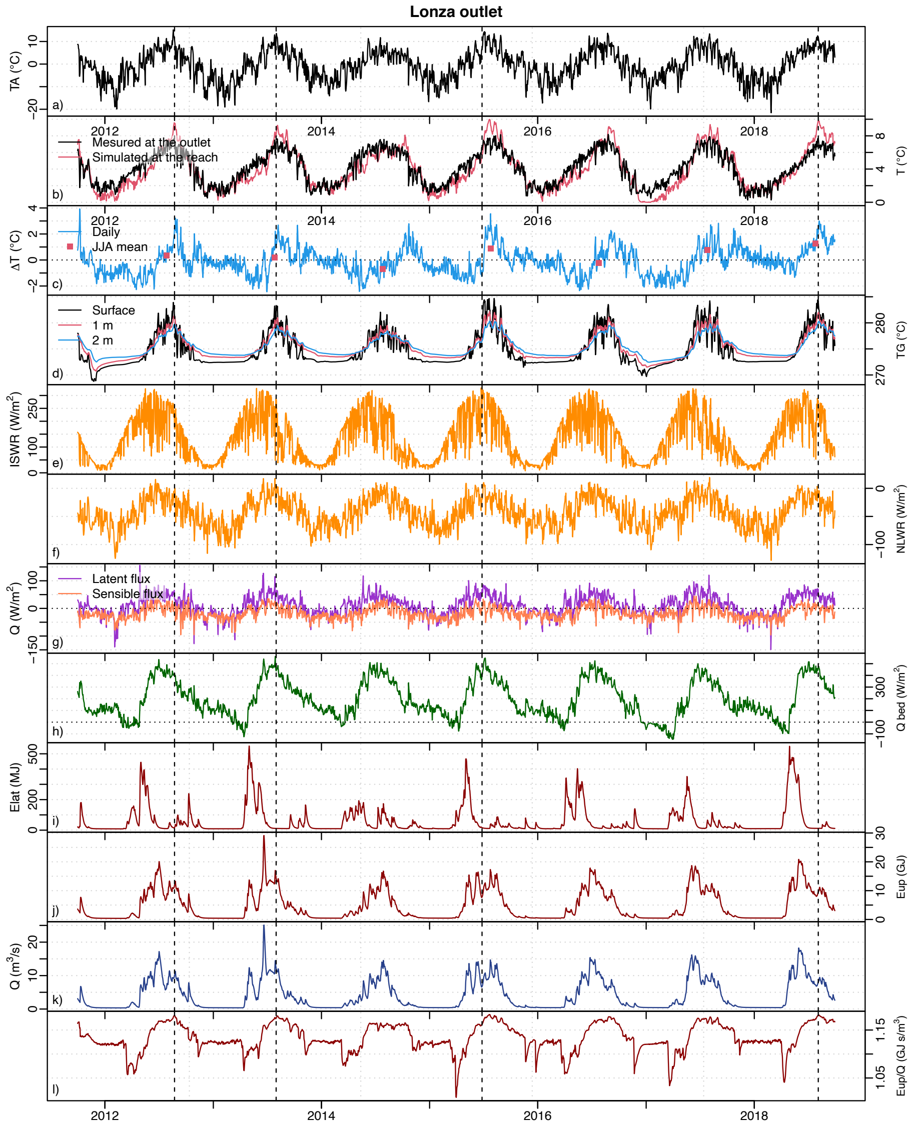

Figure S57. Energy fluxes and other relevant variables at the outlet reach of the Lonza catchment (daily values). The vertical dashed lines mark some warm events discussed in the main article (Section 4.1.2). a) Air temperature, b) measured water temperature (black) and simulated water temperature (red) both at the outlet, c) difference between simulated and measured water temperature (blue line), and mean over the difference over the summer season (red squares), d) temperature of the soil surface and at 1 m and 2 m depth, e) incoming shortwave radiation, f) net longwave radiation, g) latent heat flux (purple) and sensible heat flux (orange), positive means energy gain for the river, h) conductive heat flux between the bed and the river, positive means energy gain for the river, i) energy advected by water from the soil reservoirs, j) energy advected from upstream reaches, k) discharge, l) energy advected from upstream reaches normalized by discharge.

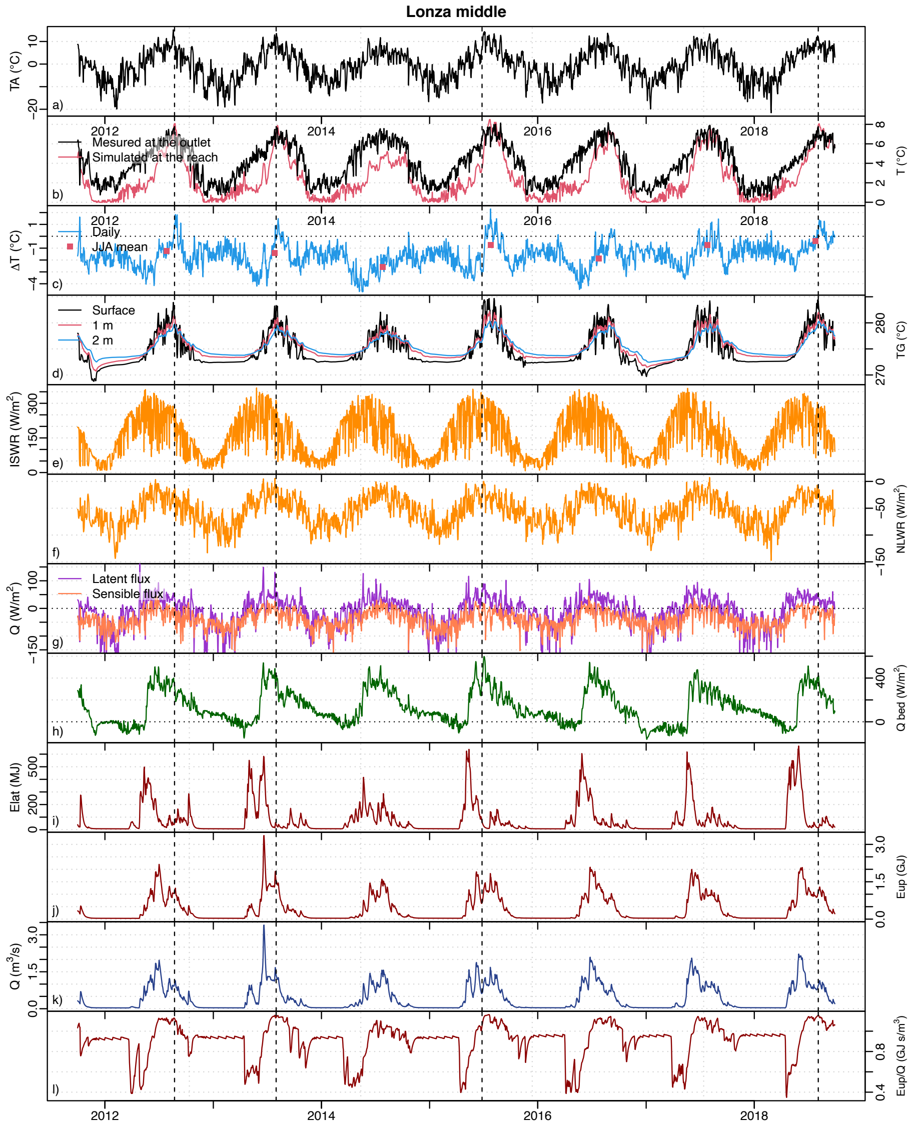

Figure S58. Energy fluxes and other relevant variables at the upstream reach 45 of the Lonza catchment (daily values). The vertical dashed lines mark some warm events discussed in the main article (Section 4.1.2). a) Air temperature, b) measured water temperature at the reach (black) and simulated water temperature at the outlet (red), c) difference between simulated and measured water temperature (blue line), and mean over the difference over the summer season (red squares), d) temperature of the soil surface and at 1 m and 2 m depth, e) incoming shortwave radiation, f) net longwave radiation, g) latent heat flux (purple) and sensible heat flux (orange), positive means energy gain for the river, h) conductive heat flux between the bed and the river, positive means energy gain for the river, i) energy advected by water from the soil reservoirs, j) energy advected from upstream reaches, k) discharge, l) energy advected from upstream reaches normalized by discharge.

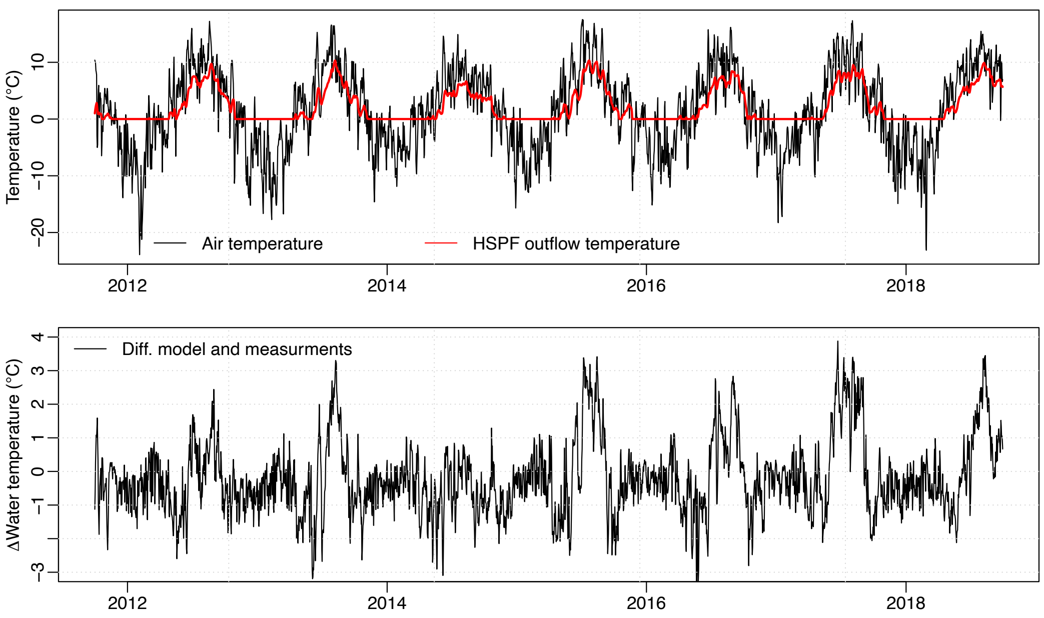

Figure S59. Top: air temperature (black) and soil outflow water temperature simulated with the HSPF scheme (red) for the Alpine Landwasser catchment. Bottom: Difference between air temperature and soil outflow water temperature simulated with the HSPF scheme.

S10 Additional figures and tables completing the 'Results' and 'Discussion' sections

In this section, figures similar to Figures 4 and 5 in the main article (Section 4.2) are shown in Figures S60 to S71 presenting the annual and seasonal changes in water and air temperature, discharge, and precipitation in each simulated catchment. Figures are split between catchments located on the Swiss Plateau (Section S10.1) and on the Alpine region (Section S10.2). As in the main article, only winter and summer are shown for the Swiss Plateau catchments (since the two other seasons are similar to winter), and the four seasons are shown for the Alpine catchments.

Section S10.2 contains figures similar to Figure 6 in the main article (Section 4.2.2) showing the annual and seasonal changes in snow water equivalent, ice water equivalent of glaciers (including snow on top of glacier pixels), solid precipitation, and surface soil temperature in Alpine catchments (Figures S72 to S76). This section also contains Figures similar to Figure 7 in the main article (Section 4.2.2), showing the evolution of the annual cycle of discharge and water temperature for each time period and RCP for the Kander, Landwasser, Lonza, and Lütschine catchments (Figures S77 to S80), and maps of average snow water equivalent and ice water equivalent for the 5 Alpine catchments for the months of February, May, and December (Figures S81 to S95).

Figure S96 shows the simulated changes in evapo-transpiration in 4 catchments situated in the Swiss Plateau, Figure S97 shows the evolution of the soil surface temperature in the Swiss Plateau catchments, and Figure S98 the changes in water temperature plotted against the changes in air temperature and discharge by the end of the century and for RCP8.5 (all in Section S10.3).

Finally, tables detailing the change in water temperature (Table S9), air temperature (Table S10), discharge (Table S11), and precipitation (Table S12) are shown for each time period and RCP, and for each catchment along with the median for the Swiss Plateau and Alpine catchments (Section S10.4).

S10.1 Swiss Plateau

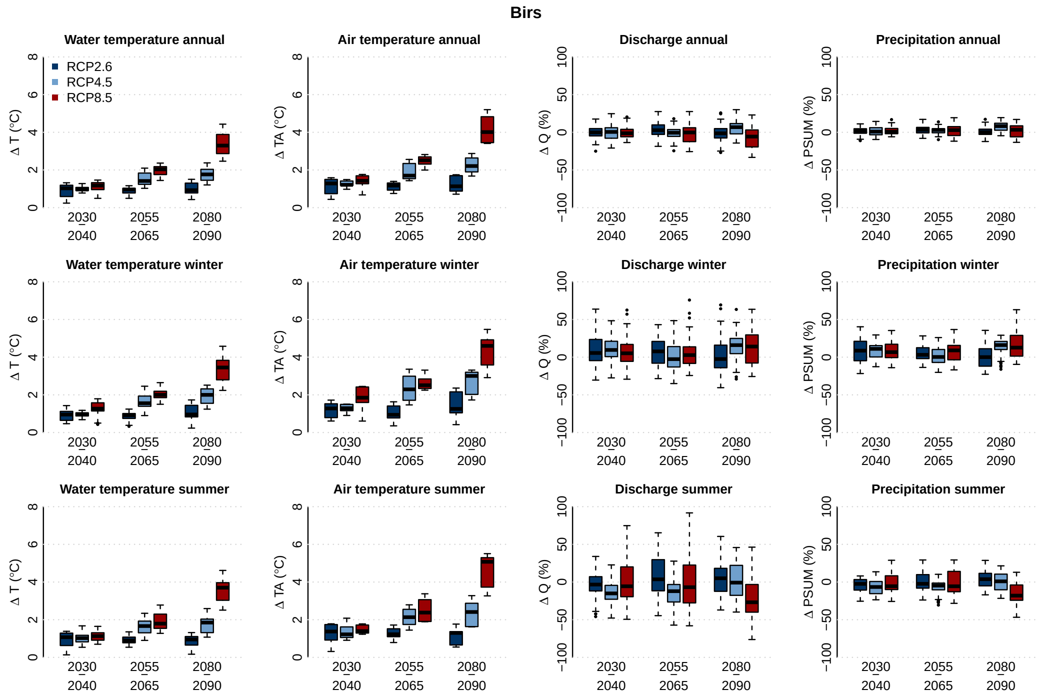

Figure S60. Change in water temperature, air temperature, discharge, and precipitation (columns, from left to right) over the periods 2030-2040, 2055-2065, and 2080-2090, compared to the reference period 1990-2000 for the Birs (located on the Swiss Plateau) and the 3 RCPs. Row 1 shows the annual changes, row 2 the winter seasonal changes, and row 3 the summer seasonal changes.

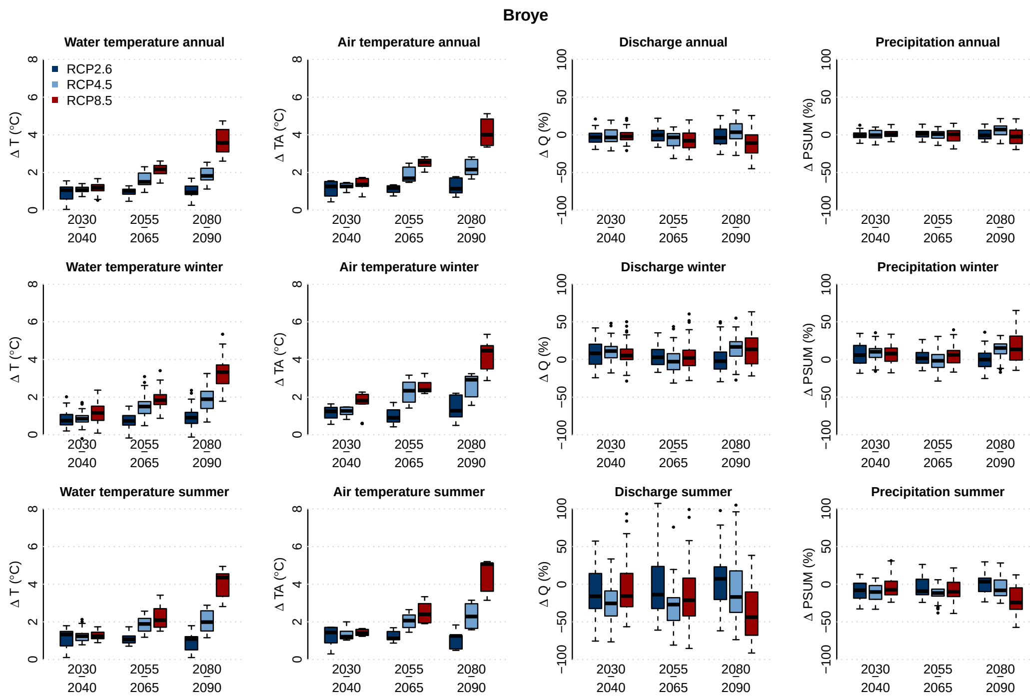

Figure S61. Change in water temperature, air temperature, discharge, and precipitation (columns, from left to right) over the periods 2030-2040, 2055-2065, and 2080-2090, compared to the reference period 1990-2000 for the Broye (located on the Swiss Plateau) and the 3 RCPs. Row 1 shows the annual changes, row 2 the winter seasonal changes, and row 3 the summer seasonal changes.

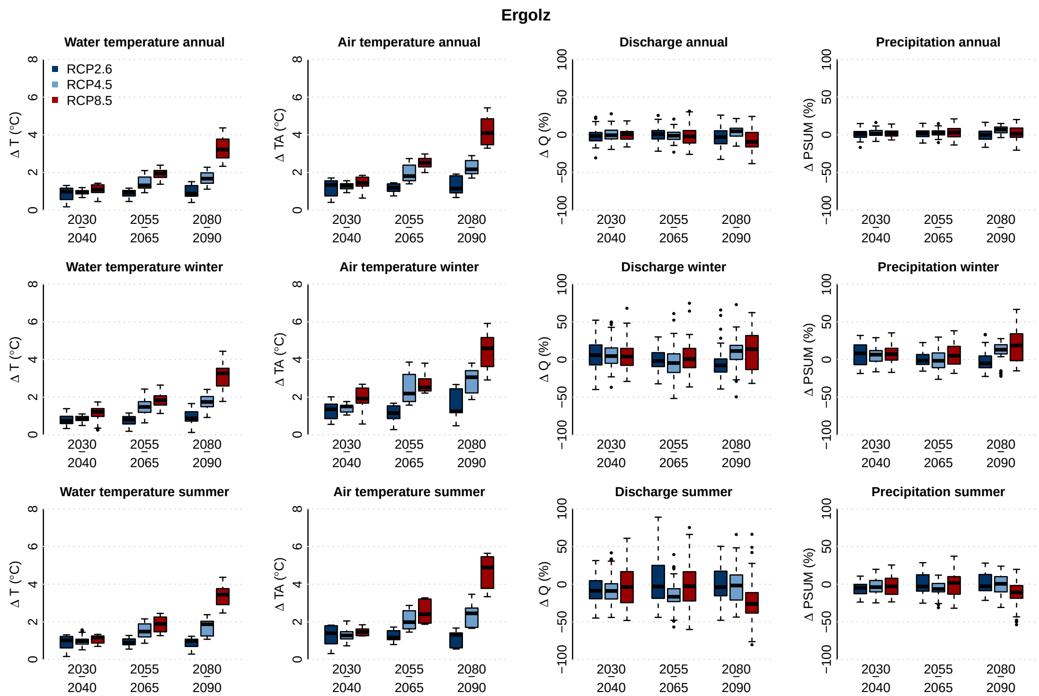

Figure S62. Change in water temperature, air temperature, discharge, and precipitation (columns, from left to right) over the periods 2030-2040, 2055-2065, and 2080-2090, compared to the reference period 1990-2000 for the Ergolz (located on the Swiss Plateau) and the 3 RCPs. Row 1 shows the annual changes, row 2 the winter seasonal changes, and row 3 the summer seasonal changes.

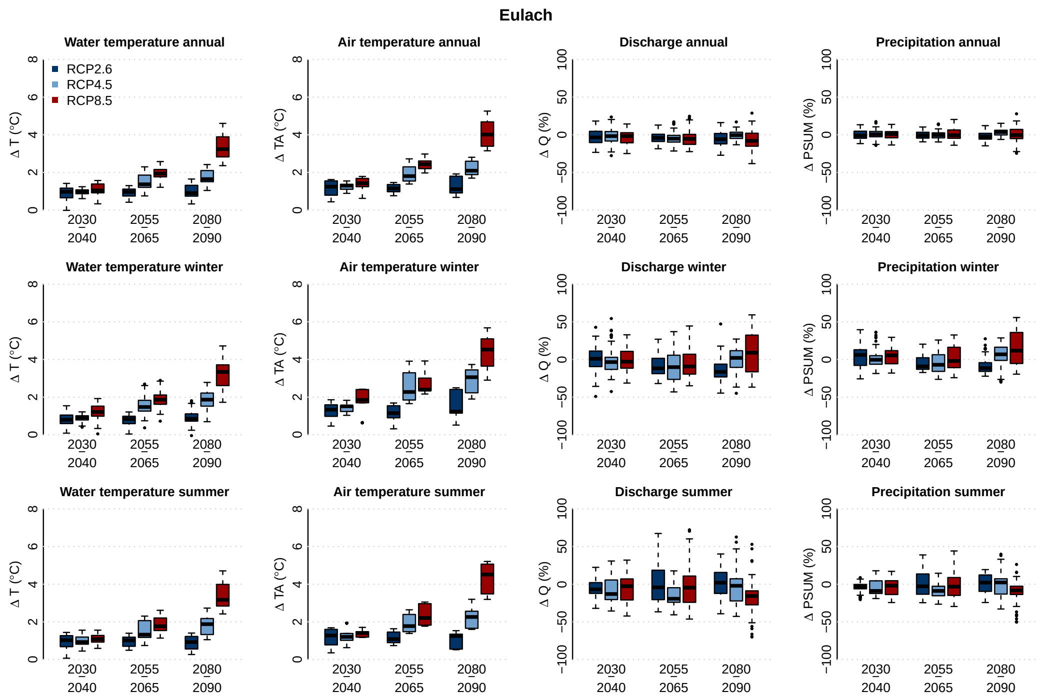

Figure S63. Change in water temperature, air temperature, discharge, and precipitation (columns, from left to right) over the periods 2030-2040, 2055-2065, and 2080-2090, compared to the reference period 1990-2000 for the Eulach (located on the Swiss Plateau) and the 3 RCPs. Row 1 shows the annual changes, row 2 the winter seasonal changes, and row 3 the summer seasonal changes.

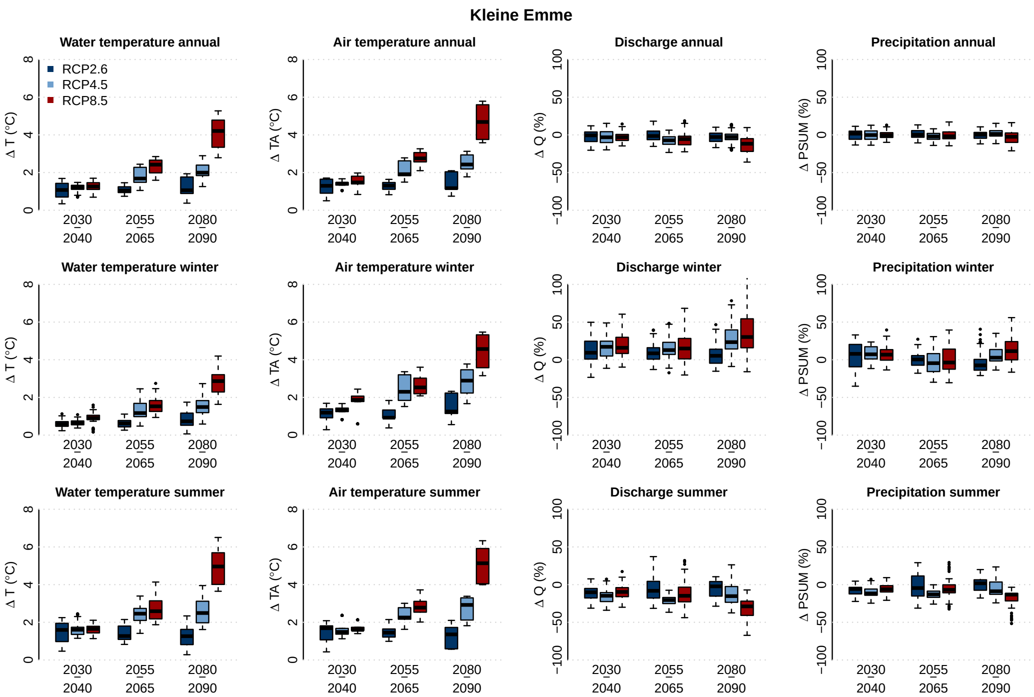

Figure S64. Change in water temperature, air temperature, discharge, and precipitation (columns, from left to right) over the periods 2030-2040, 2055-2065, and 2080-2090, compared to the reference period 1990-2000 for the Kleine Emme (located on the Swiss Plateau) and the 3 RCPs. Row 1 shows the annual changes, row 2 the winter seasonal changes, and row 3 the summer seasonal changes.

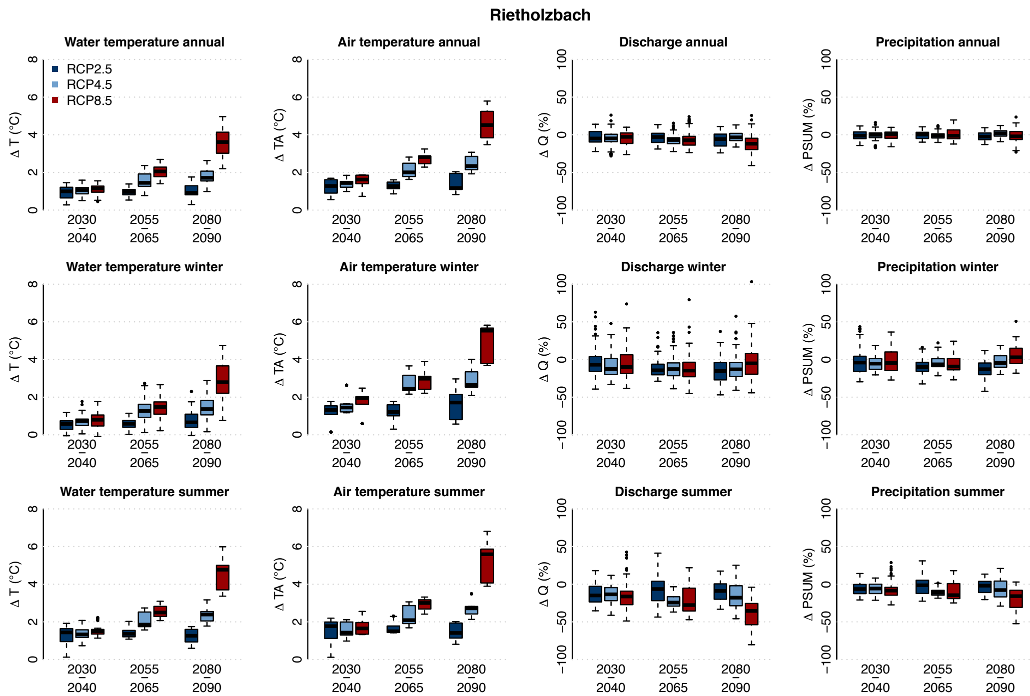

Figure S65. Change in water temperature, air temperature, discharge, and precipitation (columns, from left to right) over the periods 2030-2040, 2055-2065, and 2080-2090, compared to the reference period 1990-2000 for the Rietholzbach (located on the Swiss Plateau) and the 3 RCPs. Row 1 shows the annual changes, row 2 the winter seasonal changes, and row 3 the summer seasonal changes.

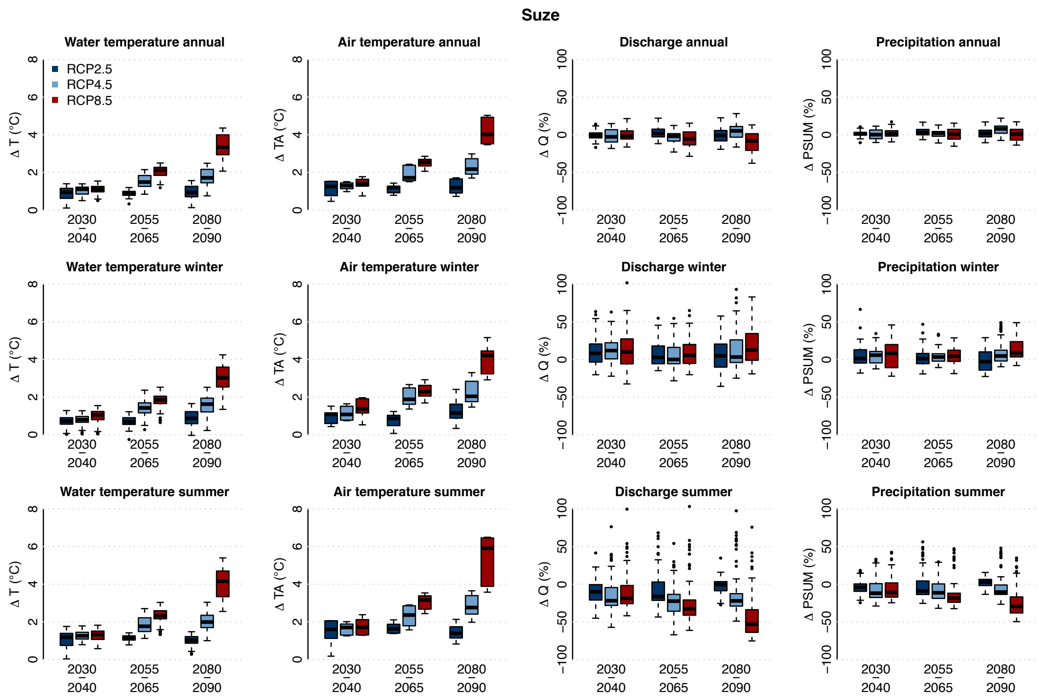

Figure S66. Change in water temperature, air temperature, discharge, and precipitation (columns, from left to right) over the periods 2030-2040, 2055-2065, and 2080-2090, compared to the reference period 1990-2000 for the Suze (located on the Swiss Plateau) and the 3 RCPs. Row 1 shows the annual changes, row 2 the winter seasonal changes, and row 3 the summer seasonal changes.

S10.2 Alpine

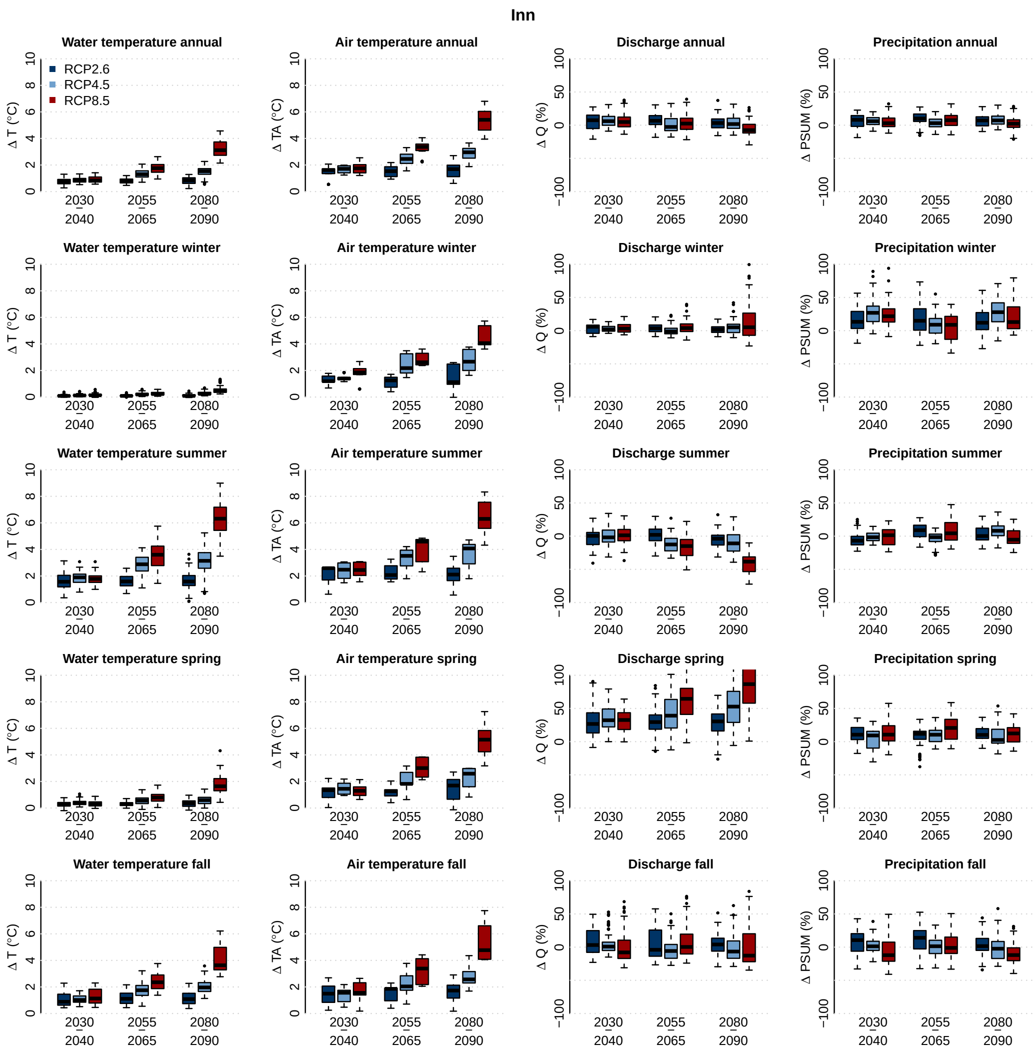

Figure S67. Change in water temperature, air temperature, discharge, and precipitation (columns, from left to right) over the periods 2030-2040, 2055-2065, and 2080-2090, compared to the reference period 1990-2000 for the Inn (located on the Alpine region) and the 3 RCPs. Row 1 shows the annual changes, row 2 the winter seasonal changes, and row 3 the summer seasonal changes.

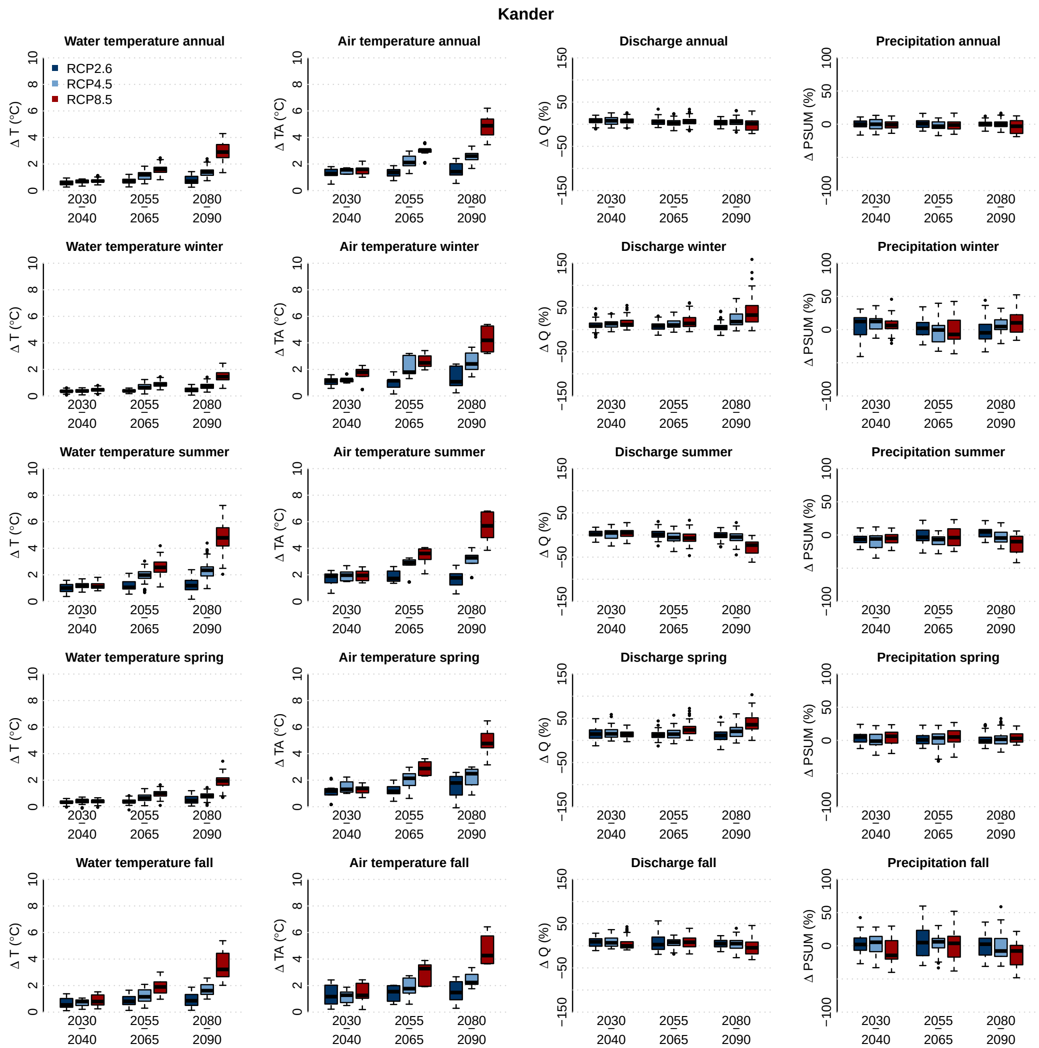

Figure S68. Change in water temperature, air temperature, discharge, and precipitation (columns, from left to right) over the periods 2030-2040, 2055-2065, and 2080-2090, compared to the reference period 1990-2000 for the Kander (located on the Alpine region) and the 3 RCPs. Row 1 shows the annual changes, row 2 the winter seasonal changes, and row 3 the summer seasonal changes.

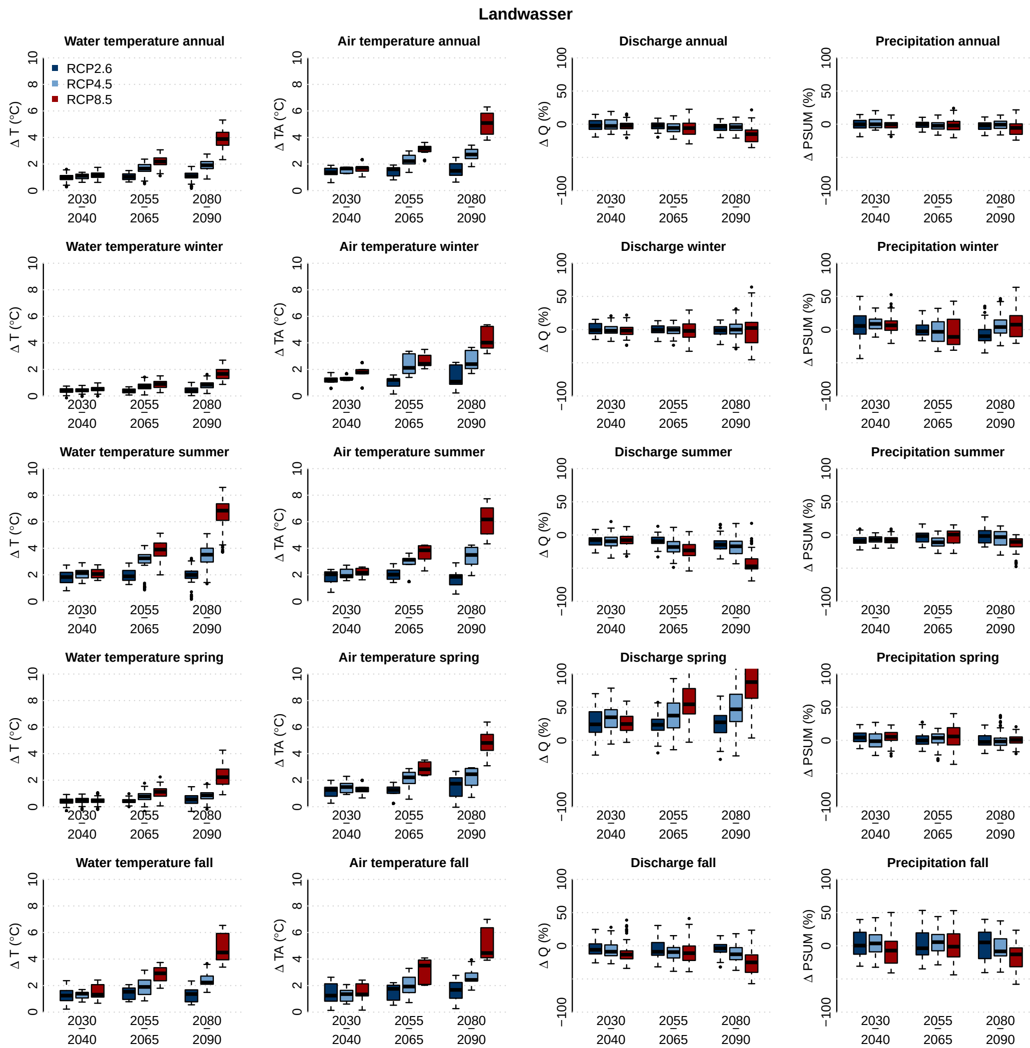

Figure S69. Change in water temperature, air temperature, discharge, and precipitation (columns, from left to right) over the periods 2030-2040, 2055-2065, and 2080-2090, compared to the reference period 1990-2000 for the Landwasser (located on the Alpine region) and the 3 RCPs. Row 1 shows the annual changes, row 2 the winter seasonal changes, and row 3 the summer seasonal changes.

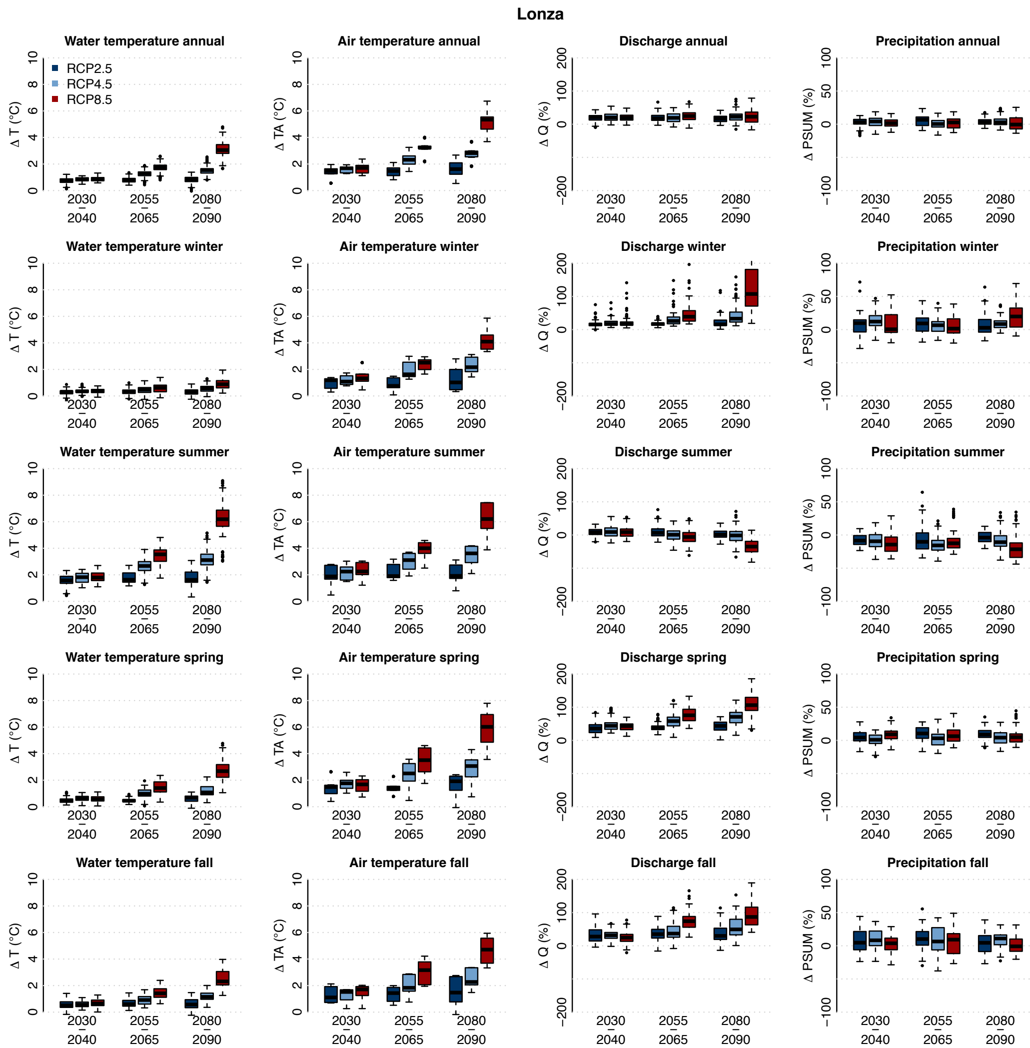

Figure S70. Change in water temperature, air temperature, discharge, and precipitation (columns, from left to right) over the periods 2030-2040, 2055-2065, and 2080-2090, compared to the reference period 1990-2000 for the Lonza (located on the Alpine region) and the 3 RCPs. Row 1 shows the annual changes, row 2 the winter seasonal changes, and row 3 the summer seasonal changes.

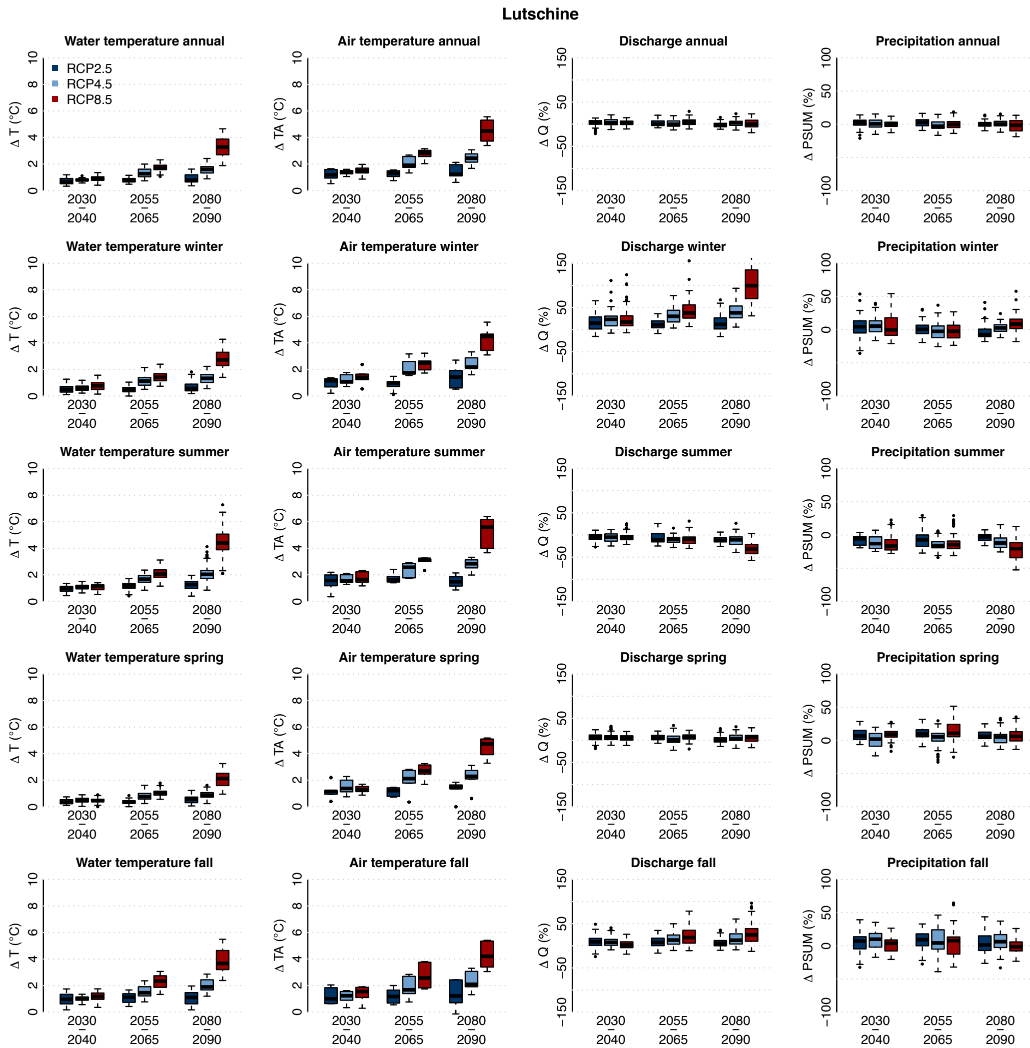

Figure S71. Change in water temperature, air temperature, discharge, and precipitation (columns, from left to right) over the periods 2030-2040, 2055-2065, and 2080-2090, compared to the reference period 1990-2000 for the Lütschine (located on the Alpine region) and the 3 RCPs. Row 1 shows the annual changes, row 2 the winter seasonal changes, and row 3 the summer seasonal changes.

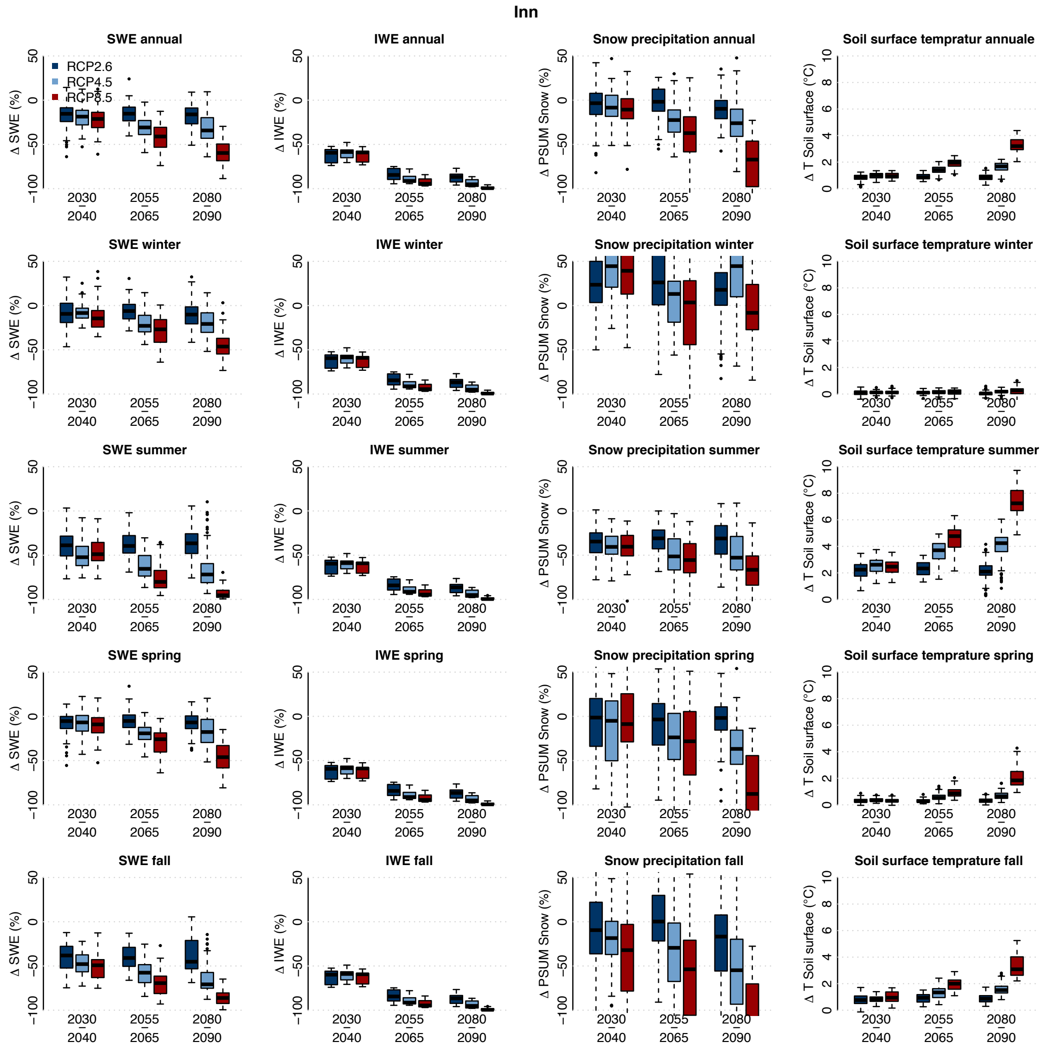

Figure S72. Change in snow water equivalent in the catchments (SWE), in ice water equivalent (mass stored in glaciers and in snow in glacier pixels) in the catchments (IWE), in solid precipitation (PSUM snow), and in soil surface temperature (TS) (columns, from left to right) over the periods 2030-2040, 2055-2065, and 2080-2090, compared to the reference period 1990-2000 for the Inn catchment (located on the Alpine region) and for the 3 RCP scenarios. Row 1 shows the annual change, row 2 the winter seasonal change, row 3 the summer seasonal change, row 4 the spring seasonal change, and row 5 the fall seasonal change.

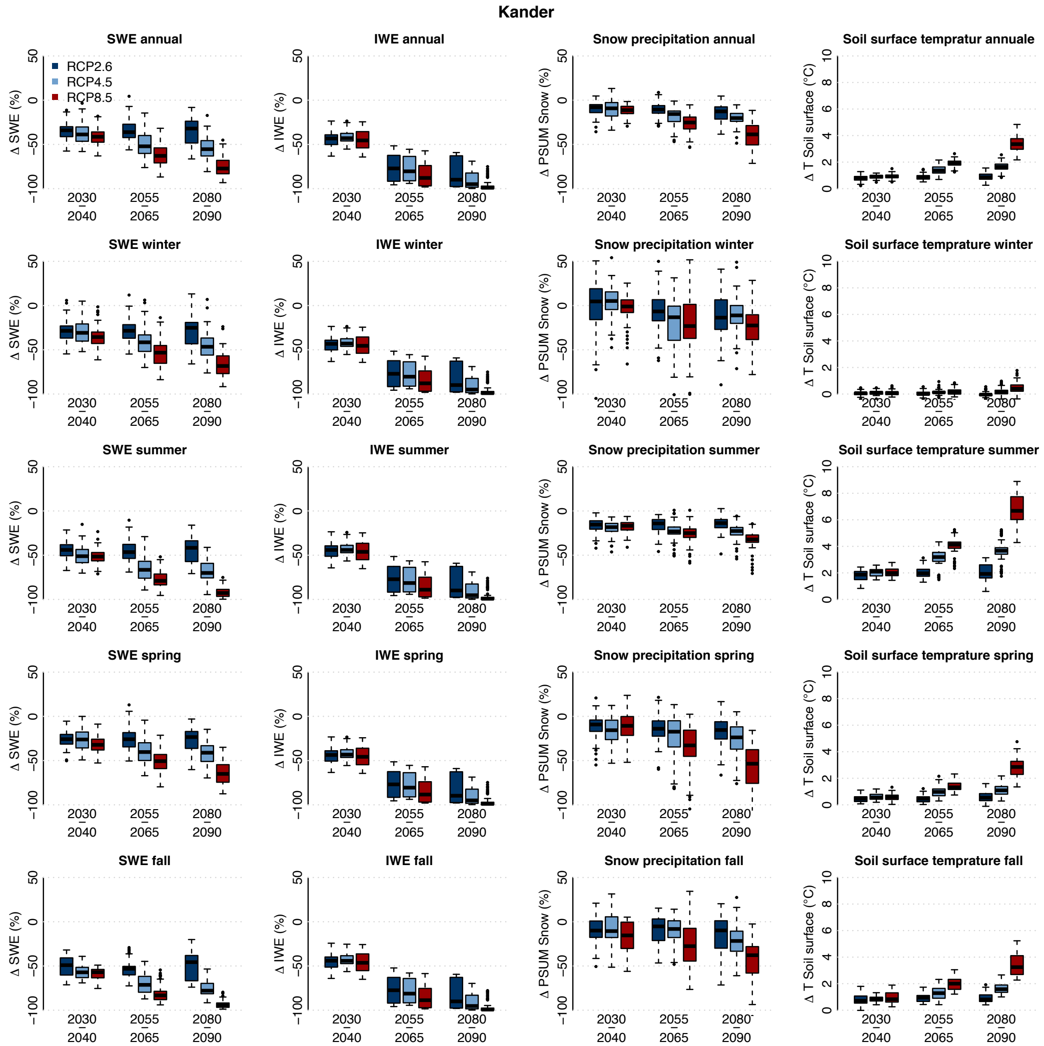

Figure S73. Change in snow water equivalent in the catchments (SWE), in ice water equivalent (mass stored in glaciers and in snow in glacier pixels) in the catchments (IWE), in solid precipitation (PSUM snow), and in soil surface temperature (TS) (columns, from left to right) over the periods 2030-2040, 2055-2065, and 2080-2090, compared to the reference period 1990-2000 for the Kander catchment (located on the Alpine region) and for the 3 RCP scenarios. Row 1 shows the annual change, row 2 the winter seasonal change, row 3 the summer seasonal change, row 4 the spring seasonal change, and row 5 the fall seasonal change.

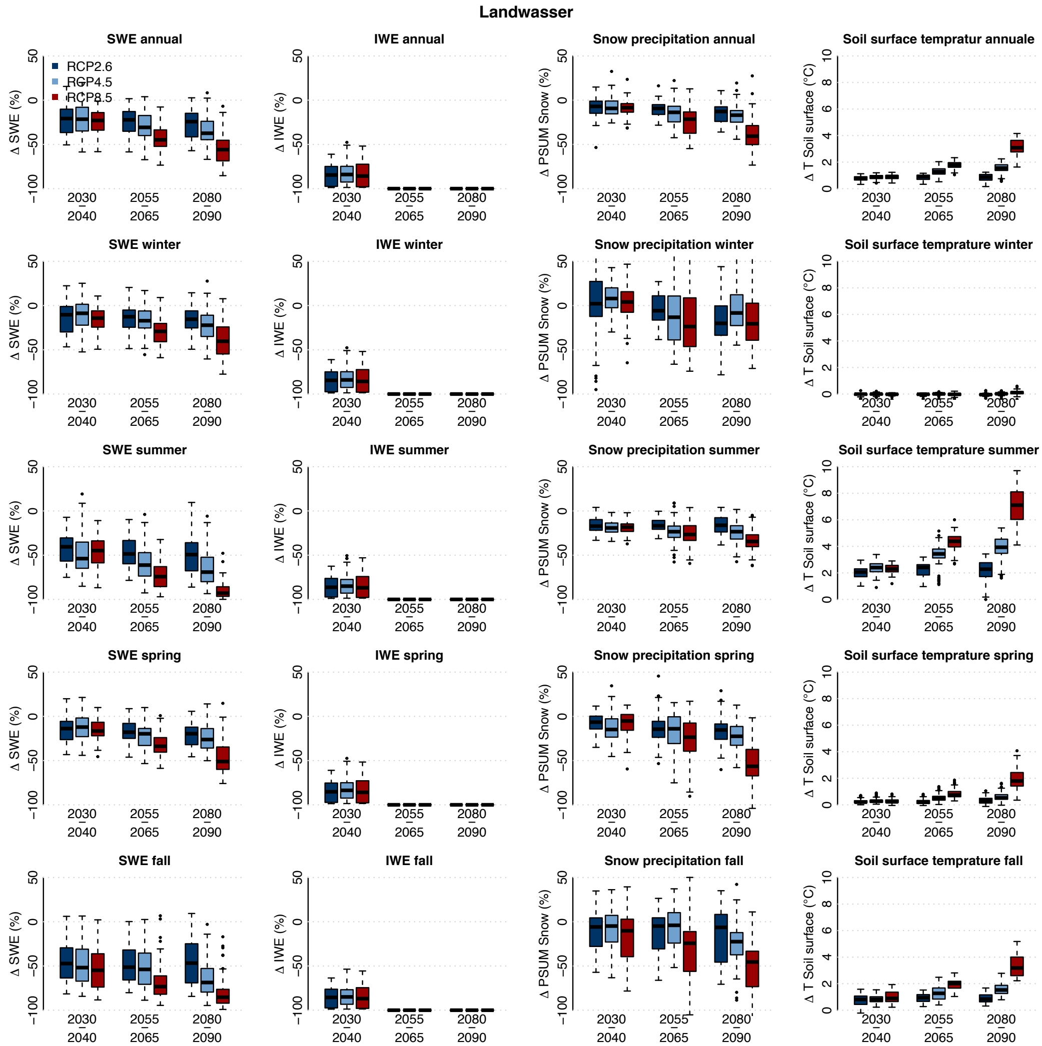

Figure S74. Change in snow water equivalent in the catchments (SWE), in ice water equivalent (mass stored in glaciers and in snow in glacier pixels) in the catchments (IWE), in solid precipitation (PSUM snow), and in soil surface temperature (TS) (columns, from left to right) over the periods 2030-2040, 2055-2065, and 2080-2090, compared to the reference period 1990-2000 for the Landwasser catchment (located on the Alpine region) and for the 3 RCP scenarios. Row 1 shows the annual change, row 2 the winter seasonal change, row 3 the summer seasonal change, row 4 the spring seasonal change, and row 5 the fall seasonal change.

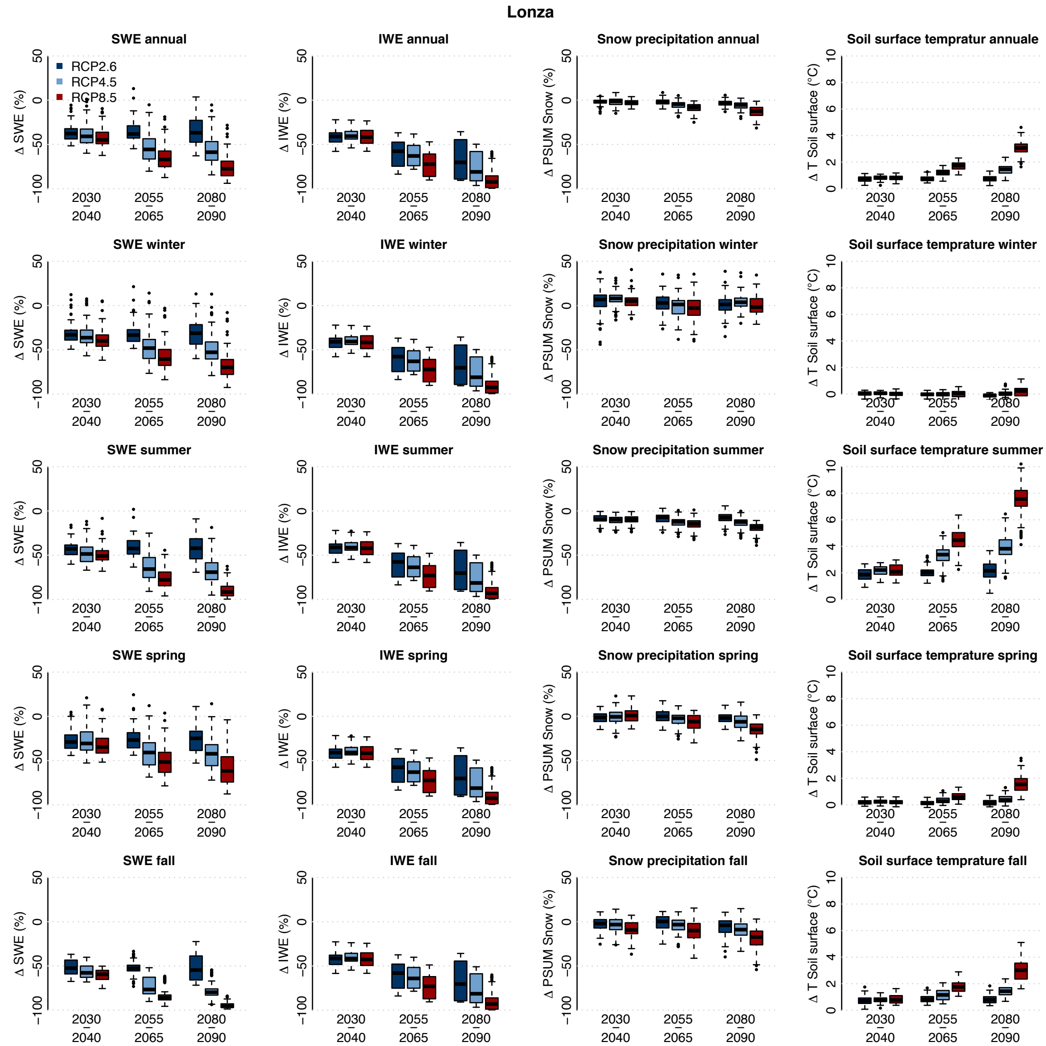

Figure S75. Change in snow water equivalent in the catchments (SWE), in ice water equivalent (mass stored in glaciers and in snow in glacier pixels) in the catchments (IWE), in solid precipitation (PSUM snow), and in soil surface temperature (TS) (columns, from left to right) over the periods 2030-2040, 2055-2065, and 2080-2090, compared to the reference period 1990-2000 for the Lonza catchment (located on the Alpine region) and for the 3 RCP scenarios. Row 1 shows the annual change, row 2 the winter seasonal change, row 3 the summer seasonal change, row 4 the spring seasonal change, and row 5 the fall seasonal change.

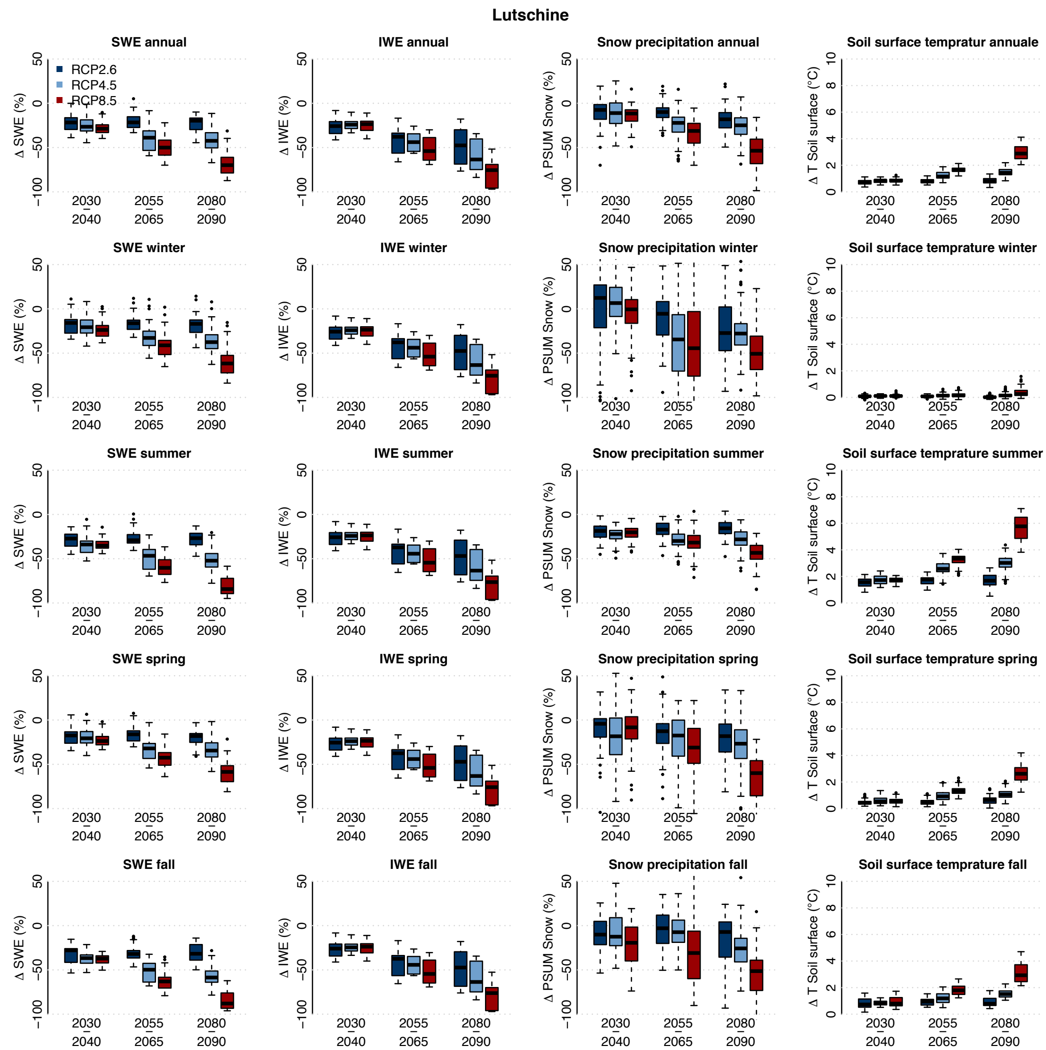

Figure S76. Change in snow water equivalent in the catchments (SWE), in ice water equivalent (mass stored in glaciers and in snow in glacier pixels) in the catchments (IWE), in solid precipitation (PSUM snow), and in soil surface temperature (TS) (columns, from left to right) over the periods 2030-2040, 2055-2065, and 2080-2090, compared to the reference period 1990-2000 for the Lütschine catchment (located on the Alpine region) and for the 3 RCP scenarios. Row 1 shows the annual change, row 2 the winter seasonal change, row 3 the summer seasonal change, row 4 the spring seasonal change, and row 5 the fall seasonal change.

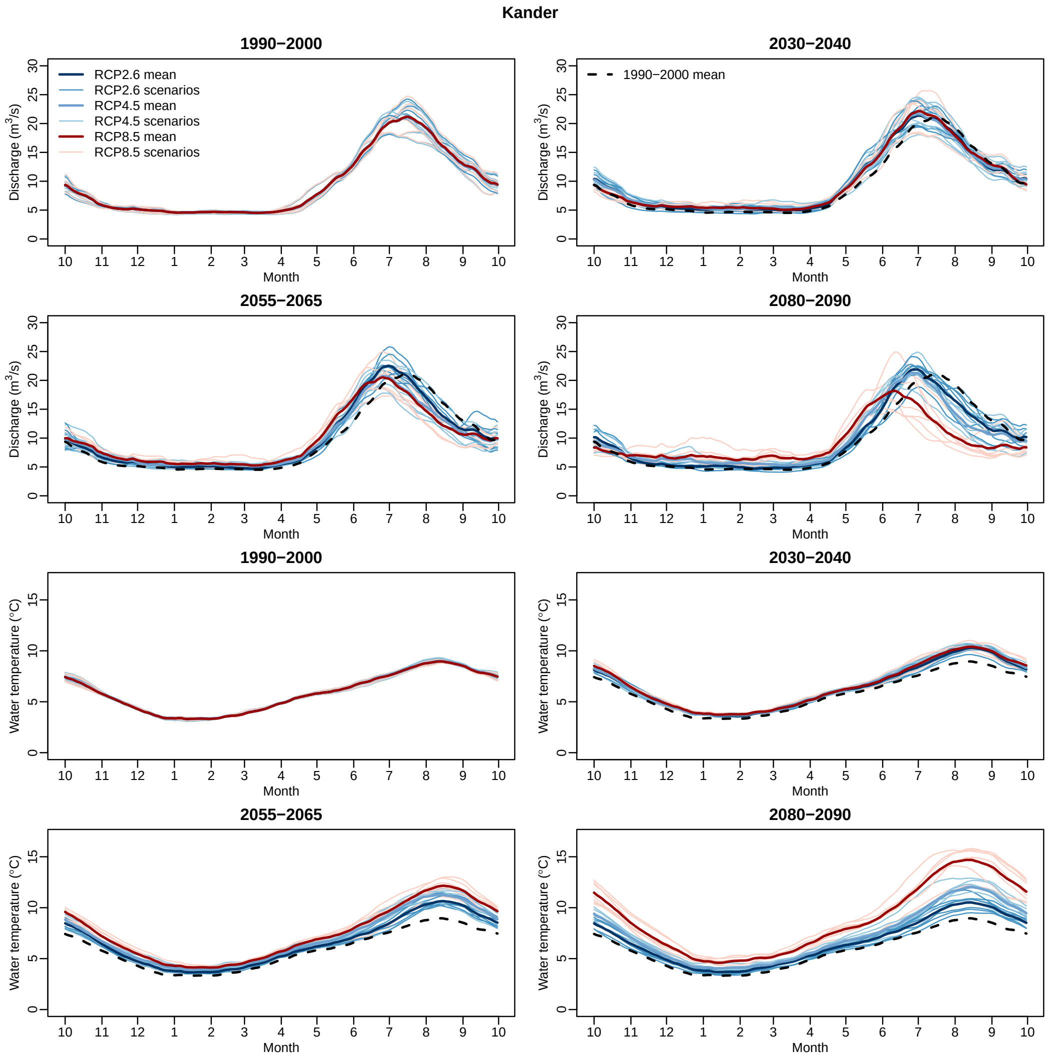

Figure S77. Annual cycle for discharge (top) and temperature (bottom) for the Kander catchment (located on the Alpine region). The cycles are obtained by computing the average for each day of the years and by applying a circular moving average of 30 days. Dark lines show the mean for each RCPs over each period, light lines show individual scenarios. Black dashed lines show the mean over the reference period 1990-2000 (only shown in subsequent periods to ease comparison).

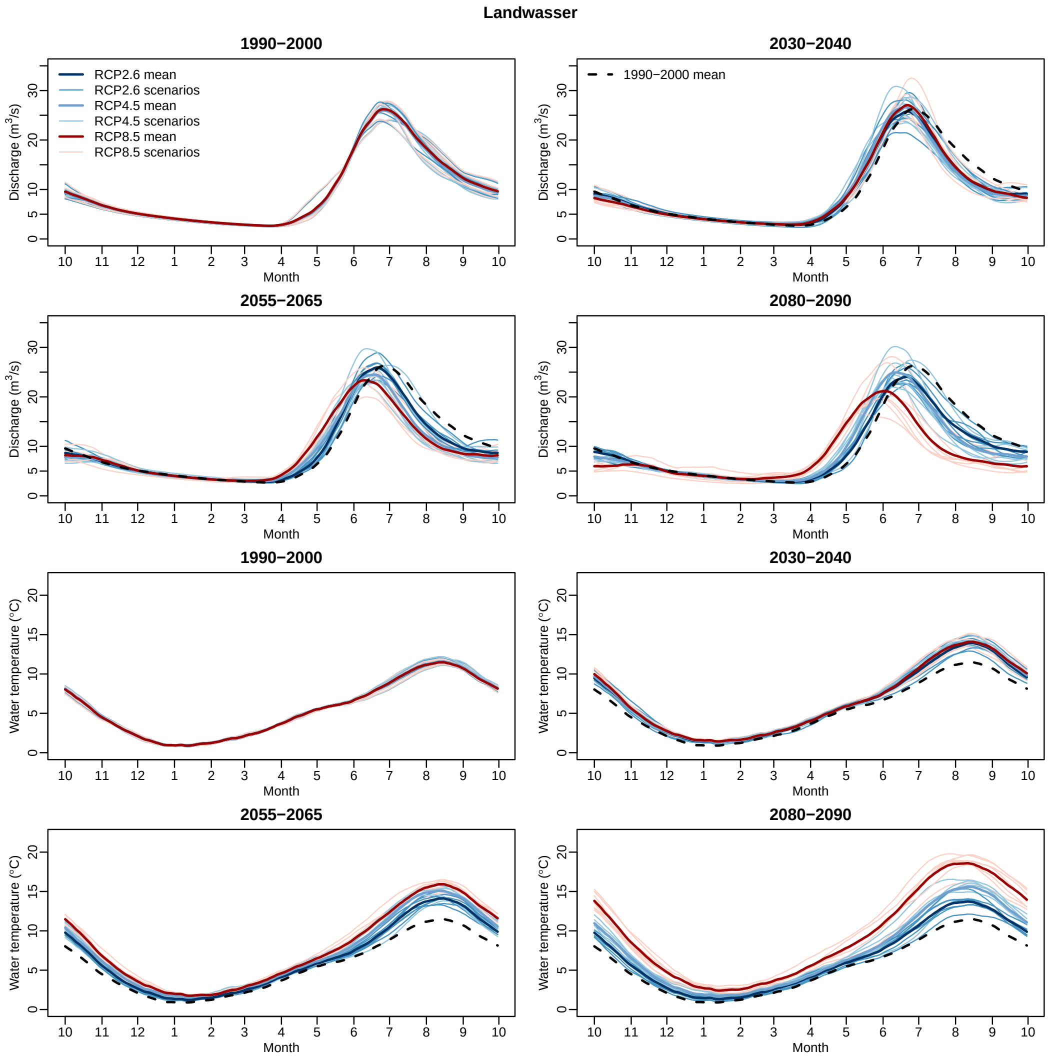

Figure S78. Annual cycle for discharge (top) and temperature (bottom) for the Landwasser catchment (located on the Alpine region). The cycles are obtained by computing the average for each day of the years and by applying a circular moving average of 30 days. Dark lines show the mean for each RCPs over each period, light lines show individual scenarios. Black dashed lines show the mean over the reference period 1990-2000 (only shown in subsequent periods to ease comparison).

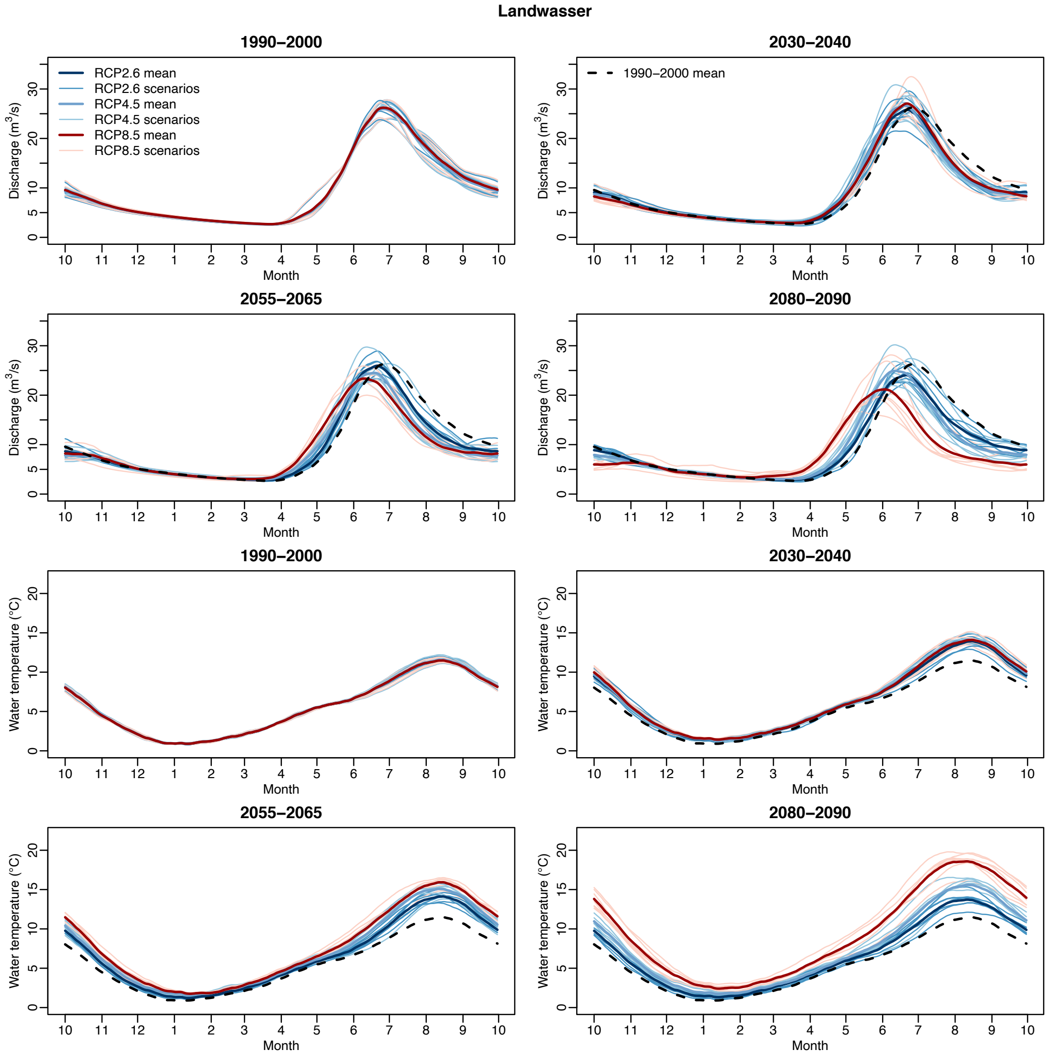

Figure S79. Annual cycle for discharge (top) and temperature (bottom) for the Lonza catchment (located on the Alpine region). The cycles are obtained by computing the average for each day of the years and by applying a circular moving average of 30 days. Dark lines show the mean for each RCPs over each period, light lines show individual scenarios. Black dashed lines show the mean over the reference period 1990-2000 (only shown in subsequent periods to ease comparison).

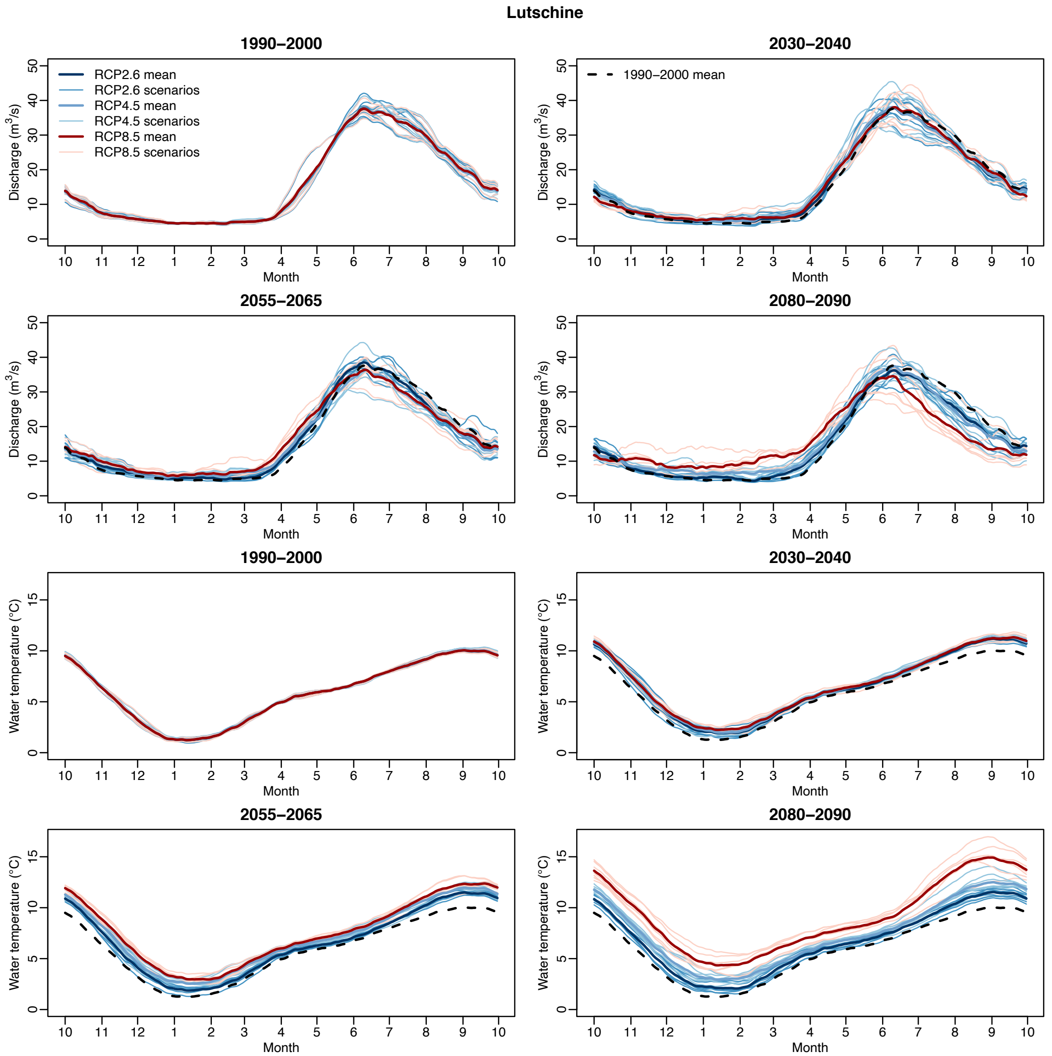

Figure S80. Annual cycle for discharge (top) and temperature (bottom) for the Lütschine catchment (located on the Alpine region). The cycles are obtained by computing the average for each day of the years and by applying a circular moving average of 30 days. Dark lines show the mean for each RCPs over each period, light lines show individual scenarios. Black dashed lines show the mean over the reference period 1990-2000 (only shown in subsequent periods to ease comparison).

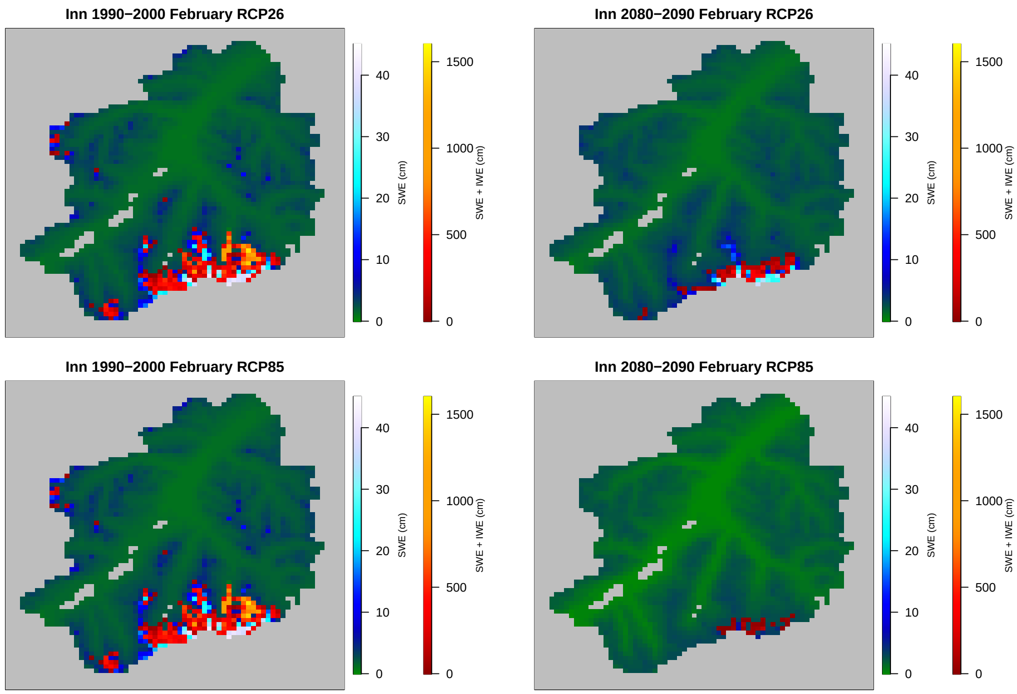

Figure S81. Average snow water equivalent (SWE) and ice water equivalent (IWE) over the Inn catchment for the month of February. Maps show the average between the 8 model chains used (see Table 2 in the main paper). For glacierized pixels, SWE and IWE are summed. Top: RCP2.6. Bottom: RCP8.5. Left: Reference period (1990-2000). Right: End of the century period (2080-2090).

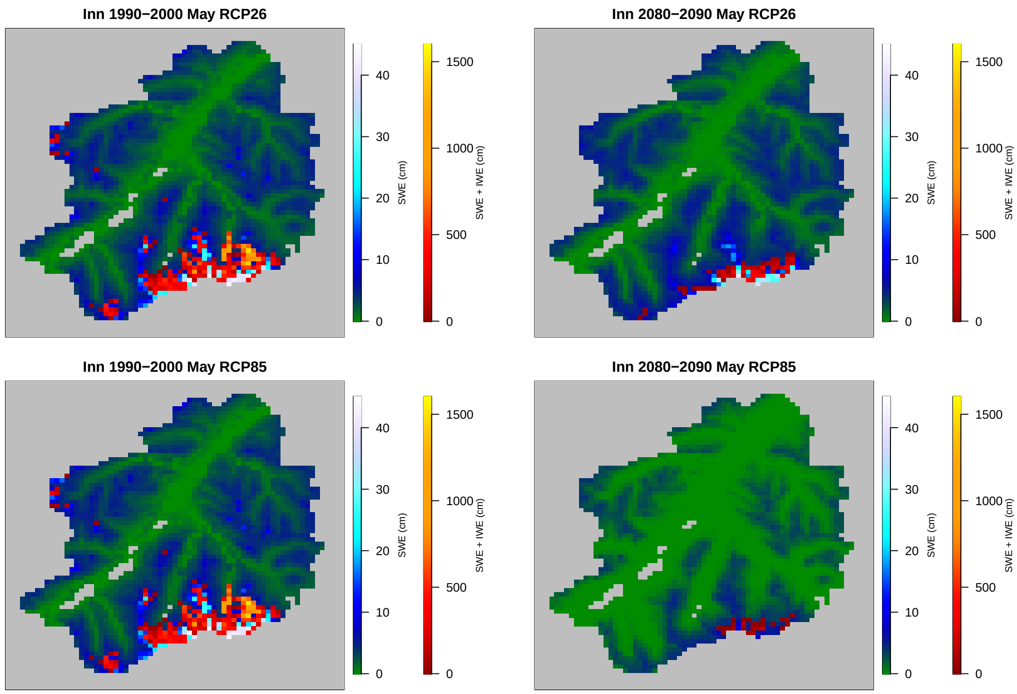

Figure S82. Average snow water equivalent (SWE) and ice water equivalent (IWE) over the Inn catchment for the month of May. Maps show the average between the 8 model chains used (see Table 2 in the main paper). For glacierized pixels, SWE and IWE are summed. Top: RCP2.6. Bottom: RCP8.5. Left: Reference period (1990-2000). Right: End of the century period (2080-2090).

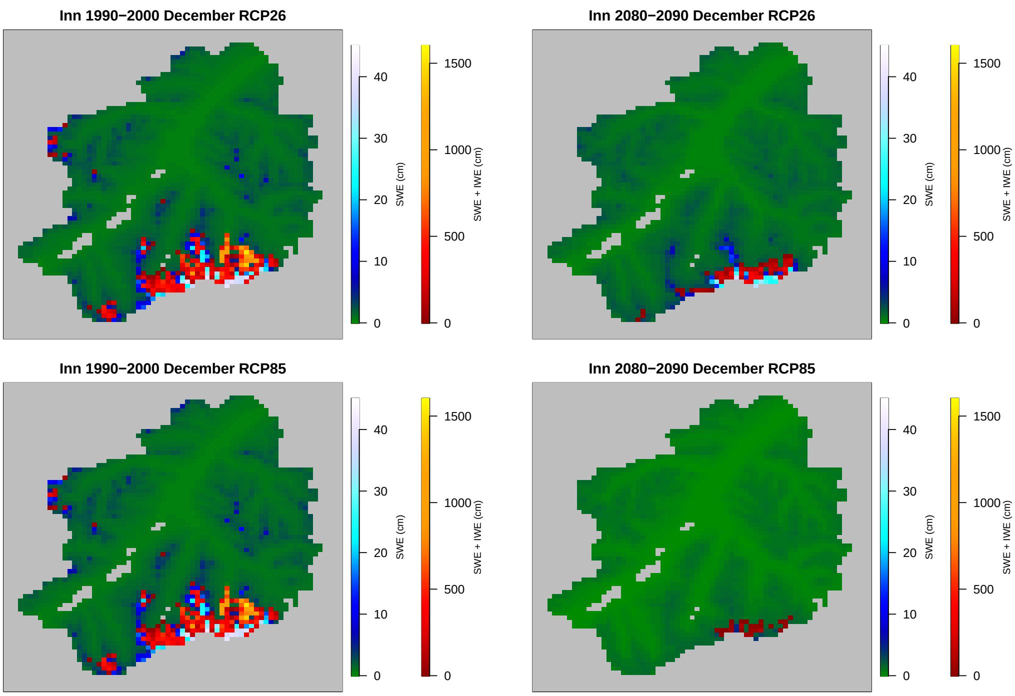

Figure S83. Average snow water equivalent (SWE) and ice water equivalent (IWE) over the Inn catchment for the month of December. Maps show the average between the 8 model chains used (see Table 2 in the main paper). For glacierized pixels, SWE and IWE are summed. Top: RCP2.6. Bottom: RCP8.5. Left: Reference period (1990-2000). Right: End of the century period (2080-2090).

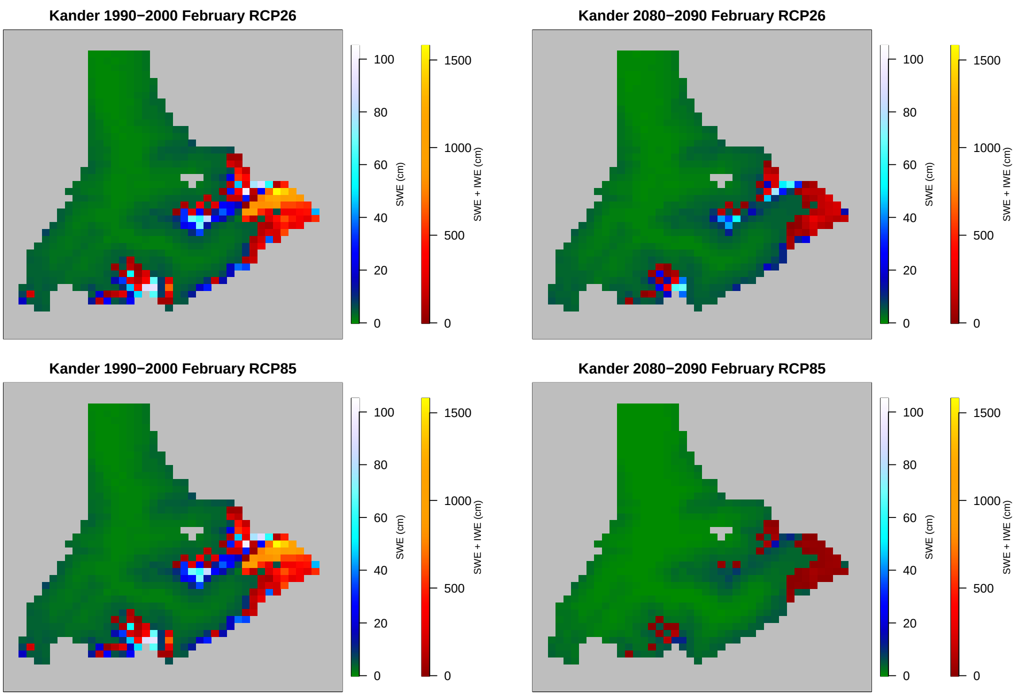

Figure S84. Average snow water equivalent (SWE) and ice water equivalent (IWE) over the Kander catchment for the month of February. Maps show the average between the 8 model chains used (see Table 2 in the main paper). For glacierized pixels, SWE and IWE are summed. Top: RCP2.6. Bottom: RCP8.5. Left: Reference period (1990-2000). Right: End of the century period (2080-2090).

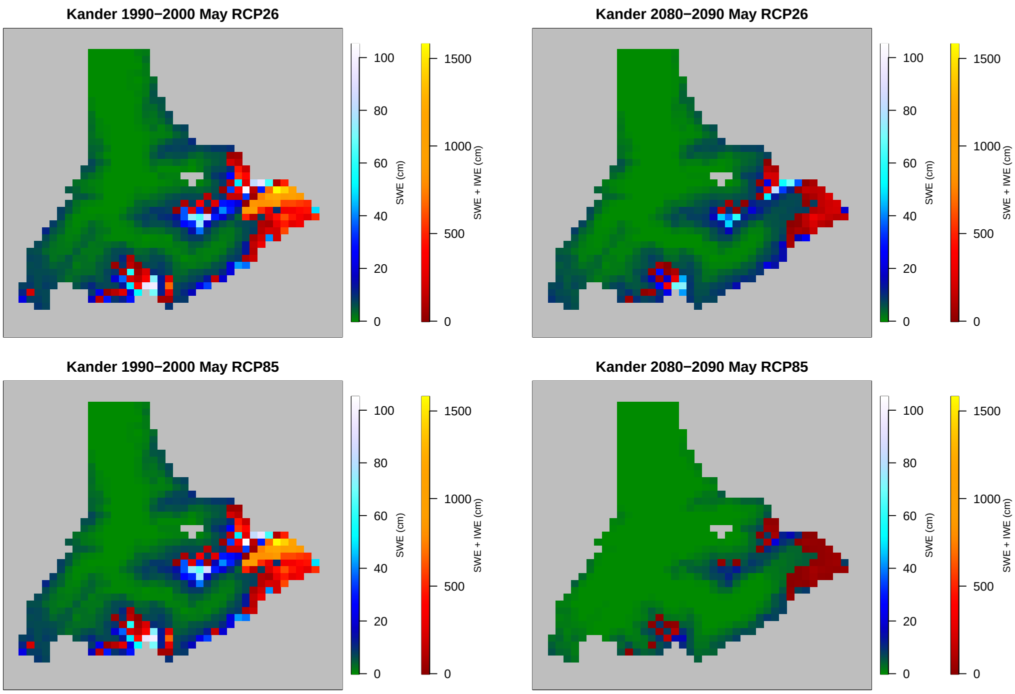

Figure S85. Average snow water equivalent (SWE) and ice water equivalent (IWE) over the Kander catchment for the month of May. Maps show the average between the 8 model chains used (see Table 2 in the main paper). For glacierized pixels, SWE and IWE are summed. Top: RCP2.6. Bottom: RCP8.5. Left: Reference period (1990-2000). Right: End of the century period (2080-2090).

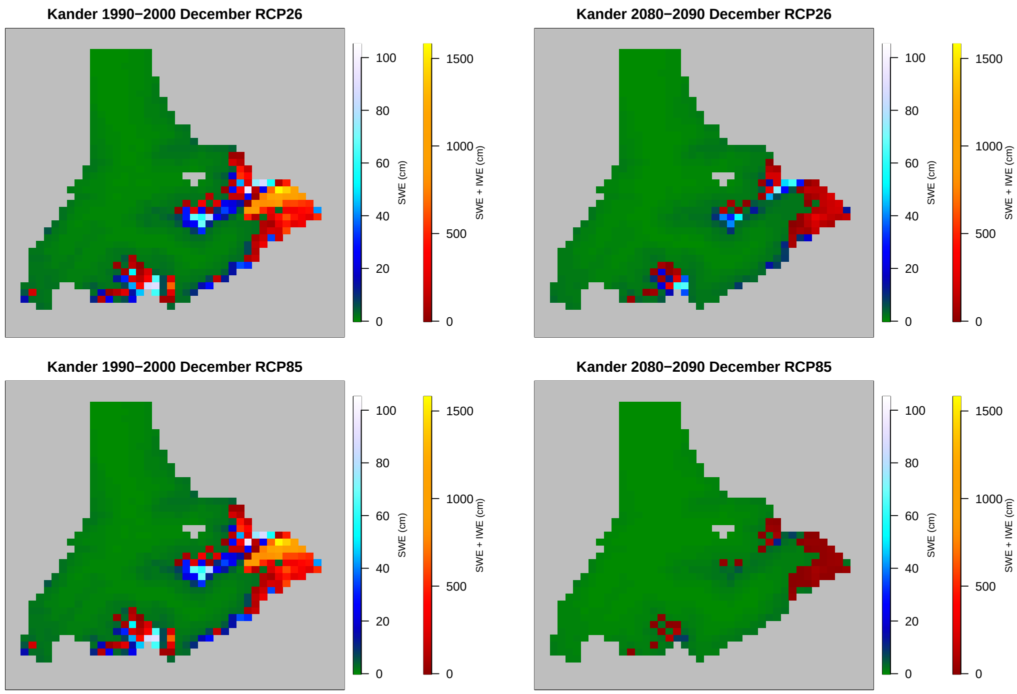

Figure S86. Average snow water equivalent (SWE) and ice water equivalent (IWE) over the Kander catchment for the month of December. Maps show the average between the 8 model chains used (see Table 2 in the main paper). For glacierized pixels, SWE and IWE are summed. Top: RCP2.6. Bottom: RCP8.5. Left: Reference period (1990-2000). Right: End of the century period (2080-2090).

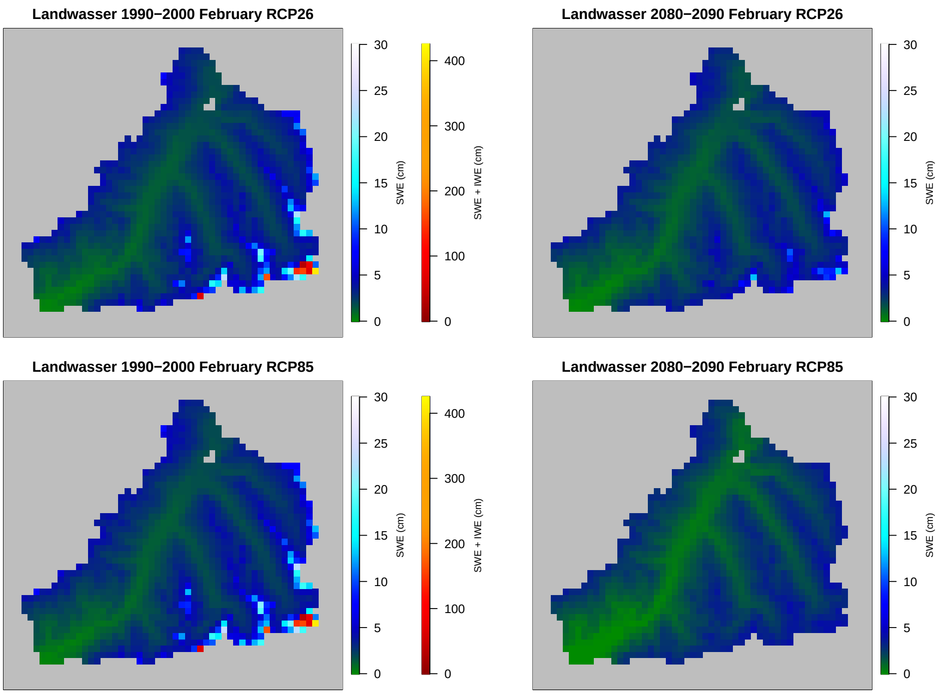

Figure S87. Average snow water equivalent (SWE) and ice water equivalent (IWE) over the Landwasser catchment for the month of February. Maps show the average between the 8 model chains used (see Table 2 in the main paper). For glacierized pixels, SWE and IWE are summed. Top: RCP2.6. Bottom: RCP8.5. Left: Reference period (1990-2000). Right: End of the century period (2080-2090).

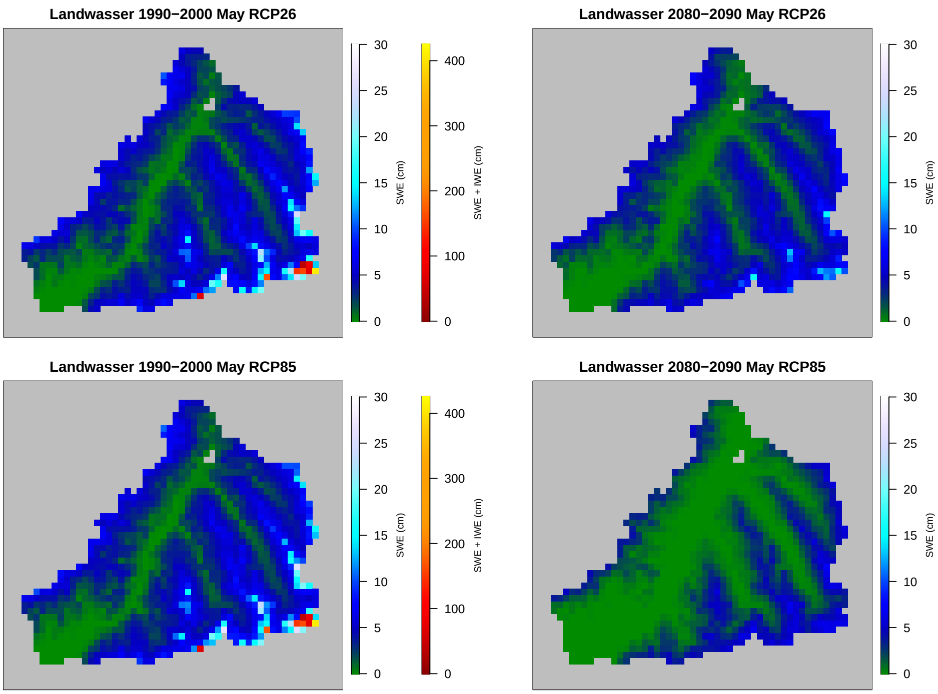

Figure S88. Average snow water equivalent (SWE) and ice water equivalent (IWE) over the Landwasser catchment for the month of May. Maps show the average between the 8 model chains used (see Table 2 in the main paper). For glacierized pixels, SWE and IWE are summed. Top: RCP2.6. Bottom: RCP8.5. Left: Reference period (1990-2000). Right: End of the century period (2080-2090).

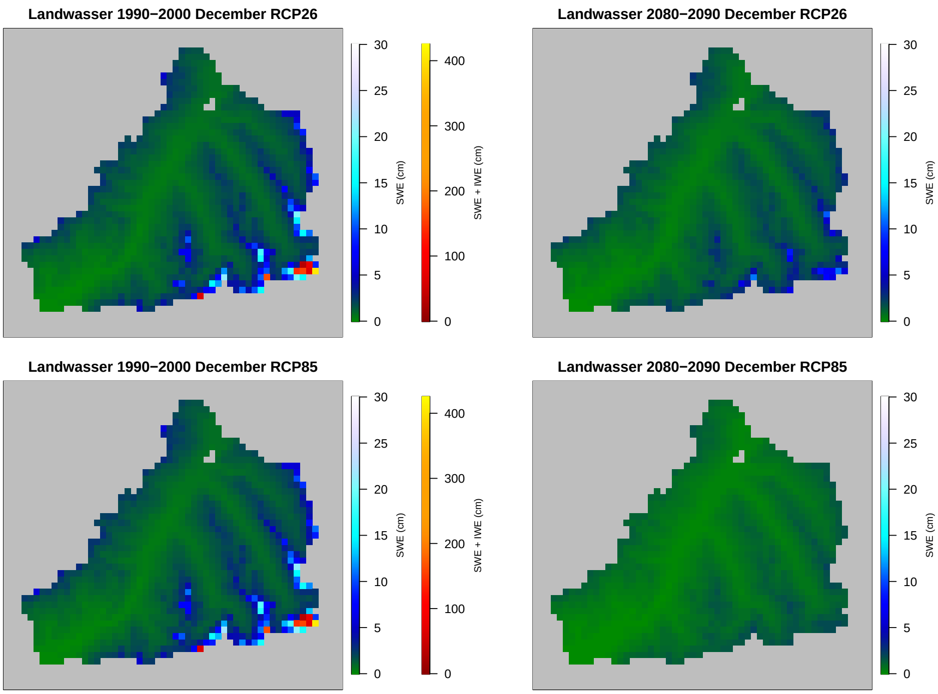

Figure S89. Average snow water equivalent (SWE) and ice water equivalent (IWE) over the Landwasser catchment for the month of December. Maps show the average between the 8 model chains used (see Table 2 in the main paper). For glacierized pixels, SWE and IWE are summed. Top: RCP2.6. Bottom: RCP8.5. Left: Reference period (1990-2000). Right: End of the century period (2080-2090).

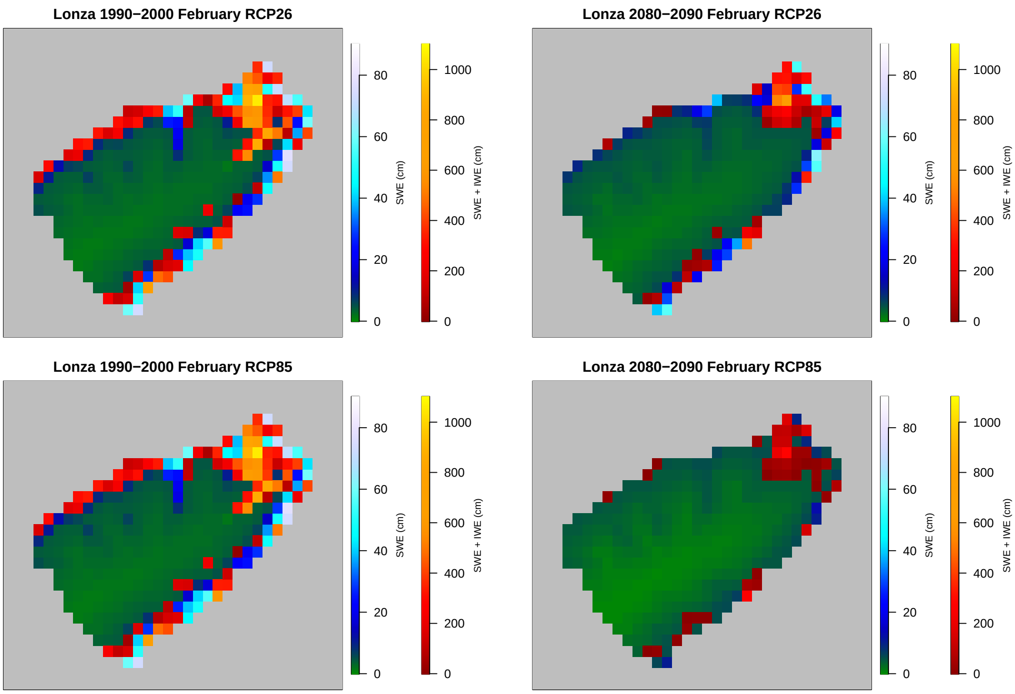

Figure S90. Average snow water equivalent (SWE) and ice water equivalent (IWE) over the Lonza catchment for the month of February. Maps show the average between the 8 model chains used (see Table 2 in the main paper). For glacierized pixels, SWE and IWE are summed. Top: RCP2.6. Bottom: RCP8.5. Left: Reference period (1990-2000). Right: End of the century period (2080-2090).

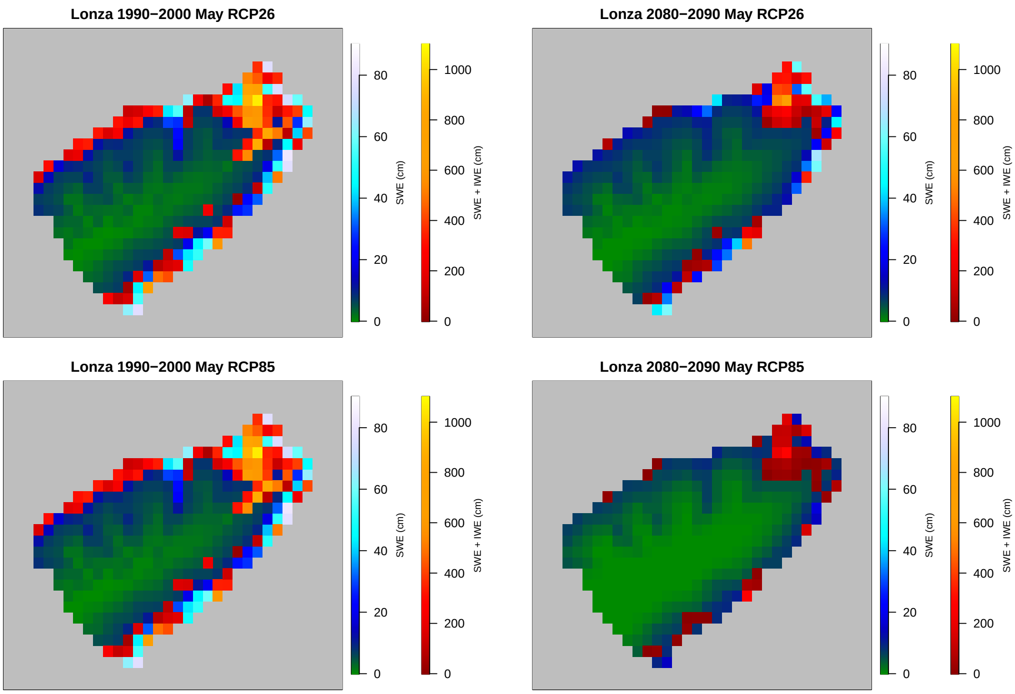

Figure S91. Average snow water equivalent (SWE) and ice water equivalent (IWE) over the Lonza catchment for the month of May. Maps show the average between the 8 model chains used (see Table 2 in the main paper). For glacierized pixels, SWE and IWE are summed. Top: RCP2.6. Bottom: RCP8.5. Left: Reference period (1990-2000). Right: End of the century period (2080-2090).

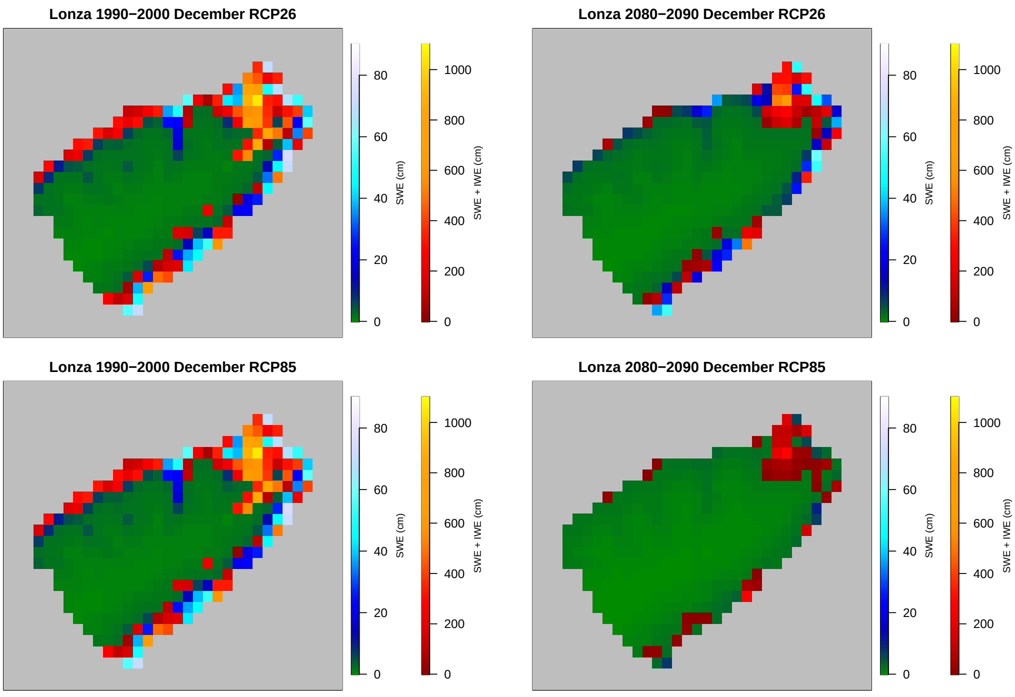

Figure S92. Average snow water equivalent (SWE) and ice water equivalent (IWE) over the Lonza catchment for the month of December. Maps show the average between the 8 model chains used (see Table 2 in the main paper). For glacierized pixels, SWE and IWE are summed. Top: RCP2.6. Bottom: RCP8.5. Left: Reference period (1990-2000). Right: End of the century period (2080-2090).

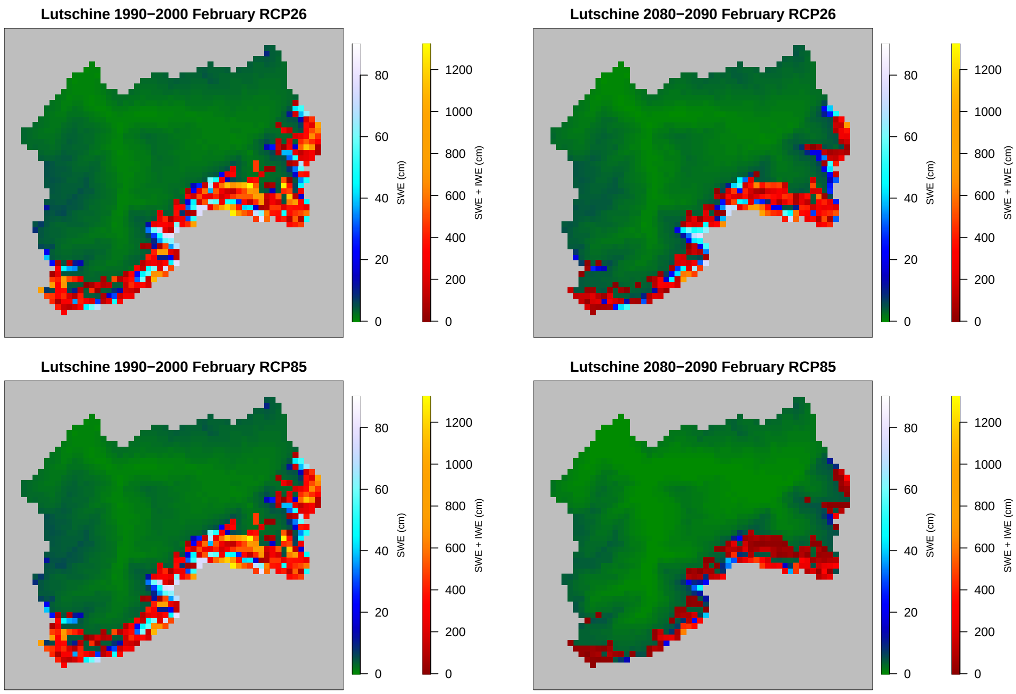

Figure S93. Average snow water equivalent (SWE) and ice water equivalent (IWE) over the Lutschine catchment for the month of February. Maps show the average between the 8 model chains used (see Table 2 in the main paper). For glacierized pixels, SWE and IWE are summed. Top: RCP2.6. Bottom: RCP8.5. Left: Reference period (1990-2000). Right: End of the century period (2080-2090).

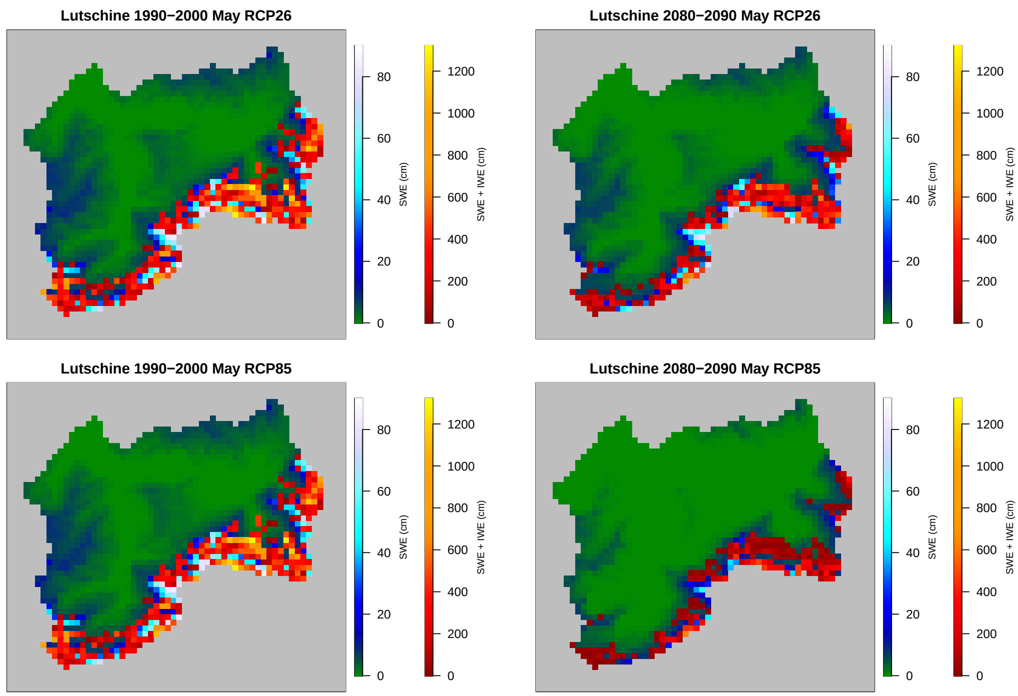

Figure S94. Average snow water equivalent (SWE) and ice water equivalent (IWE) over the Lutschine catchment for the month of May. Maps show the average between the 8 model chains used (see Table 2 in the main paper). For glacierized pixels, SWE and IWE are summed. Top: RCP2.6. Bottom: RCP8.5. Left: Reference period (1990-2000). Right: End of the century period (2080-2090).

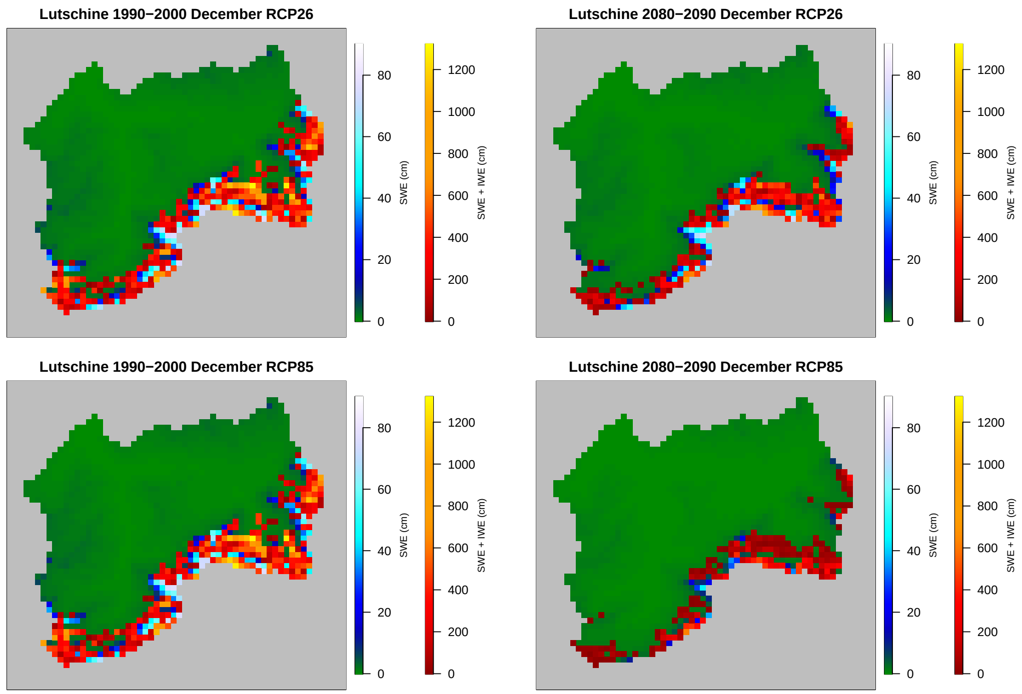

Figure S95. Average snow water equivalent (SWE) and ice water equivalent (IWE) over the Lutschine catchment for the month of December. Maps show the average between the 8 model chains used (see Table 2 in the main paper). For glacierized pixels, SWE and IWE are summed. Top: RCP2.6. Bottom: RCP8.5. Left: Reference period (1990-2000). Right: End of the century period (2080-2090).

S10.3 Miscellaneous

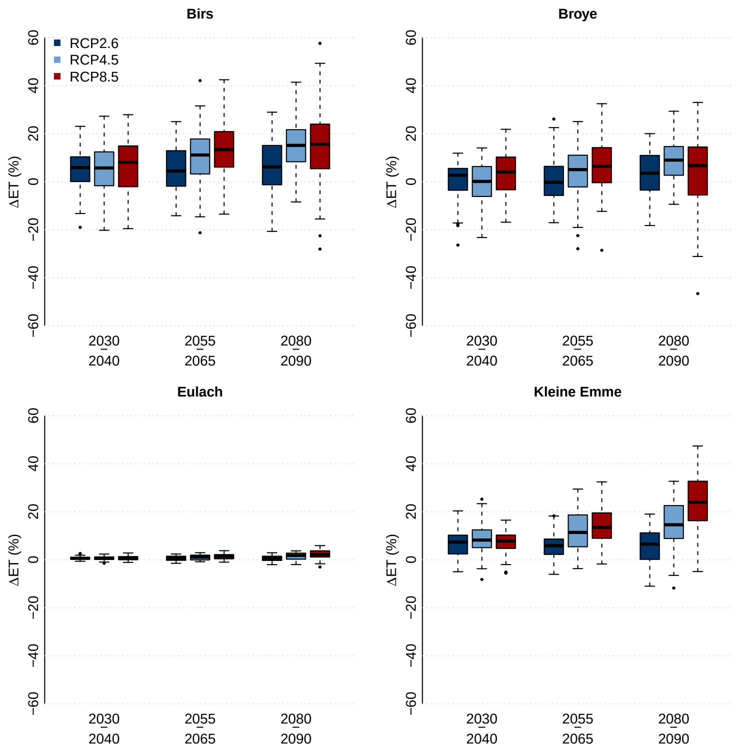

Figure S96. Relative changes in evapo-transpiration (ΔET) over the periods 2030-2040, 2055-2065, and 2080-2090, compared to the reference period 1990-2000 for 3 RCPs and for 4 catchments of the Swiss Plateau region. These 4 catchments were chosen to represent the variation in Swiss Plateau catchment type.

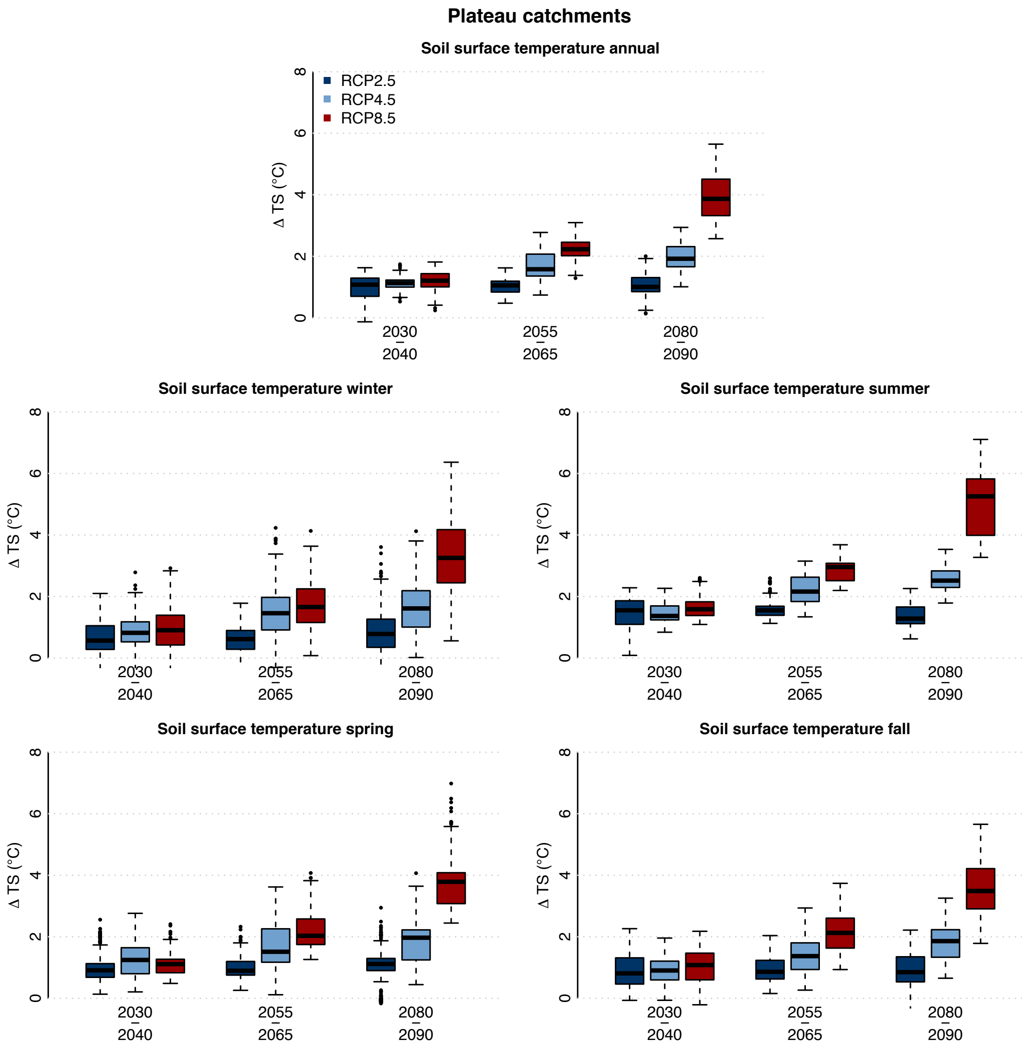

Figure S97. Annual and seasonal change in soil surface temperature over the periods 2030-2040, 2055-2065, and 2080-2090, compared to the reference period 1990-2000 for the Swiss Plateau catchments and the 3 RCPs.

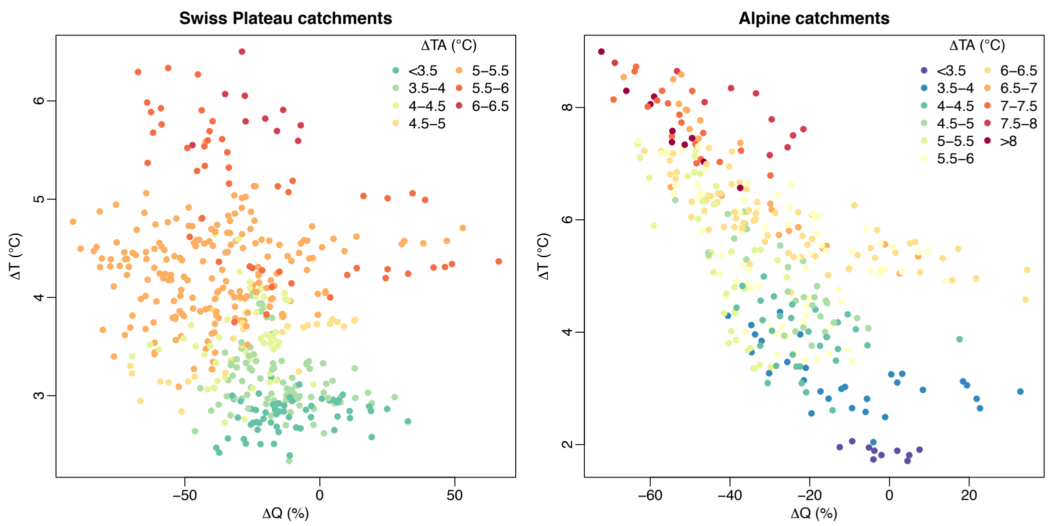

Figure S98. Changes in water temperature (ΔT) versus changes in discharge (ΔQ) during the summer season for the period 2080-2090 compared to the reference period 1990-2000 for RCP8.5 emission scenarios and for all considered Swiss Plateau catchments (left) and Alpine catchments (right). Colors indicate the corresponding change in air temperature (ΔTA).

S10.4 Tables

Table S9. Change of annual and seasonal mean water temperature for 3 periods and 3 RCPs compared to the reference period 1990-2000. The median value of all years and scenarios is indicated along with the range of the values.

Catchment	Season	△ Water temperature (°C) 2030-2040 RCP2.6	2030-2040 RCP4.5	2030-2040 RCP 8.5	2055-2065 RCP2.6	2055-2065 RCP4.5	2055-2065 RCP 8.5	2080-2090 RCP2.6	2080-2090 RCP4.5	2080-2090 RCP 8.5
Plateau	Annual	+1.0 [-0.0/+1.7]	+1.0 [+0.5/+1.6]	+1.2 [+0.3/+1.7]	+1.0 [+0.3/+1.5]	+1.5 [+0.8/+2.4]	+2.1 [+1.2/+2.8]	+0.9 [+0.1/+1.9]	+1.8 [+0.8/+2.9]	+3.5 [+2.1/+5.3]
	DJF	+0.7 [-0.5/+2.0]	+0.8 [-0.2/+1.7]	+1.1 [-0.2/+2.4]	+0.7 [-0.2/+1.5]	+1.4 [+0.0/+3.1]	+1.8 [+0.2/+3.4]	+0.9 [-0.1/+2.4]	+1.7 [+0.0/+3.3]	+3.0 [+0.5/+5.3]
	MAM	+0.8 [-0.3/+1.7]	+1.0 [+0.1/+2.1]	+1.0 [+0.3/+2.0]	+0.9 [+0.0/+1.8]	+1.4 [+0.3/+3.1]	+1.9 [+1.0/+3.2]	+1.0 [-0.2/+2.9]	+1.6 [+0.2/+3.1]	+3.4 [+1.8/+5.4]
	JJA	+1.1 [-0.1/+2.2]	+1.1 [+0.4/+2.5]	+1.2 [+0.5/+2.1]	+1.0 [+0.5/+2.1]	+1.8 [+0.7/+3.4]	+2.1 [+1.1/+4.1]	+1.0 [-0.1/+2.3]	+1.9 [+0.8/+4.0]	+3.8 [+2.3/+6.5]
	SON	+0.9 [+0.1/+2.4]	+1.1 [+0.5/+1.8]	+1.1 [+0.3/+2.6]	+1.1 [+0.4/+2.2]	+1.5 [+0.6/+2.9]	+2.3 [+1.4/+3.7]	+1.0 [+0.4/+2.5]	+1.9 [+1.1/+3.0]	+3.7 [+2.3/+6.1]
Birs	Annual	+1.0 [+0.2/+1.3]	+1.0 [+0.8/+1.3]	+1.2 [+0.5/+1.5]	+1.0 [+0.5/+1.2]	+1.4 [+1.0/+2.1]	+2.0 [+1.4/+2.4]	+0.9 [+0.4/+1.5]	+1.8 [+1.2/+2.4]	+3.3 [+2.5/+4.4]
	DJF	+1.0 [+0.5/+1.4]	+1.0 [+0.7/+1.2]	+1.3 [+0.4/+1.8]	+0.9 [+0.3/+1.2]	+1.6 [+0.9/+2.5]	+2.0 [+1.5/+2.6]	+1.0 [+0.2/+1.7]	+2.0 [+1.2/+2.5]	+3.5 [+2.2/+4.6]
	MAM	+0.8 [+0.1/+1.1]	+0.9 [+0.4/+1.5]	+0.9 [+0.4/+1.3]	+0.8 [+0.2/+1.2]	+1.2 [+0.7/+2.0]	+1.8 [+1.3/+2.2]	+0.9 [+0.1/+1.8]	+1.5 [+0.8/+2.0]	+3.2 [+2.1/+3.8]
	JJA	+1.1 [+0.1/+1.4]	+1.0 [+0.5/+1.7]	+1.1 [+0.7/+1.6]	+0.9 [+0.5/+1.4]	+1.7 [+0.9/+2.3]	+1.8 [+1.3/+2.8]	+1.0 [+0.2/+1.3]	+1.8 [+1.1/+2.6]	+3.7 [+2.5/+4.6]
	SON	+0.9 [+0.2/+1.8]	+1.1 [+0.7/+1.3]	+1.1 [+0.4/+2.0]	+1.1 [+0.5/+1.6]	+1.4 [+0.6/+2.3]	+2.2 [+1.5/+2.8]	+1.0 [+0.4/+1.8]	+1.7 [+1.2/+2.6]	+3.4 [+2.6/+5.1]
Broye	Annual	+1.1 [+0.0/+1.6]	+1.1 [+0.7/+1.4]	+1.2 [+0.5/+1.7]	+1.0 [+0.5/+1.3]	+1.5 [+0.9/+2.3]	+2.2 [+1.4/+2.6]	+1.0 [+0.3/+1.7]	+1.8 [+1.1/+2.5]	+3.6 [+2.6/+4.7]
	DJF	+0.8 [-0.5/+2.0]	+0.9 [-0.2/+1.7]	+1.2 [+0.1/+2.4]	+0.7 [-0.2/+1.5]	+1.5 [+0.5/+3.1]	+1.8 [+0.9/+3.4]	+0.9 [-0.1/+2.4]	+1.9 [+0.7/+3.3]	+3.3 [+1.8/+5.3]
	MAM	+0.8 [+0.1/+1.3]	+1.0 [+0.2/+1.9]	+0.9 [+0.4/+1.4]	+0.9 [+0.2/+1.4]	+1.4 [+0.5/+2.5]	+1.8 [+1.2/+2.9]	+1.1 [-0.0/+2.1]	+1.5 [+0.6/+2.4]	+3.5 [+1.8/+4.6]
	JJA	+1.3 [+0.1/+1.8]	+1.2 [+0.8/+2.1]	+1.2 [+0.9/+1.7]	+1.1 [+0.7/+1.7]	+1.9 [+1.2/+2.6]	+2.1 [+1.5/+3.4]	+1.1 [+0.1/+1.8]	+2.0 [+1.2/+2.9]	+4.4 [+2.8/+4.9]
	SON	+1.0 [+0.2/+2.3]	+1.3 [+0.7/+1.6]	+1.1 [+0.5/+2.5]	+1.2 [+0.6/+1.9]	+1.5 [+0.7/+2.8]	+2.6 [+1.9/+3.4]	+1.1 [+0.4/+2.1]	+2.0 [+1.6/+3.0]	+3.8 [+3.2/+5.8]
Ergolz	Annual	+1.0 [+0.2/+1.3]	+1.0 [+0.7/+1.2]	+1.1 [+0.5/+1.4]	+0.9 [+0.5/+1.2]	+1.3 [+0.9/+2.1]	+1.9 [+1.4/+2.4]	+0.9 [+0.4/+1.5]	+1.7 [+1.1/+2.3]	+3.2 [+2.3/+4.4]
	DJF	+0.7 [+0.3/+1.4]	+0.8 [+0.5/+1.1]	+1.2 [+0.3/+1.7]	+0.8 [+0.2/+1.2]	+1.5 [+0.6/+2.4]	+1.8 [+1.1/+2.6]	+0.9 [+0.1/+1.7]	+1.7 [+0.9/+2.4]	+3.3 [+1.8/+4.4]
	MAM	+0.8 [-0.0/+1.2]	+0.9 [+0.4/+1.3]	+0.9 [+0.4/+1.3]	+0.8 [+0.2/+1.2]	+1.2 [+0.7/+2.0]	+1.8 [+1.3/+2.2]	+1.0 [-0.0/+1.7]	+1.5 [+0.8/+2.0]	+3.2 [+1.9/+3.9]
	JJA	+1.0 [+0.2/+1.3]	+1.0 [+0.5/+1.6]	+1.2 [+0.7/+1.3]	+0.9 [+0.6/+1.3]	+1.5 [+0.9/+2.2]	+1.9 [+1.3/+2.4]	+1.0 [+0.3/+1.2]	+1.9 [+1.1/+2.4]	+3.4 [+2.5/+4.4]
	SON	+0.9 [+0.1/+2.0]	+1.0 [+0.7/+1.2]	+1.0 [+0.4/+2.1]	+1.1 [+0.5/+1.7]	+1.3 [+0.6/+2.4]	+2.1 [+1.5/+2.9]	+0.9 [+0.4/+1.9]	+1.7 [+1.2/+2.6]	+3.4 [+2.5/+5.1]

Catchment	Season	△ Water temperature (°C)								
		2030-2040			2055-2065			2080-2090		
		RCP2.6	RCP4.5	RCP 8.5	RCP2.6	RCP4.5	RCP 8.5	RCP2.6	RCP4.5	RCP 8.5
Eulach	Annual	+1.0 [-0.0/+1.4]	+1.0 [+0.6/+1.2]	+1.0 [+0.3/+1.6]	+1.0 [+0.4/+1.3]	+1.4 [+0.8/+2.3]	+1.9 [+1.2/+2.6]	+0.9 [+0.3/+1.6]	+1.6 [+1.0/+2.4]	+3.2 [+2.4/+4.6]
	DJF	+0.8 [+0.1/+1.5]	+0.9 [+0.4/+1.2]	+1.2 [+0.0/+1.9]	+0.8 [+0.0/+1.2]	+1.5 [+0.4/+2.7]	+1.9 [+0.7/+2.9]	+0.8 [-0.0/+1.8]	+1.9 [+0.7/+2.8]	+3.3 [+1.7/+4.7]
	MAM	+0.9 [-0.3/+1.3]	+1.0 [+0.1/+1.4]	+1.0 [+0.3/+1.3]	+0.9 [+0.0/+1.3]	+1.3 [+0.3/+2.0]	+1.8 [+1.3/+2.3]	+1.1 [-0.0/+1.7]	+1.7 [+0.7/+2.2]	+3.4 [+1.9/+4.0]
	JJA	+1.0 [+0.1/+1.4]	+0.9 [+0.4/+1.6]	+1.1 [+0.6/+1.6]	+1.0 [+0.5/+1.4]	+1.3 [+0.7/+2.3]	+1.8 [+1.1/+2.6]	+0.9 [+0.3/+1.4]	+1.9 [+1.1/+2.7]	+3.2 [+2.4/+4.7]
	SON	+0.9 [+0.1/+2.0]	+1.0 [+0.7/+1.4]	+1.1 [+0.3/+2.0]	+1.2 [+0.4/+1.6]	+1.3 [+0.7/+2.4]	+2.3 [+1.5/+3.0]	+1.0 [+0.5/+2.0]	+1.7 [+1.2/+2.6]	+3.3 [+2.5/+5.1]
Kleine Emme	Annual	+1.1 [+0.3/+1.7]	+1.2 [+0.7/+1.5]	+1.3 [+0.7/+1.7]	+1.0 [+0.7/+1.5]	+1.7 [+1.0/+2.4]	+2.4 [+1.6/+2.8]	+1.1 [+0.4/+1.9]	+2.0 [+1.3/+2.9]	+4.2 [+2.8/+5.3]
	DJF	+0.6 [+0.2/+1.1]	+0.6 [+0.4/+1.1]	+0.9 [+0.2/+1.6]	+0.6 [+0.3/+1.1]	+1.2 [+0.5/+2.5]	+1.5 [+0.9/+2.7]	+0.7 [+0.1/+1.7]	+1.5 [+0.6/+2.7]	+2.9 [+1.6/+4.2]
	MAM	+0.8 [+0.1/+1.7]	+1.3 [+0.4/+2.1]	+1.2 [+0.5/+1.7]	+1.1 [+0.2/+1.8]	+1.8 [+0.5/+3.1]	+2.4 [+1.3/+3.2]	+1.5 [-0.1/+2.9]	+2.1 [+0.6/+3.1]	+4.4 [+2.3/+5.4]
	JJA	+1.6 [+0.5/+2.2]	+1.6 [+1.2/+2.5]	+1.6 [+1.1/+2.1]	+1.3 [+0.8/+2.1]	+2.5 [+1.4/+3.4]	+2.6 [+1.9/+4.1]	+1.3 [+0.3/+2.3]	+2.5 [+1.6/+4.0]	+5.0 [+3.6/+6.5]
	SON	+0.9 [+0.3/+2.4]	+1.2 [+0.6/+1.8]	+1.1 [+0.5/+2.6]	+1.2 [+0.6/+2.2]	+1.5 [+0.6/+2.9]	+2.6 [+1.7/+3.7]	+1.0 [+0.4/+2.5]	+2.0 [+1.6/+2.9]	+4.2 [+3.2/+6.1]
RHB	Annual	+1.0 [+0.3/+1.5]	+1.1 [+0.5/+1.6]	+1.1 [+0.5/+1.6]	+1.0 [+0.5/+1.4]	+1.4 [+0.8/+2.4]	+2.1 [+1.4/+2.7]	+0.9 [+0.3/+1.8]	+1.7 [+1.0/+2.6]	+3.6 [+2.2/+5.0]
	DJF	+0.4 [-0.0/+1.2]	+0.5 [-0.1/+1.3]	+0.7 [-0.2/+1.6]	+0.5 [-0.1/+1.1]	+1.1 [+0.0/+2.5]	+1.2 [+0.2/+2.8]	+0.5 [-0.1/+1.9]	+1.2 [+0.0/+2.7]	+2.4 [+0.5/+4.6]
	MAM	+0.9 [-0.0/+1.7]	+1.2 [+0.2/+2.0]	+1.1 [+0.4/+1.6]	+1.0 [+0.4/+1.7]	+1.5 [+0.3/+2.6]	+2.1 [+1.0/+3.0]	+1.3 [-0.2/+2.2]	+1.8 [+0.2/+2.6]	+3.8 [+2.0/+4.8]
	JJA	+1.2 [+0.3/+1.7]	+1.2 [+0.6/+2.0]	+1.4 [+0.9/+1.6]	+1.1 [+0.6/+1.6]	+1.7 [+1.1/+2.6]	+2.1 [+1.6/+3.0]	+1.3 [+0.4/+1.5]	+2.3 [+1.4/+3.0]	+4.2 [+3.1/+5.2]
	SON	+1.0 [+0.3/+2.3]	+1.1 [+0.6/+1.8]	+1.2 [+0.4/+2.4]	+1.3 [+0.7/+1.9]	+1.5 [+0.7/+2.7]	+2.5 [+1.9/+3.4]	+1.0 [+0.6/+2.2]	+2.0 [+1.6/+3.0]	+3.9 [+3.1/+5.8]
Suze	Annual	+0.9 [+0.1/+1.4]	+1.1 [+0.5/+1.4]	+1.1 [+0.5/+1.5]	+0.9 [+0.3/+1.2]	+1.5 [+0.8/+2.1]	+2.1 [+1.2/+2.5]	+0.9 [+0.1/+1.6]	+1.7 [+0.8/+2.5]	+3.3 [+2.1/+4.4]
	DJF	+0.7 [+0.2/+1.3]	+0.8 [+0.2/+1.3]	+1.1 [+0.3/+1.6]	+0.8 [+0.2/+1.2]	+1.4 [+0.3/+2.2]	+1.8 [+0.6/+2.4]	+0.9 [+0.1/+1.6]	+1.6 [+0.4/+2.5]	+3.1 [+1.5/+4.2]
	MAM	+0.9 [-0.1/+1.4]	+1.1 [+0.2/+1.9]	+1.1 [+0.3/+2.0]	+0.9 [+0.0/+1.5]	+1.5 [+0.8/+2.5]	+2.1 [+1.1/+2.8]	+0.9 [-0.1/+2.1]	+1.7 [+0.5/+2.7]	+3.4 [+1.9/+4.7]
	JJA	+1.1 [-0.1/+1.5]	+1.2 [+0.7/+2.0]	+1.1 [+0.5/+1.7]	+0.8 [+0.5/+1.4]	+1.9 [+0.8/+2.6]	+2.1 [+1.2/+3.1]	+0.8 [-0.1/+1.8]	+1.8 [+0.8/+2.8]	+3.8 [+2.3/+5.1]
	SON	+0.9 [+0.1/+1.7]	+1.1 [+0.5/+1.4]	+1.0 [+0.5/+1.9]	+0.9 [+0.4/+1.6]	+1.3 [+0.7/+2.3]	+2.1 [+1.4/+2.8]	+0.9 [+0.4/+1.7]	+1.7 [+1.1/+2.8]	+3.4 [+2.3/+5.0]
Alpine	Annual	+0.7 [+0.1/+1.6]	+0.8 [+0.3/+1.4]	+0.9 [+0.4/+1.7]	+0.8 [+0.3/+1.5]	+1.3 [+0.4/+2.4]	+1.8 [+0.8/+3.1]	+0.9 [-0.0/+1.8]	+1.6 [+0.5/+2.8]	+3.2 [+1.4/+5.3]
	DJF	+0.3 [-0.4/+1.4]	+0.4 [-0.1/+1.2]	+0.5 [-0.1/+1.7]	+0.4 [-0.1/+1.2]	+0.6 [-0.1/+2.4]	+0.9 [+0.0/+2.8]	+0.4 [-0.5/+1.9]	+0.7 [+0.1/+2.9]	+1.4 [+0.2/+5.1]
	MAM	+0.3 [-0.3/+0.9]	+0.4 [-0.2/+1.1]	+0.4 [-0.2/+1.1]	+0.3 [-0.2/+1.0]	+0.7 [-0.3/+1.9]	+1.0 [+0.0/+2.2]	+0.4 [-0.4/+1.6]	+0.8 [-0.2/+1.7]	+1.9 [+0.4/+4.3]
	JJA	+1.2 [+0.4/+3.1]	+1.5 [+0.4/+3.1]	+1.5 [+0.4/+3.1]	+1.3 [+0.4/+2.9]	+2.3 [+0.5/+4.2]	+2.9 [+0.9/+5.8]	+1.4 [+0.1/+3.6]	+2.6 [+0.6/+5.2]	+5.4 [+1.7/+9.0]
	SON	+1.0 [+0.1/+2.4]	+1.0 [+0.2/+1.7]	+1.1 [+0.2/+2.4]	+1.1 [+0.1/+2.2]	+1.6 [+0.3/+3.2]	+2.3 [+1.0/+3.8]	+1.1 [+0.1/+2.3]	+2.0 [+1.0/+3.7]	+4.0 [+2.0/+6.5]

Catchment	Season	△ Water temperature (°C)								
			2030-2040			2055-2065			2080-2090	
		RCP2.6	RCP4.5	RCP 8.5	RCP2.6	RCP4.5	RCP 8.5	RCP2.6	RCP4.5	RCP 8.5
Inn	Annual	+0.8 [+0.3/+1.3]	+0.9 [+0.5/+1.3]	+0.8 [+0.6/+1.4]	+0.8 [+0.5/+1.2]	+1.3 [+0.7/+2.1]	+1.8 [+0.9/+2.6]	+0.8 [+0.2/+1.3]	+1.5 [+0.5/+2.3]	+3.1 [+2.1/+4.6]
	DJF	+0.1 [-0.0/+0.4]	+0.1 [+0.0/+0.4]	+0.1 [-0.0/+0.6]	+0.1 [-0.0/+0.3]	+0.2 [+0.0/+0.6]	+0.2 [+0.1/+0.6]	+0.1 [-0.0/+0.5]	+0.2 [+0.1/+0.7]	+0.5 [+0.2/+1.3]
	MAM	+0.3 [-0.2/+0.8]	+0.4 [+0.1/+1.1]	+0.3 [-0.0/+0.9]	+0.3 [-0.0/+0.7]	+0.6 [-0.1/+1.4]	+0.8 [+0.0/+1.7]	+0.4 [-0.2/+1.0]	+0.6 [-0.0/+1.4]	+1.6 [+0.4/+4.3]
	JJA	+1.6 [+0.4/+3.1]	+1.9 [+0.8/+3.1]	+1.8 [+1.0/+3.1]	+1.6 [+0.7/+2.6]	+2.9 [+1.1/+4.1]	+3.6 [+1.4/+5.8]	+1.6 [+0.1/+3.6]	+3.1 [+0.7/+5.2]	+6.3 [+3.5/+9.0]
	SON	+0.9 [+0.4/+2.3]	+1.0 [+0.5/+1.7]	+1.1 [+0.5/+2.3]	+1.1 [+0.4/+2.2]	+1.8 [+0.5/+3.2]	+2.4 [+1.4/+3.8]	+1.1 [+0.4/+2.3]	+2.0 [+1.1/+3.6]	+3.6 [+2.8/+6.2]
Kander	Annual	+0.6 [+0.3/+0.9]	+0.7 [+0.3/+0.9]	+0.7 [+0.4/+1.1]	+0.7 [+0.3/+1.2]	+1.2 [+0.5/+1.8]	+1.6 [+0.8/+2.5]	+0.7 [+0.3/+1.4]	+1.4 [+0.7/+2.4]	+2.9 [+1.4/+4.3]
	DJF	+0.4 [+0.1/+0.6]	+0.4 [+0.1/+0.6]	+0.5 [+0.1/+0.8]	+0.4 [+0.2/+0.6]	+0.6 [+0.2/+1.2]	+0.9 [+0.5/+1.4]	+0.5 [+0.1/+0.9]	+0.7 [+0.3/+1.4]	+1.4 [+0.6/+2.5]
	MAM	+0.3 [-0.0/+0.6]	+0.5 [-0.1/+0.7]	+0.4 [-0.0/+0.7]	+0.4 [-0.2/+0.8]	+0.7 [+0.1/+1.4]	+1.0 [+0.1/+1.7]	+0.5 [+0.1/+1.2]	+0.8 [+0.1/+1.5]	+1.9 [+0.7/+3.4]
	JJA	+1.0 [+0.4/+1.6]	+1.2 [+0.7/+1.7]	+1.1 [+0.8/+1.8]	+1.1 [+0.5/+2.1]	+2.0 [+0.7/+3.0]	+2.6 [+1.1/+4.2]	+1.2 [+0.2/+2.4]	+2.3 [+1.0/+4.4]	+4.8 [+2.0/+7.2]
	SON	+0.5 [+0.1/+1.4]	+0.8 [+0.2/+1.1]	+0.8 [+0.2/+1.5]	+0.8 [+0.1/+1.7]	+1.2 [+0.3/+2.1]	+1.9 [+1.0/+3.0]	+0.9 [+0.1/+1.9]	+1.6 [+1.0/+2.6]	+3.2 [+2.0/+5.4]
Landwasser	Annual	+1.0 [+0.3/+1.6]	+1.1 [+0.6/+1.4]	+1.2 [+0.6/+1.7]	+1.0 [+0.6/+1.5]	+1.7 [+0.5/+2.4]	+2.2 [+1.1/+3.1]	+1.1 [+0.2/+1.8]	+1.9 [+0.9/+2.8]	+3.9 [+2.3/+5.3]
	DJF	+0.4 [-0.1/+0.7]	+0.4 [-0.0/+0.8]	+0.5 [-0.0/+1.0]	+0.4 [+0.1/+0.7]	+0.7 [+0.1/+1.4]	+0.9 [+0.3/+1.5]	+0.4 [+0.0/+1.0]	+0.8 [+0.2/+1.6]	+1.7 [+0.9/+2.7]
	MAM	+0.4 [-0.3/+0.9]	+0.5 [-0.2/+1.0]	+0.5 [-0.2/+1.1]	+0.4 [-0.0/+1.0]	+0.8 [-0.3/+1.8]	+1.1 [+0.1/+2.2]	+0.6 [-0.4/+1.5]	+0.9 [-0.2/+1.7]	+2.2 [+0.9/+4.3]
	JJA	+1.8 [+0.8/+2.7]	+2.1 [+1.3/+2.9]	+2.1 [+1.6/+2.8]	+1.9 [+1.3/+2.9]	+3.2 [+0.9/+4.2]	+3.9 [+2.0/+5.1]	+2.0 [+0.2/+3.2]	+3.5 [+1.3/+5.1]	+6.8 [+3.7/+8.6]
	SON	+1.2 [+0.2/+2.4]	+1.4 [+0.8/+1.7]	+1.3 [+0.7/+2.4]	+1.5 [+0.8/+2.1]	+1.9 [+0.8/+3.2]	+2.9 [+1.8/+3.7]	+1.4 [+0.6/+2.3]	+2.2 [+1.5/+3.7]	+4.5 [+3.4/+6.5]
Lonza	Annual	+0.8 [+0.1/+1.2]	+0.8 [+0.5/+1.1]	+0.9 [+0.6/+1.3]	+0.8 [+0.4/+1.3]	+1.3 [+0.4/+1.9]	+1.8 [+0.8/+2.6]	+0.9 [-0.0/+1.4]	+1.5 [+0.8/+2.5]	+3.1 [+1.6/+4.8]
	DJF	+0.3 [-0.4/+1.0]	+0.4 [-0.1/+0.9]	+0.5 [-0.1/+1.0]	+0.4 [-0.1/+1.0]	+0.5 [-0.1/+1.3]	+0.8 [+0.0/+1.7]	+0.3 [-0.5/+1.1]	+0.7 [+0.1/+1.5]	+1.1 [+0.3/+2.3]
	MAM	+0.3 [-0.1/+0.8]	+0.4 [+0.0/+0.7]	+0.4 [+0.0/+0.6]	+0.3 [+0.1/+0.7]	+0.6 [+0.0/+1.3]	+0.9 [+0.3/+1.4]	+0.4 [-0.3/+0.8]	+0.7 [+0.2/+1.3]	+1.7 [+0.7/+2.9]
	JJA	+1.3 [+0.4/+2.1]	+1.7 [+0.8/+2.4]	+1.6 [+0.9/+2.3]	+1.3 [+0.8/+2.3]	+2.5 [+0.8/+3.7]	+3.2 [+1.3/+4.6]	+1.4 [+0.1/+2.8]	+2.8 [+1.2/+5.0]	+5.6 [+2.6/+8.8]
	SON	+0.9 [+0.2/+1.9]	+0.9 [+0.6/+1.5]	+1.0 [+0.5/+1.9]	+1.0 [+0.5/+2.0]	+1.4 [+0.6/+2.4]	+2.2 [+1.2/+3.3]	+1.0 [+0.3/+1.9]	+1.8 [+1.1/+2.9]	+3.6 [+2.2/+5.9]
Lutschine	Annual	+0.7 [+0.3/+1.2]	+0.8 [+0.6/+1.1]	+0.9 [+0.4/+1.4]	+0.8 [+0.5/+1.2]	+1.3 [+0.7/+2.0]	+1.7 [+1.1/+2.3]	+0.8 [+0.4/+1.6]	+1.6 [+0.9/+2.4]	+3.3 [+1.9/+4.7]
	DJF	+0.6 [+0.1/+1.4]	+0.7 [+0.3/+1.2]	+1.0 [+0.1/+1.7]	+0.6 [+0.0/+1.2]	+1.3 [+0.5/+2.4]	+1.7 [+0.7/+2.8]	+0.6 [+0.1/+1.9]	+1.6 [+0.8/+2.9]	+3.0 [+1.6/+5.1]
	MAM	+0.4 [+0.1/+0.9]	+0.5 [+0.1/+1.0]	+0.5 [+0.1/+1.1]	+0.4 [-0.0/+1.0]	+0.8 [+0.3/+1.9]	+1.1 [+0.5/+1.9]	+0.6 [+0.0/+1.6]	+0.9 [+0.5/+1.6]	+2.2 [+1.2/+3.4]
	JJA	+0.7 [+0.4/+1.1]	+0.8 [+0.4/+1.3]	+0.8 [+0.4/+1.2]	+0.8 [+0.4/+1.2]	+1.4 [+0.5/+2.2]	+1.7 [+0.9/+2.4]	+1.0 [+0.2/+1.8]	+1.6 [+0.6/+3.2]	+3.7 [+1.7/+5.8]
	SON	+1.1 [+0.4/+1.8]	+1.1 [+0.7/+1.4]	+1.2 [+0.6/+1.8]	+1.2 [+0.6/+1.9]	+1.7 [+1.1/+2.4]	+2.4 [+1.6/+3.2]	+1.2 [+0.6/+2.2]	+2.0 [+1.5/+3.0]	+3.9 [+2.9/+5.6]

Table S10. Change of annual and seasonal mean air temperature for 3 periods and 3 RCPs compared to the reference period 1990-2000. The median value of all years and scenarios is indicated along with the range of the values.

Plateau	Annual	+1.3 [+0.4/+1.7]	+1.3 [+0.9/+1.8]	+1.4 [+0.6/+2.0]	+1.2 [+0.8/+1.6]	+1.9 [+1.4/+2.8]	+2.6 [+2.0/+3.3]	+1.2 [+0.7/+2.1]	+2.3 [+1.7/+3.1]	+4.5 [+3.1/+5.8]
	DJF	+1.2 [+0.3/+2.0]	+1.4 [+0.8/+2.2]	+1.9 [+0.6/+2.7]	+1.1 [+0.3/+1.9]	+2.3 [+1.3/+3.9]	+2.5 [+2.1/+4.0]	+1.2 [+0.4/+2.7]	+2.9 [+1.5/+4.0]	+4.6 [+2.8/+6.0]
	MAM	+1.0 [+0.1/+1.8]	+1.2 [+0.4/+2.3]	+1.0 [+0.5/+1.5]	+1.1 [+0.5/+1.9]	+1.7 [+0.4/+2.9]	+2.1 [+1.7/+3.6]	+1.5 [-0.1/+2.3]	+1.9 [+0.6/+2.8]	+3.9 [+2.5/+5.2]
	JJA	+1.5 [+0.3/+2.1]	+1.3 [+0.6/+2.4]	+1.5 [+1.2/+2.1]	+1.2 [+0.7/+2.1]	+2.2 [+1.4/+3.0]	+2.5 [+1.8/+3.7]	+1.3 [+0.5/+2.1]	+2.4 [+1.6/+3.5]	+5.1 [+3.1/+6.3]
	SON	+1.1 [-0.0/+2.5]	+1.3 [+0.6/+1.9]	+1.3 [+0.1/+2.7]	+1.2 [+0.6/+2.2]	+1.7 [+0.5/+2.9]	+2.7 [+1.6/+3.8]	+1.2 [+0.2/+2.7]	+2.2 [+1.4/+3.0]	+4.1 [+3.3/+6.6]
Birs	Annual	+1.3 [+0.4/+1.6]	+1.2 [+1.0/+1.5]	+1.4 [+0.7/+1.8]	+1.2 [+0.8/+1.4]	+1.7 [+1.4/+2.6]	+2.5 [+2.0/+2.8]	+1.1 [+0.7/+1.7]	+2.2 [+1.7/+2.9]	+4.0 [+3.4/+5.2]
	DJF	+1.3 [+0.6/+1.7]	+1.3 [+0.9/+1.5]	+1.8 [+0.6/+2.4]	+0.9 [+0.4/+1.6]	+2.3 [+1.5/+3.4]	+2.5 [+2.2/+3.3]	+1.3 [+0.4/+2.4]	+3.0 [+1.7/+3.3]	+4.6 [+2.9/+5.5]
	MAM	+0.9 [+0.1/+1.4]	+1.1 [+0.4/+1.9]	+1.0 [+0.6/+1.2]	+1.0 [+0.5/+1.4]	+1.6 [+0.5/+2.4]	+2.1 [+1.8/+2.8]	+1.4 [-0.1/+1.6]	+1.7 [+0.7/+2.2]	+3.7 [+2.5/+4.4]
	JJA	+1.4 [+0.3/+1.8]	+1.2 [+0.9/+2.1]	+1.4 [+1.2/+1.8]	+1.2 [+0.8/+1.7]	+2.1 [+1.4/+2.8]	+2.4 [+1.9/+3.4]	+1.3 [+0.5/+1.8]	+2.4 [+1.6/+3.3]	+5.1 [+3.3/+5.5]
	SON	+1.1 [+0.1/+2.4]	+1.4 [+0.7/+1.6]	+1.3 [+0.2/+2.7]	+1.2 [+0.6/+2.0]	+1.8 [+0.5/+2.9]	+2.7 [+1.7/+3.5]	+1.2 [+0.2/+2.3]	+2.1 [+1.4/+3.0]	+3.9 [+3.6/+6.3]
Broye	Annual	+1.3 [+0.4/+1.6]	+1.3 [+0.9/+1.5]	+1.4 [+0.7/+1.7]	+1.2 [+0.8/+1.3]	+1.7 [+1.5/+2.5]	+2.5 [+2.0/+2.8]	+1.1 [+0.7/+1.8]	+2.2 [+1.7/+2.8]	+4.0 [+3.3/+5.1]
	DJF	+1.2 [+0.6/+1.6]	+1.3 [+0.8/+1.5]	+1.8 [+0.6/+2.3]	+0.9 [+0.4/+1.7]	+2.3 [+1.4/+3.2]	+2.4 [+2.2/+3.3]	+1.3 [+0.5/+2.2]	+2.9 [+1.6/+3.2]	+4.5 [+2.9/+5.3]
	MAM	+1.0 [+0.1/+1.4]	+1.1 [+0.4/+2.0]	+1.0 [+0.7/+1.3]	+1.1 [+0.5/+1.4]	+1.7 [+0.5/+2.4]	+2.1 [+1.8/+2.9]	+1.5 [-0.1/+1.7]	+1.8 [+0.7/+2.3]	+3.9 [+2.6/+4.5]
	JJA	+1.4 [+0.3/+1.7]	+1.2 [+1.0/+2.0]	+1.4 [+1.2/+1.6]	+1.1 [+0.9/+1.7]	+2.1 [+1.4/+2.6]	+2.4 [+1.9/+3.3]	+1.3 [+0.5/+1.8]	+2.3 [+1.6/+3.1]	+5.1 [+3.1/+5.2]
	SON	+1.0 [+0.2/+2.4]	+1.4 [+0.7/+1.7]	+1.2 [+0.3/+2.6]	+1.2 [+0.6/+2.0]	+1.7 [+0.6/+2.8]	+2.6 [+1.8/+3.5]	+1.1 [+0.3/+2.3]	+2.1 [+1.6/+2.9]	+4.0 [+3.7/+6.1]
Ergolz	Annual	+1.3 [+0.4/+1.7]	+1.3 [+0.9/+1.6]	+1.4 [+0.6/+1.8]	+1.2 [+0.8/+1.5]	+1.8 [+1.4/+2.7]	+2.5 [+2.0/+3.0]	+1.1 [+0.7/+1.9]	+2.2 [+1.7/+2.9]	+4.1 [+3.3/+5.4]
	DJF	+1.4 [+0.6/+2.0]	+1.5 [+1.1/+1.8]	+1.9 [+0.6/+2.7]	+1.2 [+0.3/+1.7]	+2.2 [+1.6/+3.9]	+2.5 [+2.2/+3.8]	+1.2 [+0.5/+2.7]	+3.1 [+1.9/+3.8]	+4.6 [+2.9/+5.9]
	MAM	+0.9 [+0.1/+1.4]	+1.2 [+0.5/+1.7]	+1.0 [+0.5/+1.2]	+1.0 [+0.5/+1.4]	+1.7 [+0.5/+2.3]	+2.1 [+1.8/+2.8]	+1.5 [-0.1/+1.8]	+1.8 [+0.6/+2.1]	+3.8 [+2.5/+4.3]
	JJA	+1.4 [+0.3/+1.8]	+1.3 [+0.7/+2.0]	+1.5 [+1.3/+1.8]	+1.2 [+0.8/+1.7]	+2.0 [+1.5/+2.9]	+2.4 [+1.9/+3.3]	+1.3 [+0.6/+1.7]	+2.5 [+1.7/+3.5]	+4.9 [+3.3/+5.6]
	SON	+1.1 [+0.1/+2.4]	+1.4 [+0.6/+1.7]	+1.4 [+0.1/+2.7]	+1.2 [+0.7/+2.0]	+1.6 [+0.5/+2.9]	+2.5 [+1.7/+3.5]	+1.2 [+0.2/+2.4]	+2.1 [+1.4/+3.0]	+3.9 [+3.5/+6.4]
Eulach	Annual	+1.2 [+0.4/+1.6]	+1.3 [+0.9/+1.5]	+1.4 [+0.6/+1.8]	+1.1 [+0.8/+1.5]	+1.8 [+1.4/+2.7]	+2.4 [+2.0/+3.0]	+1.1 [+0.7/+1.9]	+2.1 [+1.7/+2.8]	+4.0 [+3.1/+5.3]
	DJF	+1.3 [+0.5/+1.9]	+1.5 [+1.0/+1.8]	+1.9 [+0.6/+2.4]	+1.2 [+0.3/+1.7]	+2.3 [+1.7/+3.9]	+2.4 [+2.2/+3.9]	+1.2 [+0.5/+2.5]	+3.1 [+1.9/+3.7]	+4.5 [+2.9/+5.7]
	MAM	+1.0 [+0.1/+1.3]	+1.3 [+0.5/+1.8]	+1.1 [+0.5/+1.3]	+1.0 [+0.5/+1.5]	+1.7 [+0.5/+2.4]	+2.1 [+1.7/+2.8]	+1.5 [-0.0/+1.9]	+2.0 [+0.7/+2.2]	+3.9 [+2.5/+4.4]
	JJA	+1.3 [+0.4/+1.7]	+1.2 [+0.6/+1.9]	+1.4 [+1.2/+1.7]	+1.1 [+0.7/+1.6]	+1.8 [+1.4/+2.6]	+2.2 [+1.8/+3.1]	+1.2 [+0.5/+1.5]	+2.3 [+1.6/+3.2]	+4.5 [+3.2/+5.2]
	SON	+1.1 [+0.0/+2.3]	+1.3 [+0.6/+1.6]	+1.3 [+0.1/+2.5]	+1.2 [+0.6/+1.9]	+1.5 [+0.5/+2.8]	+2.4 [+1.6/+3.4]	+1.1 [+0.3/+2.3]	+2.1 [+1.4/+2.8]	+3.8 [+3.3/+6.0]

Catchment	Season	Δ Air temperature (°C)								
			2030-2040			2055-2065			2080-2090	
		RCP2.6	RCP4.5	RCP 8.5	RCP2.6	RCP4.5	RCP 8.5	RCP2.6	RCP4.5	RCP 8.5
Kleine Emme	Annual	+1.3 [+0.5/+1.7]	+1.4 [+1.0/+1.7]	+1.5 [+0.8/+2.0]	+1.3 [+0.8/+1.6]	+1.9 [+1.5/+2.8]	+2.8 [+2.1/+3.3]	+1.2 [+0.7/+2.1]	+2.4 [+1.8/+3.1]	+4.7 [+3.6/+5.8]
	DJF	+1.2 [+0.3/+1.7]	+1.3 [+0.8/+1.7]	+1.9 [+0.6/+2.4]	+0.9 [+0.4/+1.8]	+2.3 [+1.5/+3.4]	+2.5 [+2.1/+3.6]	+1.3 [+0.6/+2.3]	+2.9 [+1.7/+3.8]	+4.6 [+3.2/+5.5]
	MAM	+1.1 [+0.1/+1.8]	+1.4 [+0.7/+2.2]	+1.1 [+0.7/+1.5]	+1.4 [+0.5/+1.7]	+2.0 [+0.4/+2.7]	+2.8 [+2.0/+3.3]	+1.9 [-0.0/+2.3]	+2.3 [+0.7/+2.8]	+4.9 [+2.8/+5.1]
	JJA	+1.7 [+0.4/+2.1]	+1.5 [+1.1/+2.4]	+1.6 [+1.4/+2.1]	+1.5 [+1.0/+2.1]	+2.3 [+1.6/+3.0]	+2.8 [+2.0/+3.7]	+1.4 [+0.6/+2.1]	+2.9 [+1.8/+3.4]	+5.1 [+4.0/+6.3]
	SON	+1.2 [+0.2/+2.5]	+1.3 [+0.6/+1.9]	+1.4 [+0.2/+2.6]	+1.4 [+0.6/+2.2]	+1.8 [+0.6/+2.9]	+2.8 [+1.9/+3.8]	+1.2 [+0.3/+2.7]	+2.3 [+1.7/+2.9]	+4.2 [+3.8/+6.6]
RHB	Annual	+1.3 [+0.6/+1.7]	+1.4 [+1.0/+1.8]	+1.6 [+0.7/+1.9]	+1.3 [+0.9/+1.6]	+2.0 [+1.6/+2.8]	+2.8 [+2.3/+3.2]	+1.2 [+0.8/+2.0]	+2.3 [+1.9/+3.1]	+4.5 [+3.5/+5.8]
	DJF	+1.2 [+0.3/+1.9]	+1.5 [+1.1/+2.2]	+2.1 [+0.7/+2.6]	+1.3 [+0.6/+1.9]	+2.9 [+1.9/+3.8]	+2.9 [+2.2/+4.0]	+1.2 [+0.6/+2.6]	+3.1 [+2.2/+4.0]	+5.0 [+3.2/+6.0]
	MAM	+1.1 [+0.2/+1.7]	+1.4 [+0.7/+2.3]	+1.3 [+0.8/+1.5]	+1.3 [+0.5/+1.9]	+2.2 [+0.5/+2.9]	+2.5 [+2.0/+3.6]	+1.8 [+0.1/+2.2]	+2.1 [+0.8/+2.8]	+4.5 [+3.1/+5.2]
	JJA	+1.5 [+0.4/+1.9]	+1.4 [+0.7/+2.2]	+1.5 [+1.4/+1.9]	+1.3 [+0.9/+1.9]	+2.0 [+1.6/+2.8]	+2.5 [+2.0/+3.3]	+1.4 [+0.6/+1.8]	+2.6 [+1.8/+3.4]	+5.2 [+3.8/+5.9]
	SON	+1.2 [-0.0/+2.4]	+1.3 [+0.7/+1.8]	+1.3 [+0.1/+2.6]	+1.3 [+0.7/+2.0]	+1.7 [+0.6/+2.8]	+2.6 [+1.7/+3.6]	+1.2 [+0.3/+2.4]	+2.3 [+1.5/+3.0]	+4.2 [+3.5/+6.4]
Suze	Annual	+1.3 [+0.5/+1.5]	+1.3 [+1.0/+1.5]	+1.4 [+0.8/+1.8]	+1.2 [+0.8/+1.4]	+1.7 [+1.5/+2.4]	+2.5 [+2.1/+2.9]	+1.2 [+0.7/+1.7]	+2.2 [+1.7/+3.0]	+4.0 [+3.5/+5.0]
	DJF	+1.3 [+0.7/+1.6]	+1.3 [+0.8/+1.5]	+1.8 [+0.7/+2.3]	+0.8 [+0.5/+1.6]	+2.2 [+1.3/+2.9]	+2.4 [+2.2/+2.9]	+1.2 [+0.5/+2.2]	+2.8 [+1.5/+3.1]	+4.5 [+2.8/+5.1]
	MAM	+1.0 [+0.1/+1.4]	+1.1 [+0.4/+2.1]	+1.0 [+0.6/+1.4]	+1.1 [+0.5/+1.5]	+1.5 [+0.6/+2.6]	+2.1 [+1.9/+3.1]	+1.4 [-0.1/+1.7]	+1.7 [+0.7/+2.6]	+3.8 [+2.6/+4.8]
	JJA	+1.5 [+0.3/+1.8]	+1.3 [+1.1/+2.1]	+1.5 [+1.3/+1.7]	+1.2 [+0.8/+1.8]	+2.2 [+1.5/+2.8]	+2.6 [+2.0/+3.5]	+1.3 [+0.5/+2.0]	+2.4 [+1.7/+3.4]	+5.3 [+3.3/+5.5]
	SON	+1.0 [+0.2/+2.5]	+1.4 [+0.7/+1.8]	+1.2 [+0.3/+2.7]	+1.2 [+0.6/+2.1]	+1.8 [+0.6/+2.9]	+2.8 [+1.8/+3.5]	+1.2 [+0.3/+2.3]	+2.2 [+1.6/+3.0]	+4.1 [+3.8/+6.2]
Alpine	Annual	+1.4 [+0.5/+2.1]	+1.5 [+1.1/+2.0]	+1.7 [+0.9/+2.5]	+1.5 [+0.7/+2.2]	+2.3 [+1.3/+3.3]	+3.1 [+2.0/+4.1]	+1.4 [+0.5/+2.7]	+2.7 [+1.7/+3.7]	+5.1 [+3.4/+6.8]
	DJF	+1.2 [+0.4/+1.8]	+1.3 [+0.9/+1.8]	+1.8 [+0.4/+2.7]	+1.1 [+0.1/+1.8]	+2.0 [+1.3/+3.5]	+2.5 [+2.0/+3.6]	+1.1 [-0.0/+2.6]	+2.5 [+1.4/+3.8]	+4.2 [+3.1/+5.7]
	MAM	+1.2 [+0.0/+2.2]	+1.4 [+0.8/+2.3]	+1.3 [+0.6/+2.1]	+1.2 [+0.2/+2.0]	+2.0 [+0.6/+3.2]	+2.9 [+2.1/+3.8]	+1.7 [-0.2/+2.7]	+2.4 [+0.7/+3.0]	+4.8 [+3.0/+7.3]
	JJA	+1.9 [+0.6/+2.7]	+2.0 [+1.3/+3.2]	+2.0 [+1.4/+3.1]	+1.8 [+1.1/+3.3]	+3.0 [+1.5/+4.2]	+3.6 [+2.0/+5.0]	+1.8 [+0.6/+3.5]	+3.3 [+1.7/+5.0]	+6.0 [+3.7/+8.3]
	SON	+1.2 [+0.1/+2.7]	+1.3 [+0.5/+2.2]	+1.4 [+0.2/+2.6]	+1.5 [+0.4/+2.3]	+1.9 [+0.6/+3.8]	+3.3 [+1.8/+4.4]	+1.5 [+0.2/+2.9]	+2.4 [+1.6/+4.4]	+4.5 [+3.5/+7.7]
Inn	Annual	+1.6 [+0.5/+2.1]	+1.7 [+1.2/+2.0]	+1.8 [+1.2/+2.5]	+1.5 [+0.9/+2.2]	+2.5 [+1.6/+3.3]	+3.4 [+2.2/+4.1]	+1.7 [+0.6/+2.7]	+3.0 [+1.9/+3.7]	+5.4 [+3.9/+6.8]
	DJF	+1.2 [+0.7/+1.8]	+1.4 [+1.2/+1.8]	+1.9 [+0.6/+2.7]	+1.3 [+0.4/+1.7]	+2.2 [+1.5/+3.5]	+2.6 [+2.4/+3.6]	+1.1 [-0.0/+2.6]	+2.7 [+1.6/+3.8]	+4.1 [+3.6/+5.7]
	MAM	+1.3 [+0.0/+2.2]	+1.4 [+0.9/+2.2]	+1.3 [+0.6/+2.1]	+1.3 [+0.4/+2.0]	+1.8 [+0.6/+3.2]	+3.0 [+2.1/+3.8]	+1.7 [-0.1/+2.7]	+2.6 [+0.8/+3.0]	+5.1 [+3.2/+7.3]
	JJA	+2.6 [+0.6/+2.7]	+2.5 [+1.5/+3.1]	+2.5 [+1.6/+3.1]	+2.1 [+1.6/+3.3]	+3.5 [+1.8/+4.2]	+4.6 [+2.3/+4.8]	+2.1 [+0.6/+3.5]	+4.1 [+1.8/+4.7]	+6.3 [+4.3/+8.3]
	SON	+1.5 [+0.2/+2.7]	+1.6 [+0.5/+2.2]	+1.6 [+0.2/+2.6]	+1.9 [+0.4/+2.3]	+2.0 [+0.7/+3.8]	+3.4 [+2.1/+4.4]	+1.7 [+0.2/+2.9]	+2.6 [+1.7/+4.4]	+4.8 [+4.1/+7.7]

Catchment	Season	Δ Air temperature (°C) 2030-2040			2055-2065			2080-2090		
		RCP2.6	RCP4.5	RCP 8.5	RCP2.6	RCP4.5	RCP 8.5	RCP2.6	RCP4.5	RCP 8.5
Kander	Annual	+1.3 [+0.5/+1.8]	+1.6 [+1.2/+1.7]	+1.6 [+1.0/+2.2]	+1.4 [+0.7/+1.9]	+2.1 [+1.3/+3.0]	+3.1 [+2.1/+3.6]	+1.4 [+0.5/+2.4]	+2.6 [+1.7/+3.3]	+4.9 [+3.5/+6.2]
	DJF	+1.1 [+0.6/+1.6]	+1.2 [+1.0/+1.7]	+1.8 [+0.5/+2.3]	+1.1 [+0.1/+1.8]	+1.8 [+1.3/+3.2]	+2.5 [+2.0/+3.4]	+1.1 [+0.2/+2.4]	+2.4 [+1.4/+3.7]	+4.2 [+3.2/+5.4]
	MAM	+1.2 [+0.2/+2.1]	+1.3 [+1.0/+2.2]	+1.4 [+0.7/+1.8]	+1.2 [+0.4/+2.0]	+2.1 [+0.6/+3.0]	+2.9 [+2.3/+3.6]	+1.8 [-0.1/+2.6]	+2.5 [+0.9/+3.0]	+4.8 [+3.2/+6.5]
	JJA	+1.9 [+0.6/+2.3]	+2.0 [+1.5/+2.7]	+2.0 [+1.4/+2.6]	+1.7 [+1.4/+2.6]	+2.9 [+1.5/+3.3]	+3.6 [+2.1/+4.0]	+1.8 [+0.6/+2.7]	+3.3 [+1.8/+4.0]	+5.7 [+3.8/+6.8]
	SON	+1.2 [+0.2/+2.4]	+1.3 [+0.5/+1.9]	+1.3 [+0.2/+2.4]	+1.5 [+0.6/+2.0]	+1.8 [+0.6/+2.7]	+3.3 [+1.9/+3.9]	+1.5 [+0.3/+2.7]	+2.2 [+1.8/+3.4]	+4.3 [+3.6/+6.4]
Landwasser	Annual	+1.4 [+0.6/+1.9]	+1.7 [+1.3/+1.8]	+1.7 [+1.0/+2.3]	+1.6 [+0.8/+1.9]	+2.2 [+1.4/+3.0]	+3.2 [+2.2/+3.6]	+1.5 [+0.6/+2.5]	+2.7 [+1.8/+3.4]	+5.1 [+3.8/+6.3]
	DJF	+1.2 [+0.6/+1.8]	+1.3 [+1.2/+1.7]	+1.8 [+0.6/+2.5]	+1.2 [+0.1/+1.6]	+2.1 [+1.4/+3.4]	+2.4 [+2.0/+3.5]	+1.1 [+0.2/+2.5]	+2.4 [+1.7/+3.7]	+4.0 [+3.2/+5.4]
	MAM	+1.3 [+0.3/+2.0]	+1.5 [+0.9/+2.3]	+1.3 [+0.7/+2.0]	+1.3 [+0.2/+1.8]	+2.2 [+0.6/+2.9]	+2.8 [+2.3/+3.5]	+1.7 [-0.0/+2.7]	+2.4 [+0.7/+2.9]	+4.8 [+3.1/+6.4]
	JJA	+2.0 [+0.7/+2.4]	+1.9 [+1.6/+2.7]	+2.2 [+1.6/+2.6]	+2.0 [+1.4/+2.8]	+3.1 [+1.5/+3.6]	+3.8 [+2.3/+4.2]	+1.8 [+0.6/+2.9]	+3.5 [+1.9/+4.2]	+6.2 [+4.3/+7.7]
	SON	+1.2 [+0.1/+2.6]	+1.4 [+0.6/+2.1]	+1.3 [+0.2/+2.4]	+1.8 [+0.5/+2.2]	+1.9 [+0.7/+3.3]	+3.5 [+2.0/+4.1]	+1.7 [+0.3/+2.8]	+2.4 [+1.7/+4.0]	+4.5 [+3.9/+7.0]
Lonza	Annual	+1.5 [+0.6/+2.0]	+1.7 [+1.3/+1.9]	+1.7 [+1.1/+2.4]	+1.5 [+0.8/+2.1]	+2.3 [+1.4/+3.3]	+3.2 [+2.2/+4.0]	+1.6 [+0.5/+2.7]	+2.8 [+1.8/+3.7]	+5.3 [+3.7/+6.7]
	DJF	+1.1 [+0.7/+1.6]	+1.2 [+1.2/+1.8]	+1.8 [+0.4/+2.4]	+1.1 [+0.2/+1.8]	+2.0 [+1.3/+3.2]	+2.5 [+2.1/+3.4]	+1.1 [+0.2/+2.5]	+2.5 [+1.5/+3.7]	+4.2 [+3.4/+5.5]
	MAM	+1.2 [+0.1/+2.0]	+1.2 [+0.9/+2.0]	+1.4 [+0.7/+1.7]	+1.1 [+0.4/+2.0]	+2.0 [+0.6/+2.9]	+3.0 [+2.2/+3.6]	+1.7 [-0.2/+2.4]	+2.4 [+0.9/+3.0]	+5.1 [+3.1/+7.0]
	JJA	+2.0 [+0.7/+2.7]	+2.3 [+1.6/+3.2]	+2.5 [+1.5/+3.1]	+2.0 [+1.6/+3.1]	+3.5 [+1.6/+4.2]	+4.3 [+2.3/+5.0]	+2.0 [+0.6/+3.4]	+3.8 [+1.9/+5.0]	+6.5 [+4.1/+7.9]
	SON	+1.2 [+0.4/+2.6]	+1.3 [+0.5/+2.1]	+1.5 [+0.2/+2.5]	+1.7 [+0.5/+2.2]	+1.9 [+0.6/+3.1]	+3.6 [+2.0/+4.2]	+1.7 [+0.3/+2.9]	+2.4 [+1.8/+3.6]	+4.6 [+3.7/+6.7]
Lutschine	Annual	+1.2 [+0.5/+1.6]	+1.4 [+1.1/+1.6]	+1.5 [+0.9/+2.0]	+1.3 [+0.7/+1.5]	+1.9 [+1.3/+2.7]	+2.8 [+2.0/+3.2]	+1.2 [+0.6/+2.1]	+2.4 [+1.7/+3.1]	+4.5 [+3.4/+5.6]
	DJF	+1.1 [+0.4/+1.6]	+1.2 [+0.9/+1.6]	+1.8 [+0.5/+2.3]	+1.0 [+0.2/+1.8]	+1.9 [+1.4/+3.2]	+2.4 [+2.0/+3.5]	+1.1 [+0.4/+2.3]	+2.4 [+1.6/+3.6]	+4.2 [+3.1/+5.3]
	MAM	+1.1 [+0.2/+1.9]	+1.4 [+0.8/+2.1]	+1.2 [+0.7/+1.5]	+1.1 [+0.4/+1.6]	+1.9 [+0.6/+2.6]	+2.5 [+2.2/+3.2]	+1.8 [+0.0/+2.3]	+2.3 [+0.8/+2.6]	+4.6 [+3.0/+5.3]
	JJA	+1.6 [+0.6/+1.9]	+1.5 [+1.3/+2.3]	+1.8 [+1.4/+2.0]	+1.6 [+1.1/+2.2]	+2.5 [+1.5/+2.9]	+2.8 [+2.0/+3.6]	+1.5 [+0.6/+2.2]	+2.7 [+1.7/+3.4]	+5.3 [+3.7/+5.8]
	SON	+1.1 [+0.2/+2.4]	+1.3 [+0.5/+1.8]	+1.2 [+0.2/+2.4]	+1.4 [+0.6/+2.0]	+1.7 [+0.6/+2.7]	+2.8 [+1.8/+3.6]	+1.3 [+0.3/+2.5]	+2.1 [+1.6/+3.0]	+4.0 [+3.5/+6.0]

Table S11. Change of annual and seasonal mean discharge for 3 periods and 3 RCPs compared to the reference period 1990-2000. The median value of all years and scenarios is indicated along with the range of the values.

Catchment	Season	Δ Discharge (%)								
		2030-2040			2055-2065			2080-2090		
		RCP2.6	RCP4.5	RCP 8.5	RCP2.6	RCP4.5	RCP 8.5	RCP2.6	RCP4.5	RCP 8.5
Plateau	Annual	-2.0 [-30.7/+23.5]	-2.7 [-28.2/+27.9]	-1.9 [-26.2/+21.7]	-0.5 [-21.8/+27.5]	-4.2 [-31.5/+20.8]	-5.4 [-33.0/+31.5]	-3.0 [-32.7/+26.1]	+0.9 [-27.4/+32.8]	-9.7 [-45.0/+28.8]
	DJF	+7.9 [-49.1/+91.1]	+7.5 [-42.5/+78.6]	+8.2 [-36.8/+122.4]	+2.3 [-32.3/+67.4]	+2.6 [-51.8/+100.1]	+3.7 [-36.4/+141.2]	-2.5 [-44.6/+84.8]	+14.5 [-49.6/+129.1]	+17.6 [-42.0/+132.5]
	MAM	-4.6 [-52.4/+80.6]	-11.9 [-49.4/+80.4]	-5.8 [-58.4/+70.6]	-8.9 [-47.4/+49.9]	-8.3 [-59.2/+71.5]	-11.2 [-61.2/+92.1]	-10.1 [-59.8/+50.2]	-5.6 [-55.3/+95.7]	-11.8 [-59.4/+102.5]
	JJA	-7.3 [-75.5/+57.3]	-15.1 [-76.6/+41.7]	-7.2 [-56.5/+144.8]	-3.8 [-61.0/+119.8]	-19.5 [-80.9/+75.8]	-11.0 [-85.3/+136.0]	+1.4 [-61.9/+193.2]	-8.3 [-73.7/+112.3]	-26.6 [-91.4/+66.2]
	SON	-10.0 [-64.5/+133.2]	+4.2 [-45.9/+49.4]	-10.5 [-63.9/+67.5]	+1.4 [-54.6/+110.5]	+7.3 [-61.9/+76.4]	-16.1 [-75.0/+97.8]	+3.9 [-57.3/+90.9]	-1.3 [-59.6/+196.8]	-19.9 [-93.2/+66.6]
Birs	Annual	-0.1 [-25.1/+17.6]	+0.5 [-20.9/+24.7]	-1.3 [-13.6/+20.4]	+2.8 [-18.6/+27.5]	-0.6 [-24.5/+18.0]	-0.2 [-25.6/+27.5]	-1.4 [-26.9/+25.8]	+6.8 [-14.3/+30.0]	-5.7 [-33.3/+23.0]
	DJF	+5.6 [-30.4/+63.8]	+9.6 [-27.5/+48.3]	+5.1 [-29.3/+62.5]	+7.7 [-28.5/+43.1]	-2.6 [-35.0/+48.5]	+2.8 [-24.3/+75.8]	-2.5 [-40.5/+69.3]	+16.0 [-29.1/+63.3]	+14.1 [-25.7/+63.5]
	MAM	-4.4 [-46.2/+55.0]	-12.9 [-44.6/+54.0]	-2.7 [-37.4/+52.0]	-5.7 [-32.5/+38.7]	-3.6 [-40.1/+62.3]	-6.7 [-47.6/+58.4]	-7.9 [-46.1/+35.3]	-0.6 [-42.7/+64.9]	-6.5 [-40.2/+49.6]
	JJA	-3.3 [-45.9/+34.0]	-15.1 [-47.8/+22.7]	-5.6 [-49.5/+74.8]	+3.6 [-44.6/+65.3]	-12.1 [-57.2/+27.8]	-6.9 [-58.1/+91.7]	+5.0 [-37.1/+60.5]	-0.8 [-39.8/+45.8]	-26.9 [-76.3/+46.3]
	SON	-7.0 [-40.6/+88.5]	+8.6 [-34.9/+44.0]	-10.5 [-44.3/+47.4]	+10.0 [-40.9/+72.5]	+8.6 [-43.4/+68.6]	-20.0 [-47.8/+89.8]	+7.1 [-41.1/+47.7]	+5.3 [-35.6/+101.8]	-18.0 [-70.9/+46.2]
Broye	Annual	-3.3 [-19.4/+21.0]	-3.5 [-21.4/+19.4]	-1.9 [-21.0/+21.7]	-0.5 [-16.6/+22.0]	-3.4 [-31.5/+10.4]	-7.9 [-33.0/+19.7]	-3.9 [-26.1/+25.5]	+3.4 [-27.4/+32.8]	-11.0 [-45.0/+25.6]
	DJF	+8.2 [-24.2/+41.9]	+11.2 [-17.9/+48.1]	+5.2 [-28.7/+50.2]	+2.9 [-17.0/+35.4]	-2.9 [-31.3/+43.7]	+2.1 [-27.9/+60.4]	-2.1 [-29.5/+50.1]	+16.7 [-27.3/+54.9]	+13.5 [-21.8/+63.3]
	MAM	-8.0 [-52.4/+50.6]	-14.0 [-47.4/+47.8]	-3.8 [-53.4/+70.6]	-11.1 [-44.4/+49.9]	-8.7 [-59.2/+40.2]	-14.6 [-61.2/+67.6]	-15.1 [-59.8/+35.3]	-4.9 [-55.3/+95.7]	-9.9 [-59.4/+102.5]
	JJA	-16.1 [-75.5/+57.3]	-25.5 [-76.6/+33.5]	-15.7 [-56.5/+144.8]	-13.9 [-61.0/+119.8]	-27.0 [-80.9/+75.8]	-21.2 [-85.3/+136.0]	+7.2 [-61.9/+193.2]	-16.9 [-73.7/+112.3]	-43.7 [-91.4/+38.3]
	SON	-6.0 [-64.5/+133.2]	+7.4 [-45.9/+44.5]	-11.4 [-63.9/+67.5]	+11.6 [-54.6/+110.5]	+3.4 [-61.9/+73.8]	-22.7 [-75.0/+97.8]	+9.0 [-57.3/+90.9]	-3.0 [-59.6/+196.8]	-30.8 [-93.2/+66.6]
Ergolz	Annual	-1.6 [-30.7/+23.5]	-0.7 [-19.4/+27.9]	+0.7 [-16.1/+18.5]	+0.9 [-21.8/+25.7]	-1.2 [-23.1/+20.8]	-2.1 [-26.0/+31.5]	-3.1 [-32.7/+26.1]	+4.7 [-15.1/+21.6]	-9.4 [-38.3/+24.4]
	DJF	+5.7 [-39.9/+52.2]	+4.6 [-37.0/+49.8]	+4.0 [-29.1/+68.0]	-2.0 [-32.3/+29.9]	-4.7 [-51.8/+61.0]	+0.6 [-36.4/+74.7]	-7.8 [-39.2/+65.7]	+11.3 [-49.6/+72.9]	+13.7 [-31.7/+62.3]
	MAM	-2.4 [-45.7/+80.6]	-10.3 [-40.4/+80.4]	+1.9 [-33.7/+48.9]	-7.4 [-34.6/+37.3]	+1.5 [-35.0/+71.5]	-3.2 [-42.1/+92.1]	-5.8 [-51.4/+50.2]	+3.9 [-39.7/+62.8]	-1.5 [-35.3/+43.6]
	JJA	-8.7 [-44.9/+31.4]	-9.0 [-44.2/+41.7]	-3.7 [-48.2/+61.0]	-3.1 [-44.1/+89.0]	-16.7 [-56.8/+39.3]	-2.7 [-60.2/+113.0]	-3.9 [-47.9/+50.3]	-1.7 [-43.7/+66.0]	-26.0 [-80.4/+66.2]
	SON	-8.5 [-46.0/+90.6]	+11.7 [-31.9/+39.1]	-7.6 [-45.7/+41.2]	-1.3 [-51.5/+83.0]	+11.0 [-47.9/+76.4]	-17.4 [-38.8/+95.0]	+5.7 [-42.1/+61.1]	+3.4 [-29.9/+73.3]	-17.8 [-65.7/+45.4]
Eulach	Annual	-3.5 [-23.3/+18.3]	-1.8 [-27.7/+23.6]	-1.6 [-24.9/+14.4]	-4.1 [-18.6/+12.9]	-5.2 [-21.5/+17.1]	-5.4 [-22.4/+24.6]	-5.9 [-27.2/+16.2]	-0.5 [-13.3/+17.0]	-8.0 [-38.2/+28.8]
	DJF	+1.0 [-49.1/+42.8]	-3.5 [-42.5/+54.4]	-2.9 [-31.3/+32.8]	-11.8 [-31.9/+26.9]	-10.2 [-43.0/+37.0]	-9.3 [-34.9/+44.5]	-16.4 [-44.6/+47.2]	+2.1 [-44.9/+27.2]	+9.0 [-36.7/+59.2]
	MAM	-1.9 [-42.6/+48.7]	-9.4 [-37.2/+43.9]	-2.4 [-44.7/+27.0]	-9.5 [-38.0/+28.8]	-2.6 [-35.4/+29.5]	-6.9 [-50.2/+79.9]	-4.0 [-49.9/+32.4]	+0.6 [-39.7/+54.4]	-7.0 [-38.6/+23.7]
	JJA	-6.9 [-32.1/+22.4]	-13.0 [-35.6/+30.8]	-2.6 [-42.2/+32.0]	-4.2 [-36.7/+67.3]	-19.3 [-40.7/+17.7]	-4.6 [-46.3/+72.2]	+2.0 [-39.2/+40.2]	-2.1 [-42.8/+62.7]	-15.6 [-70.2/+52.9]
	SON	-12.2 [-33.2/+79.5]	+2.3 [-30.8/+49.4]	-6.7 [-43.8/+52.3]	-2.3 [-40.9/+61.1]	+9.4 [-42.4/+71.8]	-10.9 [-33.4/+93.8]	+3.9 [-32.8/+30.7]	-0.4 [-38.3/+63.1]	-13.9 [-58.6/+38.7]

Catchment	Season	Δ Discharge (%) 2030-2040 RCP2.6	2030-2040 RCP4.5	2030-2040 RCP 8.5	2055-2065 RCP2.6	2055-2065 RCP4.5	2055-2065 RCP 8.5	2080-2090 RCP2.6	2080-2090 RCP4.5	2080-2090 RCP 8.5
Kleine Emme	Annual	-0.6 [-20.4/+12.0]	-3.2 [-19.9/+15.3]	-3.1 [-14.6/+14.5]	-1.5 [-15.3/+18.2]	-7.2 [-23.3/+6.3]	-5.6 [-22.4/+18.7]	-2.8 [-16.9/+10.2]	-2.8 [-20.4/+13.9]	-11.8 [-36.1/+9.7]
	DJF	+9.3 [-23.3/+49.7]	+17.2 [-11.3/+48.8]	+15.9 [-9.8/+60.5]	+8.5 [-13.0/+39.5]	+12.8 [-17.3/+48.3]	+14.9 [-20.2/+68.3]	+5.2 [-15.2/+46.6]	+23.4 [-8.9/+78.3]	+30.2 [-15.9/+132.5]
	MAM	-0.9 [-28.1/+24.5]	-4.9 [-28.6/+20.0]	-7.9 [-32.0/+16.4]	-5.5 [-21.3/+20.3]	-13.3 [-39.5/+20.8]	-12.8 [-34.7/+37.0]	-7.6 [-38.5/+19.2]	-13.5 [-37.5/+43.3]	-21.4 [-40.9/+13.9]
	JJA	-10.2 [-31.3/+7.6]	-14.8 [-34.0/+7.3]	-9.7 [-30.0/+17.4]	-8.2 [-31.5/+37.2]	-20.5 [-36.7/-7.5]	-14.8 [-43.8/+32.0]	-2.3 [-28.6/+10.5]	-15.3 [-37.5/+26.3]	-28.9 [-67.3/-7.1]
	SON	-7.2 [-19.3/+45.9]	+1.1 [-28.8/+35.5]	-12.8 [-32.8/+36.3]	-4.9 [-26.7/+54.2]	+4.7 [-30.9/+25.1]	-4.3 [-35.5/+43.7]	+0.8 [-25.9/+21.7]	-6.8 [-35.6/+35.4]	-16.5 [-52.4/+25.8]
RHB	Annual	-4.9 [-22.1/+14.0]	-4.8 [-28.2/+26.1]	-2.7 [-26.2/+10.1]	-2.9 [-18.9/+13.6]	-6.9 [-22.2/+15.4]	-7.3 [-23.7/+24.0]	-5.7 [-24.0/+11.0]	-3.4 [-16.3/+13.1]	-11.9 [-40.9/+25.7]
	DJF	+4.0 [-34.4/+74.0]	+1.8 [-24.2/+65.8]	+8.5 [-36.8/+76.5]	-2.0 [-23.9/+45.5]	-0.8 [-33.4/+57.5]	-4.5 [-33.8/+72.0]	-7.0 [-37.5/+64.1]	+9.0 [-38.9/+58.8]	+16.9 [-42.0/+112.0]
	MAM	-10.3 [-49.7/+42.2]	-19.8 [-49.4/+47.9]	-12.9 [-58.4/+18.9]	-15.1 [-47.4/+25.0]	-11.7 [-48.5/+27.1]	-17.6 [-56.7/+76.9]	-14.1 [-53.6/+25.9]	-11.9 [-48.6/+47.7]	-19.5 [-52.6/+4.5]
	JJA	-7.9 [-34.7/+12.8]	-14.9 [-43.1/+28.5]	-7.4 [-43.0/+26.3]	-4.4 [-37.6/+67.5]	-18.6 [-43.3/+21.5]	-6.3 [-48.8/+71.1]	+2.2 [-39.5/+21.7]	-8.2 [-49.2/+63.6]	-24.4 [-72.1/+39.0]
	SON	-16.5 [-34.9/+65.8]	+1.6 [-29.7/+49.4]	-9.6 [-49.0/+58.3]	+1.7 [-48.3/+64.8]	+6.1 [-52.2/+59.7]	-11.7 [-38.7/+85.5]	-0.7 [-36.9/+50.2]	-2.8 [-38.5/+49.4]	-21.3 [-63.5/+39.7]
Suze	Annual	-1.2 [-16.8/+14.1]	-2.7 [-18.1/+14.9]	-1.6 [-16.3/+21.5]	+1.9 [-11.7/+22.0]	-1.9 [-22.9/+12.4]	-5.4 [-28.6/+15.5]	-0.8 [-19.3/+22.5]	+5.2 [-16.3/+28.2]	-8.1 [-37.8/+13.1]
	DJF	+15.7 [-15.7/+91.1]	+18.2 [-8.5/+78.6]	+15.9 [-29.5/+122.4]	+15.3 [-14.6/+67.4]	+12.2 [-21.9/+100.1]	+17.1 [-17.1/+141.2]	+9.9 [-24.1/+84.8]	+23.4 [-12.2/+129.1]	+23.1 [-18.2/+120.4]
	MAM	-9.9 [-49.4/+26.5]	-14.5 [-46.7/+19.0]	-9.3 [-47.0/+37.2]	-9.2 [-33.1/+21.9]	-15.0 [-56.8/+17.0]	-18.1 [-55.7/+37.2]	-14.2 [-42.1/+18.0]	-13.2 [-47.8/+46.9]	-18.7 [-55.5/+48.9]
	JJA	-3.6 [-37.7/+26.5]	-17.3 [-47.3/+33.5]	-4.9 [-38.5/+57.1]	+0.7 [-31.9/+55.0]	-15.3 [-55.7/+14.7]	-14.3 [-56.8/+44.3]	+2.3 [-42.9/+42.1]	-9.4 [-37.7/+60.1]	-35.2 [-64.5/+32.6]
	SON	-5.1 [-37.7/+49.6]	+1.9 [-38.4/+33.8]	-13.6 [-43.2/+32.5]	+7.6 [-37.6/+51.3]	+2.5 [-45.2/+37.9]	-21.1 [-52.6/+64.8]	+2.5 [-34.6/+52.3]	-3.9 [-37.9/+105.8]	-20.1 [-68.6/+38.4]
Alpine	Annual	+6.6 [-21.3/+43.5]	+6.9 [-15.3/+54.4]	+4.9 [-20.5/+48.5]	+4.9 [-19.6/+66.7]	+1.3 [-22.6/+50.0]	+4.9 [-29.6/+67.7]	+2.0 [-20.3/+41.9]	+3.9 [-20.9/+75.2]	-1.9 [-35.2/+78.5]
	DJF	+8.0 [-27.5/+80.0]	+8.6 [-17.7/+57.2]	+9.2 [-23.8/+127.2]	+7.0 [-19.9/+67.2]	+8.5 [-23.5/+124.1]	+14.4 [-32.7/+154.7]	+3.6 [-22.5/+101.9]	+15.9 [-29.1/+216.9]	+34.5 [-45.5/+616.3]
	MAM	+20.4 [-22.2/+95.8]	+26.6 [-9.4/+93.6]	+21.9 [-11.1/+74.6]	+21.1 [-18.9/+98.6]	+27.3 [-17.4/+119.7]	+43.0 [-9.1/+171.3]	+21.8 [-28.6/+81.9]	+35.8 [-23.3/+151.1]	+66.3 [-7.8/+364.3]
	JJA	-0.7 [-40.7/+40.8]	-0.2 [-34.8/+57.2]	+0.9 [-36.8/+50.3]	-0.5 [-33.1/+64.8]	-7.0 [-48.8/+52.8]	-9.7 [-54.2/+53.9]	-4.2 [-36.1/+41.3]	-7.1 [-45.0/+71.6]	-30.5 [-72.3/+34.5]
	SON	+5.1 [-25.7/+56.7]	+2.9 [-27.0/+77.6]	-3.0 [-34.0/+79.2]	+0.2 [-31.7/+108.2]	+1.5 [-38.5/+62.0]	+3.9 [-39.0/+93.8]	+2.9 [-32.0/+51.6]	-0.8 [-45.5/+62.6]	-7.2 [-57.1/+103.0]
Inn	Annual	+7.4 [-21.1/+27.5]	+6.1 [-9.0/+31.1]	+4.8 [-13.6/+37.6]	+6.6 [-18.3/+30.6]	-2.7 [-17.9/+32.7]	+2.4 [-21.8/+39.2]	+3.2 [-15.7/+37.3]	+1.7 [-15.0/+31.7]	-7.5 [-29.6/+26.5]
	DJF	+5.9 [-8.9/+16.9]	+2.0 [-4.0/+13.6]	+3.0 [-6.2/+21.3]	+3.5 [-8.9/+20.7]	-1.1 [-10.8/+23.2]	+3.9 [-14.2/+39.7]	+1.6 [-9.0/+17.4]	+5.0 [-10.5/+42.1]	+5.2 [-23.0/+99.6]
	MAM	+26.7 [-8.8/+90.7]	+32.2 [-0.0/+79.3]	+32.6 [-0.3/+64.1]	+29.4 [-14.7/+84.5]	+39.1 [-12.4/+101.4]	+64.5 [-1.7/+171.3]	+30.5 [-26.4/+69.8]	+52.8 [-5.8/+126.1]	+86.6 [+0.8/+193.8]
	JJA	+0.4 [-40.7/+27.0]	-1.8 [-31.4/+34.3]	+1.3 [-36.8/+30.6]	+2.0 [-29.9/+29.8]	-12.5 [-33.2/+27.0]	-14.9 [-50.8/+22.2]	-3.9 [-31.4/+32.3]	-10.9 [-39.3/+29.2]	-38.4 [-72.3/-10.2]
	SON	+3.2 [-23.0/+49.5]	+0.8 [-15.0/+52.9]	-8.0 [-31.1/+68.5]	-4.0 [-26.7/+57.6]	-5.8 [-27.5/+50.2]	+0.3 [-24.1/+76.4]	+4.0 [-29.5/+51.6]	-6.7 [-29.1/+62.6]	-12.8 [-34.7/+83.9]

Catchment	Season	Δ Discharge (%)								
		2030-2040			2055-2065			2080-2090		
		RCP2.6	RCP4.5	RCP 8.5	RCP2.6	RCP4.5	RCP 8.5	RCP2.6	RCP4.5	RCP 8.5
Kander	Annual	+7.6 [-10.7/+20.3]	+7.8 [-8.6/+25.6]	+6.5 [-8.9/+25.8]	+6.0 [-7.5/+34.1]	+2.6 [-14.6/+23.9]	+5.2 [-15.0/+33.8]	+3.3 [-10.4/+17.2]	+5.2 [-18.2/+31.0]	+1.1 [-21.1/+29.9]
	DJF	+8.0 [-17.0/+47.4]	+13.4 [-4.8/+36.2]	+11.4 [-0.9/+54.7]	+8.2 [-12.7/+30.7]	+10.4 [-5.9/+39.4]	+14.0 [-4.7/+60.7]	+3.8 [-13.1/+41.7]	+18.0 [-2.9/+70.3]	+32.9 [-2.6/+158.7]
	MAM	+14.2 [-12.2/+49.1]	+14.8 [-1.5/+58.5]	+13.9 [-2.9/+34.6]	+12.1 [-12.7/+43.9]	+14.1 [-7.5/+56.9]	+23.6 [+0.3/+72.3]	+11.0 [-20.9/+52.6]	+20.5 [-5.9/+60.0]	+35.5 [+0.0/+103.2]
	JJA	+2.0 [-16.3/+17.6]	+4.7 [-24.9/+23.9]	+4.9 [-19.4/+27.9]	+1.2 [-24.6/+30.5]	-6.0 [-37.5/+19.8]	-7.1 [-46.6/+33.3]	-1.2 [-26.9/+16.7]	-4.7 [-45.0/+28.1]	-22.9 [-61.5/-1.1]
	SON	+9.0 [-10.9/+28.4]	+6.7 [-7.0/+36.5]	-0.2 [-9.3/+43.0]	+2.6 [-19.4/+56.3]	+7.9 [-18.9/+24.2]	+8.0 [-18.4/+39.5]	+4.7 [-13.3/+22.8]	+4.8 [-26.9/+39.6]	-4.6 [-31.3/+45.8]
Landwasser	Annual	-2.2 [-19.3/+14.9]	-2.7 [-15.3/+19.3]	-2.5 [-20.5/+15.4]	-2.3 [-19.6/+9.1]	-5.6 [-22.6/+12.6]	-5.8 [-29.6/+22.5]	-3.7 [-20.3/+8.3]	-4.3 [-20.9/+10.6]	-14.9 [-35.2/+21.6]
	DJF	-0.9 [-14.9/+15.5]	-1.7 [-17.7/+20.8]	-1.5 [-23.8/+21.9]	-0.5 [-17.9/+13.4]	-0.2 [-23.5/+14.0]	-2.0 [-32.7/+29.5]	-1.0 [-22.5/+14.4]	+0.0 [-29.1/+31.3]	+2.4 [-45.5/+64.1]
	MAM	+24.2 [-22.2/+70.4]	+34.8 [-5.6/+78.8]	+24.7 [-2.9/+59.2]	+23.5 [-18.9/+57.3]	+37.4 [-14.1/+93.1]	+54.4 [-2.7/+129.8]	+27.3 [-28.6/+66.7]	+46.9 [-23.3/+112.2]	+87.8 [+3.6/+200.0]
	JJA	-7.6 [-27.0/+8.4]	-9.4 [-34.8/+20.3]	-7.8 [-32.1/+12.6]	-9.3 [-33.1/+13.1]	-18.1 [-48.8/+11.6]	-23.3 [-54.2/+5.1]	-14.8 [-36.1/+16.1]	-17.1 [-43.3/+17.4]	-47.2 [-69.2/+17.6]
	SON	-6.1 [-25.7/+24.7]	-9.0 [-27.0/+27.9]	-13.3 [-34.0/+38.7]	-9.0 [-31.7/+30.6]	-9.5 [-38.5/+15.2]	-11.2 [-39.0/+41.1]	-3.9 [-32.0/+15.2]	-12.8 [-37.0/+18.2]	-25.0 [-57.1/+23.5]
Lonza	Annual	+21.1 [-9.8/+43.5]	+20.3 [-2.2/+54.4]	+19.3 [-2.8/+48.5]	+17.6 [-3.1/+66.7]	+19.1 [-8.3/+50.0]	+24.7 [-11.8/+67.7]	+16.5 [-3.6/+41.9]	+22.5 [-15.3/+75.2]	+22.6 [-17.0/+78.5]
	DJF	+13.8 [-1.6/+80.0]	+16.4 [+6.7/+57.2]	+18.2 [+0.2/+127.2]	+16.6 [+4.1/+67.2]	+22.1 [+5.8/+124.1]	+40.4 [+11.2/+154.7]	+12.5 [-4.2/+101.9]	+32.2 [+9.5/+216.9]	+112.7 [+18.9/+616.3]
	MAM	+36.0 [+3.1/+95.8]	+43.7 [+10.7/+93.6]	+44.7 [+8.2/+74.6]	+37.5 [+2.8/+98.6]	+63.6 [+5.4/+119.7]	+96.7 [+36.0/+168.8]	+49.1 [-19.3/+81.9]	+91.7 [+10.3/+151.1]	+195.1 [+50.2/+364.3]
	JJA	+16.6 [-15.2/+40.8]	+19.2 [-18.7/+57.2]	+19.3 [-13.0/+50.3]	+17.1 [-7.2/+64.8]	+11.0 [-25.3/+52.8]	+10.9 [-42.1/+53.9]	+11.9 [-16.0/+41.3]	+14.4 [-43.0/+71.6]	-6.8 [-68.9/+34.5]
	SON	+17.7 [-9.1/+56.7]	+17.7 [-7.3/+77.6]	+9.8 [-10.7/+79.2]	+10.9 [-20.2/+108.2]	+12.4 [-24.9/+62.0]	+25.5 [-20.0/+93.8]	+14.1 [-25.8/+41.3]	+18.0 [-45.5/+56.7]	+12.3 [-38.8/+103.0]
Lutschine	Annual	+3.1 [-21.3/+14.0]	+3.2 [-11.9/+21.2]	+2.2 [-10.8/+14.7]	+0.0 [-8.1/+20.4]	-0.2 [-13.0/+19.4]	+4.4 [-10.8/+29.1]	-2.8 [-11.3/+15.4]	+3.4 [-13.3/+23.8]	+0.1 [-19.1/+23.4]
	DJF	+8.7 [-27.5/+50.0]	+13.7 [-10.2/+47.8]	+18.1 [-7.9/+88.3]	+6.2 [-19.9/+39.0]	+18.7 [-3.0/+63.7]	+25.0 [-9.7/+93.8]	+0.9 [-21.9/+56.5]	+33.6 [-0.7/+148.3]	+79.5 [+16.4/+285.5]
	MAM	+13.2 [-19.9/+41.8]	+13.3 [-9.4/+49.8]	+10.4 [-11.1/+37.5]	+12.6 [-8.2/+37.0]	+11.9 [-17.4/+47.7]	+23.1 [-9.1/+55.4]	+11.4 [-17.9/+37.2]	+17.0 [-19.1/+51.2]	+32.7 [-7.8/+65.8]
	JJA	-2.4 [-29.7/+10.2]	-3.3 [-24.2/+11.9]	-1.6 [-22.2/+14.0]	-5.7 [-17.7/+12.0]	-8.8 [-34.2/+8.9]	-9.2 [-29.9/+18.8]	-8.6 [-26.0/+9.8]	-8.2 [-29.3/+12.9]	-27.2 [-47.1/+7.5]
	SON	+5.7 [-16.1/+35.0]	+0.3 [-12.2/+26.6]	-6.0 [-23.4/+37.0]	+0.4 [-28.5/+54.5]	+2.1 [-16.7/+34.0]	+2.7 [-18.0/+50.8]	+0.6 [-19.1/+23.9]	-0.9 [-26.2/+40.2]	-4.5 [-32.2/+49.0]

Table S12. Change of annual and seasonal mean precipitation for 3 periods and 3 RCPs compared to the reference period 1990-2000. The median value all years and scenarios is indicated along with the range of the values.

Catchment	**Season**	**△ Precipitation (%)**								
		2030-2040			**2055-2065**			**2080-2090**		
		RCP2.6	**RCP4.5**	**RCP 8.5**	**RCP2.6**	**RCP4.5**	**RCP 8.5**	**RCP2.6**	**RCP4.5**	**RCP 8.5**
Plateau	Annual	+0.8 [-16.8/+15.0]	+0.4 [-17.2/+17.5]	+0.7 [-15.9/+17.2]	+1.4 [-11.0/+17.1]	+0.4 [-14.1/+14.8]	+0.4 [-18.8/+21.1]	-0.5 [-16.7/+17.2]	+4.9 [-11.8/+22.1]	-0.4 [-24.6/+27.9]
	DJF	+7.2 [-35.1/+41.5]	+5.7 [-18.6/+36.2]	+6.6 [-19.7/+39.5]	-0.1 [-21.2/+32.8]	-1.4 [-29.8/+30.7]	+3.6 [-30.5/+39.5]	-6.5 [-25.2/+40.5]	+12.0 [-31.1/+35.0]	+11.4 [-21.2/+66.6]
	MAM	+4.8 [-22.5/+44.7]	-1.4 [-20.9/+39.3]	+5.7 [-20.5/+34.0]	+0.5 [-22.7/+29.6]	+5.2 [-19.8/+45.8]	+6.8 [-23.3/+60.4]	+0.8 [-24.0/+28.9]	+9.1 [-20.7/+48.6]	+9.1 [-22.3/+54.3]
	JJA	-4.1 [-32.8/+13.1]	-9.2 [-33.2/+20.9]	-4.7 [-25.8/+31.7]	-4.6 [-31.2/+38.9]	-8.5 [-38.2/+14.6]	-6.0 [-38.8/+44.1]	+3.1 [-24.3/+34.2]	-2.1 [-32.9/+39.8]	-12.8 [-57.4/+26.2]
	SON	-4.4 [-29.3/+60.1]	+7.2 [-26.1/+40.7]	-6.1 [-36.8/+47.7]	+2.8 [-33.5/+55.9]	+8.6 [-33.2/+56.4]	-6.3 [-31.5/+74.8]	+3.3 [-31.6/+35.3]	+4.3 [-31.5/+69.9]	-4.1 [-48.4/+37.6]
Birs	Annual	+1.9 [-11.1/+11.2]	+0.9 [-9.5/+14.4]	+0.7 [-6.0/+16.9]	+3.3 [-8.1/+17.1]	+3.1 [-9.7/+13.9]	+2.9 [-11.8/+19.3]	+0.2 [-12.2/+17.2]	+8.2 [-4.5/+19.5]	+3.3 [-13.3/+17.0]
	DJF	+8.7 [-21.7/+40.3]	+11.0 [-12.7/+29.5]	+6.6 [-14.0/+35.4]	+3.1 [-13.6/+28.2]	+0.3 [-20.2/+26.0]	+9.0 [-16.9/+36.7]	+0.0 [-22.7/+35.5]	+16.1 [-16.1/+29.1]	+12.7 [-9.6/+63.0]
	MAM	+4.7 [-22.5/+32.2]	-2.6 [-19.2/+30.9]	+5.2 [-12.4/+34.0]	+1.7 [-17.9/+23.6]	+5.9 [-9.3/+41.2]	+8.9 [-21.6/+40.7]	+0.3 [-20.7/+23.0]	+11.2 [-17.5/+36.0]	+12.1 [-13.7/+36.3]
	JJA	-2.5 [-25.5/+8.1]	-6.6 [-23.6/+13.6]	-5.5 [-25.8/+28.9]	-2.4 [-23.8/+29.3]	-4.7 [-30.6/+10.3]	-5.6 [-28.3/+29.3]	+3.8 [-17.0/+28.7]	+0.9 [-21.6/+21.5]	-18.1 [-46.8/+13.0]
	SON	-1.4 [-24.1/+43.4]	+7.4 [-19.0/+31.5]	-6.9 [-26.2/+28.1]	+7.8 [-24.5/+46.3]	+9.4 [-25.1/+40.5]	-8.1 [-27.1/+62.2]	+2.0 [-26.7/+25.1]	+7.0 [-18.1/+52.9]	-1.8 [-38.3/+26.6]
Broye	Annual	-0.3 [-11.3/+12.8]	-0.5 [-13.4/+10.2]	+1.0 [-9.2/+13.7]	+1.6 [-9.7/+14.1]	+0.8 [-14.1/+10.8]	+0.7 [-18.8/+15.2]	-0.8 [-9.7/+14.2]	+7.0 [-11.8/+21.5]	-2.3 [-19.6/+21.2]
	DJF	+5.8 [-18.3/+34.7]	+10.3 [-15.7/+35.5]	+7.8 [-17.7/+33.6]	+1.5 [-14.9/+26.5]	-1.7 [-28.7/+30.7]	+6.1 [-16.7/+39.4]	-0.1 [-25.2/+36.2]	+15.3 [-17.0/+31.8]	+13.5 [-14.4/+65.1]
	MAM	+4.2 [-18.1/+25.6]	-1.3 [-16.1/+21.3]	+7.6 [-16.5/+32.1]	+2.0 [-15.6/+26.6]	+7.6 [-11.1/+32.7]	+4.7 [-22.3/+45.1]	+0.2 [-20.3/+24.3]	+12.0 [-20.7/+48.6]	+11.6 [-22.3/+54.3]
	JJA	-8.1 [-32.8/+13.1]	-10.3 [-33.2/+8.1]	-7.4 [-23.9/+31.2]	-9.2 [-24.2/+26.3]	-11.7 [-38.2/+5.9]	-10.1 [-38.8/+21.6]	+3.4 [-23.5/+29.7]	-8.2 [-25.3/+28.2]	-24.4 [-57.4/+12.4]
	SON	+0.2 [-26.6/+38.3]	+7.0 [-19.4/+34.1]	-6.4 [-29.7/+27.1]	+7.9 [-27.4/+49.2]	+8.4 [-28.3/+39.8]	-8.8 [-30.9/+56.4]	+6.5 [-31.6/+27.2]	+4.7 [-25.2/+64.9]	-5.4 [-48.4/+37.6]
Ergolz	Annual	+1.1 [-16.8/+15.0]	+1.8 [-8.8/+16.3]	+2.0 [-6.9/+14.3]	+2.0 [-11.0/+15.2]	+2.3 [-10.4/+14.8]	+3.1 [-13.5/+21.1]	-0.1 [-16.7/+16.5]	+6.8 [-3.7/+15.0]	+1.4 [-20.5/+20.3]
	DJF	+8.2 [-18.6/+32.0]	+6.4 [-16.3/+29.0]	+7.1 [-17.1/+35.4]	-1.6 [-15.5/+22.5]	-1.7 [-26.3/+29.7]	+4.9 [-18.4/+38.1]	-5.0 [-22.5/+33.2]	+13.0 [-22.3/+27.7]	+18.6 [-15.1/+66.6]
	MAM	+5.1 [-22.0/+44.7]	-0.9 [-19.1/+39.3]	+7.5 [-14.0/+33.4]	+1.2 [-21.0/+28.8]	+5.7 [-10.5/+45.8]	+7.4 [-18.6/+56.4]	+0.9 [-24.0/+28.4]	+13.1 [-16.9/+41.7]	+10.8 [-7.2/+31.3]
	JJA	-4.9 [-23.7/+10.8]	-3.9 [-24.7/+19.8]	-3.0 [-23.5/+25.5]	-3.1 [-25.2/+28.6]	-6.4 [-31.2/+12.1]	+1.7 [-31.9/+37.2]	-2.7 [-21.5/+28.0]	+0.5 [-30.9/+24.0]	-10.9 [-53.8/+19.7]
	SON	-4.5 [-29.3/+60.1]	+11.4 [-16.5/+30.7]	-4.4 [-28.9/+34.4]	+0.6 [-30.7/+55.9]	+10.4 [-28.5/+53.6]	-8.5 [-24.4/+74.8]	+3.9 [-29.0/+29.8]	+4.4 [-17.2/+48.9]	-2.7 [-38.2/+27.6]
Eulach	Annual	-1.0 [-11.7/+13.3]	+0.7 [-14.1/+17.5]	+1.1 [-13.6/+13.8]	-0.7 [-9.4/+10.3]	-0.5 [-9.5/+14.4]	-0.6 [-13.9/+20.4]	-2.3 [-14.6/+12.1]	+3.6 [-6.2/+15.2]	-0.4 [-24.6/+27.9]
	DJF	+6.0 [-25.7/+39.6]	-0.4 [-18.6/+36.2]	+5.5 [-18.0/+29.5]	-9.2 [-17.2/+20.3]	-7.0 [-26.3/+25.8]	-2.0 [-24.2/+32.5]	-11.4 [-22.2/+27.5]	+6.8 [-30.0/+28.6]	+11.7 [-19.5/+55.7]
	MAM	+4.4 [-17.1/+38.7]	-2.5 [-20.8/+30.9]	+5.6 [-20.1/+23.2]	-1.5 [-22.6/+29.6]	+4.0 [-11.6/+33.5]	+6.5 [-20.8/+60.4]	+2.3 [-23.5/+24.3]	+9.0 [-18.6/+40.6]	+6.6 [-16.1/+32.2]
	JJA	-3.4 [-20.5/+8.8]	-8.9 [-19.0/+17.9]	-1.9 [-24.4/+17.1]	-2.8 [-24.6/+38.9]	-8.9 [-26.5/+14.6]	-3.2 [-29.6/+44.1]	+2.1 [-24.3/+19.4]	+2.3 [-32.9/+39.8]	-8.3 [-50.3/+26.2]
	SON	-8.9 [-27.3/+59.0]	+7.0 [-20.0/+39.2]	-3.5 [-33.0/+43.9]	-2.5 [-33.1/+53.7]	+9.3 [-33.1/+56.4]	-4.6 [-24.0/+68.0]	+2.8 [-22.9/+21.5]	+2.1 [-27.6/+42.9]	-2.5 [-45.7/+30.5]

Catchment	Season	△ Precipitation (%)								
		2030-2040			2055-2065			2080-2090		
		RCP2.6	**RCP4.5**	**RCP 8.5**	**RCP2.6**	**RCP4.5**	**RCP 8.5**	**RCP2.6**	**RCP4.5**	**RCP 8.5**
Kleine Emme	Annual	+1.7 [-13.4/+11.4]	-0.2 [-13.7/+12.8]	-0.5 [-9.9/+13.0]	+0.3 [-10.6/+13.3]	-2.1 [-14.0/+8.1]	-1.9 [-14.4/+17.1]	+0.3 [-11.9/+10.7]	+1.3 [-11.6/+15.3]	-2.5 [-21.1/+16.3]
	DJF	+7.8 [-35.1/+33.0]	+7.2 [-11.7/+23.6]	+6.7 [-13.5/+39.5]	+0.4 [-17.9/+27.2]	-4.5 [-29.8/+30.7]	-3.7 [-30.5/+39.5]	-7.5 [-21.0/+40.5]	+2.8 [-13.7/+35.0]	+11.4 [-16.5/+55.9]
	MAM	+7.3 [-14.5/+40.9]	+0.3 [-17.4/+24.3]	+7.8 [-10.6/+18.8]	+1.3 [-13.4/+24.6]	+2.5 [-19.8/+30.8]	+8.8 [-16.6/+44.6]	+3.4 [-19.4/+28.9]	+6.6 [-14.8/+46.5]	+7.3 [-4.8/+24.9]
	JJA	-5.8 [-22.3/+4.6]	-11.7 [-24.6/+7.1]	-6.1 [-20.8/+9.3]	-4.5 [-31.2/+29.1]	-13.0 [-25.9/-0.2]	-7.0 [-32.5/+29.4]	+1.8 [-17.8/+20.0]	-8.8 [-24.2/+23.5]	-13.2 [-51.6/-3.5]
	SON	-3.6 [-18.2/+46.1]	+9.2 [-26.1/+31.5]	-8.3 [-36.8/+34.4]	-1.5 [-30.0/+54.6]	+8.6 [-31.8/+28.0]	+3.4 [-30.8/+36.4]	+4.4 [-27.7/+25.7]	-1.0 [-31.5/+39.0]	-6.1 [-46.6/+21.2]
RHB	Annual	-1.2 [-14.2/+11.7]	-0.1 [-17.2/+16.3]	+0.7 [-15.9/+9.9]	+0.3 [-9.8/+10.6]	-0.8 [-10.1/+12.1]	-1.4 [-12.3/+19.6]	-2.4 [-12.9/+9.4]	+1.9 [-9.2/+12.4]	-2.1 [-23.0/+23.5]
	DJF	+6.2 [-33.6/+38.3]	-1.1 [-18.6/+35.5]	+6.5 [-19.7/+28.4]	-7.3 [-21.2/+22.0]	-8.1 [-26.4/+21.1]	-3.9 [-30.1/+32.0]	-13.7 [-24.7/+28.8]	+5.9 [-31.1/+28.9]	+6.8 [-21.2/+49.9]
	MAM	+3.9 [-15.5/+31.9]	-3.9 [-18.7/+30.5]	+2.2 [-20.5/+21.4]	-1.9 [-22.7/+28.6]	+3.4 [-12.1/+27.9]	+6.1 [-22.4/+52.8]	+0.7 [-22.5/+17.9]	+6.5 [-20.1/+40.0]	+5.4 [-16.1/+29.2]
	JJA	-3.6 [-18.9/+5.5]	-9.7 [-21.5/+11.6]	-2.7 [-23.1/+14.8]	-3.9 [-19.6/+36.8]	-8.7 [-24.0/+10.8]	-5.4 [-23.7/+41.5]	+2.9 [-22.9/+18.1]	+1.4 [-28.5/+38.4]	-9.3 [-46.7/+13.4]
	SON	-10.1 [-25.2/+49.1]	+5.6 [-19.6/+40.7]	-4.0 [-32.9/+47.7]	+1.5 [-33.5/+52.7]	+8.2 [-33.2/+44.2]	-5.5 [-23.3/+66.4]	+1.0 [-22.7/+24.0]	-0.5 [-25.6/+32.5]	-6.2 [-43.3/+31.1]
Suze	Annual	+1.4 [-10.5/+10.6]	+0.1 [-10.2/+11.5]	+1.1 [-9.4/+17.2]	+3.0 [-6.5/+16.8]	+2.1 [-10.9/+13.0]	+0.8 [-15.2/+15.5]	+1.7 [-10.6/+17.1]	+7.8 [-7.5/+22.1]	+1.0 [-13.7/+17.2]
	DJF	+7.7 [-20.5/+41.5]	+13.0 [-12.6/+32.3]	+7.5 [-14.6/+36.7]	+4.8 [-12.2/+32.8]	-0.7 [-27.7/+23.9]	+8.0 [-14.0/+36.0]	+1.3 [-23.4/+34.6]	+16.1 [-15.0/+31.0]	+9.0 [-8.9/+55.6]
	MAM	+4.6 [-20.5/+25.4]	-0.9 [-20.9/+27.1]	+4.4 [-19.1/+31.4]	+1.3 [-13.2/+24.4]	+5.7 [-10.3/+32.8]	+6.6 [-23.3/+42.1]	-1.8 [-15.9/+27.8]	+8.4 [-16.9/+38.0]	+10.9 [-22.2/+38.4]
	JJA	-1.5 [-24.9/+13.0]	-10.4 [-32.5/+20.9]	-1.2 [-25.1/+31.7]	-2.6 [-22.7/+32.4]	-8.3 [-29.6/+14.3]	-9.8 [-29.7/+29.8]	+5.2 [-17.3/+34.2]	-3.1 [-24.1/+39.6]	-20.7 [-44.3/+26.0]
	SON	+0.1 [-24.8/+35.1]	+3.6 [-22.2/+31.0]	-7.9 [-28.0/+27.2]	+8.6 [-25.8/+38.9]	+7.1 [-28.2/+32.8]	-5.8 [-31.5/+47.0]	+2.8 [-23.2/+35.3]	+5.0 [-21.3/+69.9]	-0.7 [-38.0/+22.1]
Alpine	Annual	+2.7 [-21.2/+22.7]	+2.1 [-15.9/+20.5]	+0.5 [-18.7/+32.2]	+3.6 [-15.5/+27.4]	-0.5 [-17.2/+20.4]	+0.8 [-20.4/+32.1]	+0.8 [-17.2/+27.9]	+1.7 [-16.2/+30.3]	-1.2 [-24.0/+28.3]
	DJF	+11.1 [-43.6/+56.5]	+13.5 [-15.7/+89.3]	+8.3 [-23.1/+93.9]	+3.2 [-23.0/+73.5]	-0.2 [-32.8/+55.2]	-0.9 [-36.4/+49.7]	-1.3 [-35.2/+60.7]	+7.1 [-24.3/+70.9]	+8.2 [-20.7/+79.6]
	MAM	+6.0 [-17.8/+35.6]	+3.0 [-30.5/+30.9]	+7.3 [-23.6/+57.7]	+4.1 [-37.8/+33.6]	+4.8 [-32.5/+36.3]	+8.7 [-36.1/+58.9]	+2.0 [-19.8/+36.7]	+1.1 [-20.4/+53.7]	+5.8 [-20.1/+41.9]
	JJA	-7.8 [-22.7/+25.2]	-5.6 [-36.7/+15.0]	-5.1 [-23.9/+23.0]	-0.5 [-27.2/+27.8]	-7.5 [-30.7/+21.0]	-0.9 [-30.7/+47.5]	+2.9 [-19.2/+30.0]	-1.7 [-30.3/+36.4]	-8.4 [-49.2/+27.6]
	SON	+3.8 [-32.9/+42.8]	+2.8 [-33.0/+42.4]	-11.7 [-40.9/+50.2]	+7.8 [-34.8/+69.0]	+5.7 [-33.3/+44.0]	+0.9 [-43.8/+72.1]	+2.8 [-40.4/+44.1]	-5.5 [-39.7/+58.8]	-9.9 [-58.0/+35.8]
Inn	Annual	+8.0 [-18.7/+22.7]	+6.0 [-9.1/+20.2]	+2.9 [-12.0/+32.2]	+10.0 [-15.5/+27.4]	+3.0 [-13.9/+20.4]	+7.5 [-14.5/+32.1]	+7.1 [-9.6/+27.9]	+7.1 [-7.0/+30.3]	+2.2 [-21.2/+28.3]
	DJF	+13.3 [-18.9/+56.5]	+26.9 [-4.7/+89.3]	+21.8 [-8.9/+93.9]	+14.9 [-22.1/+73.5]	+9.0 [-19.6/+55.2]	+8.8 [-33.8/+39.7]	+11.9 [-27.1/+60.7]	+27.8 [-15.3/+70.9]	+13.0 [-6.7/+79.6]
	MAM	+10.5 [-17.8/+35.6]	+9.3 [-30.5/+30.6]	+10.6 [-19.8/+57.7]	+11.7 [-37.8/+33.6]	+10.4 [-11.1/+36.3]	+20.7 [-10.7/+58.9]	+10.1 [-10.1/+36.7]	+2.5 [-18.4/+53.7]	+12.4 [-14.3/+41.9]
	JJA	-6.8 [-22.7/+25.2]	-1.6 [-13.5/+14.7]	+1.4 [-23.6/+23.0]	+8.9 [-16.6/+27.8]	-1.5 [-28.7/+12.2]	+4.3 [-19.4/+47.5]	+0.2 [-19.2/+30.0]	+8.0 [-17.7/+36.4]	-5.3 [-24.7/+25.5]
	SON	+10.5 [-32.9/+42.8]	+1.2 [-21.9/+38.7]	-12.1 [-40.9/+49.5]	+14.1 [-32.4/+52.6]	+1.3 [-31.4/+33.2]	-1.2 [-33.2/+50.6]	+1.5 [-34.3/+44.1]	-2.4 [-28.9/+58.0]	-12.0 [-39.7/+31.2]

Catchment	Season	△ Precipitation (%)								
		2030-2040			2055-2065			2080-2090		
		RCP2.6	RCP4.5	RCP 8.5	RCP2.6	RCP4.5	RCP 8.5	RCP2.6	RCP4.5	RCP 8.5
	Annual	+0.1 [-16.4/+10.9]	-0.1 [-15.9/+13.3]	-0.8 [-13.7/+12.4]	+0.8 [-10.4/+16.4]	-3.0 [-17.2/+9.5]	-1.2 [-15.2/+16.7]	+0.5 [-10.5/+12.3]	+0.2 [-12.3/+16.7]	-3.0 [-18.7/+12.6]
	DJF	+12.2 [-40.6/+31.0]	+12.2 [-13.0/+36.0]	+6.2 [-20.7/+45.7]	+2.0 [-23.0/+34.3]	-0.6 [-32.6/+39.7]	-7.2 [-36.4/+42.5]	-4.8 [-33.5/+44.2]	+4.6 [-21.1/+32.2]	+10.2 [-16.1/+52.4]
Kander	MAM	+5.0 [-12.3/+24.2]	-1.1 [-22.4/+22.2]	+6.2 [-19.8/+23.7]	+0.8 [-12.1/+22.9]	+3.8 [-31.4/+22.7]	+5.1 [-25.3/+26.9]	-0.9 [-12.4/+23.9]	+1.6 [-17.7/+32.9]	+2.9 [-7.2/+21.7]
	JJA	-6.6 [-22.1/+10.7]	-5.9 [-34.9/+12.2]	-5.0 [-23.5/+10.5]	-3.5 [-27.2/+22.2]	-6.9 [-28.3/+6.3]	-4.0 [-24.9/+23.2]	+4.7 [-11.4/+21.7]	-4.5 [-20.9/+18.5]	-10.0 [-41.8/+6.0]
	SON	+1.9 [-27.0/+42.5]	+5.3 [-33.0/+28.2]	-14.4 [-40.1/+29.7]	+4.8 [-29.8/+59.9]	+6.0 [-33.3/+30.5]	+3.7 [-38.0/+52.0]	+2.4 [-31.1/+35.7]	-7.9 [-30.8/+58.8]	-7.8 [-48.2/+21.7]
	Annual	-0.3 [-18.8/+14.6]	-0.1 [-8.9/+20.5]	-0.4 [-18.7/+13.9]	-0.2 [-11.9/+10.4]	-2.3 [-16.5/+13.9]	-2.0 [-20.4/+24.1]	-1.8 [-17.2/+10.9]	-0.6 [-16.2/+13.8]	-5.5 [-24.0/+21.6]
	DJF	+5.6 [-43.6/+50.1]	+8.6 [-11.3/+32.6]	+6.4 [-20.8/+52.6]	-2.6 [-16.9/+28.5]	-3.3 [-32.8/+32.0]	-11.0 [-31.0/+42.8]	-10.0 [-35.2/+35.3]	+3.9 [-24.3/+46.7]	+7.5 [-20.7/+63.8]
Landwasser	MAM	+4.3 [-12.4/+23.7]	-1.2 [-22.8/+27.2]	+5.4 [-23.6/+23.2]	-0.1 [-16.6/+27.5]	+3.7 [-30.4/+18.1]	+5.9 [-36.1/+40.3]	-2.4 [-19.8/+23.1]	-1.6 [-14.9/+37.5]	+0.7 [-20.1/+20.6]
	JJA	-8.9 [-22.5/+9.1]	-6.6 [-20.0/+3.3]	-7.9 [-19.9/+9.1]	-1.6 [-19.1/+16.6]	-11.0 [-27.8/+5.9]	+0.7 [-27.7/+15.2]	-1.6 [-18.1/+27.2]	-3.1 [-30.3/+13.6]	-10.4 [-47.7/+0.4]
	SON	+0.3 [-30.8/+39.6]	+3.6 [-32.3/+42.4]	-7.3 [-40.9/+50.2]	-3.8 [-34.8/+53.3]	+5.5 [-28.7/+44.0]	-1.3 [-43.8/+53.0]	+5.1 [-40.4/+39.8]	-8.4 [-39.7/+37.5]	-13.0 [-58.0/+23.5]
	Annual	+3.1 [-17.3/+13.1]	+4.1 [-15.1/+18.7]	+1.7 [-12.2/+16.1]	+6.7 [-9.5/+23.6]	+0.4 [-16.4/+16.6]	+2.7 [-12.6/+18.7]	+2.8 [-6.3/+17.6]	+3.0 [-8.8/+24.0]	-0.5 [-13.6/+25.4]
	DJF	+13.4 [-34.9/+37.0]	+14.6 [-13.7/+37.6]	+11.5 [-16.6/+41.8]	+5.8 [-20.5/+43.6]	+4.7 [-28.0/+37.4]	-3.5 [-31.7/+38.6]	+4.0 [-27.3/+39.7]	+9.7 [-13.9/+38.4]	+7.9 [-12.9/+56.6]
Lonza	MAM	+4.7 [-16.2/+26.7]	+5.5 [-22.9/+30.9]	+9.6 [-12.3/+32.0]	+6.5 [-22.9/+26.6]	+3.5 [-17.0/+31.6]	+9.7 [-18.9/+29.0]	+2.7 [-16.7/+35.6]	+3.3 [-20.4/+42.1]	+8.0 [-9.9/+29.7]
	JJA	-8.5 [-21.0/+18.6]	-4.7 [-36.7/+15.0]	-2.0 [-23.9/+21.6]	+1.0 [-17.9/+23.4]	-7.9 [-30.7/+21.0]	-0.9 [-25.0/+34.2]	+4.7 [-19.0/+26.4]	-2.5 [-16.1/+27.5]	-7.1 [-38.2/+27.6]
	SON	+5.4 [-24.2/+35.0]	+4.0 [-27.2/+27.8]	-12.2 [-38.7/+30.0]	+13.0 [-29.2/+69.0]	+6.4 [-29.3/+28.1]	+6.8 [-35.6/+56.9]	+2.8 [-29.8/+32.8]	-5.0 [-35.9/+52.5]	-7.5 [-38.6/+35.8]
	Annual	+2.6 [-21.2/+14.0]	+0.5 [-15.3/+15.4]	+0.5 [-12.7/+12.1]	+2.7 [-9.4/+16.4]	-3.1 [-16.8/+14.9]	-0.4 [-13.8/+18.6]	-0.5 [-9.8/+13.7]	+0.3 [-12.0/+15.4]	-1.6 [-18.8/+13.5]
	DJF	+10.5 [-42.7/+33.5]	+9.6 [-15.7/+33.8]	+5.7 [-23.1/+45.0]	+1.4 [-21.8/+32.7]	-5.7 [-27.3/+40.6]	-9.1 [-35.1/+49.7]	-5.9 [-27.7/+43.8]	+1.2 [-20.6/+38.8]	+5.4 [-17.6/+39.0]
Lutschine	MAM	+6.0 [-14.4/+24.0]	-0.2 [-21.7/+27.5]	+6.3 [-18.5/+22.9]	+3.4 [-9.5/+25.9]	+5.8 [-32.5/+26.3]	+8.5 [-28.3/+32.8]	+0.8 [-11.2/+26.0]	+2.1 [-11.4/+42.2]	+7.7 [-11.3/+19.4]
	JJA	-7.9 [-19.4/+5.8]	-9.8 [-28.2/+10.1]	-7.0 [-21.1/+10.6]	-3.4 [-22.0/+26.4]	-10.3 [-25.0/+1.3]	-6.1 [-30.7/+26.7]	+3.5 [-13.4/+23.0]	-5.6 [-19.4/+16.8]	-9.0 [-49.2/+5.0]
	SON	+2.7 [-16.4/+36.9]	+3.9 [-18.9/+30.2]	-9.2 [-34.8/+25.9]	+5.7 [-27.2/+52.4]	+7.3 [-23.0/+28.7]	+1.7 [-31.9/+72.1]	+5.8 [-28.5/+33.1]	-5.4 [-29.1/+37.1]	-9.0 [-41.9/+24.9]

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