

Appendix: Description of data files

MetCR1X_L2.csv (period 2020-08-24 to 2022-11-04)			
#	Name	Unit	Variable
1	TimeStamp	YYYY-MM-DD hh:mm:ss	
2	rec_num	#	
3	HFP1	W m ⁻²	Heat flux plate measurement HFP/1 (2.0 m depth mounted on upperside of block)
4	HFP2	W m ⁻²	Heat flux plate measurement HFP/2 (operational from 2022-07-26, 1.1 m depth on underside of a block)
5	CGR3up	W m ⁻²	CGR3 pyrgeometer measurement CGR3/1 (corrected ^a ; 1.55 m depth)
6	CGR3down	W m ⁻²	CGR3 pyrgeometer measurement CGR3/2
^a Faulty housing temperature of CGR3/1 because of loose contact pin; radiation CGR3/1 corrected with CGR3/2 housing temperature. The two CGR3 are mounted back-to-back and are thermally coupled. Housing temperature difference is generally within 0.1°C, uncertainty in resulting net long-wave radiation is 0.5 W m ⁻² .			

MetCR1X_L0.csv (period 2020-08-24 to 2023-09-20)			
#	Name	Unit	Variable
1	TimeStamp	YYYY-MM-DD hh:mm:ss	
2	rec_num	#	
3	logger		(traceability)
4	VBATT	V	Battery voltage
5	TLOG	°C	CR1X internal logger temperature
6	HFP1	W m ⁻²	Heat flux plate measurement HFP/1 (2.0 m depth mounted on upperside of block)
7	HFP2	W m ⁻²	Heat flux plate measurement HFP/2 (operational from 2022-07-26, 1.1 m depth on underside of a block)
8	CGR3up	W m ⁻²	CGR3 pyrgeometer measurement CGR3/1 (corrected ^a ; 1.55 m depth)
9	CGR3down	W m ⁻²	CGR3 pyrgeometer measurement CGR3/2
11	CGR3thermC2	°C	Housing temperature of CGR3/2
^a Faulty housing temperature of CGR3/1 because of loose contact pin; radiation CGR3/1 corrected with CGR3/2 housing temperature. The two CGR3 are mounted back-to-back and are thermally coupled. Housing temperature difference is generally within 0.1°C, uncertainty in resulting net long-wave radiation is 0.5 W m ⁻² .			

MetCR6_L1.csv (period 2020-08-22 to 2023-12-07)			
MetCR6_L2.csv (period 2020-08-22 to 2022-11-01)			
#	Name	Unit	Variable
1	TimeStamp	YYYY-MM-DD hh:mm:ss	
2	rec_num	#	
3	amb_press	kPa	Barometric pressure
4	TA	°C	Air temperature
5	RH	%	Relative humidity
6	TA107	°C	Air temperature (CSI 107 probe)
7	Pluvio	sum in mm/10 minutes	Tipping bucket rain gauge SBS500
8	snow_height	m	SR50A sonic ranger measurement
9	snowT0	°C	Surface temperature (unshielded)
10	snowT25	°C	Snow temperature 25 cm above ground
11	snowT50	°C	Snow temperature 50 cm above ground
12	snowT100	°C	Snow temperature 100 cm above ground
13	Tal_HV51	°C	AL air temperature HV5/1 (0.7 m depth)
14	RHal_HV51	%	AL relative humidity HV5/1
15	Tal_HV52	°C	AL air temperature HV5/2 (2.0 m depth)
16	RHal_HV52	%	AL relative humidity HV5/2

Chain1_L2.csv (TK1 in period 2020-08-24 to 2022-11-04)			
#	Name	Unit	Variable
1	TimeStamp	YYYY-MM-DD hh:mm:ss	
2	rec_num	#	
3	Ttherm1	°C	AL air temperature TK1/1 (0.5 m depth)
4	Ttherm2	°C	AL air temperature TK1/2 (1.1 m depth)
5	Ttherm3	°C	AL air temperature TK1/3 (1.6 m depth)
6	Ttherm4	°C	AL air temperature TK1/4 (2.4 m depth)
7	Ttherm5	°C	AL air temperature TK1/5 (2.9 m depth)

Chain6r_L2.csv (TK6 in period 2022-07-08 to 2022-11-04)			
#	Name	Unit	Variable
1	TimeStamp	YYYY-MM-DD hh:mm:ss	
2	rec_num	#	
3	Ttherm26	°C	AL rock temperature TK6/1 (0.7 m depth)
4	Ttherm27	°C	AL rock temperature TK6/2 (1.8 m depth)
5	Ttherm28	°C	AL rock temperature TK6/3 (2.1 m depth)
6	Ttherm29	°C	AL rock temperature TK6/4 (2.4 m depth)
7	Ttherm30	°C	AL rock temperature TK6/5 (2.9 m depth)

eddy_flux_L3.csv (processed CSAT data, period 2020-11-04 to 2022-11-03)			
#	Name	Unit	Variable
1	TimeStamp	YYYY-MM-DD hh:mm:ss	
2	rec_num	#	
3	H	W m ⁻²	Sonic buoyancy flux from CSAT
4	Ux	m s ⁻¹	Wind velocity x
5	Uy	m s ⁻¹	Wind velocity y
6	Uz	m s ⁻¹	Wind velocity z (vertical)
7	wind_speed	m s ⁻¹	Wind speed

SWE_avg@PXT_L3.csv (processed SWE, period 2020-08-23 to 2022-11-02)			
SWE derived from snow height using the ΔSNOW model (Winkler et al., 2021), daily resolution.			
#	Name	Unit	Variable
1	TimeStamp	YYYY-MM-DD hh:mm:ss	
2	snow_height	m (daily average)	Snow height SR50A sonic ranger measurement
3	SWE	kg m ⁻²	Snow water equivalent
4	bulk_density	kg m ⁻³	Snow bulk density (snow_height/SWE)
Winkler, M., Schellander, H., and Gruber, S.: Snow water equivalents exclusively from snow depths and their temporal changes: the ΔSNOW model, Hydrology and Earth System Sciences, 25, 1165–1187, https://doi.org/10.5194/hess-25-1165-2021 , 2021.			

ground_ice_table_data.csv ('ablation measurements' in thaw seasons 2022 and 2023)			
#	Name	Unit	Variable
1	date	DD-MM-YYY	
2	ice surface wrt. tube top (cm)	cm	Distance between top of tube ('ablation stake') to ground-ice table

WS L1.csv (AL airflow speed in period 2020-08-24 to 2022-10-31)			
#	Name	Unit	Variable
1	TimeStamp	YYYY-MM-DD hh:mm:ss	
2	RecNum	#	
3	BoreHole		(for traceability)
4	WS1stat		Measurement status (0=valid)
5	WS2stat		
6	WS3stat		
7	WS4stat		
8	WS5stat		
9	WS6stat		
10	VBATTact	V	Battery voltage (WS operation mode controlled by battery voltage)
11	WS1avg	m s ⁻¹	Average airflow speed of past 30' interval
12	WS2avg	m s ⁻¹	
13	WS3avg	m s ⁻¹	
14	WS4avg	m s ⁻¹	
15	WS5avg	m s ⁻¹	
16	WS6avg	m s ⁻¹	
17	WS1max	m s ⁻¹	Maximum airflow speed of past 30' interval
18	WS2max	m s ⁻¹	
19	WS3max	m s ⁻¹	
20	WS4max	m s ⁻¹	
21	WS5max	m s ⁻¹	
22	WS6max	m s ⁻¹	
23	WS1min	m s ⁻¹	Minimum airflow speed of past 30' interval
24	WS2min	m s ⁻¹	
25	WS3min	m s ⁻¹	
26	WS4min	m s ⁻¹	
27	WS5min	m s ⁻¹	
28	WS6min	m s ⁻¹	

Chain1 L1.csv (TK1 in period 2020-08-24 to 2023-09-20)			
#	Name	Unit	Variable
1	TimeStamp	YYYY-MM-DD hh:mm:ss	
2	rec_num	#	
3	Ttherm31	°C	Measurement status (8.59=valid)
4	Ttherm32	°C	Measurement status (-0.334±0.002=valid)
5	Ttherm1	°C	AL air temperature TK1/1 (0.5 m depth)
6	Ttherm2	°C	AL air temperature TK1/2 (1.1 m depth)
7	Ttherm3	°C	AL air temperature TK1/3 (1.6 m depth)
8	Ttherm4	°C	AL air temperature TK1/4 (2.4 m depth)
9	Ttherm5	°C	AL air temperature TK1/5 (2.9 m depth)

Chain4 L1.csv (TK4 in period 2020-08-24 to 2023-09-21)			
#	Name	Unit	Variable
1	TimeStamp	YYYY-MM-DD hh:mm:ss	
2	rec_num	#	
3	Ttherm31	°C	Measurement status (8.59=valid)
4	Ttherm32	°C	Measurement status (-0.334±0.002=valid)
5	Ttherm16	°C	AL air temperature TK4/1
6	Ttherm17	°C	AL air temperature TK4/2
7	Ttherm18	°C	AL air temperature TK4/3
8	Ttherm19	°C	AL air temperature TK4/4
9	Ttherm20	°C	AL air temperature TK4/5

Chain5 L1.csv (TK5 in period 2020-08-24 to 2023-12-07; not destroyed by the huge block)			
#	Name	Unit	Variable
1	TimeStamp	YYYY-MM-DD hh:mm:ss	
2	rec_num	#	
3	Ttherm31	°C	Measurement status (8.59=valid)
4	Ttherm32	°C	Measurement status (-0.334±0.002=valid)
5	Ttherm21	°C	AL air temperature TK5/1
6	Ttherm22	°C	AL air temperature TK5/2
7	Ttherm23	°C	AL air temperature TK5/3
8	Ttherm24	°C	AL air temperature TK5/4
9	Ttherm25	°C	AL air temperature TK5/5

ISO2021_L2.csv, ISO2022_L2.csv Isotope data collected in summer 2021 and 2022.			
#	Name	Unit	Variable
1	ID	#	Sample ID (for traceability)
2	Job	#	Picarro Job (for traceability)
3	TimeStamp	YYYY-MM-DD hh:mm:ss	Sampling time (UTC+01:00)
4	Loc		Sampling location (abbreviations explained in Publication)
5	Tw	°C	Water temperature (field measurement using the WTW probe)
6	EC	$\mu\text{S cm}^{-1}$ (referenced to 25°C)	Water electrical conductivity (field measurement using the WTW probe)
7	d18O	‰	$\delta^{18}\text{O}$
8	d2H	‰	$\delta^2\text{H}$
9	d_excess	‰	Deuterium excess = $\delta^2\text{H} - 8 \delta^{18}\text{O}$

Water data files: abbreviations

- Location: @SE eastern main spring; @SW western main spring; @GS gauging station in rock-glacier forefield (after confluence of both rock-glacier streamlets SE and SW).
- Parameter: EC electrical conductivity [$\mu\text{S cm}^{-1}$]; PA total pressure [kPa]; WL water level [m]; Q discharge [L sec^{-1}].