

README file for Stordalen Lake Temperatures  
to accompany stordalen-lakes-temperatures-4.zip  
(updated 210703, P.M.Crill)

Temperature measurements are made in three small subarctic post-glacial lakes surrounding the Stordalen Mire, 9 km east of Abisko, south of Lake Torneträsk, in northern Sweden.  
Locations are marked as yellow filled circles on the map file (Stordalen Lakes sampling points.pdf)

This is version 4. Data are comma delimited. Date stamp formats regularized to yyyy-mm-dd hh:mm. File names were checked and regularized. Negative temperatures for the winters of 2017 and 2018 were restored (minus signs had been inadvertently stripped from the data in version 3).

Lake names and locations:

Inre Harrsjön (IH) 68°21'30.84"N, 19° 2'43.36"E  
Mellersta Harrsjön (MH) 68°21'30.38"N, 19° 2'30.13"E  
Villasjön (VS) 68°21'16.63 "N, 19° 3'7.84"E

Measurement time period:  
2009-06-11 – 2019-10-09

Depths of measurements below water surface:

Determined by the depth of the lake

All Lakes (IH, MH, VS) 0.1, 0.3, 0.5, 1.0 meter

IH, MH 3.0, 5.0 m

MH 6.7 m

Additional depths (IH 2.0; June 2017-2019, MH 2.0 and MH 4.0; June 2017-2019)

Measurement interval:  
usually 5 to 15 minutes

Data coverage (depth, time, sampling intervals) vary over time and between the lakes.  
HOBO U22 dataloggers are used. All dataloggers intercalibrated in a stirred water bath before deployment

Relative precision estimated to be 0.03 °C after correction

Accuracy is estimated to be 0.2°C

See Instrument Specifications Below

Data publisher:

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There should be 25 files in the folder "Corrected CSV files" plus two \*.pdf files ("ReadMe file for Stordalen Lakes Temperatures\_v4.pdf" and "Stordalen Lakes Sampling Points.pdf") contained in the zipped file package.

Data values are separated by commas. See below for information about the file content and other details.

Raw HOBO data logger files and specific s/n and offset of loggers used are available from Patrick Crill.

Relative Offsets for HOBO dataloggers  
avg offset of the average of the twenty loggers (n=2991)

T-loggers in a stirred water bath for two weeks  
before May 2 - 5, 2008 2 minute sample intervals used for averages

New set of dataloggers intercalibrated in a stirred water bath as the previous intercalibration  
with some old loggers 5-16 October 2015

OFFSET determined by comparison of individual logger temperature logged every two minutes  
to the midpoint average of a 10 minute running average of ALL loggers

The average relative offset of all loggers is 0.007 °C

T-loggers            Example 11 Jun 10 - 20 Jul 10 deployment  
Locations on strings not altered for subsequent deployments

InreHarrsjön		MellanHarrsjön		Villasjön	
Depth(m)	ID	Depth(m)	ID	Depth(m)	ID
0.1	1298961	0.1	1298959	0.1	1298957
0.3	1285451	0.3	1298963	0.3	1298968
0.5	1285450	0.5	1298955	0.5	1298962
1	1298969	1	1298960	1	1285438
3	1298965	3	1285449		
5	1298964	5	1298954		
		7	1298966		

#### WARNING:

Watch out for unusual temperatures during the download period the strings are being pulled from the water  
Details

T strings deployed in the deepest parts in three lakes around the palsa mire complex; Stordalen Mire about 10 km East  
of Abisko, Sweden

IH = Inre Harrsjön, 68° 21' 32.37"N; 19° 02' 41.75"E (2.2 ha, 5.0 m max depth)

MH = Mellersta Harrsjön, 68° 21' 30.37"N; 19° 02' 27.63"E (1.1 ha, 6.7 m max depth)

VS = Villasjön, 68° 21' 16.81"N; 19° 03' 04.20"E (17.0 ha, 1.5 m max depth)

locations from Google Earth

Further descriptions of locations and lakes can be found in

Wik, M., P.M. Crill, R.K. Varner and D. Bastviken (2013). Multiyear measurements of ebullitive methane flux from three  
subarctic lakes. J. Geophys. Res. Biogeosci., 118, 1–14, doi:10.1002/jgrg.20103, 2013.

#### Logging history

there is one header line, logging does NOT begin and end coincidentally in all cases

StrdIn\_Twater\_090611-090828\_corr.csv (11188 lines)

090611-090828: MH and IH only, 0.1m to 1.0m logged every 10 minutes, 3, 5 and 7m logged every 60 minutes,  
No VS data

Strdln\_Twater\_090829-091012\_corr.d.csv (6358 lines)  
 090829-091012: MH and IH only, 0.1m to 1.0m logged every 10 minutes, 3, 5 and 7m logged every 60 minutes,  
 No VS data

Strdln\_Twater\_091015-100602\_corr.d.csv (22086 lines)  
 091015-100602: MH and IH only, 0.1m and 0.3m loggers removed for winter; 0.5m to bottom logged every 15  
 Minutes, No VS data

Strdln\_Twater\_100609-100720\_corr.d.csv (11716 lines)  
 100609-100720: MH,IH and VS all depth logged every 5 minutes. VS starts 100611

Strdln\_Twater\_100721-100828\_corr.d.csv (10917 lines)  
 100721-100828: MH,IH and VS all depth logged every 5 minutes

Strdln\_Twater\_100829-100927\_corr.d.csv (8415 lines)  
 100829-100927: MH,IH and VS all depth logged every 5 minutes

Strdln\_Twater\_100928-110610\_corr.d.csv (24477 lines)  
 100928-110610: MH,IH and VS all depth logged every 15 minutes, VS ends 110609

Strdln\_Twater\_110611-111020\_corr.d.csv (37700 lines)  
 110611-111020: MH,IH and VS all depth logged every 5 minutes

Strdln\_Twater\_111020-120529\_corr.d.csv (21319 lines)  
 110611-111020: MH,IH and VS all depth logged every 15 minutes

Strdln\_Twater\_120530-120928\_corr.d.csv (34707 lines)  
 120530-120928: MH,IH and VS all depth logged every 5 minutes

Strdln\_Twater\_120928-130627\_corr.d.csv (26073 lines)  
 120928-130627: MH,IH and VS all depth logged every 15 minutes, MH, IH end 130620

Strdln\_Twater\_130620-130923\_corr.d.csv (9130 lines)  
 130620-130923: MH,IH and VS all depth logged every 15 minutes VS starts 130627

Strdln\_Twater\_130923-140609\_corr.d.csv (24883 lines)  
 130923-140609: MH,IH and VS all depth logged every 15 minutes

Strdln\_Twater\_140609-140829\_corr.d.csv (23366 lines)  
 140609-140829: MH,IH and VS all depth logged every 5 minutes

Strdln\_Twater\_140829-141003\_corr.d.csv (10054 lines)  
 140829-141003: MH,IH all logged every 5 minutes except IH at 5 meters logged every 15 min \*NO VS data\*

Strdln\_Twater\_141003-150620\_corr.d.csv (36877 lines) very different start and end times  
 141003-150620: MH,IH, VS all logged every 15 then 5 minutes - IH logged 2 min later starting 150611 14:07 - MH  
 loggers at 0.5, 1, 5 and 6.7 m depths stopped 150514 02:55 -every 15 min \*NO VS data\*

Strdln\_Twater\_150620-151001\_corr.d.csv (29648 lines)  
 150620-151001: MH,IH, VS all logged every 5 minutes but different time stamps - VS data end 150918 22:53

Strdln\_Twater\_151001-160607\_corr.d.csv (27553 lines)  
 151001-160607: MH, IH, VS all logged every 5 minutes - 2nd set of loggers on same string in IH

Strdln\_Twater\_160607-161016\_corr.d.csv (37752 lines)  
 160607-161016: MH, IH, VS all logged every 5 minutes Different start and stop times

Strdln\_Twater\_161016-170316\_corr.d.csv (43421 lines)  
 161016-170316: MH, IH, VS logged every 5 minutes Different start and stop times

Strdln\_Twater\_170610-170929\_corr.d.csv (31874 lines)  
 170610-170929: MH, IH, VS logged every 5 minutes IH and MS same start and different stop times,  
 VS 11 days later start, earlier end

Strdln\_Twater\_170929-180615\_corr.d.csv (24876 lines)  
 170930-180615: MH,IH, VS logged every 15 min IH and MS same start and stop times, VS starts later and ends earlier

Strdln\_Twater\_180615-181016\_corr.d.csv (35705 lines)  
 180615-181017: logged every 5 min. Different start and end times in each lake

Strdln\_Twater\_181018-190606\_corr.d.csv (22159 lines)  
 181018-190606: logged every 15 min. Same Start but Different end times in each lake

Strdln\_Twater\_190606-191009\_corr.d.csv (11968 lines).  
 190606-191009: logged every 15 min. Same Start but Different end times in each lake, additional string in IH,  
 malfunction no data from MH\_ 4.0 m, Additional thermistor string deployed in IH at 1.0, 2.0 and 3.0 m

Data available in \*.csv (, separated) files (Gaps –between extraction and redeployment, days)

Data available in *.csv files	Inre Harrsjön		Mellersta Harrsjön		Villasjön		Gaps		
File	start	stop	start	stop	start	stop	IH	MH	VS
Strdln_Twater_090611-090828_corr ***	2009-06-11 22:00	2009-08-28 13:40	2009-06-11 22:00	2009-08-28 14:20	No data	No data			
Strdln_Twater_090829-091012_corr ***	2009-08-29 13:00	2009-10-12 15:30	2009-08-29 13:00	2009-10-12 16:20	No data	No data	0.97	0.94	NaN
Strdln_Twater_091015-100602_corr ***	2009-10-15 17:00	2010-06-02 18:00	2009-10-15 17:00	2010-06-02 18:00	No data	No data	3.06	3.03	NaN
Strdln_Twater_100609-100720_corr ***	2010-06-09 21:00	2010-07-20 13:10	2010-06-09 21:00	2010-07-20 12:45	2010-06-11 22:00	2010-07-20 12:10	7.13	7.13	NaN
Strdln_Twater_100721-100828_corr ***	2010-07-21 17:00	2010-08-28 13:35	2010-07-21 17:00	2010-08-28 13:45	2010-07-21 17:00	2010-08-28 14:35	1.16	1.18	1.20
Strdln_Twater_100829-100927_corr ***	2010-08-29 11:00	2010-09-27 16:05	2010-08-29 11:00	2010-09-27 14:35	2010-08-29 11:00	2010-09-27 13:30	0.89	0.89	0.85
Strdln_Twater_100928-110610_corr ***	2010-09-28 15:00	2011-06-10 13:45	2010-09-28 15:00	2011-06-10 13:30	2010-09-28 15:00	2011-06-09 12:45	0.95	1.02	1.06
Strdln_Twater_110611-111020_corr ***	2011-06-11 16:00	2011-10-20 12:25	2011-06-11 16:00	2011-10-20 12:30	2011-06-11 16:00	2011-10-20 13:30	1.09	1.10	2.14
Strdln_Twater_111020-120529_corr ***	2011-10-20 16:00	2012-05-29 17:15	2011-10-20 16:00	2012-05-29 17:00	2011-10-20 16:00	2012-05-29 14:15	0.12	0.12	0.10
Strdln_Twater_120530-120928_corr ***	2012-05-30 20:00	2012-09-28 08:05	2012-05-30 20:00	2012-09-28 08:05	2012-05-30 20:00	2012-09-28 08:05	1.11	1.13	1.24
Strdln_Twater_120928-130627_corr ***	2012-09-28 15:00	2013-06-20 11:15	2012-09-28 15:00	2013-06-20 10:45	2012-09-28 15:15	2013-06-27 04:45	0.25	0.25	0.26
Strdln_Twater_130620-130923_corr ***	2013-06-20 11:45	2013-09-23 11:00	2013-06-20 11:15	2013-09-23 10:45	2013-06-27 12:00	2013-09-23 13:15	0.01	0.02	0.30
Strdln_Twater_130923-140609_corr ***	2013-09-23 11:45	2014-06-09 16:00	2013-09-23 11:15	2014-06-09 15:30	2013-09-23 16:30	2014-06-09 11:30	0.01	0.01	0.11
Strdln_Twater_140609-140829_corr ***	2014-06-09 16:30	2014-08-29 16:20	2014-06-09 16:00	2014-08-29 15:55	2014-06-09 14:00	2014-08-29 17:00	0.02	0.02	0.10
Strdln_Twater_140829-141003_corr ***	2014-08-29 16:35	2014-10-03 14:15	2014-08-29 1610	2014-10-03 13:20	No data	No data	0.01	0.01	
Strdln_Twater_141003-150520_corr ***	2014-12-06 00:00	2015-06-20 14:37	2014-10-03 17:00	2015-06-20 16:25	2014-11-19 16:15	2015-06-20 11:00	63.4	0.15	81.9
Strdln_Twater_150620-151001_corr ***	2015-06-20 14:55	2015-10-01 13:25	2015-06-20 16:43	2015-10-01 15:13	2015-06-20 11:18	2015-09-18 22:53	0.01	0.01	0.01
Strdln_Twater_151001-160607_corr ***	2015-10-01 16:15	2016-06-07 10:45	2015-10-01 16:00	2016-06-07 13:05	2015-10-01 17:15	2016-06-07 14:55	0.09	0.02	0.02
Strdln_Twater_151001-160607_corr 2nd IH string ***	2015-10-01 16:30	2016-06-07 10:45							
Strdln_Twater_160607-161016_corr ***	2016-06-07 11:30	2016-10-16 13:20	2016-06-07 13:35	2016-10-16 14:20	2016-06-07 15:10	2016-10-16 11:25	0.02	0.01	0.01
Strdln_Twater_161016-170316_corr ***	2016-10-16 13:25	2017-03-16 07:05	2016-10-16 14:50	2017-03-16 08:40	2016-10-16 10:50	2017-03-16 05:05	0.00	-0.01	0.02
Strdln_Twater_170610-170929_corr ***	2017-06-10 19:00	2017-09-29 10:30	2017-06-10 19:00	2017-09-29 11:00	2017-06-21 17:00	2017-09-29 07:50	86.5	86.44	97.5
Strdln_Twater_170929-180615_corr ***	2017-09-29 13:45	2018-06-15 15:30	2017-09-29 19:00	2018-06-15 15:30	2017-09-29 12:00	2018-06-15 14:30	0.08	0.29	0.16
Strdln_Twater_180615-181016_corr ***	2018-06-15 18:00	2018-10-16 15:00	2018-06-15 18:15	2018-10-17 12:35	2018-06-15 17:00	2018-10-17 16:15	0.10	0.13	0.27
Strdln_Twater_181018-190606 _corr***	2018-10-18 21:00	2019-06-06 16:15	2018-10-18 21:00	2019-06-06 14:30	2018-10-18 21:00	2019-06-06 10:15	2.25	1.35	1.20
Strdln_Twater_190606-191009 _corr***	2019-06-06 21:00	2019-10-09 12:30	2019-06-06 21:00	2019-10-09 12:15	2019-06-06 21:00	2019-06-06 11:30	0.28	0.27	0.45

Instrument Information, From manufacturer specifications

HOBO® Pro v2 Water Temperature (400 ft.) Data Logger

Operation range†: -40° to 70°C (-40° to 158°F) in air; maximum

sustained temperature of 50°C (122°F) in water

Accuracy: 0.2°C over 0° to 50°C (0.36°F over 32° to 122°F)

Resolution: 0.02°C at 25°C (0.04°F at 77°F)

Response time: (90%) 5 minutes in water; 12 minutes in air moving 2 m/sec (typical)

Stability (drift): 0.1°C (0.18°F) per year

Logger

Real-time clock: ± 1 minute per month 0° to 50°C (32° to 122°F)

Battery: 2/3 AA, 3.6 Volt Lithium, factory-replaceable ONLY

Battery life (typical use): 6 years with 1 minute or greater logging interval

Memory (non-volatile): 64K bytes memory (approx. 42,000 12-bit temperature measurements)

Weight: 42 g (1.5 oz)

Dimensions: 3.0 cm (1.19 in.) maximum diameter, 11.4 cm (4.5 in.) length; mounting hole 6.3 mm (0.25 inches) diameter

Wetted materials: Polypropylene case, EPDM® o-rings, stainless steel retaining ring

Buoyancy (fresh water): +13 g (0.5 oz.) in fresh water at 25°C (77°F); +17 g (0.6 oz.) with optional boot

Waterproof: To 120 m (400 ft.)

Shock/drop: 1.5 m (5 ft.) drop at 0°C to 70°C (32°F to 150°F)

Logging interval: Fixed-rate or multiple logging intervals, with up to 8 user-defined logging intervals and durations; logging intervals from 1 second to 18 hours. Refer to HOBOWare software manual.

Launch modes: Immediate start and delayed start

Offload modes: Offload while logging; stop and offload

Battery indication: Battery voltage can be viewed in status screen and optionally logged in datafile. Low battery indication in datafile.