

README file for Stordalen Lake Temperatures
(updated 200603, PMC)

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.

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 – 2019-10-16

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 (or 7.0) m

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 Below

Data publisher:

Bolin Centre for Climate Research, Stockholm University, SE-106 91 Stockholm, Sweden

Contact Person:

Patrick Crill

Professor of Biogeochemistry

Department of Geological Sciences

Stockholm University

Svante Arrhenius väg 8C

SE-106 91 Stockholm

Sweden

tfn: +46 (0)8 16 4740

email: patrick.crill@geo.su.se

File names:

Strdln_Twater_090611-090828_corrd.csv

Strdln_Twater_090829-091012_corrd.csv

Strdln_Twater_091015-100602_corrd.csv

Strdln_Twater_100609-100720_corr.csv
 Strdln_Twater_100721-100828_corr.csv
 Strdln_Twater_100829-100927_corr.csv
 Strdln_Twater_100928-110610_corr.csv
 Strdln_Twater_110611-111020_corr.csv
 Strdln_Twater_111020-120529_corr.csv
 Strdln_Twater_120530-120928_corr.csv
 Strdln_Twater_120928-130627_corr.csv
 Strdln_Twater_130620-130923_corr.csv
 Strdln_Twater_140609_140829_corr.csv
 Strdln_Twater_140829_141003_corr.csv
 Strdln_Twater_141003_150520_corr.csv
 Strdln_Twater_150620_151001_corr.csv
 Strdln_Twater_151001_160607_corr.csv
 Strdln_Twater_151001_160607_corr.csv
 Strdln_Twater_160607-161016_corr.csv
 Strdln_Twater_161016-170316_corr.csv
 Strdln_Twater_170610-170929_corr.csv
 Strdln_Twater_170930-180615_corr.csv (extra depths added in IH and MH)
 Strdln_Twater_180615-181016_corr.csv
 Strdln_Twater_181018-190606_corr.csv
 Strdln_Twater_190606-191009_corr.csv

Data values are separated by semicolons. 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 = Mellan Harrsjön, 68° 21' 30.37"N; 19° 02' 27.63"E (1.1 ha, 7.0 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 begin and end coincidentally in all cases

Strdln_Twater_090611-090828_corr.d.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

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

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

Strdln_Twater_100609-100720_corr.d.csv (11716 lines)

100609-100720: MH, IH and VS all depth logged every 5 minutes

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

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 (34718 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

Strdln_Twater_130620-130923_corr.d.csv (9130 lines)

130620-130923: MH, IH and VS all depth logged every 15 minutes

Strdln_Twater_130923-140609_corr.d.csv (24886 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 (10062 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)

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 (29654 lines)

150620-151001: MH, IH, VS all logged every 5 minutes but different time stamps - IH 3m, MH 0.5, 1.0, 5.0, 6.7, VS all depths BAD after 150919 02:05 - All MH 0.3 and VS 0.5 m All_BAD

Strdln_Twater_151001-160607_corr.d.csv (27575 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 (37755 lines)

160607-161016: MH, IH, VS all logged every 5 minutes Different start and stop times for all

Strdln_Twater_161016-170316_corr.d.csv (43414 lines)

161016-170316: MH, IH, VS all logged every 5 minutes Different start and stop times for all

Strdln_Twater_170610-170929_corr.d.csv (31874 lines)

170610-170929: MH, IH, VS all logged every 5 minutes IH and MS same start and stop times, VS later start, earlier end

Strdln_Twater_170930-180615_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. Same Start but Different 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 (22159 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
 Data available in *.csv (; separated) files (Gaps –between extraction and redeployment, days)

Data available in *.csv files									
File	Inre Harrsjön		Mellersta Harrsjön		Villasjön		Gaps		
	start	stop	start	stop	start	stop	IH	MH	VS
Strdln_Twater_090611-090828_corr.d	2009-06-11 22:00	2009-08-28 13:40	2009-06-11 22:00	2009-08-28 14:20	NoData	NoData			
Strdln_Twater_090829-091012_corr.d	2009-08-29 13:00	2009-10-12 15:30	2009-08-29 13:00	2009-10-12 16:20	NoData	NoData	0.97	0.94	NaN
Strdln_Twater_091015-100602_corr.d	2009-10-15 17:00	2010-06-02 18:00	2009-10-15 17:00	2010-06-02 18:00	NoData	NoData	3.06	3.03	NaN
Strdln_Twater_100609-100720_corr.d	2010-06-09 21:00	2010-07-20 13:10	2010-06-09 21:00	2010-07-20 12:45	2010-06-09 21:00	2010-07-20 12:10	7.13	7.13	NaN
Strdln_Twater_100721-100828_corr.d	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.d	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.d	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.d	2011-06-11 16:00	2011-10-20 13:05	2011-06-11 16:00	2011-10-20 13:05	2011-06-11 16:00	2011-10-20 13:30	1.09	1.10	2.14
Strdln_Twater_111020-120529_corr.d	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.d	2012-05-30 20:00	2012-09-28 09:00	2012-05-30 20:00	2012-09-28 09:00	2012-05-30 20:00	2012-09-28 09:00	1.11	1.13	1.24
Strdln_Twater_120928-130627_corr.d	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.d	2013-06-20 11:30	2013-09-23 11:15	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.d	2013-09-23 11:30	2014-06-09 16:00	2013-09-23 11:00	2014-06-09 15:30	2013-09-23 16:00	2014-06-09 11:30	0.01	0.01	0.11
Strdln_Twater_140609-140829_corr.d	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.d	2014-08-29 16:30	2014-10-03 14:20	2014-08-29 16:05	2014-10-03 13:20			0.01	0.01	
Strdln_Twater_141003-150520_corr.d	2014-12-06 00:00	2015-06-20 14:37	2014-10-03 17:00	2015-06-20 16:25	2014-11-19 16:00	2015-06-20 11:00	63.4	0.15	81.9
Strdln_Twater_150620-151001_corr.d	2015-06-20 14:55	2015-10-01 13:50	2015-06-20 16:43	2015-10-01 15:38	2015-06-20 11:18	2015-09-18 22:53	0.01	0.01	0.01
Strdln_Twater_151001-160607_corr.d	2015-10-01 16:00	2016-06-07 10:55	2015-10-01 16:00	2016-06-07 13:10	2015-10-01 16:00	2016-06-07 14:55	0.09	0.02	0.02
Strdln_Twater_151001-160607_corr.d	2015-10-01 16:00	2016-06-07 10:55							
Strdln_Twater_160607-161016_corr.d	2016-06-07 11:25	2016-10-16 13:30	2016-06-07 13:30	2016-10-16 15:00	2016-06-07 15:10	2016-10-16 11:25	0.02	0.01	0.01
Strdln_Twater_161016-170316_corr.d	2016-10-16 13:25	2017-03-16 07:05	2016-10-16 14:50	2017-03-16 08:30	2016-10-16 10:50	2017-03-16 04:30	0.00	-0.01	-0.02
Strdln_Twater_170610-170929_corr.d	2017-06-10 19:00	2017-09-29 11:00	2017-06-10 19:00	2017-09-29 11:00	2017-06-21 17:00	2017-09-29 08:15	86.5	86.44	97.5
Strdln_Twater_170930-180615_corr.d	2017-09-29 13:00	2018-06-15 15:30	2017-09-29 18:00	2018-06-15 15:00	2017-09-29 12:00	2018-06-15 10:30	0.08	0.29	0.16
Strdln_Twater_180615-181016_corr.d	2018-06-15 18:00	2018-10-16 15:00	2018-06-15 18:00	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.d	2018-10-18 21:00	2019-06-06 14:15	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.d	2019-06-06 21:00	2019-10-09 13:00	2019-06-06 21:00	2019-10-09 13:15	2019-06-06 21:00	2019-06-06 10:30	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.