Lake Surface Temperature: Physical Limnology Information Sheet

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IISD-ELA Database Fields for Precipitation:

Location ID, Sublocation, Station ID
Measure Date (YYYY-MM-DD), Time
Temperature (^{o}C)
Data Set ID = GC3

General

The IISD-ELA dataset for surface temperature consists of data collected using three different methods, with the longest dataset for Lake 239.

Lake surface temperature is one of several components measured at IISD Experimental Lakes Area, with the record beginning on May 02, 1969 for Lake 239. Surface water temperature is used in hydrometeorological studies for evaporation calculations. In addition to this data set, daily mean values of Lake 239 surface temperatures were recorded on a data logger on an instrument tower installed by Environment Canada from 1969 – 1971. These data can be found in Beaty (1981) Appendix 8, Tables 81-83.

Lake surface temperature data is utilized by a variety of research projects, scientists and graduate students from both within and outside of IISD-ELA. Long term datasets provide understanding of natural variability in our ecosystems and are valuable for studies such as climate change. They have also proven invaluable in the planning of new experiments.

A table of lakes and data collection date ranges for each lake is included below. Additional temperature string data also exist for some lakes, collected by the ELA Fish Crew.

Lake	**Date range**
L114	2000-2021 (hourly)
L224	2000-2021 (hourly)
L226	1997-1998 (hourly)
L227	2008-2015 (hourly)
L239	1969-1997 (daily), 1998-2021 (hourly)
L239 streams (NWIF, NEIF, EIF)	2018-2021 (hourly)
L260	1999-2004, 2017-2021 (hourly)
L302 S	2008 (hourly)
L303	2009 (hourly)
L304	2009 (hourly)
L373	2000 – 2021 (hourly)
L378	2020 – 2021 (hourly)
L442	2000-2019, 2021 (hourly)
L626	2008-2014 (hourly)
L632	1992-1995 (daily)
L658	2001-2009 (hourly)
L979	1992-1993 (daily), 1994 (half-hourly), 1995 (daily), 1997-1998, 2001, 2006 (hourly)

Collection Methods

Lake Surface Temperature Instrumentation

Over the years lake surface temperature has been collected by one of 3 basic methods. Records in the data set are coded with the following codes: VPT (manual thermometer readings), LS1 (floating analog temp logger), and LS2 (floating digital temp logger).

VPT – manual thermometer readings

This method was used from 1969 to 1979. The longer style Hg thermometers were used to take manual readings to the nearest 0.5°C. These measurements were taken manually (Qualifier code A, not sure if measurements were taken at the dock or centre buoy).

LS1 – floating analog temp loggers

This method was used from 1979 to 1988. Peabody Ryan model J thermographs were installed on a floating raft. Daily means were calculated from an average of 4 data points per day from the paper chart record. Accuracy of ±2% or 0.6°C.

LS2 – floating digital temp loggers

From 1989 to 1997 Richard Branker XL-800 temperature loggers were used to provide daily mean temperatures. These loggers have an accuracy of 0.1°C. Daily mean temperatures were assigned a timestamp of 12:00.

From 1998 to 2007 HOBO Onset Optic Stow Away temp loggers were used. These loggers have an accuracy of 0.1°C. Hourly mean temperatures provide a timestamp for each record. Means are from measurements taken from the hour previous to the recorded time (e.g. 08:00 data record is from measurements between 07:00 and 08:00).

From 2008 to 2021 HOBO Water Temp Pro v2 loggers were used. These loggers have an accuracy of 0.2 °C. In addition to the HOBO Water Temp Pro v2 loggers, HOBO MX2201 temperature loggers were deployed in 2019, and have an accuracy of 0.5 °C. In 2021, TinyTag Aquatic 2 TG-4100 temperature loggers were trialed and will replace HOBO loggers going forward. TinyTag Aquatic 2 loggers have an accuracy of 0.5 °C.

These floating digital temp loggers are deployed during the ice-free period. Loggers are attached to the centre buoy and downloaded periodically throughout the season. Depending on the method of attachment, and style of logger, these loggers are situated ~10-15 cm below the lake surface.

Stream and Temperature String Instrumentation

Stream temperature and temperature string data have been collected using HOBO Pendant UA-001 or UA-002 data loggers. These loggers have an accuracy of 0.53 °C.

Temperature loggers in streams have typically been anchored in place using a small weight, and were deployed within easy reach for downloading. No shielding was used to protect loggers from direct sunlight.

References

Beaty K.G. 1981. Hydrometeorological Data for the Experimental Lakes Area, Northwestern Ontario, 1969 through 1978 Part I. Can. Data Rep. Fish. Aquat. Sci. 285: vi + 1-97.