IGB
Leibniz-Institut für Gewässerökologie
und Binnenfischerei

FRESHWATER RESEARCH AND ENVIRONMENTAL DATABASE

Tiefwarensee

Lake Tiefwaren thermistor chain with oxygen

FRED Package 633

In recent years, numerous lakes throughout Germany have been included in a climate impact measurement programme. Long-term climate monitoring that provides continuous series of measurements with high temporal resolution over many years is an essential basis for better understanding the interrelationships in lakes, carrying out trend analyses and developing adaptation strategies from them. In addition to measuring changes, they provide a basis for model-based management scenarios.

Lake Tiefwaren

Lake Tiefwaren is a dimictic meso-eutrophic hardwater lake located on the northeastern perimeter of the town of Waren (Müritz) in the district of Mecklenburgische Seenplatte, MecklenburgVorpommern, Germany (53°31‘40“N 12°41‘30“E). The lake has a maximum depth of 23.6 m, a mean depth of 9.7 m, a surface area of 1.38 km^2 and a volume of 13.41 x 10^6 m^3 (Morphometric data from Umweltministerium M-V, calculation base 2015). The catchment area has a size of 21.9 km^2 and is dominated by agriculture, forests, and gardens in direct vicinity of the lake (Nixdorf et al. 2004). Due to the discharge of communal, agricultural and and industrial sewage waters into the lake, Lake Tiefwaren became more and more hypertrophic in the 1980s. To enhance water quality, $NaAl(OH)_4$ and $Ca(OH)_2$ were introduced into the hypolimnion in the years 2001-2005 to provoke the precipitation of nutrients. After the restoration measure, the phosphorus release from the sediments was almost completely eliminated for several years and the phosphorus concentrations in the water body drastically decreased, while secchi depth increased (Gonsiorczyk et al. 2015).

Measuring chain

The measuring chain consists of a rope that is kept in tension by a weight on the bottom and a pressure-resistant buoy located 1-1.5 m below the water surface. The loggers are attached to the rope at fixed intervals.

The logger depth given indicate the depth below the water surface. Due to the anchoring on the bottom, the distances of the logger from the bottom are always the same, but not when

viewed from the surface. This can cause problems if the water level fluctuates, as it changes the real distance between the logger and the water surface.

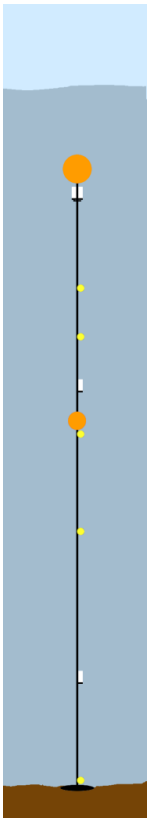


Abb. Scheme of a measurement chain with autonomous loggers

Autonomous datalogger

Between 2001 and 2008, loggers from Hotdog loggres from Elpro-Buchs, Switzerland, were used for the temperature measurements. Since 2020, Tinytag Aquatic 2 TG-4100 underwater data loggers from Gemini Data Loggers, UK, have been used.

MiniDOT data loggers from PME (Precision Measurement Engineering, Inc.) are used for the oxygen measurements. To prevent mussel settlement, the 1 m O_2 logger is covered with copper tape and equipped with a miniWIPER, an autonomous antifouling system, since 2019.

Logger specifications

Parameter	name	accuracy	resolution	max. operating depth	
temperature	Hotdog DT1, Elpro-Buchs, Switzerland	± 0.21 K	0.1 °C	10m**	
temperature	Tinytag Aquatic 2 TG-4100, Gemini Data Loggers	± 0.5°C according to manufacturer) ± 0.1°C (own experience)*	0.01 °C	500 m	
oxygen and temperature	miniDOT, Precision Measurement Engineering (PME)	according to manufacturer ± 5% ± 0.3 mg/l ± 0.1°C	0.01 mg/L 0.01 °C	100 m	

*only loggers with an accuracy of ± 0.03°C are used
** used shrink-wrapped up to 70 m

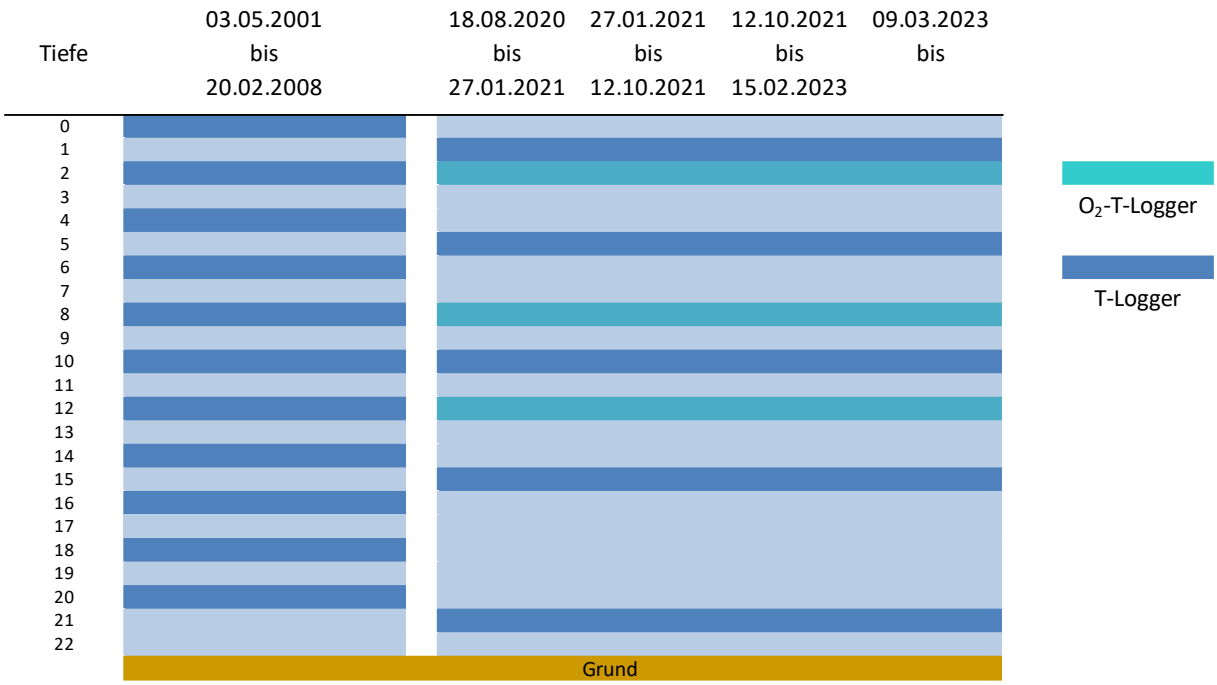
Data

Time span 2001-05-03 to 2008-02-20, 2020-08-18 ongoing

Intervall 60 min. (2001 to 2008), 30 min since 2020

The temperature data are stored as individual csv files in the IGB Cloud Nimbus, the O2 data as txt files.

Logger depth distribution 2001 to 2023



Contact

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Data origin:	IGB Neuglobsow und IGB Berlin

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References

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Nixdorf B, Hemm M, Hoffmann A, Richter P. 2004. "Tiefwarensee", Dokumentation von Zustand und Entwicklung der wichtigsten Seen Deutschlands. Teil 2 Mecklenburg-Vorpommern. Umweltbundesamt. UBA-Bericht Forschungsbericht 29924274, UBA-FB 000511, p. 287.

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