



## FRESHWATER RESEARCH AND ENVIRONMENTAL DATABASE

# Laacher See

## LAA temperature and oxygen chain

### FRED Package 586

*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.*

### 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.

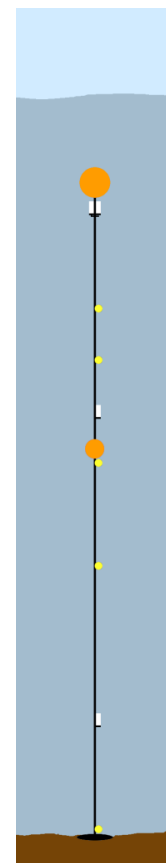
### Information about the depth values of the loggers

The logger depths given indicate the depth below the water surface. Due to the anchoring on the bottom, the distances of the loggers from the bottom are always the same, but not when viewed from the surface. This can cause problems when the water level fluctuates, because this changes the distance of the loggers from the water surface.

### Autonomous datalogger




Tinytag Aquatic 2 TG-4100 underwater data loggers from Gemini Data Loggers, UK, are used for the temperature measurements.

MiniDOT data loggers from PME (Precision Measurement Engineering, Inc.) are used for the oxygen measurements. To prevent mussel settlement, the 1 m O<sub>2</sub> logger is covered with copper tape and equipped with a miniWIPER, an autonomous antifouling system, since 2021.



From Feb. 2018 to May 2020, d-opto loggers from zebra-Tech Ltd, NZ, were used for the oxygen measurements. Especially the measurements in the epilimnion are strongly influenced by biofouling.

### Logger specifications

Parameter	name	accuracy	resolution	max. operating depth	
<b>temperature</b>	Tinytag Aquatic 2 TG-4100, Gemini Data Loggers	± 0.5°C according to manufacturer) ± 0.1°C (own experience)	0.01 °C	500 m	
<b>oxygen and temperature</b>	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	
<b>oxygen and temperature 2018-2020</b>	D-Opto Logger, Zebra-Tech, LTD, NZ	according to manufacturer ± 1% ± 0.02 mg/l ± 0.1°C	0.001 mg/L 0.01 °C	30 m	

### Logger depth distribution 2016 bis 2022



## Data

Time span 24.08.2015 ongoing (gap 24.03. to 13.04.2016)

Intervall first 60 min., then 30 min.

The data are stored as individual txt and csv files in the IGB Cloud Nimbus.

Ordner:	20160622_LAA_data						
Datei	Logger	Parameter	Logger-Nr.	Tiefe (m)	Messintervall	Messzeitraum	Bemerkungen
Cat1185_1m.txt	miniDot RS232	O2 + T	6881-1185	1	60	24.08.2016 - 22.06.2017	nur miniDot ausgelesen, Tinytag weiter bis 10.04.2017
Cat1101_40m.txt	miniDot RS232	O2 + T	6881-1101	40	60	24.08.2016 - 22.06.2017	24.03.2016- 13.04.2016: Kette an Land
Ordner	20170410_LAA_data						
Datei	Logger	Parameter	Logger-Nr.	Tiefe (m)	Messintervall	Messzeitraum	Bemerkungen
Cat1311_LAA_1m	miniDot RS232	O2 + T	6881-1311	1	60	22.06.2016 - 10.04.2017	
Cat1325_LAA_40m	miniDot RS232	O2 + T	6881-1325	40	60	24.08.2016 - 10.04.2017	40m wieder nachträglich zugefügt
Cat1322_LAA_45m	miniDot RS232	O2 + T	6881-1322	45	60	22.06.2016 - 10.04.2017	neu in 45m
Tinytag664469_LAA_5m	Tinytag	T	664469	5	60	25.08.2015 - 10.04.2017	
Tinytag656711_LAA_10m	Tinytag	T	656711	10	60	25.08.2015 - 10.04.2017	16.-24.08.2016: Kette verdriftet?
Tinytag632355_LAA_49m	Tinytag	T	632355	49	60	25.08.2015 - 10.04.2017	
Ordner	20180228_LAA_data						
Datei	Logger	Parameter	Logger-Nr.	Tiefe (m)	Messintervall	Messzeitraum	Bemerkungen
Cat7392-186076_LAA_1m	miniDot USB	O2 + T	7392-186076	1	60	10.04.2017 - 28.02.2018	
Cat7392-214312_LAA_40m	miniDot USB	O2 + T	7392-214312	40	60	10.04.2017 - 28.02.2018	
Cat7392-218690_LAA_45m	miniDot USB	O2 + T	7392-218690	45	60	10.04.2017 - 28.02.2018	
Tinytag664469_LAA_5m	Tinytag	T	664469	5	30	10.04.2017 - 28.02.2018	
Tinytag656711_LAA_10m	Tinytag	T	656711	10	30	10.04.2017 - 28.02.2018	
Tinytag632355_LAA_49m	Tinytag	T	632355	49	30	10.04.2017 - 28.02.2018	
Ordner	20190415_LAA_data						
Datei	Logger	Parameter	Logger-Nr.	Tiefe (m)	Messintervall	Messzeitraum	Bemerkungen
d-opto#2897_LAA_1m	d-opto Logger	O2 + T	2897	1		28.02.2018 - 15.04.2019	O2 nicht zu gebrauchen
d-opto#2880_LAA_40m	d-opto Logger	O2 + T	2880	40		28.02.2018 - 15.04.2019	
d-opto#2881_LAA_45m	d-opto Logger	O2 + T	2881	45		28.02.2018 - 15.04.2019	
Tinytag580520_LAA_5m	Tinytag	T	580520	5	30	28.02.2018 - 15.04.2019	
Tinytag632359_LAA_10m	Tinytag	T	632359	10	30	28.02.2018 - 15.04.2019	
Tinytag580521_LAA_49m	Tinytag	T	580521	49	30	28.02.2018 - 15.04.2019	
Ordner	20200528_LAA_data						
Datei	Logger	Parameter	Logger-Nr.	Tiefe (m)	Messintervall	Messzeitraum	Bemerkungen
d-opto#2871_LAA_1m	d-opto Logger	O2 + T	2871	1	60	19.04.2019 - 21.09.2019	
d-opto#2880_LAA_40m	d-opto Logger	O2 + T	2880	40	60	15.04.2019 - 26.02.2020	
d-opto#2876_LAA_45m	d-opto Logger	O2 + T	2876	45	60	15.04.2019 - 28.04.2020	
Tinytag589398_LAA_5m	Tinytag	T	589398	5	30	15.04.2019 - 28.05.2020	
Tinytag58045_LAA_10m	Tinytag	T	658045	10	30	15.04.2019 - 28.05.2020	
Tinytag656712_LAA_20m	Tinytag	T	656712	20	30	15.04.2019 - 28.05.2020	
Tinytag590526_LAA_30m	Tinytag	T	590526	30	30	15.04.2019 - 28.05.2020	
Tinytag58038_LAA_49m	Tinytag	T	658038	49	30	15.04.2019 - 28.05.2020	
Ordner	20210414_LAA_data_miniDot						
Datei	Logger	Parameter	Logger-Nr.	Tiefe (m)	Messintervall	Messzeitraum	Bemerkungen
Cat368086_LAA_2m.TXT	miniDot USB	O2 + T	7450-368086	1	30	28.05.2020 - 14.04.2021	
Cat246451_LAA_40m.TXT	miniDot USB	O2 + T	7450-246451	40	30	28.05.2020 - 14.04.2021	
Cat273186_LAA_45m.TXT	miniDot USB	O2 + T	7450-273186	45	30	28.05.2020 - 14.04.2021	
Ordner	20210615_LAA_data_Tinytag						
Datei	Logger	Parameter	Logger-Nr.	Tiefe (m)	Messintervall	Messzeitraum	Bemerkungen
Tinytag851093_LAA_01m_LfU.csv	Tinytag	T	851093	1	60	28.05.2020 - 15.06.2021	LfU
Tinytag891342_LAA_05m_IGB.csv	Tinytag	T	891342	5	30	28.05.2020 - 15.06.2021	IGB
Tinytag851101_LAA_06m_LfU.csv	Tinytag	T	851101	6	60	28.05.2020 - 15.06.2021	LfU
Tinytag850236_LAA_07m_LfU.csv	Tinytag	T	850236	7	60	28.05.2020 - 15.06.2021	LfU
Tinytag843289_LAA_08m_LfU.csv	Tinytag	T	843289	8	60	28.05.2020 - 15.06.2021	LfU
Tinytag850244_LAA_09m_LfU.csv	Tinytag	T	850244	9	60	28.05.2020 - 15.06.2021	LfU
Tinytag664489_LAA_10m_IGB.csv	Tinytag	T	664489	10	30	28.05.2020 - 15.06.2021	IGB
Tinytag851067_LAA_15m_LfU.csv	Tinytag	T	851067	15	60	28.05.2020 - 15.06.2021	LfU
Tinytag590528_LAA_20m_IGB.csv	Tinytag	T	590528	20	30	28.05.2020 - 15.06.2021	IGB
Tinytag890904_LAA_25m_LfU.csv	Tinytag	T	890904	25	60	28.05.2020 - 15.06.2021	LfU
Tinytag656718_LAA_30m_IGB.csv	Tinytag	T	656718	30	30	28.05.2020 - 15.06.2021	IGB
Tinytag590527_LAA_49m_IGB.csv	Tinytag	T	590527	49	30	28.05.2020 - 15.06.2021	IGB

## Contact

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Data collection: IGB und LfU (Landesamt für Umwelt Rheinland-Pfalz)

Version 2022-04-13