Measuring station at lake Müggelsee

The station

In autum 2001 a floating measuring station was installed about 300 m off the shore of IGB, Müggelseedamm 310. It was a used and rebuilt 20 feet container, based on two floating bodies, each consisting out of 4 floating steel chambers. The station is held by 4 dolphins, which were driven about 17 m deep into the sediment. At that position the water depth amounts to about 5.5 m, which is corresponding to the average depth of lake Müggelsee. The coordinates of the station are: 52.4462°N and 13.6500°E (WGS84).

In August 2019 the old measuring station was replaced by a new one. The new station, almost identical in construction and size is completely made of aluminium. With only a few exceptions the measured parameters and the software remained the same as well. Data processing and power supply were redesigned.

Power supply

The station was equipped with an independent power supply, consisting out of 8 lead acid batteries with a capacity of 6V 330Ah each, 16 solar modules with 115Wp each and a wind generator with a capacity of about 500W. A 3KW current generator is supporting the power supply of the station and can be automatically started by a mini PC in case the board voltage is dropping below 48V.

Since August 2019, at the new measuring station the power supply is carried out by 5 x 2.4KWh LiFePO4 modules. They are installed in the 19" computer rack. The solar modules were replaced by 6 x 315Wp. The emergency power generator is now controlled by the PC measuring programme.

Data collection

The station was equipped with a 19" industrial PC cabinet. At the beginning the PC was running on Windows98, later on WindowsXP. Because of missing drivers a change to Windows7 was not possible until 2013.

The software for the data collection is a programme created by ourselves using LabVIEW. For the collection of data Newport Electronics GmbH AD converters were used during the first years. In 2015 they were replaced by National Instruments converters. They collect the data every second and calculate averages for 5-minute periods. Until 2013 the data were saved in prn files. Since 2013 the data are directly being saved in our data base. Since August 2019 with the start of the new measuring station we use Windows 10. The installation of all sensors and probes is carried out with the National Instruments Measurement & Automation explorer (NI-MAX).

Sensores and probes

For the collection of meteorological data as temperature and air humidity as well as wind direction and intensity two combined sensors from the Thies company are used. The sensors are installed about 5 m above the water surface.

For capturing global radiation data an albedometer CM7B by Kipp&Zonen is used. The sensor is installed at a boom about 2.5 m above the water surface. It can be swivelled, so that the sensor can be cleaned.

For capturing data of light under water two spheric light sensors LI-193 by Li-Cor are used. They are fixed at a boom of about 0.75 cm and 1.25 m water depth and can be taken out for cleaning. Normally, cleaning is done on Mondays when the routine sampling takes place.

A multi parameter sensor YSI6600 is hanging in the stilling well. It measures the temperature, the conductivity, the pH value, oxygen, chlorophyll_a and the turbidity. Since 2004 also the profiles from 0.5 till 5.0 m depth are being measured with this sensor. The measuring takes place every full hour.

In July 2007 the multi parameter sensor was replaced by a newer model YSI6600V2-4.

Since then the measurement of oxygen is carried out with an optical oxygen sensor (ROX). It is more precise and needs less maintenance. With the new sensor model we began the measurement of phycocyanin. All optical sensors have own wipers and thus, are mainly maintenance-free. Nevertheless, in case optical sensors are used, there could be disturbing outliers of data due to algae, fish or leaves. These outliers always lead to increased values. Therefore, when in doubt, minimal values should be used. Since October 2014 two multi parameter sensors are used – one for profile measurement and one for a constant measurement at 1.5 m depth. The profile measurement since then is being carried out every half hour. Since May 2018 the dissolved carbon dioxide is measured at a depth of 1.5 m with a CO2-sensor and the dissolved inorganic carbon (DIC) is calculated with the help of temperature and pH value.

Since August 2019 (new measuring station) two YSI EXO2 multiparameter sensors are used. The meteorological measurement is now carried out additionally with the combined sensor US from the Thies GmbH.

The station in winter

In March 2003, due to ice drift the dolphins were damaged above the sediment and had to be replaced. In this connection the dolphins were additionally equipped with cone-shaped ice deflectors. Thus, the dolphins do not have to be sawed free from ice in winter any more.

Due to the fact that the measuring station would not resist the ice pressure, it is necessary to remove it from the lake before the ice formation starts. During the first years it was drawn to the shipyard at Müggelseedamm 66. Since 2010, in case of icing of the lake it is moored at our own institute's harbour. For the time without the data of the measuring station a multi parameter sensor fixed to a dolphin at a depth of 1.5 m is measuring instantaneous values every hour.

Overview on meteorological parameters

Parameter	unit	Type / manufacturer	resolution (sensor)	accuracy (sensor)	interval [min]	period	hight [m]	Data bank ser.-no.	remarks
air temperature	°C	Pt100, Thies GmbH	0.1	±0.2 K	5	2002-2019	5	156	
		Climatete Sensor US, Thies GmbH	0.1	±0.3 K		2019-20..		484	
wind direction	Grad	Wind vane, Thies GmbH	2.5	2.5°	5	2002-2019	5	156	
		Climatete Sensor US, Thies GmbH	1	±2 °		2019-20..		484	
wind velocity	m/s	cup anemometer, Thies GmbH	0.1	±0.5 m/s	5	2002-2019	5	156	
		Climate Sensor US, Thies GmbH	0.1	±0.3 m/s		2019-20..		484	
gusts	m/s	cup anemometer , Thies GmbH	0.1	±0.5 m/s	5	2002-2019	5	156	
		Climate Sensor US, Thies GmbH	0.1	±3 %		2019-20..		484	
air pressure	hPa	PTB100A, Thies GmbH	0.1	±1.5 hPa	5	2002-2019	5	156	
		Climate Sensor US, Thies GmbH	0.1	±1 hPa		2019-20..		484	
rel. humidity	%	Hygrometer, Thies GmbH	0.1	±2 %	5	2002-2019	5	156	
		Climate Sensor US, Thies GmbH	0.1	±3 %		2019-20..		484	
precipitation	mm	Climate Sensor US, Thies GmbH	0.01		5	2019-20..	5	484	
kind of precipitation	synop	Climate Sensor US, Thies GmbH			5	2019-20..	5	484	Synop table 4680, VuB volume D appendix 6
light intensity	Lux	Climate Sensor US, Thies GmbH	1	±3 %	5	2019-20..	5	483	
global radiation above	W/m²	CM7B, Kipp&Zonen	0.01	±5 %	5	2002-2019	3	156	310 .. 2800nm
		CMA6, Kipp&Zonen		±2 %		2019-20..		483	
global radiation below	W/m²	CM7B, Kipp&Zonen	0.01	±5 %	5	2002-2019	3	156	310 .. 2800nm
		CMA6, Kipp&Zonen		±2 %		2019-20..		483	
global radiation net value	W/m²	calculated	0.01		5	2002-2019	3	156	gr_up - gr_down; global radiation less reflected radiation
						2019-20..		483	
global radiation_0	W/m²	calculated	0.01		5	2002-2019	3	156	calculated for cloudless and Linke-Turbidity = 3; G0 (max. global radiation between cloudless and an atmosphere turbidity at a value of Linke-Turbidity = 3)
						2019-20..		483	
Albedo	%	calculated	0.01		5	2002-2019	3	156	gr_down / gr_up * 100; albedo
						2019-20..		483	
global radiation rel.	%	calculated	0.01		5	2002-2019	3	156	gr_up / gr_0 * 100; cloudlessness in % (GSoben/G0*100)
						2019-20..		483	

Overview on water physical parameters

parameter	unit	Type / manufacturer	resolution (sensor)	acurracy (sensor)	interval [min]	period	hight / depth [m]	data bank ser.-no.	remarks
water temperature	°C	YSI6600V2-4 (6560)	0.01	±0.15 K	5	2001-2019	1.5	320	bis 10.2014 mit stündl. Unterbrechungen
					60 / 30	2004-2019	0.5, .. ,5.0	320	seit 10.2014 30min Intervall
		Xylem EXO2 (599870)	0.001	±0.01 K	5	2019-20..	1.5	485	
					30		0.5, .. ,5.0	486	
conductivity	µS/cm	YSI6600V2-4 (6560)	0.01	±0.5 %	5	2001-2019	1.5	320	until 10.2014 with breaks every hour
					60 / 30	2004-2019	0.5, .. ,5.0	320	since 10.2014 30min interval
		Xylem EXO2 (599870)	0.001	±0.5 %	5	2019-20..	1.5	485	
					30		0.5, .. ,5.0	486	
pH value		YSI6600V2-4 (6579)	0.01	±0.2	5	2001-2019	1.5	320	until 10.2014 with breaks every hour
					60 / 30	2004-2019	0.5, .. ,5.0	320	since 10.2014 30min interval
		Xylem EXO2 (577602)	0.01	±0.2	5	2019-20..	1.5	485	
					30		0.5, .. ,5.0	486	
oxygen rel.	%	YSI6600V2-4 (6562, 6150)	0.1	±1 %	5	2001-2019	1.5	320	since 2007 with optical oxygen sensor
					60 / 30	2004-2019	0.5, .. ,5.0	320	since 10.2014 30min interval
		Xylem EXO2 (599100-01)	0.1	±1 %	5	2019-20..	1.5	485	
					30		0.5, .. ,5.0	486	
oxygen abs.	mg/l	YSI6600V2-4 (6562, 6150)	0.01	±1 %	5	2001-2019	1.5	320	since 2007 with optical oxygen sensor
					60 / 30	2004-2019	0.5, .. ,5.0	320	since 10.2014 30min interval
		Xylem EXO2 (599100-01)	0.01	±1 %	5	2019-20..	1.5	485	
					30		0.5, .. ,5.0	486	
turbidity	NTU	YSI6600V2-4 (6136)	0.1	±2 %	5	2001-2019	1.5	320	until 10.2014 with breaks every hour
					60 / 30	2004-2019	0.5, .. ,5.0	320	since 10.2014 30min interval
		Xylem EXO2 (599101-01)	0.01	±2 %	5	2019-20..	1.5	485	
					30		0.5, .. ,5.0	486	
chlorophyll_a	µg/l	YSI6600V2-4 (6125)	0.1	n.a.	5	2001-2019	1.5	320	until 10.2014 with breaks every hour
					60 / 30	2004-2019	0.5, .. ,5.0	320	since 10.2014 30min interval
		Xylem EXO2 (599102-01)	0.01	n.a.	5	2019-20..	1.5	485	
					30		0.5, .. ,5.0	486	
phycocyanin	RFU	YSI6600V2-4 (6131)	0.1	n.a.	5	2001-2019	1.5	320	
					60 / 30	2004-2019	0.5, .. ,5.0	320	since 10.2014 30min interval
		Xylem EXO2 (599102-01)	0.01	n.a.	5	2019-20..	1.5	485	
					30		0.5, .. ,5.0	486	
CO_2-concentration	mg/l	AMT GmbH	0.01	±0.06 mg/l	5	2018-20..	1.5	461	additionally DIC calculated
PAR	µmol/s/m²	LI-COR LI-193	0.01	±5 %	5	2001-2019	0.75 , 1.25	159	
						2019-20..		483	
attenuation	1/m	calculated	0.01		5	2001-2019	1	159	
						2019-20..		483	

Data of the annual measuring period

2002	
2002-03-26 15:00:00	Start of measurements
2002-05-31 12:30:00	The average value of the wind direction was not calculated any more arithmetically, but with the help of angular coordinates and windspeed.
2002-06-01 15:00:00	temperature measuring chain put into operation (10 sensors at every 0.5m)
2002-12-07 15:10:00	End of measurements
2003	
2003-05-26 14:50:00	Start of measurements
2003-12-11 08:55:00	End of measurements
2004	
2004-03-05 14:25:00	Start of measurements
2004-04-01 13:00:00	YSI profile measuring put into operation for the first time
2004-11-15 13:35:00	End of measurements
2005	
2005-04-13 12:35:00	Start of measurements
2005-04-14 15:45:00	start of YSI profile measuring
2005-10-20 11:00:00	End of measurements
2006	
2006-04-12 16:20:00	Start of measurements
2006-12-12 11:10:00	End of measurements
2007	
2007-03-27 14:55:00	Start of measurements
2007-04-19 14:50:00	YSI sensor put into operation
2007-07-20 16:10:00	YSI sensor replaced by YSI6600V2-4 (with optical oxygen sensor and phycocyanin)
2007-11-26 11:45:00	End of measurements
2008	
2008-03-07 11:55:00	Start of measurements
2008-12-08 15:00:00	End of measurements
2009	
2009-03-20 11:30:00	Start of measurements
2009-12-17 07:00:00	End of measurements
2010	
2010-04-07 11:36:00	Start of measurements
2010-11-30 16:00:00	End of measurements
2011	
2011-03-15 15:00:00	Start of measurements
2012-01-24 14:40:00	End of measurements
2012	
2012-02-29 11:20:00	Start of measurements
2012-12-08 10:11:00	End of measurements
2013	
2013-03-06 17:10:00	Start of measurements

2013-03-08 16:34:06	YSI sensor put into operation
2013-03-11 11:18:56	end of profile measurement due to frost
2013-06-05 12:00:00	measurements with new software, storage of data directly in the data base
2014-01-22 10:41:25	End of measurements
2014-2015	
2014-02-18 12:05:00	Start of measurements
2014-10-08 17:00:00	from here with two YSI sensors, profile measurements now every 30 min
2016-01-05 11:11:23	End of measurements
2016	
2016-03-02 10:30:00	Start of measurements
2017-01-06 09:50:36	End of measurements
2017	
2017-03-06 13:15:00	Start of measurements
2018-02-06 11:22:23	End of measurements
2018-2019	
2018-03-23 11:39:35	Start of measurements
2018-03-27 13:00:00	profile measurement (SN.164) from here with YSI EXO2 sensor
2018-05-25 11:55:44	CO2-Sonde in Betrieb genommen (Serie-Nr. 461)
2019-08-30 10:00:00	End of measurements with the old measuring station
2019-2021	
2019-08-30 13:40:00	Start of measurements with new station IR radiation sensor (SN.483) and measurement of precipitation as supplement (SN.484) for continuous measurement in 1.5m (SN.485) and profile measurement (SN.486) with YSI EXO2 sensors
2020-03-06 13:57:54	Meteorologiesche Sensoren der alten Station wieder in Betrieb genommen (SN 156)
2020-07-21 17:00:00	Ultraschallsensor für Oberflächen-Wellen in Betrieb (SN 540)

Raw data and measurement methods

Name and content of the data files:

ext-*yymm*[m,h,d][min,max].prn	attenuation coefficient (calculated)
ms-*yymm*[m,h,d][min,max].prn	
gs-*yymm*[m,h,d][min,max].prn	Global radiation
ysi1-*yymm*[m,h,d][min,max].prn	multiparameter sensor YSI6600
YSI-AutoLog-*yymm*.prn	hourly data of the sensor (all-year values)
YSI-dolphi-*yymm*.prn	
Kommentar-*yy*.txt	remarks
batterie*yymm*.prn	
bde-*yymm*h.prn	weather data from the roof of MSD310
bde-gs-*yymm*h.prn	
YSI-dolphin-*yymm*.prn	YSI data in winter at the dolphin (hourly instantaneous values)

Abbriviations in the file name:

yy	year (2-digit from 2000)
mm	month (01..12)
m	5 min average
h	average of the hour (average from the 5 min averages)
d	daily average (average from the averages of the hour)
mmax	max. 5 min value
mmin	min. 5 min value
hmax	max. hourly value
hmin	min. hourly value
dmax	max. daily value
dmin	max. daily value

All values are **averages**! The scanning frequency of the sensor der Sonden is 1 s.

ext-*yymm*[m,h,d][min,max].prn

column	name	unit	resolution	accuracy
1	date/time			
2	attenuation coefficients (0.8 – 1.3m)	1/m	0.01	

ms-*yymm*[m,h,d][min,max].prn

column	name	unit	resolution	accuracy
1	date/time			
2	wind direction	°		
3	wind velocity	m/s		
4	global radiation from above	W/m²		
5	global radiation from below	W/m²		
6	light (PAR) in 80 cm depth	µmol/s		
7	light (PAR) in 130 cm depth	µmol/s		
8	air pressure	mbar		
9	relative humidity	%		
10	air temperature	°C		
11	water temperature (0.5m)	°C		
12	water temperature(1.0m)	°C		
13	water temperature (1.5m)	°C		
14	water temperature (2.0m)	°C		
15	water temperature (2.5m)	°C		
16	water temperature (3.0m)	°C		
17	water temperature (3.5m)	°C		

18	water temperature (4.0m)	°C		
19	water temperature (4.5m)	°C		
20	water temperature (5.0m)	°C		

gs-*yymm*[m,h,d][min,max].prn

column	name	unit	resolution	accuracy
1	date/time			
2	global radiation (above)	W/m²		
3	global radiation (below)	W/m²		
4	net global radiation (above-below)	W/m²		
5	G0 (max. global radiation between cloudless and atmosphere turbidity at a value of Linke-Turbidity = 3)	W/m²		
6	Albedo (GSunten/GSoben*100)	%		
7	cloudless (GSoben/G0*100)	%		

ysi1-*yymm*[m,h,d][min,max].prn

column	name	unit	resolution	accuracy
1	date/time			
2	water temperature	°C		
3	conductivity	µS/cm		
4	rel. Oxygen saturation	%		
5	absolute oxygen content	mg/l		
6	Condition of the oxygen sensor (25…75 = ok)			
7	depth	m		
8		pH		
9	turbity	NTU		
10	Chla	µg/l		
11	voltage	V		

Sources of error and corrections made

The measuring of the turbidity and of the Chla content is very much disturbed by amphipods (gammarus) and fish. These disturbances always lead to higher values. Therefore, when in doubt, only median or minimum values should be used.

The YSI-autoLog-file contains the hourly values for the following parameters (measured by the YSI1 sensor): temperature, specific conductivity, oxygen saturation, concentration of oxygen, depth, pH value, disturbity and Chl_a. In winter the sensor is hanging below the ice.

In the comments (kommentar.txt) most of the possible sources of error (because of cleaning the sensor etc.) are listed, as well as other sources of error, which were taken into account during the check of data so far.

Data recording until 2013

The raw data are available in the files of the different years as 5-minute-averages, hourly average, daily average. The 5-minute-averages are calculated from values taken at a scanning frequency of 1 second. Attention should be paid to the fact that there might occur some gaps in the measurement series, for instance because of short-term failure of a sensor. Checking the minima and maxima regarding on outliers of the data can give hints to failures in measurements. In the raw data the hourly averages were calculated from the 5-minutes averages, the daily averages from the hourly averages. The largest source of error could be a restart of the computer, because the values for the averages will get lost. Restarts of the computer are documented only sporadically. The problem of the incorrect calculation of averages at a necessary restart of the computer applies also to the data of the weather station.

Adjustments of parameters between 2002-2006 (listed for the different variables)

1) wind velocity:
- until 27.7.2003 some problems occurred, since then everything is ok; the values before that time should be checked on extreme wind velocities (too high values at very low wind velocity)
- quality check: max und min from the 5-minutes-averages are good indicators for outliers in the data and other problems!
- the wind velocity data increased by 8%, because the data are measured now at 10m instead of 4m (see Wilhelm et al. 2006 – only data June-August 2002)

2) air pressure:
- the air pressure is always related to the sea level and the measuring device has a failure of +- 1hPa, which is relatively much
- problems with the air pressure were retrospectively adjusted by Thomas Hintze

3) global radiation:
Due to a too small calibration value we had some problems with the measurement of the global radiation until November 2004. The maximum of the measured GR was too low (764 W m^{-2}). In the files gs* and bde_gs* this was retrospectively adjusted. The original values are still in the ms* files. The global radiation of the station was adjusted by the factor 1.308 (for Wilhelm et al. 2006).

4) PAR (measured in 0.75 m and 1.25 m depth)
At the beginning the sensors for the PAR measurement were calibrated not in the correct way. Later on the values were newly calculated with the help of adjustment factors. For the verification the PAR at the water surface was calculated with an extinction coefficient and measured values at a depth of 0.75m. These values were then compared with the measured global radiation. This way, we received partly differing correction factors:

year	Based on calibration values		Based on data comparison	
	above	below	above	below
2003	1.34	1.25	1.11	1.11
2004	1.23	1.24	1.25	1.25
since 2005	2.5	2.5	2.76	2.76

5) air humidity:
The values on air humidity from measured at the station are lower than those from the roof of the building at MSD 310 and never reached values near 100%. The default setting had not been correct since 2002. However, this should have produced failures only in case of very low air humidity. The data were not adjusted retrospectively. The measuring accuracy amounts to +-2%.

6) precipitation:
Value for an hour and measured at the roof of MSD 310

Additional comments for the individual years

2002

Light sensor has always to be cleaned

12.6. YSI was installed, newly calibrated and cleaned - Chl and Trübung were not correct before that, may be conductivity (MS) as well

Oxygen sensor not reacts properly sometimes

Time values are behind sometimes!

2004

Much more problems with the oxygen sensor than ever – values of September and October are useless.

2007

In August 2007 Clark oxygen sensor replaced by optical oxygen sensor. From now on values are reliable.

2008

In August 2008 the coating of the oxygen sensor came away. Values for oxygen for August are not reliable.

2009

2009-11-11 15:41:48	chlorophyll-sensor was replaced, was repeatedly negative (ca. -4.1)

2010

2010-04-13 10:58:00	temperature/turbidity sensor at YSI-sensor replaced, was defect.

2011

2011-05-11 11:57:11	station was not working for 1 week (PC defect)
2011-05-30 13:58:58	PAR boom was torn off. Values are fluctuating very much!
2011-06-21 09:42:00	LiCor cleaned, was very much overgrown, that is why the last data were deleted.
2011-06-28 10:40:21	LiCor cleaned, was very much overgrown (2 days deleted). Computer has made a restart.

2012

2012-09-21 14:44:35	Charge controller defect (batteries were overcharged!!!)
2012-11-26 09:49:11	YSI sensor had stopped at 2.50m.

2013

2013-03-08 16:34:06	YSI sensor was set into operation again. New pH sensor (12G)
2013-05-14 17:25:21	YSI cable defect - was replaced.
2013-06-08 11:00:00	Restart of the PC, power failure in the night (again battery charge controller??!)
2013-07-08 11:46:37	LiCor cleaned. Between June 21st and now the depth of the sensors was by 15cm too high. (damage caused by storm)
2013-07-09 08:02:20	LiCor deactivated – someone had taken out the sensors out of the water.
2013-07-09 09:16:16	PAR values are wrong between 08.07.2013 14:50 and now!
2013-10-29 12:26:20	PAR2 (below) has negative values, was deactivated.
2013-10-29 14:20:59	LiCor2 (below) had a loose contact.
2013-12-27 11:32:17	Water temperature YSI sensor ca. 2°C too low!!! – Was meanwhile adjusted in the data base

2014

2014-03-10 15:41:59	LiCor PAR2 had negative values (was deactivated)
2014-05-09 10:59:56	Protective strainer was connected to the conductivity sensor.

2015

2015-05-11 06:53:34	Solar controller was replaced (was burnt through).
2015-05-18 09:29:13	YSI2 replaced
2015-06-04 10:53:03	YSI profiler and YSI2 cleaned, calibrated and replaced
2015-06-10 12:54:44	Conductivity sensor was replaced at YSI-2 (was defect)
2015-06-16 14:03:11	defect solar charge controller replaced (repeated power failure)
2015-08-11 09:39:34	YSI2 shut down for maintenance
2015-08-17 11:43:46	pH sensor of the YSI sensor (profiler) was calibrated, it was appr. 0.25pH too high.
2015-08-31 10:09:41	Protection basket of the conductivity sensor at YSI-2 replaced

2016

2016-03-02 12:00:00	the A/D converter by instruNet were replaced by measuring cards by National Instruments (PCI-6010 and PCI-6220); the software was re-edited
2016-03-07 13:22:17	Wind sensor was cleaned, started only at ca. 2m/s!
2016-05-26 11:08:19	Light temperature in the night increased rapidly about 18.7°C. Reason is not clear. May be the PT100 is defect. At the moment, an adjustment is possible by offset only.
2016-06-22 10:19:34	YSI2 (fixed depth) cleaned. The wiper of the chlorophyll_a sensor was overgrown, that is why the values of the days were too high!
2016-06-27 06:21:10	Sensor for water temperature is too low -> offset 1-25°C
2016-07-19 10:41:48	Temperature/conductivity sensor at YSI2 replaced, the old sensor had an offset of -1.5°K
2016-08-12 11:48:22	Second temperature/humidity sensor set into operation. Configuration at first only according to the data sheet (no comparative measurements carried out).

2017

2017-07-11 09:58:26	YSI2 clened, protection basket of the disturbity sensor replaced (error duing the last days caused by gammarids)
2017-09-21 12:26:40	2. air humidity and air temperature sensor after repair set into operation again. SN:433
2017-11-17 12:13:47	Current transmitter repaired - 2 days no operation!!!

2018

2018-03-27 13:00:00	Profile measurement (SN.164) from here with YSI EXO2 sensor
2018-05-07 13:20:16	Stilling well cleaned from mussel growth
2018-05-25 11:55:44	CO2 sensor put into operation (serial-no. 461)
2018-08-29 13:47:28	YSI2 wiper of the O2 sensor defect. Wiping rubber was replaced.
2018-11-01 12:08:10	Error fixed at the emergency power unit - PC-restart
2018-12-10 11:33:19	Air pressure increased by 2.4hPa – it drifted away during the last days. Reason not yet known.

2019	
2019-03-11 08:29:31	Boom for the PAR sensors were torn off, measurements were stopped.
2019-08-30 14:32:18	New measuring station set into operation – the old one was deactivated!
2019-09-26 10:31:09	PAR sensors were put deeper – so far they were at a depth of 0.5m and 1m; now they are at 0.75m and 1.25m
2019-12-19 13:16:16	pH sensor of the EXO sensors calibrated. Temperature sensor of the EXO2 sensor replaced by a more exact sensor (with protection basket against Gammerus)

2020	
2020-01-06 12:35:29	EXO sensors were replaced – at the profiler sensor the depth sensor is not working since 23.12.2019!
2020-01-06 12:37:14	Offset error at the attenuation (PAR_below), obviously defect on the amplifier board (multi board)
2020-01-09 14:21:55	Ports at the PAR sensors at the multi board were mixed up (now negative factor!)
2020-01-09 14:22:52	at global radiation below, the plug had come off
2020-01-09 14:23:23	Drying agents replaced at both global radiation sensors
2020-01-09 14:24:43	correct sunshield installed at global radiation below (against disturbance at low sun condition)
2020-01-14 08:26:01	Temperature/conductivity sensor replaced at both EXO sensors
2020-02-10 08:32:13	Boom for the PAR sensors were torn off.
2020-02-17 08:23:53	Profiler motor stopped February, 15th
2020-02-28 15:19:04	CO2-Sensor Luft hing seit letzem Sturm im Wasser und ist leider versunken.
2020-03-04 13:27:58	Umstellung der DAQ-Abtastrate auf 10Hz (10 Messungen/sec.) für Wellenmessung.
2020-03-06 13:57:54	Meteorologiesche Sensoren der alten Station wieder in Betrieb genommen (SN 156)
2020-05-27 10:34:57	Clima Sensor US mit Vogelabweiser bestückt. Beeinträchtigung noch unbekannt!
2020-05-28 12:12:17	Drift des alten Luftdrucksensors (-2hPa) korrigiert
2020-05-28 12:13:43	negative Nullwerte bei PAR-Sensoren. Ursache noch nicht geklärt.
2020-07-21 17:00:00	Ultraschallsensor für Oberflächen-Wellen in Betrieb (SN 540)
2020-08-12 10:57:44	Temperatur und Luftfeuchte bei MSD310 durch Neuanschaffung ersetzt.
2020-08-13 10:33:59	CO2-Sensor 18231101 gegen 18141201 getauscht
2021-01-15 18:57:54	Wellensensor abgebaut, wurde beschädigt.
2021-02-15 12:27:07	Wellensensor wieder angebaut. Station noch eingefroren, ca. 10cm Eis