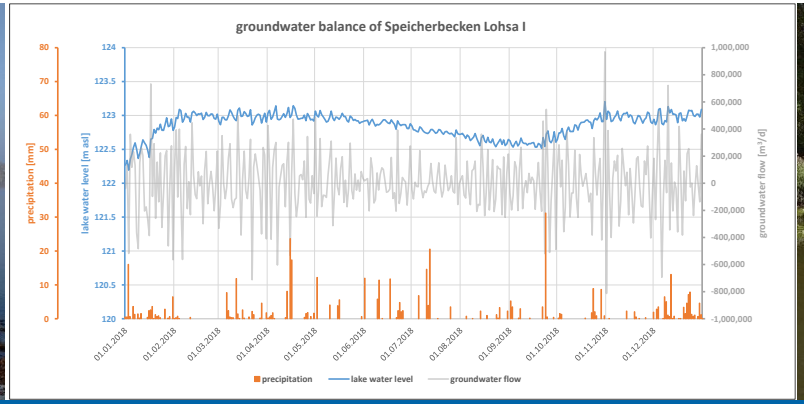
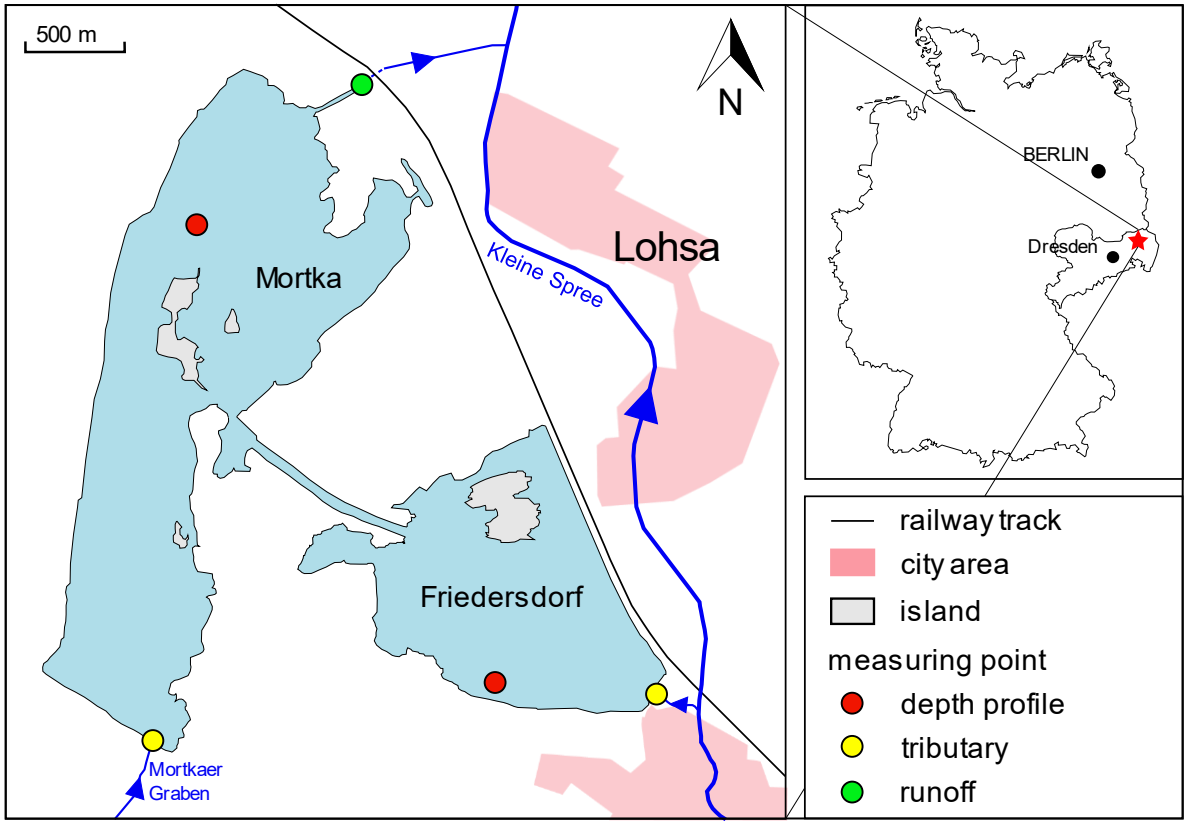
TECHNISCHE UNIVERSITÄT
BERGAKADEMIE FREIBERG
Die Ressourcenuniversität. Seit 1765.

# Influence of climate conditions and lake characteristics on the former lignite mining pit Lohsa I



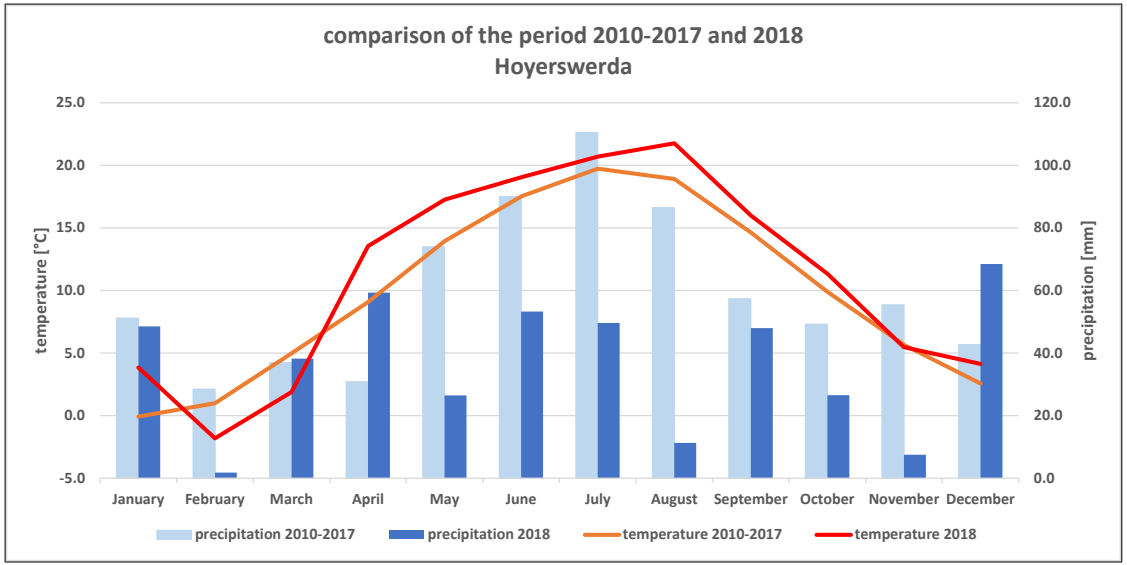

Lisa Jarosch & Traugott Scheytt, TU Bergakademie Freiberg



# Climate situation of 2018

mean annual temperature
2010-2017: 9.8°C
2018: 11.1°C

annual precipitation (corrected)
2010-2017: 712 mm
2018: 438 mm



# Mass death of fish in 2018

- 20 tons of dead fish

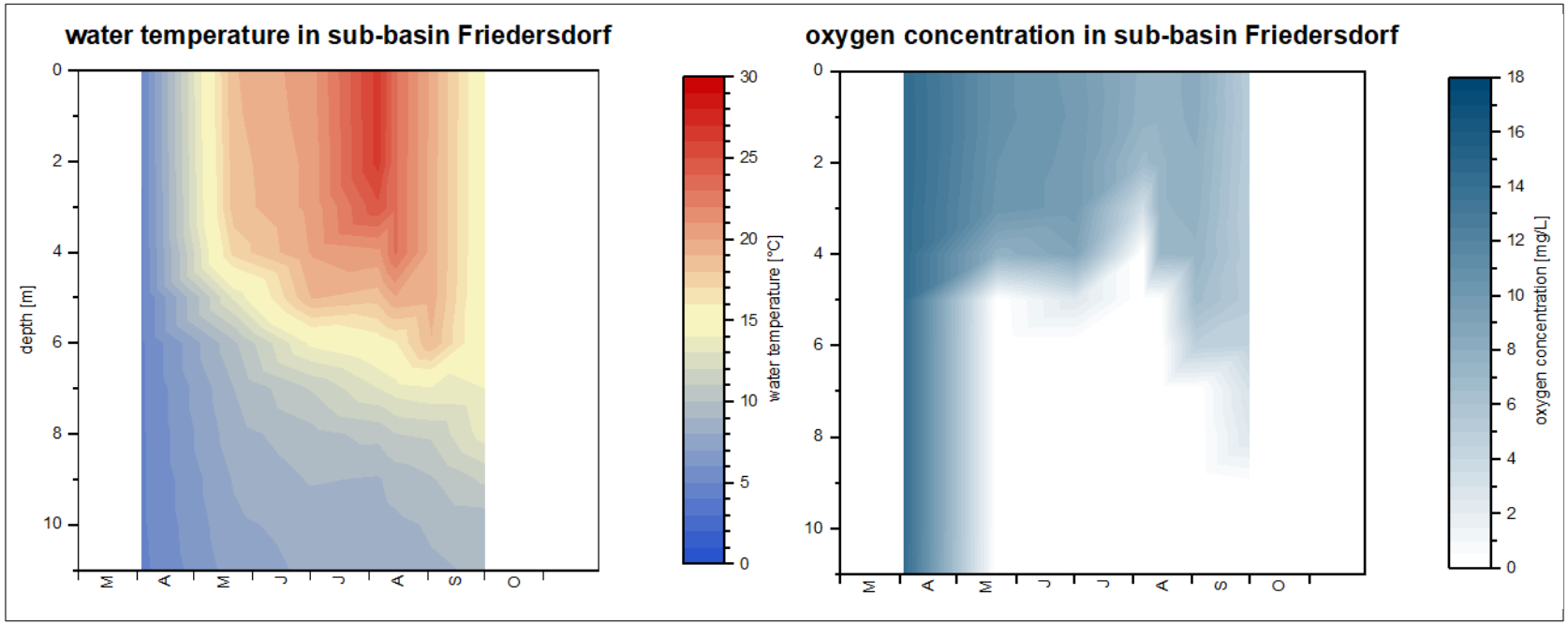
- high water temperatures
- no external water input
- high production of pollen

→ oxygen deficit

source: Dresdner Neueste Nachrichten on 06.08.2018 [26.05.2021; 13:22 Uhr]

- hypolimnion water samples showed a black water colour and the smell of $H_2S$

# Situation 2018



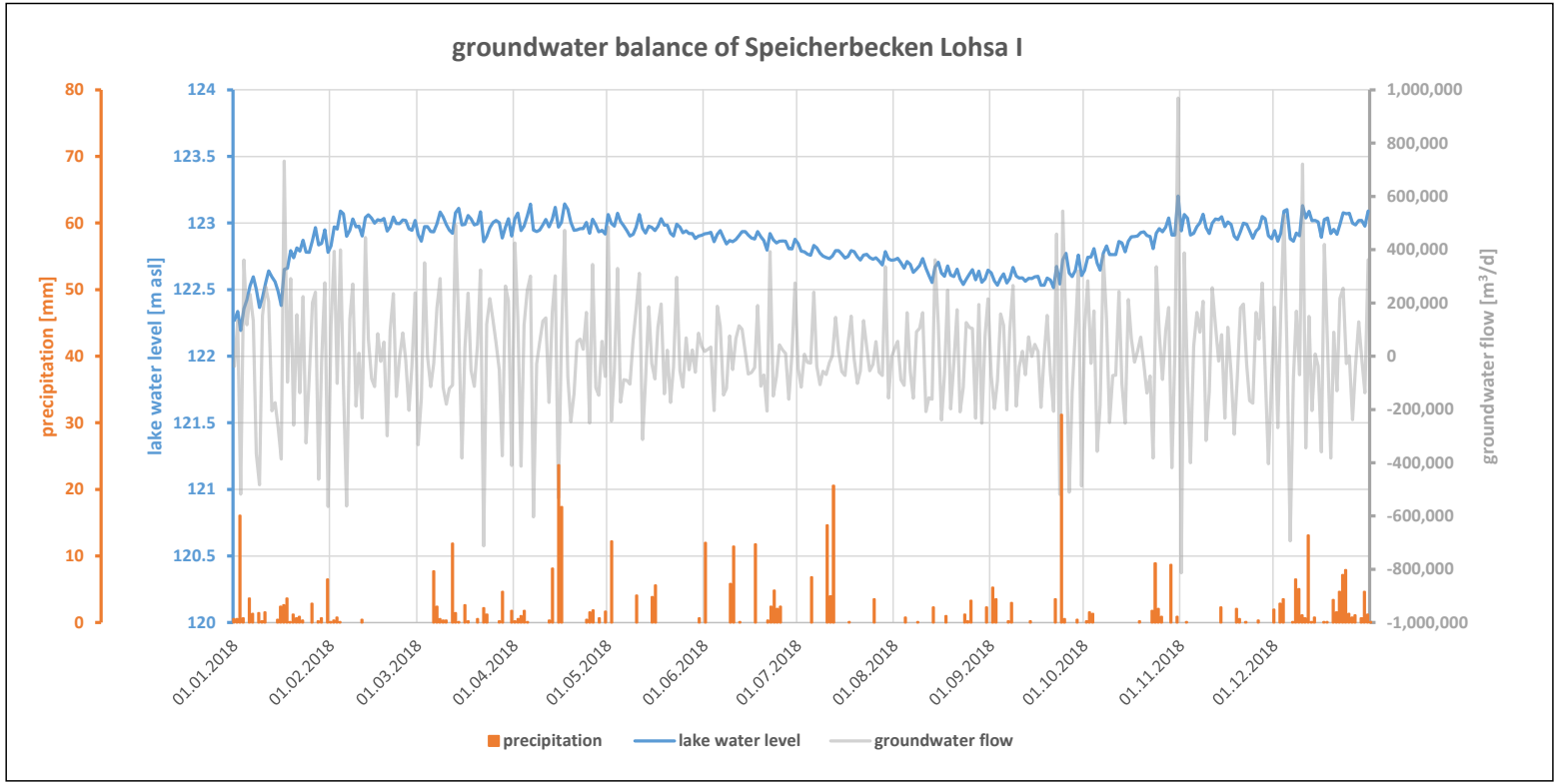
# Calculation of water balance

$$V_{GW} = ETR + V_{out} + \Delta V_{lake} - P - V_{in}$$

| | |
|---|---|
| $V_{GW}$ | volume of groundwater |
| $ETR$ | evapotranspiration |
| $V_{out}$ | runoff volume |
| $\Delta V_{lake}$ | difference in lake volume |
| $P$ | precipitation |
| $V_{in}$ | volume of input |

modelling of ETR with BOWAHALD 17.10a

negative…lake water flows into the aquifer
positive…groundwater flows into the lake

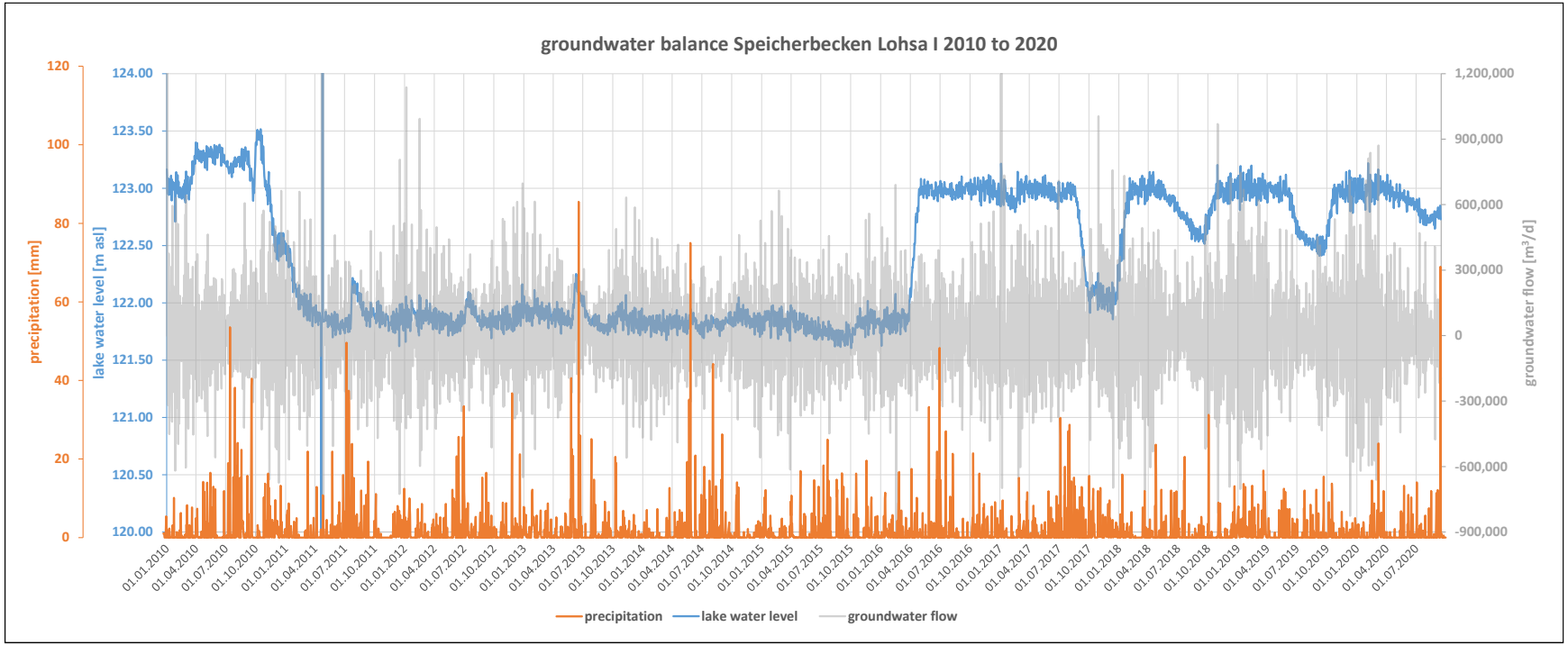


# Groundwater flow

- strong coherence between sea water level, precipitation and groundwater flow
- extremly high daily fluctuations
- 2018
  - sum 696 $m^3$
  - mean 1.91 $m^3/d$

| 2018 | monthly groundwater flow [$m^3 * 10^3$] |
|---|---|
| January | -661.95 |
| February | 520.56 |
| March | -198.64 |
| April | 459.59 |
| May | 484.07 |
| June | 232.31 |
| July | -10.79 |
| August | 63.26 |
| September | -496.07 |
| October | 887.50 |
| November | -1,035.47 |
| December | 451.64 |

negative…lake water flows into the aquifer
positive…groundwater flows into the lake




Europa fördert Sachsen.
Europäische Union

Sharing not permitted

- Lohsa I functions as compensation water body
    - represents changing (barometic) pressure conditions

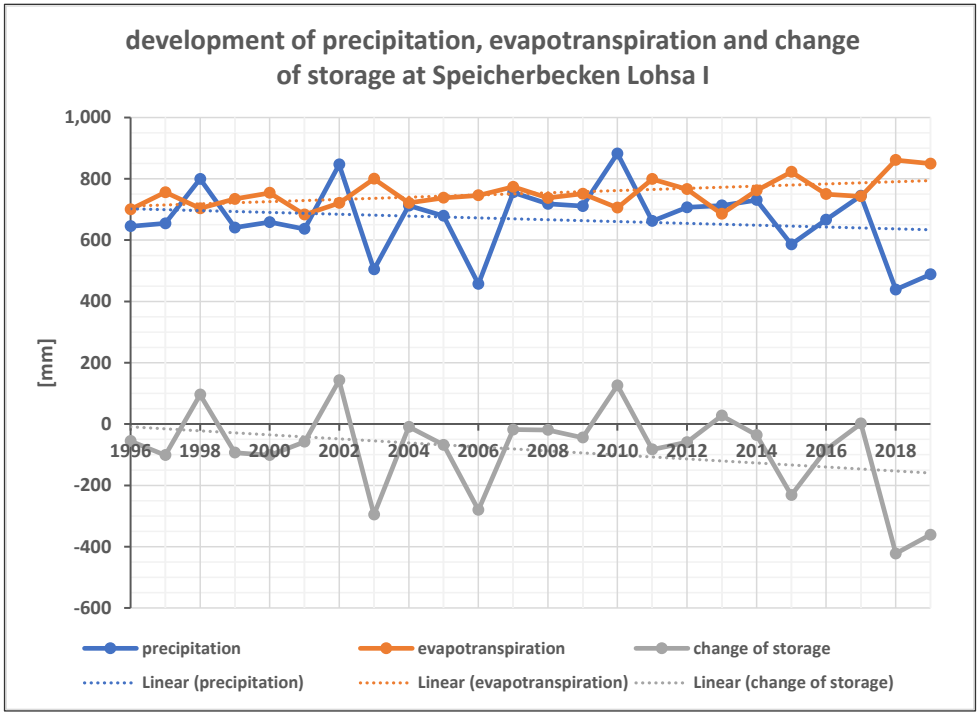
→ groundwater flow mostly overestimated

- groundwater observation wells not usable because they are too far away

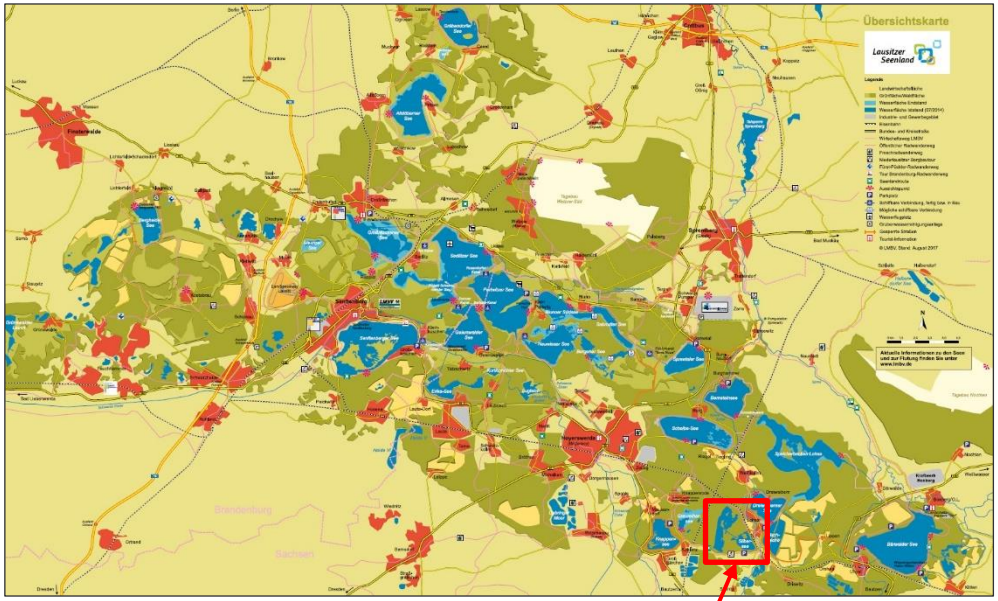
- groundwater flow becomes more deficient within last years

| | groundwater flow [$m^3 * 10^3$] |
|---|---|
| 2010 | 2,653 |
| 2011 | 3,820 |
| 2012 | 3,345 |
| 2013 | 5,557 |
| 2014 | 2,699 |
| 2015 | 1,897 |
| 2016 | 2,169 |
| 2017 | 6,254 |
| 2018 | 696 |
| 2019 | 1,182 |

# Trends in water balance



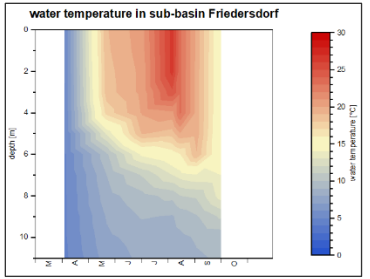
# Lusatian lakes



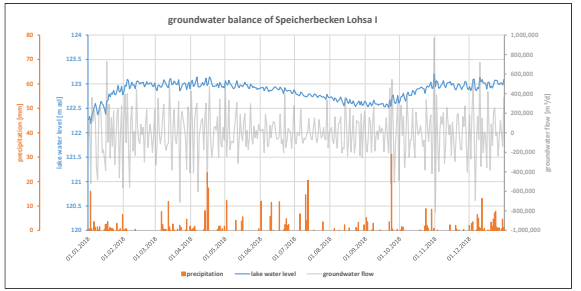

source: https://www.lmbv.de/aufgaben/nachnutzung/tagebauseen/; 14.05.2022; 11:15 a.m.

- more than 20 post open-pit mining lakes
- water area of >14,000 ha
- projection of change of storage: 2018 with
  **- $4.51 \times 10^7$ $m^3$** for the Lusatian lakes
- rethinking about current water management?!

# Summary




- climate conditions affect the reservoir
  - stratification, dissolution of elements from the sediments




- SP Lohsa I is influenced by groundwater
  - decreasing influence of groundwater with last years

- increasing stress for all water reservoirs
  - water management with new challenges

RoBiMo
https://tu-freiberg.de/robimo

tu-freiberg.de

TU Bergakademie Freiberg  bergakademie_freiberg  TUBergakademie  TUBergakademie

## KONTAKT

TU BERGAKADEMIE FREIBERG
Lisa Jarosch
Gustav-Zeuner-Straße 12
09599 Freiberg
Tel. +49(0)3731 39-3309