

Dissolved anions and cations at Lake Stechlin 2000-2020

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Data origin Data were collected by IGB (Ute Beyer).

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Data

Sampling site

Lake Stechlin is a deep, dimictic, formerly oligotrophic clear-water lake that has been undergoing eutrophication since at least the early 2000s and especially since 2010. The lake is located in a nature reserve approximately 80 km north of Berlin, Germany (53°9'5.6"N, 13°1'34.2"E) at 59 m altitude. The lake has a maximum depth of 69.5 m, a mean depth of 23.3 m, a surface area of 4.3 km² and a volume of 96.9 × 10⁶ m³. The lake basin was formed during the last continental glaciation ca. 12,000 years ago and is today situated at the transition between temperate maritime and temperate continental climate (Fraedrich et al. 2001). The catchment has a size of 12.6 km² and is almost completely covered by managed forest (95%). The main species is Scots pine (*Pinus sylvestris*), although beech (*Fagus sylvatica*) is the dominant tree species along the shoreline. Non-forested areas are the site of a former nuclear power plant and a small village (Neuglobsow with about 300 residents but more during the summer tourist season), whose wastewater is diverted to a different catchment. The shoreline is largely undeveloped with no notable infrastructure except on the properties of a fisherman, the Federal German Environment Agency and the Leibniz Institute of Freshwater Ecology and Inland Fisheries. The seepage lake is mainly fed by precipitation and groundwater, resulting in a theoretical water retention time of more than 40 years (Koschel 1995, Holzbecher et al. 1999). There are no river inflows except for occasional discharge from a small stream channel that is dry in most years. The water level of Lake Stechlin is regulated. From 1966 to 1990, the lake received a total of about 300,000 m³ d⁻¹ of cooling water from the nearby nuclear power plant. The cooling water was withdrawn from neighbouring Lake Nehmitz (North

basin) and discharged into Lake Stechlin at an average temperature of approximately 10 °C above the ambient surface water temperature. This resulted in an average increase in water temperature by 1-2 °C during the power plant operation (1966-1990). For more information, see Casper (1985), Koschel and Casper (1986), Casper and Koschel (1995), Koschel and Adams (2003) and Kirillin et al. (2013).

Time span 2000-2020

Sampling method

Samples were taken monthly at the deepest site of the lake (69.5 m) in the main basin (53°9'19.5"N, 13°1'52.9"E), and in 2019 and 2020 additionally in the West basin (53°9'15.1"N, 13°0'30.5"E) and in the South basin (53°8'37.0"N, 13°1'14.9"E). From May to September fortnightly samples have sometimes been taken. The spatial resolution was oriented according to thermal stratification patterns. 2-3 separate samples were taken and afterwards pooled representing the situation of the upper mixed layer (epilimnion). After 2009, another 3-4 samples were collected but not mixed in order to reflect the situation in the deep water (hypolimnion).

Dissolved anions (chloride and sulfate) and cations (sodium, potassium, magnesium and calcium) were determined by ion chromatography using conductivity detection (Dionex Corp., Sunnyvale, USA) following standardized protocols outlined in the user manual. The ion chromatograph was "DX-100" from 2000-2006, "Dionex 1000" from 2007-2018, and "Dionex Aquion" after 2019, as indicated in the data file. All ions were estimated after filtration of the sample through a 0.45 µm membrane. Filtered samples were stored frozen (-20 °C) until analysis.

Parameters

- `date` – date of measurement [YYYY-MM-DD]
- `depth` – depth of measurement [m]
- `Na` – concentration of dissolved sodium (Na⁺) [mg l⁻¹]
- `K` – concentration of dissolved potassium (K⁺) [mg l⁻¹]
- `Mg` – concentration of dissolved magnesium (Mg²⁺) [mg l⁻¹]
- `Ca` – concentration of dissolved calcium (Ca²⁺) [mg l⁻¹]
- `Cl` – concentration of dissolved chloride (Cl⁻) [mg l⁻¹]
- `SO4` – concentration of dissolved sulfate (SO₄²⁻) [mg l⁻¹]
- `device` – measurement device
- `site` – measurement site
- `comment` – comments

References

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Change log

- 2020/2021 Silke R. Schmidt: In the years when the “DX-100” ion chromatograph was used, the measured K concentrations were not covered by the calibration curve and for several records less than zero. These were excluded from the dataset.