Ice observations at Lake Stechlin 1961-1997

Version 2021-11-23

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Data responsibility   Sabine Wollrab

Former data responsibility   Neubert, Deutscher Wetterdienst (DWD), the German Federal Meteorological Service

Data origin   Data were collected and provided by Deutscher Wetterdienst (DWD) (Neubert).

Rights of usage   Access to the data can be requested from the contact person.

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 km^2 and a volume of 96.9 x 10^6 m^3. 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 km^2 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 m^3 d^{-1} of cooling water from the nearby nuclear power plant. The cooling water was withdrawn from

neighbouring Upper Lake Nehmitz 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   1961-1997

Sampling method

From the 1980s onwards, the DWD used paper copies of a schematic map of the lake in which areas of ice and snow cover were marked (Figure 1). These areas were evaluated using a stencil (Figure 2) which was placed over the map of the lake, counting the points over the marked areas. The sum of points yields the percentage of ice and snow cover according to the table in Figure 3. The maps are available as scans. Some contain further information, including ice thickness and comments. The recording method before the 1980s is not documented.

Parameters

- `date` – date of measurement [YYYY-MM-DD]

- `winter` – years of respective winter season [YYYY/YYYY]

- `ice cover` – percentage of the lake area covered with ice [%]

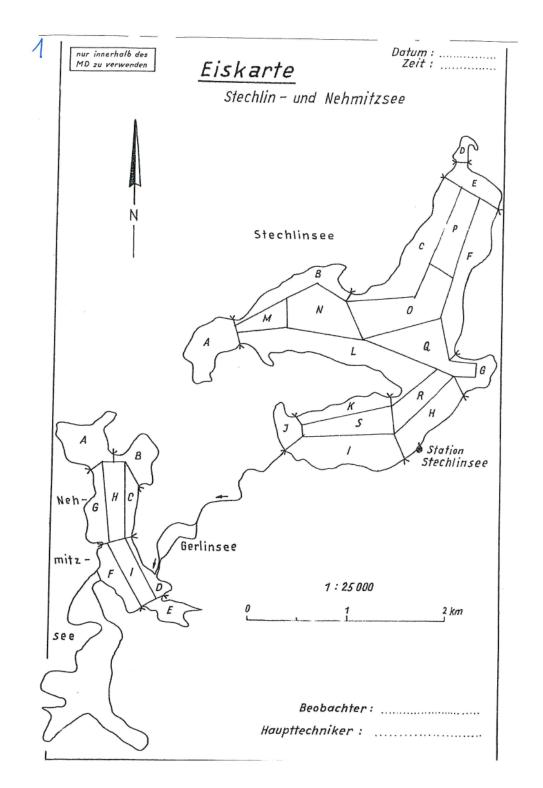- `snow cover` – percentage of the lake area covered with snow on ice [%]

Figure 1: Schematic map of Lakes Stechlin and Nehmitz that served as template to mark areas of ice and snow cover
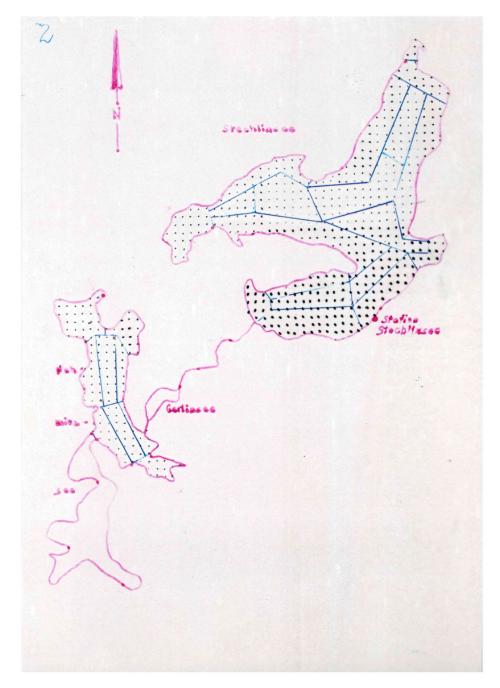
Figure 2: Stencil used to evaluate the number of points of ice-covered and snow-covered areas on Upper Lake Nehmitz and Lake Stechlin

Eisbedeckung (in %) | Punktauszählung

Stechlinsee			Nehmitzsee		
(Zwischenwerte)	Anz. d. Punkte	%	(Zwischenwerte)	Anz. d. Punkte	%
14	28	5		8	5
41.5	55	10	11.5	15	10
69	83	15	19	23	15
97	111	20	26.5	30	20
125	139	25	34	38	25
152.5	166	30	42	46	30
180	194	35	49.5	53	35
208	222	40	57	61	40
235.5	249	45	64.5	68	45
263	277	50	72	76	50
291	305	55	80	84	55
318.5	332	60	87.5	91	60
346	360	65	95	99	65
374	388	70	102.5	106	70
402	416	75	110	114	75
429.5	443	80	118	122	80
457	471	85	125.5	129	85
485	499	90	133	137	90
512.5	526	95	140.5	144	95
540	554	100	148	152	100

Punktzahl auf dem gesamten See ergibt die prozentuale Eisbedeckung!

Figure 3: Original table to evaluate the percentage of ice and snow cover corresponding to the number of points counted on marked areas in the map. Left: Lake Stechlin, right: Upper Lake Nehmitz

References

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Change log

- 2020/2021 Silke R. Schmidt: Ice cover values in the original files were set to 0 when snow cover equalled ice cover. The corresponding ice cover values were set to the same value as the snow cover values to reflect the fact that ice must have been present under the snow.

- 2021-10-27 Silke R. Schmidt: The original file contains temperature values described as "t0Eis = Temperatur in 30 cm Wassertiefe (Information Herr Ulbrich)". These temperature data were recorded irregularly and the values were set to 0 in the original file at times when no measurements were taken. This results in an ambiguity of 0 values in the original file in that they could refer to either a lack of a temperature record or a measured temperature of 0 °C. Furthermore, there is no information about where and how these measurements were made. Given these uncertainties, the values were excluded from the dataset. However, they can be requested from the contact person. Values range from -20 °C to 0 °C.