

Practical calibration of *in situ* chlorophyll fluorometers for humic lakes

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Data description

Data of this study is stored in an .xlsx file named “data_Kuha_et_al_2019”. The file has two separate sheets. Here we describe the contents of the file in detail.

sampling data -sheet:

Column A: *In situ* measurements on the selected lakes were done with two separate sondes (Sondes 1 and 2). Both of them were YSI6600 multiparameter sondes (type V2-4; YSI Inc., Yellow Springs, OH, USA) equipped with chlorophyll (Chl) fluorometers (ex.470/em.650–700nm) without temperature correction. Additionally, Sonde 1 was equipped with Cyclops-7 organic matter (OM) fluorometer (ex.350/em.430 nm; Turner Designs Inc., Sunnyvale, CA, USA).

Columns B-D: Names and WGS coordinates of the study lakes. Coordinates are given as dd°mm’ss.sss’’

Column E: Date when the measurements were done and samples taken as yyyy-mm-dd.

Column F: depth in meters from where water samples were taken. Sampling depth was determined according to the wire attached to a Limnos-tube sampler. Samples were taken with a 4.4 liter Limnos-tube sampler and stored in cool and dark until the analysis within 24-h after the collection.

Column G: Temperature at the sampling depth measured with the YSI6600 sonde deployed at the lake (either Sonde 1 or 2, appointed in the column A)

Column H: Chl *a* ($\mu\text{g l}^{-1}$) means chlorophyll *a* concentration assessed from the water samples. From lakes where Sonde 1 was deployed (column A) Chl *a* was assessed in the laboratory after filtration of 0.5–1.0 liter of sample water through GF/C filters. Chl *a* was assessed using the cold ethanol extraction method and water colour spectrophotometrically. Absorbances of 665 and 750 nm wavelengths were measured with the Shimadzu UV-1800 spectrophotometer (Shimadzu Co., Kyoto, Japan) in five centimeter quartz cuvettes. Analysis was done according to ISO 10260:1992. From lakes where Sonde 2 was deployed Chl *a* samples were filtered onto Whatman GF/F filters and stored in a freezer (-20 °C) until measurements with 1-3 weeks after sampling using a hot ethanol extraction method and spectrophotometer (ISO 10260:1992).

Column I: Untreated chlorophyll concentration yielded by chlorophyll fluorometers as $\mu\text{g l}^{-1}$.

Column J: Relative Fluorescence Unit (RFU) for *in situ* Fluorescent Organic Matter (FOM) yielded by the Cyclops-7 fluorometer. The OM fluorometer was calibrated for water temperature as in Watras *et al.* (2011), for which the temperature coefficient (ρ) of -0.009 was used to transform data to a reference temperature of 20 °C (RFU₂₀).

Column K: Water colour assessed from the water samples expressed as platinum concentration (mg Pt l^{-1}). In the research article this is referred as colour_{Lab}. These values were obtained according to ISO 7887:2011 in the laboratory after filtration of 0.5–1.0 liter of sample water through GF/C filters. Absorbance of 420 nm wavelength was measured with the Shimadzu UV-1800 spectrophotometer (Shimadzu Co., Kyoto, Japan) using one centimeter quartz cuvettes.

Columns L-N: Basic limnological parameters illustrating the general conditions in the studied lakes. Colour_{typical} expressed as mg Pt l^{-1} is referred as colour_{typical} in the research article. Tot-P_{typical} refers to total phosphorus concentration and Chl *a*_{typical} refers to chlorophyll *a* concentration. These values are shown in Table 1 in the research article. For most of the study lakes, these values were available from the database of Finnish Environment Institute (SYKE, http://www.syke.fi/en-US/Open_information). For four of the study lakes (Alinen Rautjärvi, Joutjärvi, Pääjärvi and Työtjärvi) colour_{typical} value was taken from Dolman *et al.* (2015), and it was based on the spectrophotometric analysis from 0.45 μm pre-filtered samples according to ISO 7887: 2011.

Columns O-T: These columns show the chlorophyll *a* concentrations according to the calibration models 1-4 for the data of Sondes 1 and 2. Model equations are given in Table 2a-b in the research article.

Continuous measurement -sheet

To study seasonal variation in Chl and OM, Sonde 1 was continuously deployed in Lake Konnevesi during the open water season in 2013 (June-October). One profile in every three hours at 0.5 meter step was recorded from the 42 m deep water column. Daily averages of Chl and OM from 1.5-2.0 m depth were taken into analysis.

Columns A-B: These are time stamps and corresponding depths from the automatically measured profiles.

Column C: Untreated chlorophyll concentration yielded by chlorophyll fluorometers as $\mu\text{g l}^{-1}$.

Column D: Relative Fluorescence Unit (RFU) for *in situ* Fluorescent Organic Matter (FOM) yielded by the Cyclops-7 fluorometer. The OM fluorometer was calibrated for water temperature as in Watras *et al.* (2011), for which the temperature coefficient (ρ) of -0.009 was used to transform data to a reference temperature of 20 °C (RFU₂₀).

Columns F-J: These columns show the data from columns A-D as daily averages.

Columns J-K: These columns show the chlorophyll *a* concentrations according to the calibration models 1-4 given in Table 2a in the research article.

Columns N-Q: Surface (0-2 m) Chl *a* data from 2013 were collected by the regional environmental agency KES-ELY during the open water period (June-October, n=5, Database of Finnish Environment Institute) and supplemented by our Chl *a* samplings (n=4) from 1 m and 2 m depths with the Limnos sampler analysed according to ISO 10260:1992.

References:

- Dolman et al. 2015. Final report for the project CEN M424 WP6. Development and inter-laboratory comparison to enhance the draft European Standard on water quality – Guidance on quantitative and qualitative sampling of phytoplankton from inland waters based on draft document N118 (2008/04/15).
- ISO 10260:1992. Water quality—measurement of biochemical parameters—spectrometric determination of the chlorophyll—a concentration. International Organization for Standardization, Geneva, Switzerland
- ISO 7887:2011. Water quality— Examination and determination of colour. International Organization for Standardization, Geneva, Switzerland