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Figure S1: Linear regression models for the proxy-to proxy calibration of a) TChl, and b) Bphe (red lines).
The black dots indicate the samples distribution and the dashed lines the 95% confidence intervals of the
regression values (in black) and the predicted values (in green).







Fig. S2: PCA analysis on selected biogeochemical proxies (XRF elements Ti, Ca, Si, Si/Ti, Fe, Mn, Mn/Fe;
LOI/CNS data TOC,TIC,TN, TOC/TN ratio and lithogenic flux; and HSI-TChl, Bphe). The scree plot
indicated thee significant PCs that explain together more than 75% of the total variability. The PCA
analysis combined with the unconstrained clustering on the same dataset defined the four lithotypes A–D
(Fig. 3) indicated with different colors.



15 Fig. S3: Sediment sequence of Lake Jaczno with the description of the lithology, lithotypes and close-up RGB images with their biogeochemical composition.

- 16 Table S1: The results of the permutation test, which assesses the significance of our model by running 999
- 17 free permutations i.e. all units are considered equivalent and fully exchangeable (Borcard et al., 2011;
- 18 Legendre and De Cáceres, 2013).

	Df	Variance	F	Pr(>F)	
RDA1	1	5.2387	13.433	0.001	***
RDA2	1	2.8144	7.2168	0.001	***
RDA3	1	0.7758	1.9893	0.124	
RDA4	1	0.1815	0.4654	0.938	
Residual	41	15.9895			

19 Significant codes: 0 '***'

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21 References

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