



## Site-dependent proxy response to climate change during the last 140 years observed in varved lake sediments in Northern Poland

Florian Ott (1,2), Mateusz Kramkowski (1,3), Sabine Wulf (1,4), Birgit Plessen (1), Johanna Serb (1), Rik Tjallingii (1), Markus Schwab (1), Michał Słowiński (1,3), Dariusz Brykała (1,3), Sebastian Tyszkowski (3), Victoria Putyrskaya (5), Oona Appelt (6), Mirosław Błaszczewicz (3), and Achim Brauer (1)

(1) Helmholtz Centre Potsdam - GFZ German Research Centre for Geosciences, 5.2: Climate Dynamics and Landscape Evolution, Potsdam, Germany (ottflo@gfz-potsdam.de), (2) Max Planck Institute for the Science of Human History, 07745 Jena, Germany, (3) Institute of Geography and Spatial Organization of the Polish Academy of Sciences, Department of Environmental Resources and Geohazards, 87-100 Toruń, Poland, (4) Heidelberg University, Institute of Earth Sciences, 69120 Heidelberg, Germany, (5) Hochschule Ravensburg-Weingarten, University of Applied Sciences, 88250 Weingarten, Germany, (6) Helmholtz Centre Potsdam - GFZ German Research Centre for Geosciences, 4.3 – Chemistry and Physics of Earth Materials, 14473 Potsdam, Germany

This accurate dating and chronological correlation using crypto-tephras provide a powerful way to compare the varved sediment records of the lakes Głęboćzek (JG), Czechowskie (JC) and Jelonek (JEL) (north-central Poland). For the last 140 years, high-resolution varve micro-facies analyses (seasonal layer composition and thickness) and  $\mu$ -XRF element scanning as well as bulk geochemical analyses (TOC,  $\text{CaCO}_3$ ) at sub-decadal to decadal resolution were conducted for all three records. Varve chronologies have been independently established by means of annual layer counting.  $^{137}\text{Cs}$  activity concentration measurements confirmed the varve chronology from JC. The Askja AD1875 tephra has been used to synchronize the records. A comparison of sediment data with monthly temperature data from Koszalin since 1870 and daily temperature data from Chojnice since 1951 revealed different responses of lake deposition to recent temperature change. Varves are well-preserved over the entire 140 years only in the sediments of JG, while in the JC record two faintly varved intervals are intercalated and in JEL two non-varved intervals occur at the base and top of the profile. These differences likely are due to variations in lake characteristics. Climate changes at the demise of the Little Ice Age and the recent warming since the 1980s are expressed in varve micro-facies,  $\text{CaCO}_3$  and TOC contents in the three lakes with different response times and amplitudes. This allows us to discuss the role of local parameters like lake size, bathymetry and water depth in transferring climate change signals into lake sediment records.

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