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Geochemical survey of Lake Balaton sediments: holocene paleoenvironment and paleoclimate

Ivett Pálfi[1], Mihály Pósfai[2], Ferenc Kristály[3], Daniel Veres[4], Fabien Arnaud[5], Zoltán Szalai[1,6], Fruzsina Gresina[1,6], Zoltán Szabó[1], Gabriella Darabos[1], János Korponai[7], György Czuppon[8], Attila Demény[8], and Enikő Magyari[1]

[1]Department of Environmental and Landscape Geography, Eötvöd Loránd University, Hungary (palfiivett@student.elte.hu)
[2]Department of Earth and Environmental Sciences, University of Pannonia, Veszprém, Hungary
[3]Institute of Mineralogy and Geology, University of Miskolc, Miskolc-Egyetemváros, Hungary
[4]Institute of Speleology, Academia Romana Cluj, Cluj-Napoca, Romania
[5]EDYTEM Laboratory of Environment Dynamics and Territories of the Mountain, Université Savoie Mont Blanc, Le Bourget-du-Lac, France
[6]Geographical Institute, Research Centre for Astonomy and Earth Sciences, Budapest, Hungary
[7]Department of Water Supply and Sewerage, National University of Public Service, Baja, Hungary
[8]Institute for Geological and Geochemical Research, Research Centre for Astonomy and Earth Sciences, Budapest, Hungary

In the winter of 2017 three undisturbed sediment cores were retrieved from the Szemes Basin of Lake Balaton. The sediments were sampled for AMS ^{14}C dating and we used 8 of the radiocarbon dates for age-depth modelling. Based on this, the investigated sediment sequence covers the entire Holocene and Late Glacial period and the bottom of the sediment is ca. ~16,000 cal yr BP old. X-ray fluorescence spectrometry (XRF) was used to reconstruct rapid changes in the element content of the lake sediment. The evaluation of the measured results makes it possible to reconstruct the changes in the discharge environment and lake water level that can be related to the climate and human impact. Based on the data, two major evaporation events can be observed at 5500 BP and 8100 BP. These results were also verified by oxygen isotope studies. To reconstruct the energy of the deposition environment, particle size analysis was performed. The obtained results confirmed that river sediments are common at the bottom of Lake Balaton sediments, while biogenic carbonate dominates in the upper, Holocene part of the sediment core. To identify each mineral phase in the sediment, X-ray diffraction (XRD) studies were used to determine the ratio of calcite to Mg-calcite. Based on our XRF measurements, focusing primarily on quantitative changes in magnesium and calcium, transmission electron microscopy (TEM) studies were performed, mainly in the Mg enrichment layer around 8100 BP. The precipitation of biogenic carbonate in Lake Balaton is still taking place, mainly in the form of calcite and Mg-calcite. Their relative proportions strongly depend on the Mg saturation of the water and the substrates on which they are separated. From our results we can draw conclusions about the possible previous deeper phases of the lake and the evaporation conditions of the water. The data obtained from transmission electron microscopy shows a good agreement with the results of the XRF measurement, the proportion of Mg-calcite increases around 8100 BP that likely indicate drier

climatic conditions connectable to the well know 8.2 ka cal BP climatic reversal.