EGU2020-13551
https://doi.org/10.5194/egusphere-egu2020-13551
EGU General Assembly 2020

Reconstruction of paleoenvironmental changes using geochemical data from South Carpathian Mountains

Katalin Hubay[1], Mihály Braun[1], Sándor Harangi[2], Mihály Molnár[1], Krisztina Buczkó[3], and Enikő Magyari[4]

[1]Isotope Climatology and Environmental Research Centre (ICER), Institute for Nuclear Research, H-4026 Debrecen, Bem square 18/C, Hungary (hubay.katalin@atomki.mta.hu)

[2]University of Debrecen, Department of Ecology, Debrecen, Hungary

[3]Department of Botany, Hungarian Natural History Museum, 1088 Budapest, Baross utca 13, Hungary

[4]MTA-MTM-ELTE Paleontological Research Group, 1476 Budapest, Pf.222., Hungary

This study applied bulk sediment geochemistry to reconstruct lateglacial and early Holocene climatic changes in a glacial lakes (Lake Brazi, 1740 m a.s.l. and Lake Lia, 1910 m a.s.l.) in the Retezat Mts. (South Carpathians, Romania). We studied how the changes of chemical element concentration in the sediment can indicate environmental changes, climate variations and human effects. Our aim was to develop analytical methods, which may complement the methodology of routinely applied paleoenvironmental methods and can be used to identify environmental changes in the past and help us reconstruct local and regional processes.

In the Retezat Mts., Southern Carpathians, more than hundred glacial lakes were formed after the last glaciation. These glacial lakes are paleoecologically significant because they are characterized by continuous sedimentation since their origin to the present.

In 2007 and 2008 continuous undisturbed sediment cores were obtained from Lake Brazi and Lake Lia in the Retezat Mts. (Southern Carpathians, Romania) with Livingstone and modified Kullenberg corers. The lowermost part of the sediment cores, covering the period between 9900 and 15 800 cal yr BP, was used for high resolution bulk analysis of major elements (Al_2O_3, SiO_2, TiO_2, CaO, MgO, K_2O, Na_2O, Fe_2O_3 and MnO). Linear discriminant analysis (LDA) was used to compare a priori classified main chemical groups. Subsamples from the core were priory ordered to “warm” and “cold” groups respectively, according to their age and evidence of cold and warm events in the record, as suggested by proxy correlation with the lateglacial event stratigraphy of North Greenland Ice Core Project (NGRIP). The discriminant function was calculated using concentration of major elements after log ratio transformation. Loss-on-ignition and silicon concentration were not used for the discriminant analysis, but regarded as comparison proxies for checking up the validity of outputs.

The calculated discriminant values are good indicators of changes in sediment caused by climate change, as their values give the cold and warm directions. The “a posteriori” groups can be used to determine the period during which local changes differed from the climate changes in the

North Atlantic region. The chemical composition of sediments deposited during the “cold” and “warm” periods shows differences in both sediments. The discriminant scores showed strong correlation with the NGRIP $d^{18}O$ data and with the pollen percentage sum of trees and shrubs.

Discriminant analyses of bulk sediment major oxide chemical data may be a useful tool to identify the impact of climate events upon the nature and composition of materials delivered to a lake basin.

Key words: climate reconstruction, sediment geochemistry, Retezat Mts.