Universitatea
Ştefan cel Mare
Suceava

Editor **Marcel Mîndrescu**

Climate Change in the Carpathian-Balkan Region During Late Pleistocene and Holocene

Book of abstracts

ISSN 2343-7391 GEOREVIEW
ISSN online 2343-7405

Ştefan cel Mare University Press

http://georeview.ro www.usv.ro http://pages-igbp.org http://mri.scnatweb.ch

A 14,000-year diatom oxygen isotope record from the Romanian South Carpathians reflect changes in the seasonal distribution of precipitation and temperature

Magyari Enikő K.[1], Buczkó Krisztina[2], Vennemann T.[3], Kern Zoltán[4], Fórizs I.[4], Demény A.[4], Braun Mihály [5], Veres Dan[6]

[1]HAS-NHMUS Research Group for Paleontology, HU-1476 Budapest, P.O. Box 222, Hungary

[2]Department of Botany, Hungarian Natural History Museum, HU-1476 Budapest, P.O. Box 222, Hungary

[3]Institut de Minéralogie et Géochimie, Université de Lausanne,CH-1015 Lausanne

[4]Institute for Geochemical Research, Hungarian Academy of Sciences,1112 Budapest, Budaörsi út 45

[5]University of Debrecen, Department of Inorganic and Analytical Chemistry, 4010 Debrecen, P.O. Box 21, Hungary

[6]Department of Geology, Babes-Bolyai University and Institute of Speleology, Romanian Academy, Cluj-Napoca, Romania

*Corresponding author: Enikő Magyari. Email: magyari@bot.nhmus.hu.

Oxygen isotope records from lacustrine sediments have the potential to reflect short-term and long-term changes in temperature, seasonal changes in the distribution of precipitation and changes in lake water budget determined by the evaporation to inflow ratio. This proxy has widely been used in the Alps and NW Europe to provide high-resolution temperature or evaporation records, but similar studies in the Carpathians are missing. Here we provide a continuous Lateglacial and Holocene record of diatom silica oxygen isotope changes ($\delta^{18}O_{DIAT}$) in a subalpine lake sediment sequence coming from the northern flank of the Retezat Mts (Taul dintre Brazi, TDB, 1740 m a.s.l.). This through-flow, shallow, high-altitude lake with a surface area of only 0.4 ha has short water residence time, is predominantly fed by snowmelt and to some extent by rainwater. Its $\delta^{18}O_{DIAT}$ record principally reflects the oxygen isotope composition of the winter and spring precipitation as diatom blooms occur mainly in the spring and early summer. Changes in $\delta^{18}O_{DIAT}$ were interpreted by us to reflect past changes in the contribution by winter precipitation. We found low oxygen isotope values (from 27 to 28.5 ‰) during the Lateglacial until 12,300 cal yr BP, followed by a sharp increase. In the Holocene $\delta^{18}O_{DIAT}$ values ranged from 29 to 31 ‰ until 3200 cal yr BP, followed by generally lower values during the Late Holocene (27 to 30 ‰). Short-term decreases in the isotopic values were found at 9000-8500, 8200, 6300-5100, 4400, 4000, 3100-2500 and 2100 cal yr BP. After 1900 cal yr BP $\delta^{18}O_{DIAT}$ values showed a gradual decrease up to the present day. The general trend in the record suggests that contribution by winter precipitation was generally lower between 12300 and 3200 cal yr BP, followed by increased contribution after 3200 cal yr BP. An alternative interpretation of the record is that the higher $\delta^{18}O_{DIAT}$ values in the early and mid Holocene reflect changes in annual mean $\delta^{18}O_P$ and thus indirectly infer higher annual mean temperatures. Short-term decreases in the isotopic values were interpreted to denote episodic increases in the contribution of winter precipitation that can either be achieved by increased snowfall (cold and wet winters) or enhanced seasonality with longer ice-cover season. Our late Holocene decrease in $\delta^{18}O_{DIAT}$ show good agreement with the speleothem $\delta^{18}O$ records from the S Carpathians that also indicate gradual decrease in average regional temperatures after 3200 cal yr BP.

The 8.2 and 4.2 cold events are also prominent in both the speleothem and our $\delta^{18}O_{DIAT}$ records. The first significant decrease in our $\delta^{18}O_{DIAT}$ record occurred between 6300 and 5100 cal yr BP and coincided with a major terrestrial vegetation reorganization (spread of hornbeam at lower altitudes), a local ecosystem productivity decrease as reflected by decreasing sediment organic content, and also with a major diatom floristic change towards the dominance of low pH indicator benthic and tychoplanktonic assemblages. Altogether these data suggest that orbitally-driven solar forcing had a major impact on the terrestrial and aquatic environments: decreasing summer and increasing winter insolations in the second half of the Holocene resulted in a less productive environment in the subalpine belt of the Retezat Mts. Longer and likely wetter winters, however, only prevailed steadily after the 3.3 warm event (also recorded in TDB) as suggested by our depleted $\delta^{18}O_{DIAT}$ values afterwards.